Lake Tahoe Water Quality Investigations

Algal Bioassay • Phytoplankton • Atmospheric Nutrient Deposition • Periphyton •

Annual Report:

July 1, 2011– June 30, 2012

Agreement No. 10-031-160

Submitted to:

State Water Resources Control Board
Lahontan Regional Water Quality Control Board

Submitted by:

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Project Overview

The following document is our Annual Report for work completed July 1, 2011 to June 30, 2012 for Agreement No. 10-031-160: Lake Tahoe Water Quality Investigations by the U.C. Davis – Tahoe Environmental Research Center (TERC).

Under terms of this contract TERC is to provide the SWRCB with water quality research and monitoring at Lake Tahoe to assess the progressive deterioration of the lake. This contract will accomplish the necessary research, monitoring and data collection for addition to the Lake Tahoe Interagency Monitoring Program (LTIMP), the State Water Board and other governmental entities will be provided with the hard scientific data needed to develop planning, management and enforcement strategies which will prevent future degradation of the lake's famous clarity and protect the surrounding watershed and streams.

The objective of this project is to continue monitoring critical ongoing long-term water quality parameters in Lake Tahoe. The primary research and monitoring tasks addressed in this project include:

<u>Algal growth bioassay tests to assess nutrient limitation (Task 3)</u>. The purpose of this task is to determine the nutrient or nutrients which limit phytoplankton growth. These findings have been very important in current efforts toward lake restoration. They have highlighted the need for an expanded erosion control strategy. Bioassays are to be done four times per year using Lake Tahoe water containing natural phytoplankton, collected at the TERC's Index station along the west shore. The bioassay method to be used is described in detail in Hackley et al. (2007). It is similar to that published in Goldman et al. (1993) with the exception that14C uptake is not measured. In these bioassays, water is collected and composited from depths of 2,5,8,11,14,17 and 20m at TERC's Lake Tahoe Index Station following TERC standard protocol for sample collection (Hunter et al., 1993). The water sample is returned to the laboratory where three replicate samples are treated as follows: Control – no nutrient additions; N_{20} (add NH_4NO_3 to a final concentration of approximately 20 µg/l N); P_2 (add ortho-P to a final concentration of approximately 2 µg/l P); P_{10} (10 µg/l P); $N_{20}P_{10}$ (20 µg/l N + 10 µg/l P). Flasks of lake water and treatments are incubated under controlled laboratory conditions. Biomass accumulation over the course of the experiment is measured by *in vivo* fluorescence.

<u>Enumeration and identification of phytoplankton and collection of zooplankton samples for archiving (Task 4)</u>. This task is particularly critical since changes in the biodiversity of the phytoplankton are both indicators of pollution and affect food-chain structure. Implementation of this task allows TERC to determine if new and undesirable species are colonizing the lake. In addition, the size and composition of particles, including phytoplankton cells in the water, have a significant effect on light transmittance, and hence affect the famed clarity of Lake Tahoe. Characterization of phytoplankton dynamics in Lake Tahoe fills a critical knowledge gap, allowing for more informed management decisions. Zooplankton are significant in the food chain structure of the lake. The zooplankton community is composed of both herbivorous species (which feed on phytoplankton) and predatory species (which feed on other zooplankton.)

Samples of both phytoplankton and zooplankton will be collected monthly from the Index and Mid-lake stations. At the Index station monthly phytoplankton samples will include: a 0-105m composite and discreet samples from depths of 5, 20, 40, 60, 75, 90m. At the Mid-lake station monthly phytoplankton samples will include: a 0-100m composite sample and a 150-450m composite. Phytoplankton samples are preserved with an iodine preservative (Lugol's reagent) and counted to the species level when feasible following established TERC protocol (e.g. Hunter et al., 1990; Hunter et al., 1993). Monthly samples of zooplankton will include: a 150m to surface tow at both the Index and Mid-lake stations. Zooplankton samples are preserved with formalin and archived.

<u>Atmospheric deposition of nitrogen and phosphorus (Task 5).</u> The purpose of this task is to provide ongoing information on nutrient loading to the lake via atmospheric deposition. The historical TERC data shows that atmospheric deposition of nitrogen, and to a lesser extent phosphorus, is an important source of nutrients to the lake. Atmospheric deposition also contributes fine particles directly to the lake surface. Atmospheric deposition data from TERC monitoring was utilized in the Tahoe TMDL to help determine estimates of wet deposition loads and to provide additional information on dry loading of nutrients to the lake. Data collected from collectors located on buoys on the lake has proved valuable in providing estimates of N and P loading directly to the lake. Continued collection of atmospheric deposition data is important for updating and applying the Tahoe lake clarity model. Atmospheric deposition monitoring will be continued at TERC's Lower Ward Valley station and on buoys on the lake. Approximately 35 dry bucket samples and 30 wet samples are to be collected over the year at Ward Lake level, 30 dry-bulk samples and approximately 15 snow tube samples are to be collected at the mid-lake station, and approximately 30 dry-bulk samples are to be collected at an additional lake buoy station i.e. TB-4. Samples are to be analyzed for NO_3-N, NH_4-N, TKN, DP and TP.

<u>Monitoring of attached algae or periphyton along the shoreline (Task 6).</u> The purpose of this monitoring is to assess levels of nearshore attached algae (periphyton) growth around the lake. Thick growths of periphyton coat the rocks in the spring in many areas around the lake and bright green filamentous algae occur along portions of the shoreline in the summer. The rate of periphyton growth is an indicator of local nutrient loading and long-term environmental changes. Monitoring trends in periphyton growth is important in assessing local and lake-wide nutrient loading trends. The near shore periphyton can significantly impact the aesthetic, beneficial use of the shore zone in areas where thick growth develops. Nine sites are to be monitored for periphyton biomass a minimum of five times per year. Three of the samplings are to be done between January and June when attached algae growth in the eulittoral zone (0.5m) is greatest; the remaining two samplings are to be done between July – December. Duplicate biomass samples will be taken from natural substrate at each site for a total of 90 samples per year. Biomass is to be reported as chlorophyll *a* and Ash Free Dry Weight (AFDW). Once a year, 39 additional sites will be visited and visual assessment of the level of growth visible near shore (ranking 1-5) will be done.

The additional tasks associated with this project include: project management (Task 1), quality assurance (Task 2), and reporting of data. The summary of % work completed based on a three-year granting period is shown in Table 1.

Table 1. The summary of % work completed (based on a 3 year granting period) for the period July 1, 2011 – June 30, 2012) for each task is listed below:

Task	**% Completion in Quarter** (for full 3 yr granting period)
1 – Project Management	67%
2 – Quality Assurance	67%
3 – Algal Growth Bioassays	67%
4 – Phytoplankton and Zooplankton Analysis	67%
5 – Atmospheric Deposition of Nutrients	67%
6 – Periphyton	67%
7 - Reporting	67%

Task 1. Project Management and Administration

1.1. Project oversight – Entailed sampling coordination, overall project coordination, discussions with staff, assist in data evaluation, interfacing with agency staff, and incorporation of data into other Basin research/monitoring projects.
1.2. Quarterly invoicing – Entails ensuring that contract requirements were met through completion of this quarterly status report and the report was submitted to the SWRCB Project Representative on schedule. Ensure that invoicing is properly carried out.

Task 2. Project Quality Assurance

Standardized QA/QC practices for components were followed as specified in the TRG QA/QC Manual (Janik et al., 1990). For QA/QC applied to periphyton monitoring see "Periphyton Quality Assurance Project Plan" in Hackley et al. (2004). QA/QC procedures for algal bioassays are described in Appendix 7 of Hackley et al. (2007).

A primary objective for the atmospheric deposition quality control samples was to check for potential contamination associated with field monitoring and equipment. Nutrient levels in field blanks were compared with the Method Detection Levels (MDLs) and the source (deionized water) blank sample concentrations to check for levels of contamination. Table 2 presents the results for analyses of atmospheric deposition field quality control samples back to September 30, 2009 and includes any revised or added data since the last report (Hackley et al., 2011). Twelve new QA/QC samples were analyzed during the last year.

Levels of Nitrate nitrogen (NO_3-N) and Ammonium nitrogen (NH_4-N) in QA/QC samples were generally very low. Only two of twelve QA/QC samples NO_3-N levels were slightly elevated (1-2 µg/l) above the Method Detection Level (MDL). Ammonium nitrogen in QA/QC samples was also generally very close to the MDL in QA/QC samples. Three of 12 samples (including one source blank sample) had NH_4-N concentrations slightly above the MDL (1-3 µg/l above the MDL). One ST QA/QC sample (TB-1, 3/15/12 16:00) however, had an elevated NH_4-N concentration of 12 µg/l indicative of NH_4-N contamination. This may have been the result of incomplete cleaning of the ST bag or contamination in the processing equipment or sample bottles. Back through 2009, contamination by NO_3-N or NH_4-N in field blanks has been rare, indicating generally good cleaning and sample processing techniques.

Levels of TKN were found to be elevated in one set of QA/QC samples during the 2011-2012 period. Both the source blank and field blanks collected on 6/21/12 and 6/22/12 had slightly elevated TKN relative to MDL (TKN=40 µg/l). The 6/21/12 source blank TKN concentration was 66 µg/l while the three field blanks run with the same deionized water had TKN's ranging from 60-76 µg/l. The deionized water may have been the source of the contamination on this date (other possible sources include contamination of bottles or contamination during analysis). In a subsequent QA/QC sample prepared 6/28/12 (FBWLLW) TKN was below the MDL indicating that contamination did not persist. Overall, eight of twelve QA/QC, TKN samples were below the MDL. TKN contamination of samples has been infrequent in the past data back to 2009 again indicating good cleaning and processing techniques.

Levels of dissolved inorganic P (SRP) in QA/QC samples were very low to non-measurable, while DP and TP which includes both inorganic + organic P were slightly elevated in most QA/QC samples. Levels of SRP in ten of twelve samples were at or below the MDL. SRP in the remaining two QA/QC samples were only 1 µg/l above the MDL indicating very little SRP contamination typically. On the other hand, QA/QC samples had slightly elevated levels of DP and TP relative to the MDL. Eleven of twelve DP samples (excluding one source blank at the MDL) were elevated to 1-4 µg/l above the MDL and all twelve TP samples were elevated 1-4 µg/l above the MDL. Since DP and TP tended to be similar in the samples, the low level contamination must have been associated with DP. Since most source blanks had slightly elevated DP, the deionized water source, sample bottles or contamination during analysis may be contributing a portion of the low level DP contamination. The sampling and or filtration equipment may be contributing additional low levels of DP for those samples in which the field blank DP was greater than the source blank DP. Since even very slight contamination with DP can significantly affect loading estimates for those samples which have very low concentrations of DP due to atmospheric deposition, additional QA/QC work will be done to try to determine the sources of low level DP contamination.

Table 2. Quality Control samples collected for the atmospheric deposition monitoring September 30, 2009 to June 28, 2012 (shaded and underlined values >MDL).

QC Sample	Date	Type	Vol. liters	NO_3-N (µg/l)	NH_4-N (µg/l)	TKN (µg/l)	SRP (µg/l)	DP (µg/l)	TP (µg/l)	Notes
Source Blk	9/30/09 13:20	Source Blk	-	1	4	6	3	2	2	1
FBWLLW	10/2/09 10:45	Field Blk	0.5	1	5	18	2	3	5	A
FBWLLD	10/1/09 16:40	Field Blk	4.0	3	2	48	1	3	3	2
FBTB1D	10/1/09 16:25	Field Blk	4.0	1	4	8	1	3	3	3
FBTB1ST	10/1/09 15:55	Field Blk	0.5	1	5	1	1	4	3	4
Source Blk	12/29/09 16:50	Source Blk		1	2	13	0	0	2	1
FBWLLD	1/6/10 12:35	Field Blk	4.0	1	2	0	0	2	2	2
FBTB1D	12/30/09 17:45	Field Blk	4.0	1	1	27	1	2	4	3
FBTB1ST	12/30/09 17:30	Field Blk	0.5	1	1	0	0	2	2	4
Source Blk	3/23/10 12:55	Source Blk		1	1	10	0	1	1	1
FBWLLW	3/24/10 13:00	Field Blk	0.5	2	2	34	0	2	1	B
FBWLLD	3/24/10 17:55	Field Blk	4.0	1	1	30	0	2	4	2
FBTB1D	3/24/10 18:15	Field Blk	4.0	2	1	15	1	2	2	3
FBTB1ST	3/24/10 17:45	Field Blk	0.5	2	1	16	1	2	1	4
Source Blk	7/14/10 11:10	Source Blk	-	12	5	29	1	2	6	1
FBWLLD	7/15/10 14:15	Field Blk	4.017	0	26	380	2	3	5	2
FBTB1D	7/15/10 13:50	Field Blk	4.015	1	9	0	1	2	3	3
FBTB1ST	7/15/10 13:30	Field Blk	0.5	1	6	46	2	3	1	4
FBWLLW	7/16/10 10:30	Field Blk	0.5	6	8	34	2	1	5	5
Source Blk	11/15/10 15:15	Source Blk	-	1	2	0	0	2	6	1
FBTB1D	11/16/10 15:00	Field Blk	4.0	1	2	0	0	3	4	3
FBWLLD	11/16/10 16:10	Field Blk	4.0	3	4	30	0	4	4	2
FBWLLW	11/17/10 10:45	Field Blk	0.5	2	3	0	0	4	3	6
Source Blk	11/30/10 15:15	Source Blk	-	2	3	8	0	2	5	1
FBWLLW	11/30/10 15:25	Field Blk	0.5	2	4	26	0	3	3	7
Source Blk	4/13/11 14:25	Source Blk		1	2	8	0	2	2	1
FBWLLD	4/14/11 15:45	Field Blk	4.0	3	3	12	1	5	5	2
FBTB1D	4/14/11 16:00	Field Blk	4.0	2	3	15	1	4	5	3
FBTB1ST	4/14/11 15:25	Field Blk	0.5	2	3	20	1	3	4	4
Source Blk	8/18/11 16:15	Source Blk	-	1	2	0	0	2	3	1
FBTB1D	8/19/11 18:15	Field Blk	4.0	1	3	0	0	3	3	2
FBTB1ST	8/19/11 18:30	Field Blk	0.5	4	3	2	0	3	3	3
Source Blk	3/14/12 14:30	Source Blk	-	1	1	5	0	3	3	1
FBWLLD	3/15/12 16:30	Field Blk	4.0	2	3	0	2	4	3	2
FBTB1D	3/15/12 16:50	Field Blk	4.0	2	4	18	1	3	4	3
FBTB1ST	3/15/12 16:00	Field Blk	0.5	1	12	17	2	4	4	4
Source Blk	6/21/12 16:00	Source Blk		1	4	66	0	4	4	1
FBWLLD	6/22/12 14:05	Field Blk	4.0	3	6	76	1	5	5	2
FBTB1D	6/22/12 13:15	Field Blk	4.0	1	3	63	0	5	5	3
FBTB1ST	6/22/12 13:45	Field Blk	0.5	2	3	60	0	5	5	4
FBWLLW	6/28/12 10:30	Field Blk	0.5	2	2	10	0	6	6	6
MDL				2	3	40	1	2	2	8

Notes

A. Ward Lake Level Wet Field Blank, 0.5 liters deionized water to Wet bucket in Aerochem Metrics sampler, overnight during dry period. Note, significant new land excavation occurring adjacent to station associated with construction of new home, workers trying to minimize dust with water spray, still dust suspension. Potential for impacts on station results.
B. Ward Lake Level Wet Field Blank, 0.5 liters deionized water to Wet bucket in Aerochem Metrics sampler, overnight during dry period.

1. Deionized water system source blank.
2. Ward Lake Level Dry Field Blank, ~4 liters deionized water to sealed Dry bucket for approx. 24 hours.
3. TB-1 Dry-Bulk Field Blank, ~4 liters deionized water to sealed Dry-Bulk bucket for approx. 24 hours.
4. TB-1 Snow Tube (ST) Field Blank, 0.5 liters deionized water to sealed ST for approx. 24 hours.
5. Ward Lake Level Wet Field Blank, 0.5 liters deionized water to Wet bucket in Aerochem Metrics sampler, overnight during dry period. Note, significant construction ongoing at station. Potential for impact on station results.
6. Ward Lake Level Wet Field Blank, 0.5 liters deionized water to Wet bucket in Aerochem Metrics sampler, for approximately 2 days during dry period.
7. Equipment cleaning blank, new intern cleaned bucket, then added 0.5 liters deionized water and processed.
8. MDL = Method Detection Limit

Task 3. Algal Growth Bioassays

The response of Lake Tahoe water to nitrogen (N) and phosphorus (P) enrichment was tested using an algal growth bioassay procedure. In a typical bioassay, lake water is collected from the upper photic zone (0-20 m water was used for these bioassays), pre-filtered through 80 µm mesh netting to remove the larger zooplankton and returned to the lab. The water is distributed among experimental flasks to which small amounts of N (20 µg N/L) or P (at two different levels: 2 µg P/L and 10 µg P/L) or the combination of both N and P are added. One set of flasks is left as a "control" in which no nutrients are added and all treatments are replicated in triplicate. The flasks are then placed in a laboratory incubator under fluorescent lighting at ambient lake temperature and day length, and growth response of phytoplankton is measured over a period of six days. Relative growth was assessed by measuring changes in algal biomass (i.e. fluorescence or chlorophyll *a*). Treatments are "stimulatory" if the mean growth response exceeds the control at the $p \leq 0.05$ level of significance. (See Appendix 7 in the 2004-2007 Final Report (Hackley et al., 2007) for a more detailed description of the bioassay method). The record of bioassays for Lake Tahoe (extending back to the 1960s) has proven extremely useful for evaluating long-term changes. When combined with lake chemistry data and information on atmospheric and watershed nutrient loading ratios, these simple enrichment bioassays allow us to better understand patterns of nutrient limitation in Lake Tahoe.

Summary of Bioassay Results 2011-2012

During July 2011 – June, 2012 four bioassays were done on a schedule of approximately one bioassay every three months. Table 3 (a-d) presents the results for each of the individual bioassays:

Table 3a. Bioassay done using 2,5,8,11,14,17,20m lake water collected 7/11/11.

Treatment	Day 6 Mean Fluorescence	Std. Dev.	n	Day 6 Mean Fluorescence as % of Control	Statistically Signif. ($p \leq .05$) Response =“*”
Control	0.290	0.003	3	100	
N(20)	0.502	0.010	3	173	*
P(2)	0.292	0.003	3	101	
P(10)	0.306	0.008	3	106	
N(20)P(2)	0.841	0.009	3	290	*
N(20)P(10)	1.053	0.025	3	364	*

Note – used Day 5 fluorescence results

Table 3b. Bioassay done using 2,5,8,11,14,17,20m lake water collected 11/16/11.

Treatment	Day 6 Mean Fluorescence	Std. Dev.	n	Day 6 Mean Fluorescence as % of Control	Statistically Signif. ($p \leq .05$) Response =“*”
Control	0.277	0.010	3	100	
N(20)	0.319	0.012	3	115	*
P(2)	0.254	0.003	3	92	
P(10)	0.279	0.028	3	101	
N(20)P(2)	0.380	0.008	3	137	*
N(20)P(10)	0.514	0.011	3	185	*

Table 3c. Bioassay done using 2,5,8,11,14,17,20m lake water collected 1/25/12.

Treatment	Day 6 Mean Fluorescence	Std. Dev.	n	Day 6 Mean Fluorescence as % of Control	Statistically Signif. ($p \leq .05$) Response =“*”
Control	0.469	0.015	3	100	
N(20)	0.458	0.011	3	98	
P(2)	0.590	0.023	3	126	*
P(10)	0.589	0.035	3	126	*
N(20)P(2)	0.627	0.035	3	134	*
N(20)P(10)	0.612	0.019	3	131	*

Table 3d. Bioassay done using 2,5,8,11,14,17,20m lake water collected 4/23/12.

Treatment	Day 6 Mean Fluorescence	Std. Dev.	n	Day 6 Mean Fluorescence as % of Control	Statistically Signif. ($p \leq .05$) Response =“*”
Control	0.530	0.012	3	100	
N(20)	0.580	0.008	3	109	*
P(2)	0.785	0.033	3	148	*
P(10)	0.774	0.012	3	146	*
N(20)P(2)	0.802	0.021	3	151	*
N(20)P(10)	0.772	0.024	3	146	*

As has been the pattern for Lake Tahoe, the response to nutrients varied seasonally. During the summer bioassay done in July 2011, there was a strong response to the N(20) treatment (173% of control) and no significant response to P(2) or P(10) treatments, indicating likely N limitation. The phytoplankton still showed evidence of N limitation in November, 2011 bioassay, however the community may have been closer to colimitation by N and P. During that bioassay, the N(20) alone treatment stimulated growth to 115% of control, while a progressively stronger response was measured to the combination of nitrogen + increasing amounts of phosphorus (i.e. the response to N(20)+P(2) was 137% of control and the response to N(20)+P(10) was 185% of control). The January 2012 bioassay showed the typical pattern of predominant P limitation as P(2) and P(10) treatments increased growth to 126% of control and the combination of N(20)+P(2) or N(20)+P(10) increased growth only slightly more to 131% or 134% respectively. In the April 2012 bioassay, P limitation still appeared to be in force as the P-alone treatments and N+P treatments significantly increased phytoplankton growth to a similar extent (146-151% of control). The N(20) treatment also caused a small but statistically significant increase in growth (109% of control) which may indicate some portion of the community was responding to the addition of N.

Figure 1 summarizes bioassay responses for data collected for completed years 2002-2011. The percent of total number of bioassays with statistically significant increases in growth upon addition of the nutrient(s) is shown, for three periods representing different stages of lake thermal stratification: January to April (generally representing the period of no lake thermal stratification to early onset of stratification); May to September (continued development of stratification to fully stratified); October to December (breakdown of stratification). The presence or absence of stratification has ramifications for distribution of nutrients and phytoplankton in the water column. For instance during periods of stratification, nutrients are generally less likely to be mixed upwards into surface waters to be accessible to the phytoplankton (the exception being some areas prone to upwelling during summer winds). When stratification breaks done, nutrients (and phytoplankton), located below the stratified layer may be mixed upwards in the water column. The 2002-2011 data below in Table 4 was used in preparation of Figure 1.

Some general patterns for apparent nutrient limitation based on the 2002-2011 in Figure 1 are apparent, i.e.:

1) For 2002-2011 bioassays, during the period January – April, P limitation continues to be prevalent and the combination of N+P was stimulatory over 90 percent of the time.

2) During May to September, N limitation was more frequent (47% of bioassays) than P limitation (11% of bioassays). N limitation during this period has occurred every year for the last five years. The combination of N+P always increased growth during this period.

3) During October to December, P limitation occurred in 43% of the bioassays, N limitation occurred in 36% of the bioassays and the combination of N+P always increased growth. Based on the data in Table 4, P limitation was primarily observed in Oct. – Dec. bioassays done 2002-2005, while N limitation was observed during Oct. – Dec. in 5 out of the seven years during 2005-2011.

4) It is very apparent from Figure 1 that the combination of N+P nearly always increased phytoplankton growth. The observation that N+P additions almost always stimulate growth is strong evidence that nutrient load should be controlled as called for as part of the Lake Tahoe TMDL. Decisions on control of nutrient inputs to Lake Tahoe should not be made on the basis of these growth bioassays alone, however. Increased nutrient loading nutrients is also thought to affect the growth of attached algae (periphyton) on hard surfaces in the nearshore. While any future management action to specifically control N or P-loading will use this bioassay response data, these actions will require additional supportive information.

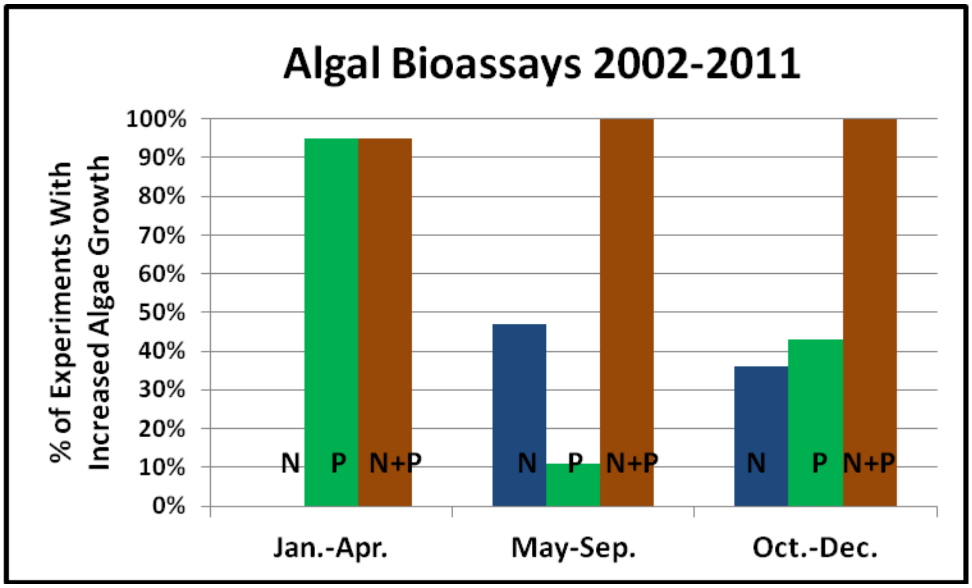

Figure 1. Percentage of bioassays done during 2002-2011 in which N, P or N+P significantly increased phytoplankton growth during periods generally representative of different stages of annual lake thermal stratification, i.e.: Jan.-April (unstratified to onset of stratification period), May – Sept. (stratified period), and Oct. – Dec. (breakdown of stratification).

Table 4. Summary of N and P bioassay treatment responses as % of control done in: (a) 2002, (b) 2003, (c) 2004, (d) 2005, (e) 2006, (f) 2007, (g) 2008, (h) 2009, (i) 2010, (j) 2011, (k) 2012. Treatment responses statistically significantly different from the control at the p≤.05 level are indicated with borders and shading.

(a) 2002 Bioassays

	2/7/02	4/1/02	6/12/02	8/30/02	10/28/02	12/30/02
Control	100	100	100	100	100	100
N20	104	97	101	101	93	101
P2	154	-	-	108	-	116
P10	135	157	104	100	113	110
N20P2	139	-	-	157	151	118
N20P10	138	178	180	231	238	116

(b) 2003 Bioassays

	1/30/03	2/26/03	4/8/03	5/21/03	6/16/03	7/10/03	8/29/03	10/20/03	12/3/03
Control	100	100	100	100	100	100	100	100	100
N20	101	98	102	138	116	141	129	101	107
P2	112	129	168	101	99	100	100	100	98
P10	114	134	181	98	104	106	105	106	104
N20P2	141	136	178	253	248	221	196	187	124
N20P10	159	147	190	264	297	317	280	334	142

(c) 2004 Bioassays

	1/5/04	4/23/04	8/20/04	10/28/04	12/11/04
Control	100	100	100	100	100
N20	100	97	112	104	99
P2	133	112	101	103	134
P10	135	122	112	114	150
N20P2	132	153	210	127	161
N20P10	134	202	248	185	173

(d) 2005 Bioassays

	2/16/05	4/15/05	6/10/05	8/15/05	10/20/05	12/15/05
Control	100	100	100	100	100	100
N20	99	97	109	105	109	113
P2	121	193	99	109	110	102
P10	122	233	105	105	121	108
N20P2	123	214	176	177	143	162
N20P10	127	241	239	258	193	190

(e) 2006 Bioassays

	2/21/06	4/12/06	6/19/06	8/9/06	10/31/06
Control	100	100	100	100	100
N20	98	98	84	117	98
P2	181	155	85	113	100
P10	214	162	91	141	113
N20P2	195	155	153	120	135
N20P10	200	161	253	173	273

(f) 2007 Bioassays

	1/9/07	3/2/07	4/13/07	6/12/07	9/27/07	11/9/07
Control	100	100	100	100	100	100
N20	99	100	97	100	143	114
P2	142	112	131	113	91	104
P10	143	112	136	93	89	108
N20P2	143	120	138	145	202	150
N20P10	146	118	136	176	284	180

(g) 2008 Bioassays

	1/30/08	4/24/08	7/24/08	10/27/08
Control	100	100	100	100
N20	102	99	269	99
P2	123	104	109	102
P10	127	102	105	100
N20P2	124	99	293	124
N20P10	127	102	318	171

(h) 2009 Bioassays

	1/30/09	5/1/09	8/17/09	11/13/09
Control	100	100	100	100
N20	98	100	178	124
P2	140	153	105	103
P10	144	166	109	103
N20P2	154	164	285	160
N20P10	159	182	338	207

(i) 2010 Bioassays

	1/28/10	4/15/10	8/17/10*	11/9/10
Control	100	100	100	100
N20	100	100	142	130
P2	141	152	107	103
P10	144	162	108	103
N20P2	147	164	165	192
N20P10	150	171	172	248

(j) 2011 Bioassays

	1/21/11	5/20/11	7/11/11*	11/16/11
Control	100	100	100	100
N20	103	120	173	115
P2	112	103	101	92
P10	112	98	106	101
N20P2	173	169	290	137
N20P10	192	206	364	185

(k) 2012 Bioassays

	1/25/12	4/23/12
Control	100	100
N20	98	109
P2	126	148
P10	126	146
N20P2	134	151
N20P10	131	146

***- Note, for 8/17/10, 7/11/11 bioassays used Day 5 results. For other bioassays typically use Day 6 results.**

<u>Summary Points for Bioassay Monitoring 2011-2012</u>

1. **Nitrogen added alone was stimulatory in the July 2011 bioassay, while the combination of N+P caused even greater growth. For bioassays done during May to September during 2002-2011, N limitation was more frequent (47% of bioassays) than P limitation (11% of bioassays). N limitation during this period has occurred every year for the last five years. The combination of N+P always increased growth during this period.**

2. **Nitrogen added alone was also stimulatory in the November 2011 bioassay, while the combination of N+P caused even greater growth. For 2002-2011 bioassays, done during October to December, P limitation occurred in 43% of the bioassays, N limitation occurred in 36% of the bioassays and the combination of N+P always**

increased growth. Based on the data in Table 4, P limitation was primarily observed in Oct. – Dec. bioassays done 2002-2005, while N limitation was observed during Oct. – Dec. in 5 out of the seven years during 2005-2011.

3. **Phosphorus added alone was stimulatory in the January and April, 2012 bioassays and the combination of N+P caused nearly the same level of growth. For 2002-2011 bioassays done during the period January – April, P limitation continues to be prevalent and the combination of N+P was stimulatory over 90 percent of the time.**

4. **There was a significant growth response to the combination of N+P in all bioassays (4 of 4 bioassays) in 2011-2012. The combination of N+P has nearly always increased phytoplankton growth in bioassays done 2002-2011. The observation that N+P additions almost always stimulate growth is strong evidence that nutrient load should be controlled as called for as part of the Lake Tahoe TMDL. Decisions on control of nutrient inputs to Lake Tahoe should not be made on the basis of these growth bioassays alone, however. Increased nutrient loading nutrients is also thought to affect the growth of attached algae (periphyton) on hard surfaces in the nearshore. While any future management action to specifically control N or P-loading will use this bioassay response data, these actions will require additional supportive information.**

Task 4. Enumeration and Identification of Phytoplankton

Tracking long-term changes in phytoplankton are essential to any study of aquatic science. Because phytoplankton are so crucial to lake biology, any change in their productivity could have a significant influence on the famed aesthetics of Lake Tahoe. Biological and chemical properties of the lake would be affected, causing changes in biodiversity and fisheries.

In recent years we have seen changes in the abundance of algal cells and that has lead researchers to suspect that this is a response to global climate change. Long term changes show that the size of cells has decreased. Shifts in the relative abundance of larger versus smaller species of phytoplankton have been observed already in places around the world, but whether it will change overall productivity remains uncertain. Tahoe is essentially a closed system and a bit easier to model than the world's oceans. However, it remains difficult to predict what phytoplankton changes will occur in Lake Tahoe as a direct response to global warming. Indeed, climate changes have added yet another dimension to an already complicated ecosystem.

Hundreds of species of phytoplankton live in Lake Tahoe, each adapted to particular water conditions (Figure 2 shows photos of some of the types prevalent at times during the collection period). Changes in water clarity, temperature, and nutrient content will result in changes to the species that live in a given place. These shifts in species composition may be benign, or they may result in a cascade of negative consequences throughout the food web.

The reporting period (July 2011-June 2012) covered in this document is just a snap-shot in time. The time period is brief which does not make it irrelevant but it is a part of a greater whole, the long-term data set. Inter-annual variability is quite common in the historical phytoplankton records. It is therefore important to look at the data for this year with the past as a reference.

The annual (2011-2012) phytoplankton abundance (Figure 3) shows the seasonal variability in cell numbers. The year began with high abundance throughout the water column from July through early September 2011. *Cyclotella gordonensis* and *Cyclotella glomerata*, the two smallest Cyclotella species, were abundant with over 1 million cells per liter. Peak phytoplankton abundance was in early September 2011 when *Cyclotella gordonensis* had concentrations of over 2.8 million cells per liter in the upper 10m of the water column. The water column composite abundance was 1,270,000 cells per liter. This concentration was comparable to the abundance seen in the summer of 2010 but the timing of the peak was different, coming later in the year.

Cyclotella spp. controlled the species assemblage for five months (May-Sept 2011). During this period the phytoplankton community had low species richness, reflecting how the diatom population was able to exploit the rigorous environmental conditions of the upper euphotic, to the exclusion of most other competitors. The green algae were the second most abundant group during this summer season with ~ 120,000 cells per liter. Most of these numbers were contributed by the filamentous alga, *Planktonema lauterbornii*. Chrysophytes and Cryptophytes were nearly equivalent with 70,000 cells per liter in July. A Blue-green alga, *Leptolyngbya sp.* was abundant (50,000 cells per liter) only in the late summer.

Figure 2 a-d. Examples of some of the more prevalent Lake Tahoe phytoplankton types measured during portions of 2011-12. Photos made using microscope, linear scale as shown on each photo with magnification indicated in caption.

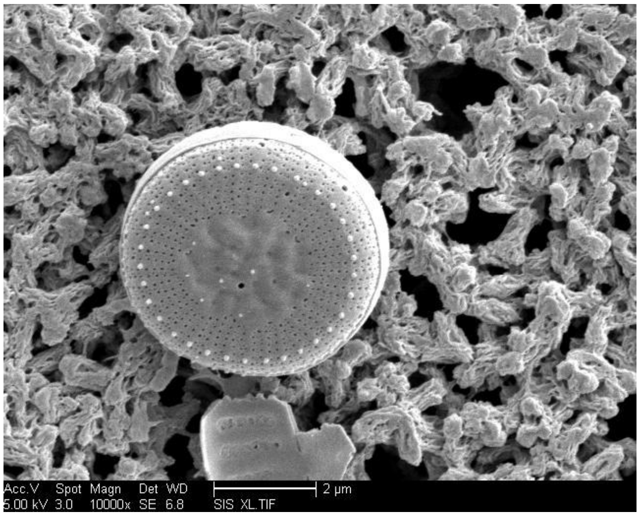

Figure 2 a. *Cyclotella gordonensis* Kling & Hakansson. Centric diatom. SEM 10000X Total Magnification.

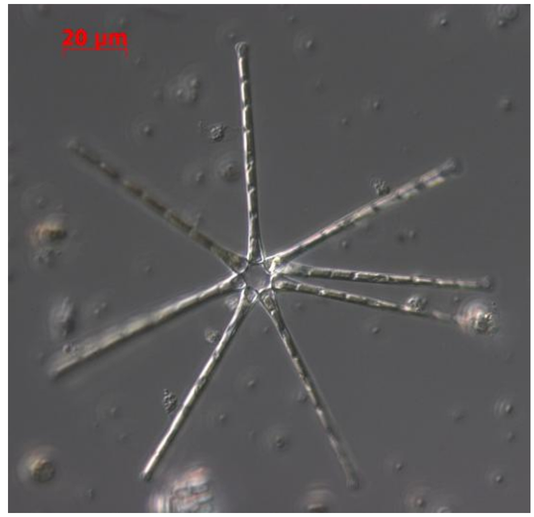

Figure 2 b. *Asterionella formosa* Hassal, colonial pennate diatom. DIC 400X Total Magnification.

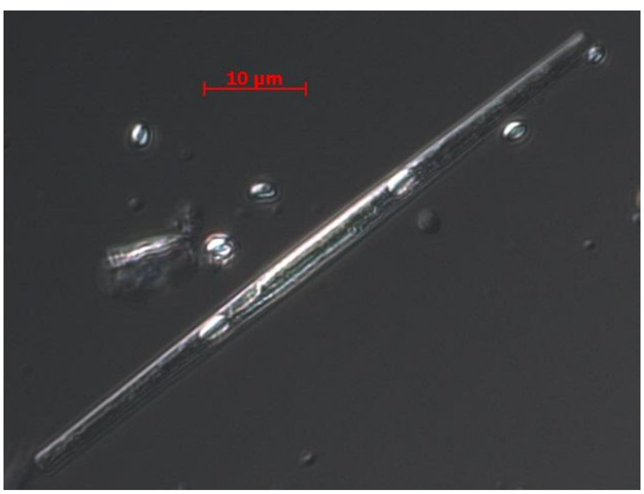

Figure 2 c. *Synedra acus var. radians* (Kützing) Hustedt , pennate diatom. DIC 630X Total Magnification.

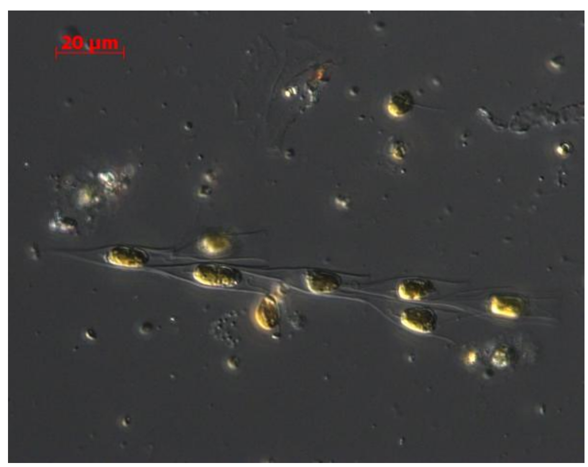

Figure 2 d. *Dinobryon sociale var. americanum* (Brunnth.) Bachmann, colonial chrysophyte. DIC 400X Total Magnification

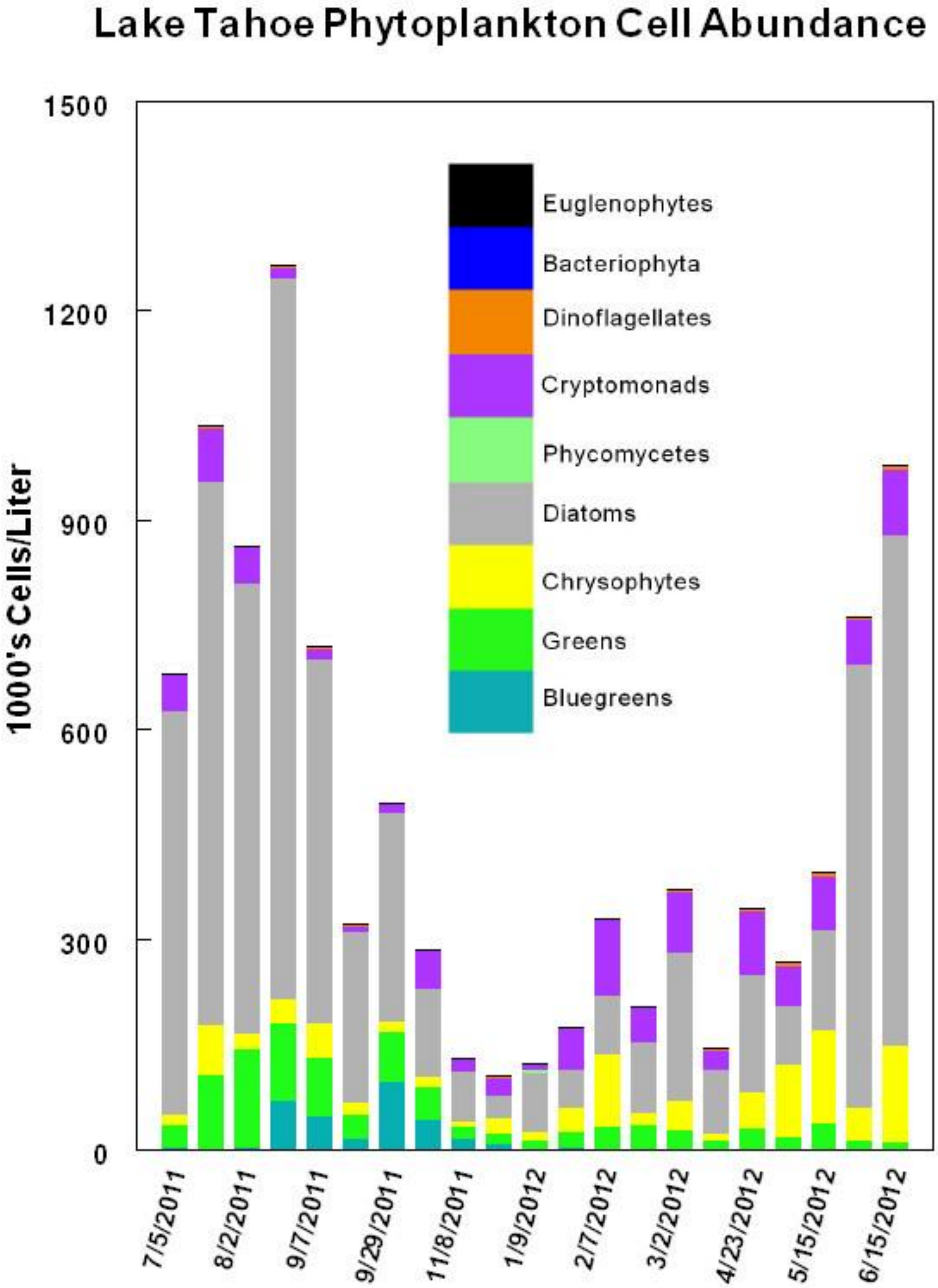

Figure 3   Phytoplankton Abundance 2011-2012

The lowest phytoplankton abundance occurred in November with only 150,000 cells per liter and the taxonomic groups were fairly evenly represented in terms of numbers. Cryptomonads and diatoms were typically dominant during this winter period. Diatom populations gradually increased throughout the 2012 spring, dominated by pennate diatoms *Synedra acus var. radians* and *Asterionella formosa*. In late May, as the lake's thermal profile began to stratify, the Cryptomonads were found mostly at or below the thermocline. On the other hand, the upper euphotic was populated by diatoms, both pennate and centric. *Syndra acus var. radians* populations were sinking, possibly following the higher nutrient concentrations. The surface waters were blooming with the small centrics, *Cyclotella glomerata* and *Cyclotella gordonensis* and the summer population patterns resumed much as the previous summer.

In addition to tracking phytoplankton abundance, it was important to also look at the phytoplankton as physiologically active units of photosynthesis. Indeed, looking at phytoplankton cellular productivity and biovolume (Figure 4) was perhaps a better measure of the health of the population. The variability in population biovolume was seasonally dependent. Peak biovolume was seen twice during the year. In late June to early July 2011 the peak (185 mm^3/m^3) was a result of the high abundance of small *Cyclotella spp*. Even though the cells were small, in great quantities, they had an impact on the biovolume numbers. The second biovolume peak was in March 2012 (180 mm^3/m^3). The timing of this peak was early in the growth season. While this was not unique in occurrence, diatom peaks have not occurred in the early spring for a number of years. *Synedra acus var. radians*, a pennate diatom, was primarily responsible for the high biovolume with some contributions from the filamentous centric, *Aulacoseira italica*. This assemblage differed from years in the recent past, since the pennate diatoms were unusually abundant. *Asterionella formosa*, which has not been seen in large numbers for nearly a decade, briefly contributed to higher bio-volume numbers in January. Most of these diatoms were relatively large cells and to remain suspended in the water column (to enable photosynthesis) required turbulence within the euphotic zone. Physical mixing gave the cells physical buoyancy but also stirred up nutrients from deeper waters. These elevated surface nutrients were present from January-March 2012 (NO_3-N >14 µg/l). This helped to fuel consistently higher biovolume numbers from January through June 2012.

Chrysophytes became more important in late spring 2012 as the nutrient concentrations (NO_3-N = 2 µg/l, PO_4 –P = 2 µg/l) in the surface waters was waning. In June 2012 there was a bloom of *Dinobryon sociale var. americanum*. These cells were colonial and with the colony's branched morphology, they certainly contributed to the low visibility during that month.

Several phytoplankton parameters have been carefully watched over the years. Significant changes in abundance and biovolume could indicate changes in trophic conditions in the lake. With inter-annual variability, sometimes these changes are difficult to discern. More subtle, would be changes within the community of phytoplankton, with one group or species creating a new, tenuous relationship within the assemblage. The green algae (chlorophytes) have been a focus of concern for several years since gains in this algal group often foretell of future changes in lake trophic conditions. In 2011 this group was a significant contributor to the community in the late summer through the fall. *Carteria sp., Planktonema lauterbonii, Tetraëdron minimum var. tetralobulatum*, and *Cosmarium bioculatum* (desmid) were the bio-

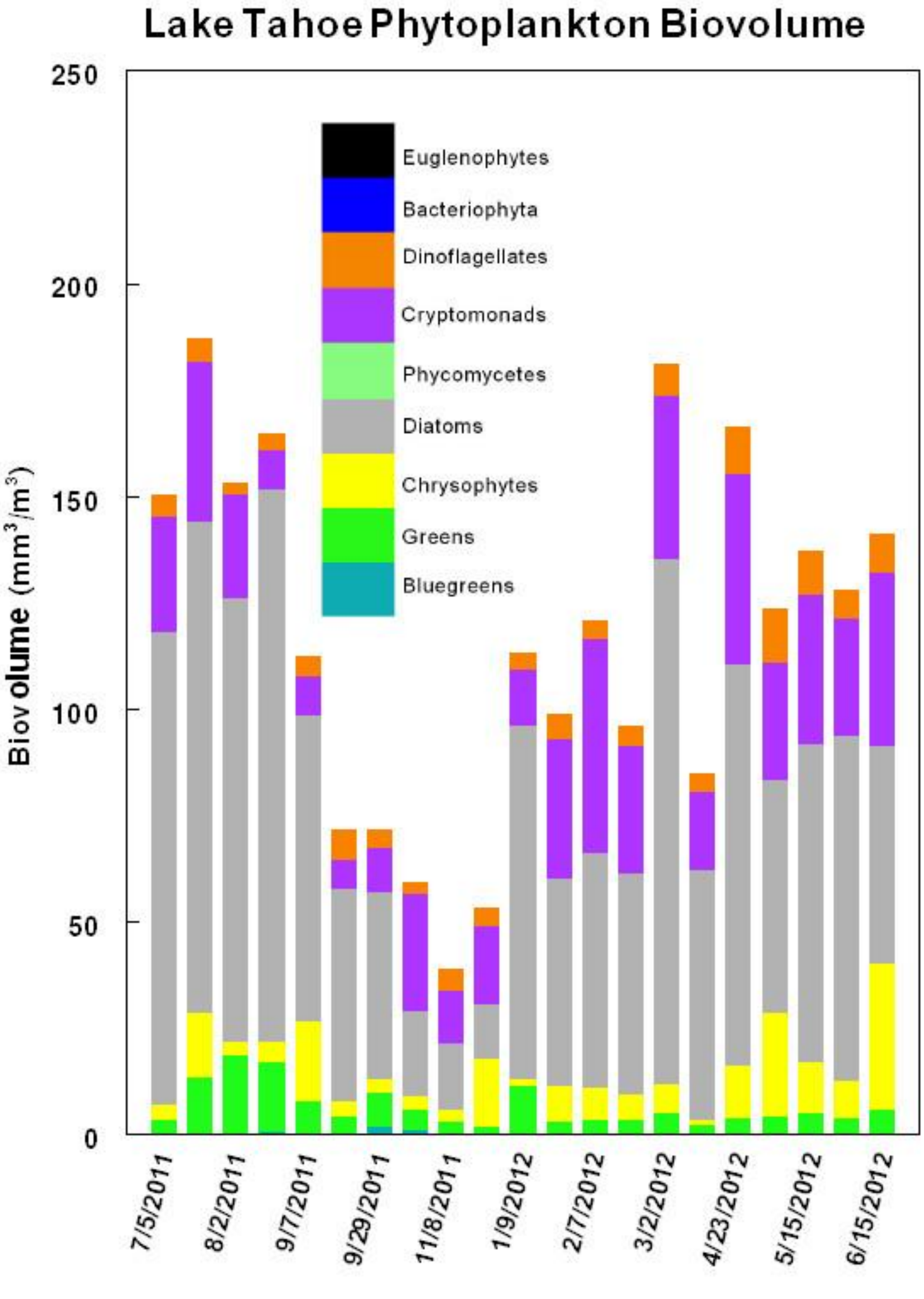

Figure 4 Phytoplankton Biovolume 2011-2012

volume dominant algae from this group. Last year the green algae did not gain any ground within the community structure with 32% of species richness determined by this group. In 2010, by comparison, 33% of species richness was determined by the green algae. Interestingly, the green alga biovolume and numbers were less than seen in recent years.

Trends and Implications

Phytoplankton species composition changes from year to year but the basic group structure and inter-relationships in the assemblage changes very little. There is a clear annual species succession, triggered by both chemical and physical events in the euphotic waters. The timing of the peaks is sometimes variable and often weather dependent. The longevity of the blooms depend on nutrient availability. Summer assemblages are ruled by the small centric diatoms. *Cyclotella spp*. are important in biological processes within the food web. They are an important food source for protozoans and zooplankton because their small size makes herbivore consumption relatively easy. *Cyclotella spp*. are also important to the lake's productivity. Their large surface to volume ratio certainly indicates that they can fix carbon and recycle nutrients at a fast pace. Physical processes are also impacted by the additional particulate loading in the water column from the *Cyclotella spp*. bloom. Increased particulates have a deleterious effect on water visibility. As mentioned earlier, in the summer of 2011 the *Cyclotella spp*. abundance is over 1 million cells per liter for several months. This is a count of only living cells. Empty diatom frustules (deceased cells) which co-exist in the water column during the bloom are often 2 or 3 times greater than the living individuals. Taken together, the number of small particles attributed to just the *Cyclotella spp.* had a significant impact on light absorption and transmission. Secchi readings in July and August 2011 were rarely over 14m.

The success of pennate diatoms in the winter and spring of 2012 was atypical, compared to previous recent years. It is not clear what single factor or group of factors triggered the growth of these cells. Often the algal species seen early in the calendar year will set-up a favorable set of conditions for the succession to another community later in the year. The pennate diatoms were biovolume dominants for six months. When their populations started to wane, in early May, there was a significant increase in the chrysophytes. This trend harkened back to earlier days in Lake Tahoe when chrysophytes were a dominant group (prior to the year 2000). Chrysophytes were known for excelling in nutrient poor conditions with their unique properties of nutrient uptake. It was quite likely that the early season pennate diatoms decreased ambient nutrient concentrations, leaving only the chrysophytes to fulfill this niche. What was more interesting was that the *Cyclotella spp*., so very dominant in the summer of 2011, would be much less dominant in 2012. I believe this was a result of many months of algal growth prior to the arrival of the summer assemblage. If this proves to be a viable hypothesis, it might be possible to predict the summer population species and productivity as early as January of the same year. This level of predictability has never been possible with the complexity of Tahoe's waters.

Task 4 b. Archiving of Zooplankton samples.

During the period July 1, 2011 to June 30, 2012 twenty zooplankton samples were collected and archived for possible later enumeration. These samples included twelve 150-0m tows at the Index station and eight 150-0m tows at the Mid-lake station.

Task 5. Atmospheric Deposition of Nitrogen and Phosphorus

Monitoring of atmospheric deposition is crucial to an understanding of its role in degradation of the lake and for use in watershed management. Atmospheric deposition contributes nitrogen, phosphorus and fine particles which all impact lake clarity. Atmospheric deposition contributes about 55% of the total nitrogen, 15% of the total phosphorus and 15% of the total fine (<20µm) particles to the lake. A significant portion of the nitrogen, phosphorus and fine particles in the atmospheric deposition is thought to originate in the basin. Control of air pollutants generated within the basin is therefore potentially a tool for watershed managers to reduce pollutants which impact the clarity of the lake. The atmospheric deposition monitoring program of TERC provides basic information on nutrient loading from this source (atmospheric deposition both in the watershed on land and directly to the lake surface), as well as on precipitation timing and amounts. The data also provides information on past and current trends in atmospheric deposition.

The current contract provides for atmospheric monitoring at 3 primary stations: the lower Ward Lake Level station and two stations located on the lake: the Mid-lake buoy station (TB-1) and buoy station TB-4.

Stations and Methods

Lower Ward Valley Lake Level Station

This station is located slightly south of the Ward Creek mouth on an estate, approximately 75-100 m back from the lake edge. This station has an Aerochem Metrics model 301 wet/dry deposition sampler. This sampler contains two deposition collection buckets and moveable lid, which automatically covers one, or the other bucket depending on whether precipitation is detected by a sensor. A 3 ½ gallon standard HDPE plastic bucket is used in the Wet-side of the sampler. This “Wet bucket” is covered by the lid during dry periods and exposed when wet precipitation is detected during a storm event. The Dry-side contains a modified HDPE bucket with reduced side-wall height, filled with 4 liters of deionized water, (and contains a heater in winter). This “Dry-bucket” is exposed during dry periods and covered by the lid when precipitation is detected. Wet samples are collected from this station also on an event basis, or as wet buckets fill with snow. Dry samples are collected about every 7-10 days and collection is usually coordinated with lake buoy Dry-Bulk sample collection.

Mid-lake Buoy Station

This station is located in the northern middle portion of the lake. During the current study the station was located on a large buoy (TB-1) in the north central portion of the lake (coordinates 39° 09.180 N and 120° 00.020 W). The collector consists of a HDPE plastic bucket similar to the Aerochem Metrics modified dry collector. It is filled with 4 liters of deionized water when placed out. However, the bucket also contains plastic baffles to dampen splash from the bucket. Unlike the Dry bucket, this collector collects both wet and dry deposition and therefore is called a Dry-Bulk collector. The station also contains a Snow Tube for collection of wet precipitation. Sample collection from this station is done as much as possible on a regular basis (7-10 days if possible), however, lake conditions and weather govern frequency to a large extent. The buoy also has a variety of scientific instrumentation for NASA's studies on the lake in addition to the atmospheric deposition collectors.

Northwest Lake (TB-4) Station

Station TB-4 (coordinates 39° 09.300 N and 120° 04.330 W) was located between the mid-lake (TB-1) station and Tahoe City. This was desirable since it provided a second collection site to compare with Mid-lake data. The station contained a Dry-Bulk sampler similar to that used on the Mid-lake station. Samples were collected on the same frequency as the Mid-lake samples. The station was supported on a large buoy (TB-4). The buoy has a variety of scientific instrumentation for NASA's studies on the lake in addition to the atmospheric deposition collectors. (Note for more detailed methods at the different stations see the TERC's Standard Operating Procedures for precipitation monitoring).

Results

Data collected for this task include information on atmospheric deposition concentrations, precipitation amounts and timing. During October 1, 2011 through September, 2012, 109 new samples were collected from the 3 primary stations (27 dry bucket and 30 wet bucket samples from the Ward Lake Level station, 21 Dry-bulk samples from each of the lake buoy stations and 10 Mid-lake snow tube samples). Samples were analyzed for ammonium (NH_4-N), nitrate (NO_3-N), total Kjeldahl nitrogen (TKN), soluble reactive phosphorus (SRP), total dissolved phosphorus (DP) and total phosphorus (TP).

The nutrient concentration and loading data for Water Year 2012 for Lower Ward Valley Wet and Dry deposition, lake buoy TB1 Snow Tube Bulk deposition, Mid-lake buoy TB-1 Dry-bulk deposition and lake buoy TB-4 Dry-bulk deposition are presented in report Appendices 1-5. In addition, revised and updated concentration and load data for these stations during Water Years 2009-2011 is also presented. Presentation again of data for these past years results from necessary amendment of a portion of the historical data. An internal review of data revealed a portion of the 2009-2011 sample concentrations were calculated incorrectly (as a result of omission of a step in a new chemistry data entry and calculation program). Omission of the step generally resulted in very slight differences in concentrations from the correctly calculated values for NO3-N, NH4-N, SRP, DP, and TP. However, omission of the step in calculation of TKN concentrations had a greater impact with significant differences between originally calculated values and true values in many cases. Appendices 1-5 therefore include all corrected concentrations and loads. Corrected values in which the concentration or load substantially changed relative to previously reported levels are indicated by shading. Annual loading rates were also recalculated for 2009-2011 using the amended data (see Table 5 below).

General Patterns for Precipitation Oct. 1, 2011- September, 2012

We focus on WY 2012 data in this year's report since the previous annual report (Hackley et al., 2011) included data through the end of WY 2011. Figure 5 below shows the distribution of precipitation amounts for samples collected at the Lower Ward Valley station during WY 2012 (Oct. 1, 2011 to Sept. 30, 2012).

Although precipitation began soon after the water year began in October, 2011 the period October through December 2011 ultimately ended up being relatively dry. An early fall storm on Oct. 4 and 5 dropped 2.23 inches of precipitation at the Lower Ward Valley station as rain and snow. Then an additional 0.66 of rain fell on 10/10-10/11/11. The next precipitation didn't occur until early November when 0.63 inches of precipitation (4 inches of snow) fell at the Lower Ward Station. An additional 0.20 inches of precipitation as snow fell associated with a storm a few days later. Two more storms contributed less than an inch of additional precipitation around Nov. 18-20. After that only a trace of additional snow was recorded through Dec. 7 and no precipitation occurred the rest of Dec. There were several strong wind events during the quarter. A couple of the more notable among these were extremely strong winds from the SW and W on Nov. 18, 2011 and a period of very strong winds from the N and NE Nov. 30-Dec. 1, 2011. Wind events can have an impact on lake mixing and may also impact attached algal communities if waves cause sloughing of growing periphyton from the rocks.

The relatively dry conditions continued into January, until an intense rain and snow event Jan. 21, 22, 2012 broke the pattern. This storm had periods of moderate to heavy rain and strong winds, before changing to snow. The rainfall resulted in increased flows in the west shore streams. Relatively dry conditions returned until late February when storms became more frequent through March. A significant rain and snow event occurred in mid-March (3/15, 3/16/12). This storm contributed a mix of rain and snow at lake level with significant snow at higher elevations. This storm however, did not result in significant rises on the west shore streams. Several small to moderate storms occurred during the period April to June. Warm temperatures for a period in the second half of April began the snowmelt. A wet storm with mild temperatures and rain occurred 4/25-26 which contributed runoff on top of the spring snowmelt. The combination of storm runoff and snowmelt resulted in peak flows for the spring for several of the west shore streams. Late-season rain-snow storms also occurred at the end of May and in early June.

The summer of 2012 was characterized by generally warm, dry weather with a few periods of localized or regional thunderstorms interspersed. Frequent thunderstorms occurred from the morning through evening on 7/23/12 and deposited 0.37 inches of precipitation as rain and hail at the lower Ward Valley station. Periods of thunderstorms also occurred in mid-August totaling 0.15 inches. In early September (9/5, 9/6/12) thunderstorms along with non-thunderstorm precipitation occurred (totaling 0.15 inches) at the lower Ward station. Overall precipitation for WY 2012 was relatively low, totaling only 27.53 inches of water at the Lower Ward Valley station.

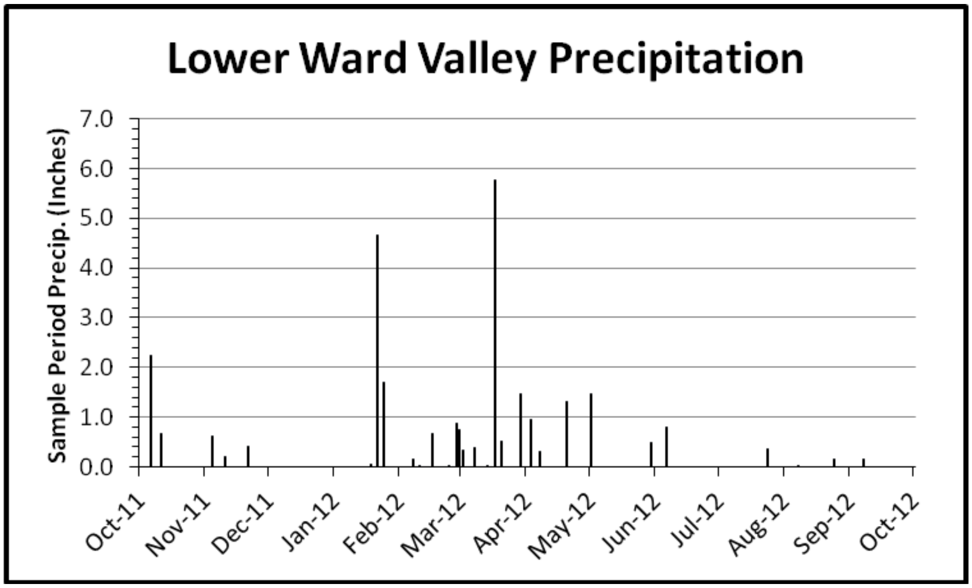

Figure 5. Precipitation amounts occurring at the Lower Ward Valley station Water Year 2012. Each vertical bar represents total amount of precipitation during a collection period for a sample – in some cases samples include multiple events, (date under bars are collection dates).

Annual Loading of Nitrogen and Phosphorus in Atmospheric Deposition

The atmospheric deposition monitoring in the Ward Creek watershed and on the lake at the buoy sampling locations provides data from which N and P deposition loading estimates are calculated. Appendices 1b-5b show the estimated loads (grams/hectare) of N and P associated with samples collected. Table 5 below presents estimated overall WY 2012 N and P loading expressed as a rate (grams/hectare/day) at the Lower Ward Valley, Mid-lake buoy TB-1 and buoy TB4 stations. Recalculated loads for WY 2009-2011 which incorporate amended data (see explanation above) are also included in Table 5.

First, as expected, recalculation of annual loads using corrected concentration data from 2009-2011 caused only slight changes in most of the annual loading rates (NO_3-N, NH_4-N, SRP, DP and TP), but did alter TKN loading estimates. When loading rate data from the 2011 annual report (Hackley et al., 2011) for NO_3-N, NH_4-N, SRP, DP and TP was compared with the updated data presented in Table 5 here, many of the updated values were the unchanged or very close (within 0. 1 g/ha/d) relative to those previously calculated. Exceptions were: Lower Ward Dry NH_4-N (the initially calculated value for WY 2010 was 1.17 g/ha/d and the recalculated value was 1.02 g/ha/d); Buoy TB-4 NH_4-N (the initially calculated value for WY 2011 was 1.83 g/ha/d and the recalculated value was 2.01 g/ha/d). However, incorporation of revised TKN data from 2009-2011, significantly affected many of the loading estimates for TKN. In most cases the corrected TKN concentrations and therefore annual loading rates were less than the initially calculated values. Significant changes in estimated TKN loading for each site included: Lower Ward Wet (2009 uncorrected 2.90, corrected 2.52 g/ha/d; 2010 uncorrected 3.76, corrected 2.77 g/ha/d, 2011 uncorrected 4.39, corrected 3.57 g/ha/d); Lower Ward Dry (2009 uncorrected 11.73, corrected 11.41 g/ha/d; 2010 uncorrected 14.50, corrected 11.38 g/ha/d, 2011 uncorrected 12.78, corrected 11.08 g/ha/d); Buoy TB-1 Dry-Bulk (2009 uncorrected 3.61, corrected 3.42 g/ha/d; 2010 uncorrected 6.11, corrected 5.23 g/ha/d, 2011 uncorrected 3.09, corrected 3.56 g/ha/d); Buoy TB-4 (2009 uncorrected 4.49, corrected 4.03 g/ha/d; 2010 uncorrected 6.10, corrected 4.64 g/ha/d, 2011 uncorrected 3.28, corrected 3.36 g/ha/d).

When all the data for 2009-2012 from Table 5 is analyzed, some general patterns emerge, i.e.:

1) WY 2012 precipitation and loading of N and P was quite reduced in Wet deposition at the Lower Ward Valley station relative to levels in WY2011.
2) Among the last 4 Water Years, annual loading of N in Wet deposition was highest in WY2011 which had significantly higher precipitation. Precipitation at the Lower Ward station in WY 2011 was 66.92 inches, while significantly lower precipitation occurred in WY's 2009, 2010 and 2012 (37.34, 38.64 and 27.53 inches respectively). WY 2011 loading values for Wet deposition at the Lower Ward Valley station were: NO_3-N (1.91 g/ha/d), NH_4-N (2.33 g/ha/d) and TKN (3.57 g/ha/d). Loading rates for WY2009, 2010, 2012 respectively were less, i.e.: NO_3-N (1.11, 1.27, 1.02 g/ha/d), NH_4-N (1.06, 1.65, 1.46 g/ha/d), and TKN (2.52, 2.77, 2.48 g/ha/d).
3) WY 2012 loading rates for N and P in Dry deposition at the Lower Ward station showed only slight variation from the previous three years. WY 2012 NO_3-N loading (0.83 g/ha/d) and NH_4-N loading (0.93 g/ha/d) was slightly less than the previous three Water Years (where NO_3-N loading ranged from 0.99-1.13 g/ha/d and NH_4-N loading ranged from 1.02-1.26 g/ha/d). TKN loading was slightly higher in Dry deposition in 2012 (12.38 g/ha/d) relative to the previous 3 years (TKN loading range 11.08-11.41 g/ha/d). TP showed a similar pattern with 2012 TP loading (1.22 g/ha/d) slightly higher than the 2009-2011 range (0.86-0.96 g/ha/d). SRP and DP loading in 2012 (0.18 and 0.41 g/ha/d respectively) were within or close to the ranges for loading observed the previous three years in Dry deposition (SRP range 0.15-0.24 g/ha/d and DP range 0.27-0.39 g/ha/d).
4) WY 2012 loading rates for N and P in Dry-bulk deposition (wet and dry deposition combined) at the lake buoy stations was relatively close to values observed the previous 3 WY. WY 2012 loading rates were: NO_3-N (TB-1=1.98 g/ha/d, TB-4=1.88 g/ha/d); NH_4-N (TB-1=1.96 g/ha/d, TB-4=2.01 g/ha/d); TKN (TB-1=3.37 g/ha/d, TB-4=3.36 g/ha/d); SRP (TB-1=0.04 g/ha/d, TB-4=0.04 g/ha/d); DP (TB-1=0.10 g/ha/d, TB-4 0.09 g/ha/d); TP (TB-1=0.23 g/ha/d, TB-4=0.20 g/ha/d). Loading rate ranges for the previous 3 WY for TB-1 and TB-4 stations combined were: NO_3-N (1.88-2.53 g/ha/d); NH_4-N (1.71-2.67); TKN (3.42-5.23); SRP (0.04-0.07); DP (0.06-0.12); TP (0.14-0.25).
5) WY loading rates of NO_3-N (range 1.85-2.26 g/ha/d) and NH_4-N (range 2.32-2.67 g/ha/d) for Wet + Dry deposition combined at the Lower Ward Station were relatively close to those for Dry-bulk deposition at buoy TB-1 (NO_3-N range 1.98-2.53 g/ha/d; NH_4-N range) and buoy TB-4 (NO_3-N range 1.88-2.28 g/ha/d; NH_4-N range 1.84-2.48g/ha/d) during low-moderate precipitation years WY 2012 and 2009, 2010. During WY 2011 which had high precipitation however, loading rates of NO_3-N and NH_4-N in Wet + Dry deposition combined at the Lower Ward Valley station (NO_3-N 3.02 g/ha/d; NH_4-N 3.43 g/ha/d) were greater than in bulk deposition at the buoy stations TB-1 (NO_3-N 2.07 g/ha/d NH_4-N 1.71 g/ha/d) and TB-4 (NO_3-N 1.88 g/ha/d and NH_4-N 1.84 g/ha/d).
6) Loading rates for SRP, DP, TP in Wet+ Dry deposition combined were higher at the Lower Ward Valley station on land than in Dry-bulk deposition on the lake at buoys TB-1 and TB-4.

Table 5. Comparison of loading rates (in grams/ hectare/ day) of N and P at the Lower Ward Valley and buoy stations TB-1 and TB-4 during Water Years 2009 through 2012. Note the 2009-2011 data was updated from previous reports to include recalculated concentrations and loads for that portion of samples collected 2009-2011 which had been incorrectly calculated with a new chemistry data entry program (see explanation in text above), as well as to incorporate any additional chemistry data which became available after preparation of previous reports and to incorporate any subsequent censoring of data (i.e. exclusion of data based on possible contamination or unusual conditions which may have compromised a sample).

	Precip. (in)	**NO_3-N g/ha/d**	**NH_4-N g/ha/d**	**TKN g/ha/d**	**SRP g/ha/d**	**DP g/ha/d**	**TP g/ha/d**
Lower Ward (Wet) WY'09	37.34	1.11[a]	1.06[a]	2.52[a]	0.10[a]	0.14[a]	0.24[a]
Lower Ward (Wet) WY'10	38.64	1.27[bc]	1.65[bc]	2.77[bc]	0.05[bc]	0.11[bc]	0.46[bc]
Lower Ward (Wet) WY'11	66.92	1.91[c]	2.33[c]	3.57[c]	0.10[c]	0.24[c]	0.35[c]
Lower Ward (Wet) WY'12	27.53	1.02	1.46	2.48	0.06	0.13	0.20
Lower Ward (Dry) WY'09		1.13[a]	1.26[a]	11.41[a]	0.24[a]	0.39[a]	0.92[a]
Lower Ward (Dry) WY'10		0.99 [bc]	1.02 [bc]	11.38 [bc]	0.18 [bc]	0.29 [bc]	0.96 [bc]
Lower Ward (Dry) WY'11		1.11 [c]	1.10 [c]	11.08 [c]	0.15 [c]	0.27 [c]	0.86 [c]
Lower Ward (Dry) WY'12		0.83	0.93	12.38	0.18	0.41	1.22
Lower Ward (Wet+Dry) WY'09		2.24	2.32	13.93	0.34	0.53	1.16
Lower Ward (Wet+Dry) WY'10		2.26 [c]	2.67 [c]	14.15 [c]	0.23 [c]	0.40 [c]	1.42 [c]
Lower Ward (Wet+Dry) WY'11		3.02 [c]	3.43 [c]	14.65 [c]	0.25 [c]	0.51 [c]	1.21 [c]
Lower Ward (Wet+Dry) WY'12		1.85	2.39	14.86	0.24	0.54	1.42
TB-4 (Dry-Bulk) WY'09		2.00	2.48	4.03	0.04	0.06	0.14
TB-4 (Dry-Bulk) WY'10		2.28	2.08	4.64	0.06	0.11	0.20
TB-4 (Dry-Bulk) WY'11		1.88	1.84	3.46	0.04	0.09	0.20
TB-4 (Dry-Bulk) WY'12		1.88	2.01	3.36	0.04	0.09	0.20
Mid-lake TB-1 (Dry-Bulk) WY'09		1.99	2.03	3.42	0.05	0.07	0.16
Mid-lake TB-1 (Dry-Bulk) WY'10		2.53	2.67	5.23	0.07	0.11	0.25
Mid-lake TB-1 (Dry-Bulk) WY'11		2.07	1.71	3.56	0.06	0.12	0.25
Mid-lake TB-1 (Dry-Bulk) WY'12		1.98	1.96	3.37	0.04	0.10	0.23

Notes: To determine a daily loading rate for Wet samples, the annual total load for a nutrient was first extrapolated by dividing the total load for samples analyzed by the proportion of total precipitation for the year analyzed. This annual load was then divided by number of days/year to estimate daily loading rate. To determine Dry deposition loading rate, the load for analyzed dry samples was divided by the total number of sampling days for the analyzed samples. Additional notes: "a" – The Wet/Dry sampler malfunctioned in Dec. 2008, resulting in the Dry bucket collecting a portion of the precipitation for several storms, the Wet bucket loading values shown do not account for Wet precipitation in the Dry bucket, the Dry bucket values include some Wet precipitation. "b" - In early October 2010 the power line to the station was removed during construction activities. The Wet and Dry buckets were continually exposed to deposition for 2-3 weeks. Both Wet and Dry deposition collected in the Wet buckets during storm events was included in the Wet total loading. "c" – during some periods in WY 2010, 2011 there were power interruptions and problems with dust due to construction on property at the Lower Ward Valley station, samples noted to be contaminated with significant amounts of silt or organic material were not used to determine annual loading rates.

Patterns of Precipitation Amount, Dissolved Inorganic Nitrogen (DIN) Concentration and Load in Wet Deposition at Lower Ward Valley 1981-2012

The long-term (WY 1981- 2012) data for total precipitation, Dissolved Inorganic Nitrogen (DIN) annual average concentration and annual (WY) load in Wet deposition at the Lower Ward station is presented in Figure 6 to give some idea of trends through time. In WY 2012, total precipitation dropped significantly from the WY2011 total as did the WY2012 DIN load. The WY 2012 DIN load (908.94 g/ha) was close to the levels measured in 2009 (789.21 g/ha) and 2010 (1064.61 g/ha/d) which were among the lower DIN loads measured since 1981 (median value of 1118.01 g/ha for data 1981-2012). The average annual DIN concentration increased somewhat in WY2012 compared to that measured in 2011.

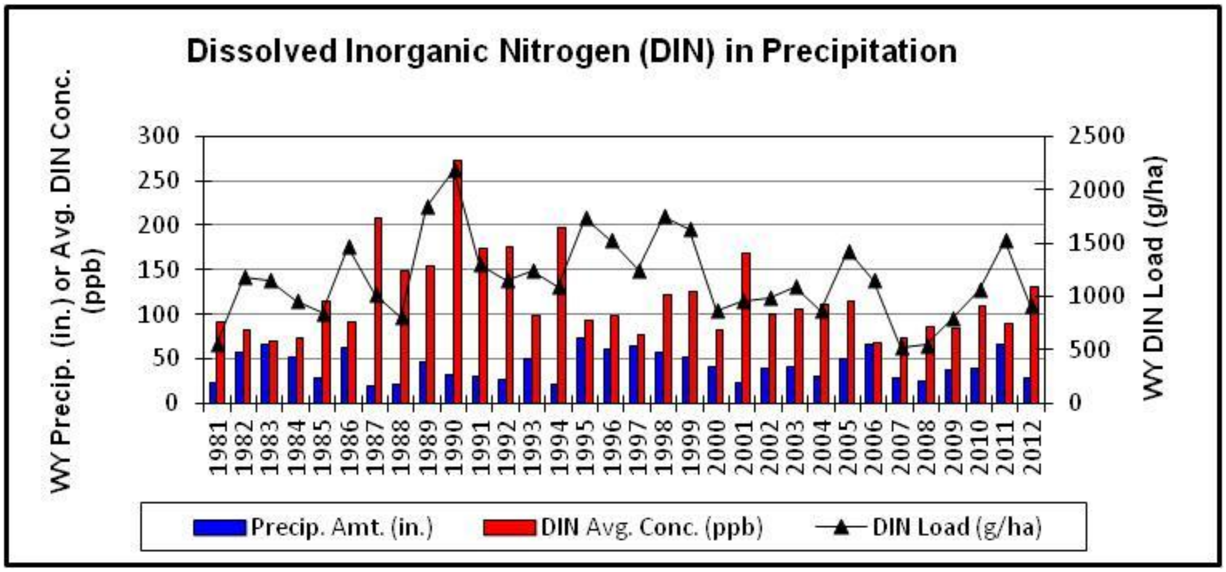

Figure 6. Summary plot of Water Year (WY) total precipitation (inches), average Dissolved Inorganic Nitrogen (DIN) concentration (ppb), and extrapolated annual DIN load (g/ha/yr) in Wet Deposition at the Ward Valley Lake Level station for WY 1981-2012. A Water Year begins Oct. 1 and ends Sept. 30 (i.e. WY 1981 ended 9/30/81).

Patterns of Precipitation Amount, Soluble Reactive Phosphorus (SRP) Concentration and Load in Wet Deposition at Lower Ward Valley 1981-2012

Figure 7 presents the WY 1981- 2012 data for total precipitation, Soluble Reactive Phosphorus (SRP) annual average concentration and annual (WY) SRP load in Wet deposition at the Lower Ward station to give some idea of trends through time. In WY 2012, SRP load (22.01 g/ha) decreased relative to WY 2011 (36.18 g/ha) while the average annual concentration increased slightly to 3.15 µg/l. The SRP load in Wet deposition since WY 2000 has fluctuated within a fairly consistent range between about 17-36 g/ha. The median SRP loading value for all the data since 1981 is 27.24 g/ha.

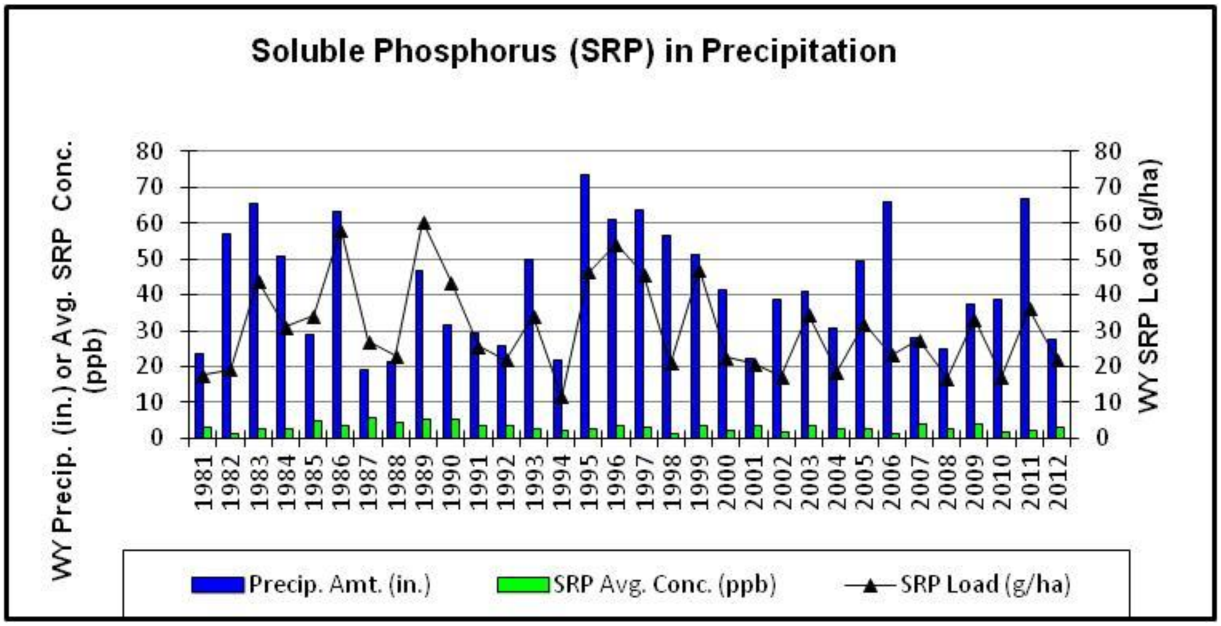

Figure 7. Summary plot of Water Year (WY) total precipitation (inches), average Soluble Reactive Phosphorus (SRP) concentration (ppb), and extrapolated annual SRP load (g/ha/yr) in Wet Deposition at the Ward Valley Lake Level station WY 1981-2011.

<u>Summary Points for Atmospheric Deposition Monitoring WY2012</u>

1. **Precipitation amount was relatively low (27.53 in.) in WY2012 at the TERC Lower Ward Valley station. About 25% of the WY since 1981 had similar or less precipitation.**
2. **WY 2012 loading of N and P was quite reduced in Wet deposition at the Lower Ward Valley station relative to levels in WY2011. Among the last 4 Water Years, annual loading of N in Wet deposition was highest in WY2011 which had significantly higher precipitation.**
3. **WY 2012 loading rates for N and P in Dry deposition at the Lower Ward station showed only slight variation from the previous three years.**
4. **WY 2012 loading rates for N and P in Dry-bulk (Wet+Dry combined) deposition at the lake buoy stations were within or nearly in ranges observed the previous 3 WY.**
5. **A portion of the 2009-2011 concentration and loading data was revised and reported in the Appendices 1-5. These revisions were primarily significant for TKN and generally resulted in decreases in TKN concentration and loading values for those years compared with levels reported in earlier reports.**
6. **While overall precipitation was relatively low in 2012, there were a couple of moderate rain/snow mix events. One occurred January 21, 22, 2012 that had moderate to heavy rain associated with it at times, strong winds and resulted in**

increased flows in some Basin tributaries. A second moderate rain and snow event occurred in mid-March, however tributary flows were little impacted by this storm.

7. **Warm temperatures for a period in the second half of April began the spring snowmelt. A wet storm with mild temperatures and rain occurred 4/25-26/12 which resulted in runoff on top of the spring snowmelt and peak flows for the spring on several of the west shore streams.**
8. **There were several intense wind events during the fall/early winter period 2011. A couple of the more notable among these were extremely strong winds from the SW and W on Nov. 18 and a period of very strong winds from the N and NE Nov. 30-Dec. 1.**

Task 6. Periphyton

The purpose of the periphyton monitoring task is to assess the levels of nearshore attached algae (periphyton) growth around the lake. As for phytoplankton, nutrient availability plays a large role in promoting periphyton growth. The amount of periphyton growth can be an indicator of local nutrient loading and long-term environmental changes.

Periphyton grows in the littoral (shore) zone of Lake Tahoe, which may be divided into the eulittoral zone and the sublittoral zone, each with distinct periphyton communities. The eulittoral zone is the shallow area between the low and high lake level and is significantly affected by wave activity. It represents only a very small (<1%) of the total littoral area. Substrata within this region desiccate as the lake level declines, and periphyton must recolonize this area when lake level rises. The sublittoral zone extends from the bottom of the eulittoral to the maximum depth of the photoautotrophic growth. The sublittoral zone remains constantly submerged and represents the largest littoral benthic region of Lake Tahoe.

The eulittoral zone community is typically made up of filamentous green algae i.e. *Ulothrix sp, Zygnema sp* and stalked diatom species i.e. *Gomphoneis herculeana*. The attached algae in the eulittoral zone display significant growth allowing for rapid colonization. These algae are able to take advantage of localized soluble nutrients, and can establish a thick coverage over the substrate within a matter of months. Similarly, as nutrient concentrations diminish and shallow nearshore water temperatures warm with the onset of summer, this community rapidly dies back. The algae can slough from the substrate and disperse into the open water, as well as be washed ashore. In areas where biomass is high, the slimy coating over rocks and sloughed material accumulated along shore can be a nuisance. The eulittoral zone periphyton plays an important role in the aesthetic, beneficial use of the shorezone. It is the rapid growth ability of the eulittoral periphyton in response to nutrient inputs that lend particular value to monitoring this community as an indicator of localized differences in nutrient loading.

The sublittoral zone is made up of different algal communities down through the euphotic zone. Cyanophycean (Blue-green) algal communities make up a significant portion of the uppermost sublittoral zone. These communities are slower growing and more stable than the filamentous and diatom species in the eulittoral zone.

Stations and Methods

Nine routine stations were monitored during Oct. 2011- July, 2012 (Rubicon Pt., Sugar Pine Pt., Pineland, Tahoe City, Dollar Pt., Zephyr Pt., Deadman Pt., Sand Pt, Incline West). These nine sites are located around the lake (Table 6) and represent a range of backshore disturbance levels from relatively undisturbed land (Rubicon Point and Deadman Point) to a developed urban center (Tahoe City).

Table 6. Locations of Routine Periphyton Monitoring Stations

SITE NAME	LOCATION
Rubicon	N38 59.52; W120 05.60
Sugar Pine Point	N39 02.88; W120 06.62
Pineland	N39 08.14; W120 09.10
Tahoe City	N39 10.24; W120 08.42
Dollar Point	N39 11.15; W120 05.52
Zephyr Point	N39 00.10; W119 57.66
Deadman Point	N39 06.38; W11957.68
Sand Point	N39 10.59; W119 55.70
Incline West	N39 14.83; W119 59.75

A detailed description of the sample collection and analysis procedures is given in Hackley et al. (2004). Briefly, the method entails collection while snorkeling of duplicate samples of attached algae from a known area of natural rock substrate at a depth of 0.5m, using a syringe and toothbrush sampler. These samples are transported to the laboratory where the samples are processed and split, with one portion of the sample analyzed for Ash Free Dry Weight (AFDW) and the other portion frozen for later analysis of Chlorophyll *a* concentration (both AFDW and chlorophyll *a* are used as measures of algal biomass). We also measure average filament length, % algal coverage, and estimate the visual score in field observations. The visual score is a subjective ranking (1-5) of the level of algal growth viewed underwater (as well as above water for a portion of the data) where 1 is least offensive appearing (usually natural rock surface with little or no growth) and 5 is the most offensive condition with very heavy growth.

Results

Monitoring at Routine Sites

In this report we summarize the data collected from July 2011- July 2012. Nine routine sites were sampled. All sites were sampled five or more times during the period. Three of the sampling circuits were made during the spring (March-June), with additional sampling circuits made during Oct. 2011 and Jan. 2012. Table 7 presents the results for biomass (chlorophyll *a* and Ash Free Dry Weight (AFDW)) and field observations (visual score, average filament length, percent algal coverage, biomass index and basic algal types) at the nine routine periphyton sites for the period July 2011-June 2012. The results for periphyton Chlorophyll *a* biomass are also presented graphically in Figures 8(a-i) together with earlier data collected since 2000.

Water Year 2012 Patterns of Periphyton Biomass

Very low periphyton biomass was present in the fall and early winter of WY 2012. Rocky substrate was nearly free of periphyton growth at Rubicon Pt., Sugar Pine Pt. and Sand Pt., while very low chlorophyll *a* biomass was measured at Deadman Pt. (3.69 mg/m^2), Zephyr Pt. (4.55 mg/m^2), Incline West (7.61 mg/m^2), Pineland (8.92 mg/m^2) and Dollar Pt. (10.24 mg/m^2). The exception was Tahoe City where a moderate amount of algal biomass (43.77 mg/m^2) was present as a mixture of old stalked diatom material, sand and silt. Periphyton biomass remained low at most sites through early winter (January) 2012. Exceptions were Tahoe City (where biomass stayed moderately high) and Pineland (where a biomass of 38.97 mg/m^2 in January indicated increased growth.

During spring or early summer 2012 significant peaks in periphyton biomass occurred at several of the West Shore monitoring stations, while biomass along the north and east shores remained relatively low. The most significant peaks in periphyton biomass occurred along the northwest shore at Pineland (173.32 mg/m^2) and Tahoe City (119.30 mg/m^2) and along the southwest shore at Rubicon Pt. (168.62 mg/m^2). Peak biomass at Dollar Pt. was less pronounced (35.91 mg/m^2). Periphyton biomass at Sugar Pine Pt. remained very low (maximum chlorophyll *a* = 5.71 mg/m^2) throughout WY 2012. Relatively small spring peaks in biomass were measured at Incline West (19.48 mg/m^2) along the north shore and Zephyr Pt. (19.53 mg/m^2) along the south east shore. Biomass remained very low through most of the spring and was a maximum in June at Sand Pt. (9.13 mg/m^2) and Deadman Pt. (11.30 mg/m^2).

Heavy biomass developed at Rubicon Pt., Pineland and Tahoe City in WY 2012 despite relatively low WY precipitation and associated runoff. As has been indicated in previous reports a combination of factors likely contributes to periphyton biomass patterns. These factors may include: nutrient inputs (surface runoff, enhanced inputs from urban/disturbed areas, groundwater, lake mixing/upwelling/ currents), lake level, substrate availability and wind/wave events which may affect periphyton loss from the rocks. The growth in 2012 was also likely due to a combination of these factors, with some factors likely playing more of a role than others. Much of the heavy biomass at these sites was associated with stalked diatom growth.

The 2012 chlorophyll biomass data is presented with biomass data collected since 2000 to help discern patterns through time (Figures 8 a-i). Lake level data for the same period is presented in Figure 9, (lake level plays a role in the level of biomass observed through time (Hackley et al., 2010)). The most apparent trend was the repeated significant peaks in spring periphyton biomass at sites the northwest portion of the lake (Pineland, Tahoe City and Dollar Pt.). In most years, much of this periphyton biomass was due to stalked diatoms and the period of lowest growth has tended to occur in the summer and fall. Rubicon Pt. has also had repeated spikes in growth since about 2007, however the spikes have not always occurred in the spring there. For instance in fall 2010 a significant peak occurred which was associated with very heavy growth of a “tufted” Blue-green algae. This growth of Blue-greens was some of the heaviest Blue-green growth the research diver had seen, and likely represented the normally deeper Blue-green community which was thriving near the surface during lowered lake level conditions (Figure 9).

The relatively low periphyton biomasses observed in WY 2012 for east shore and north shore sites have also been observed also in other years. Similarly low biomasses were observed at east shore sites in WY 2007. During that year precipitation was close to that which occurred in 2012 (27.92 inches occurred in 2007 at Lower Ward, 27.53inches occurred in 2012). The lake elevation pattern was also fairly similar in WY 2007 compared with 2012. There was a rapid rise to high surface elevation the preceding year followed by a lowered peak in surface elevation the following year. The low biomasses in spring 2007 and 2012 along east and north shore sites may be in part due to slow colonization of substrate rapidly submerged the previous year. Low contribution of runoff nutrients associated with low precipitation in WY 2007 and 2012 likely played a role in the low growth observed in those years.

Annual Maximum Biomass

WY 2010-WY2012 maximum biomass values as estimated by chlorophyll *a* for all sites are shown in Figure 10. In WY2012 peak biomass was highest at Pineland, Tahoe City and Rubicon Pt., moderately high at Dollar Pt., Incline West and Zephyr Pt. and lowest at Sand Pt. and Deadman Pt. along the east shore and Sugar Pine Pt. along the west shore.

WY 2011 was a bit unusual in that biomass was high at many sites early in the year associated significant Blue-green algae biomass in proximity to the surface while the lake level was quite low. This was true for sites along the north and east shore where moderate biomass was measured early in the WY. During the spring however, during a rapid rise in lake level, biomass was heavy at Pineland (though slightly less than the 2012 peak biomass) and moderate to heavy at Dollar Pt. (greater than the 2012 peak biomass) associated with stalked diatom growth. Moderate spring biomass was measured at Tahoe City (which was significantly less than the 2012 peak biomass), Incline West, Zephyr and Rubicon Pt. Low spring biomass was measured at Sugar Pine Pt., Sand Pt. and Deadman Pt.

In WY2010 the lake surface elevation was quite low and Blue-green algae made up a portion of the biomass at many sites. Spring periphyton biomass was highest at Pineland (peak biomass was slightly less than the 2011 and 2012 peaks) and Tahoe City (peak biomass was slightly less than the 2012 peak biomass). Much of the biomass was due to stalked diatoms at both sites, in addition green filamentous algae and possibly Blue-green algae also appeared to contribute at Pineland. Moderate amounts of biomass were present at the other routine monitoring sites. Much of the biomass appeared to be due to Blue-green algae and green filamentous algae at sites along the east shore and at Incline West and Rubicon Pt. At Sugar Pine Pt. the biomass appeared to be mostly due to Blue-green algae, while at Dollar Pt. the biomass was a mix of Blue-greens, stalked diatoms and green filamentous algae.

Table 7. Summary of eulittoral periphyton Chlorophyll _a_ (Chlor._a_), Ash Free Dry Weight (AFDW), visual score from above and below water, average filament length, percent algal coverage, and predominant algal types estimated visually underwater (where SD= stalked diatoms; FG= filamentous greens; CY= blue-green algae) for routine periphyton monitoring sites during July 2011-July 2012. Note for Chlorophyll *a* and AFDW, n=2 unless otherwise indicated (i.e. two replicate samples were taken). Visual score is a subjective ranking of the aesthetic appearance of algal growth ("above" viewed above water; "below" viewed underwater) where 1 is the least offensive and 5 is the most offensive. Biomass Index is Filament Length times % Algal Cover. Also,"na" = not available or not collected; "nes" = not enough sample for analysis. Sampling depth and corresponding sampling elevation are also indicated.

Site	Date	Sampling Depth/Elev (m/ ft)	Chlor. *a* (mg/m^2)	Std Dev (mg/m^2)	AFDW (g/m^2)	Std Dev (g/m^2)	Above Visual Score	Below Visual Score	Fil. Length (cm)	Algal Cover. (%)	Biomass Index	Algal Type
Rubicon Pt.	10/28/11	0.5/6225.80	NES	NES	1.65	(n=1)	1	1.5	<0.1	50	<0.05	SD
	1/12/12	0.5/6225.02	3.73	(n=1)	NES	NES	3	2	0.2	50	0.10	SD
	3/19/12	0.5/6225.36	15.78	2.49	5.65	0.48	2	3	1.0	60	0.60	SD
	4/9/12	0.5/6225.45	74.15	22.21(n=3)	25.93	4.29(n=3)	4	4	2.0	90	1.80	SD,FG
	6/11/12	0.5/6225.96	168.62	82.41(n=3)	99.26	55.25(n=3)	4	5	4.0	90	3.6	SD
Sugar Pine Pt.	10/28/11	0.5/6225.80	NES	NES	0.38	(n=1)	1	1	0.0	0	0.00	NA
	1/12/12	0.5/6225.02	1.71	0.58	NES	NES	2	1	0.1	40	0.04	SD
	3/19/12	0.5/6225.36	5.71	0.78	2.42	0.62	NA	2	0.3	80	0.24	SD
	4/9/12	0.5/6225.45	3.89	2.04	3.57	(n=1)	2	2	0.1	90	0.09	SD
	6/11/12	0.5/6225.96	1.48	0.13	NES	NES	NA	2	0.2	50	0.10	SD
Pineland	10/28/11	0.5/6225.80	8.92	0.12	5.13	1.60	2	2	0.2	80	0.16	FG
	1/12/12	0.5/6225.02	38.97	0.58	19.47	1.20	1	2	0.5	80	0.40	SD,FG
	3/19/12	0.5/6225.36	128.51	29.17	67.66	9.42	NA	NA	2.5	90	2.25	SD,FG
	4/9/12	0.5/6225.45	173.32	81.48(n=3)	115.14	47.36(n=3)	5	5	3.0	100	3.00	SD,FG
	6/11/12	0.5/6225.96	162.20	62.39	70.60	16.57	2	3	1.0	70	0.70	SD,CY
Tahoe City	10/28/11	0.5/6225.80	43.77	6.22	37.46	0.96	2.5	2.5	0.2	80	0.16	SD
	1/12/12	0.5/6225.02	41.45	5.26	33.57	6.27	2	2	0.3	80	0.24	SD
	3/19/12	0.5/6225.36	105.88	7.74(n=3)	106.49	29.17(n=3)	4	4	1.6	80	1.28	SD
	4/11/12	0.5/6225.45	119.30	21.05(n=3)	94.16	14.96(n=3)	3	4	2.0	80	1.60	SD
	6/11/12	0.5/6225.96	19.96	2.81	23.25	3.58	2	3	0.5	60	0.30	SD

Site	Date	Sampling Depth/Elev (m/ ft)	Chlor. *a* (mg/m^2)	Std Dev (mg/m^2)	AFDW (g/m^2)	Std Dev (g/m^2)	Above Visual Score	Below Visual Score	Fil. Length (cm)	Algal Cover. (%)	Biomass Index	Algal Type
Dollar Pt.	10/28/11	0.5/6225.80	10.24	3.32	NES	NES	3	2	0.1	80	0.08	SD,FG
	1/13/12	0.5/6225.01	12.42	1.34	2.05	1.30	1	1	<0.1	5	<0.01	NA
	3/19/12	0.5/6225.36	35.91	16.15	20.48	9.22	2	2	0.4	90	0.36	SD
	4/9/12	0.5/6225.45	33.36	8.44(n=3)	23.71	7.09(n=3)	3	4	1.8	90	1.62	SD
	6/11/12	0.5/6225.96	7.90	1.77	8.82	0.26	2	2	0.2	40	0.08	SD
Incline West	10/28/11	0.5/6225.80	7.61	0.83	4.82	0.46	1	1	0.1	70	<0.07	SD
	1/13/12	0.5/6225.01	10.57	1.00	6.04	0.30	2	2	0.2	70	0.14	CY,FG
	3/19/12	0.5/6225.36	19.48	0.36	12.42	0.18	3	3	0.3	80	0.24	CY,FG
	4/20/12	0.5/6225.52	13.56	1.14	8.43	0.59	3.5	3.5	0.4	80	0.32	SD,CY,FG
	6/11/12	0.5/6225.96	15.46	2.55	17.07	0.58	4	4	1.2	80	0.96	SD,CY,FG
Sand Point	10/28/11	0.5/6225.80	NES	NES	2.68	0.50	1	2	0.2	50	0.10	FG
	1/13/12	0.5/6225.01	4.41	0.00	NES	NES	3	2	0.2	60	0.12	FG
	3/19/12	0.5/6225.36	NES	NES	0.28	0.40	2	2	0.1	40	0.04	SD,FG
	4/20/12	0.5/6225.52	3.96	0.31	3.99	1.50	2	2	0.1	70	0.07	SD
	6/11/12	0.5/6225.96	9.13	0.34	9.38	1.75	3.5	3	0.6	70	0.42	FG
Deadman Pt.	10/28/11	0.5/6225.80	3.69	0.45	NES	NES	2	2	0.2	70	0.14	FG
	1/13/12	0.5/6225.01	3.50	0.11	NES	NES	1	2	0.1	60	0.06	FG
	3/19/12	0.5/6225.36	4.19	0.66	NES	NES	2	2	0.1	95	0.10	FG
	4/20/12	0.5/6225.52	7.39	0.39	4.49	0.60	2	2	0.2	60	0.12	FG
	5/11/12	0. 5/6225.86	6.78	0.72	6.39	1.11	3	3	0.2	90	0.18	FG
	6/11/12	0.5/6225.96	11.30	3.00	14.34	6.99	3	3	1.0	50	0.50	CY,FG
Zephyr Point	10/28/11	0.5/6225.80	4.55	1.24	3.20	1.36	1	2	0.2	50	0.10	SD
	1/13/12	0.5/6225.01	5.40	2.03	4.64	2.83	2	2.5	0.2	80	0.16	FG
	3/19/12	0.5/6225.36	7.35	1.50	1.73	0.19	2	2.5	0.2	50	0.10	SD,FG
	4/20/12	0.5/6225.52	19.53	10.45	12.22	9.38	2	3	0.8	60	0.48	SD,FG
	5/11/12	0. 5/6225.86	8.67	1.05	5.90	0.60	2.5	2.5	0.4	80	0.32	SD,FG
	6/11/12	0.5/6225.96	12.81	0.72	9.71	0.85	3	3	0.4	100	0.40	SD

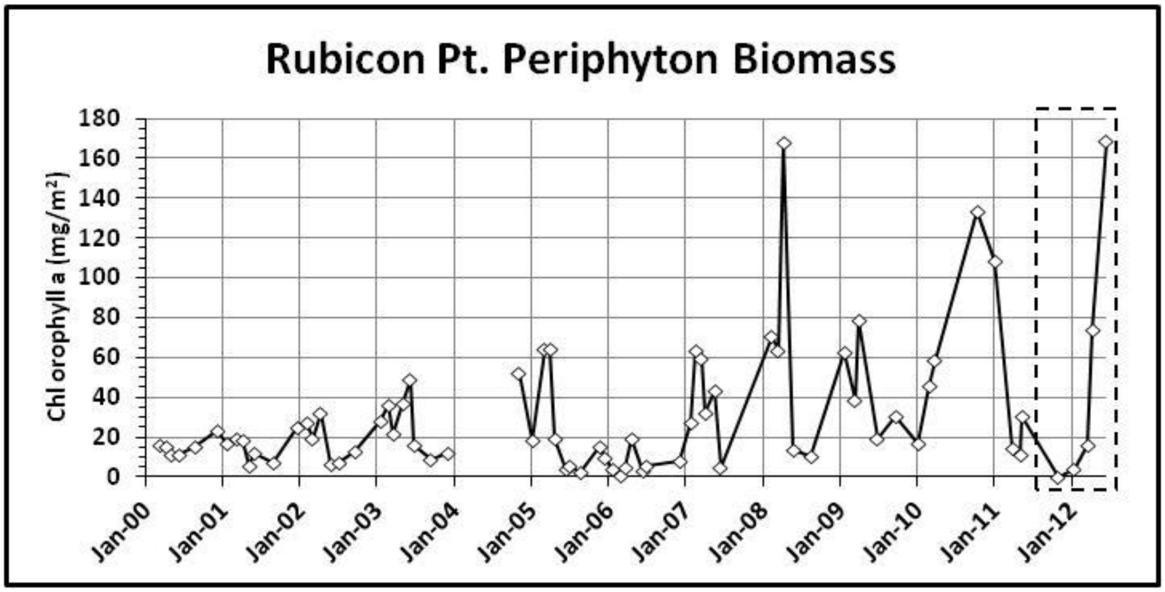

Figure 8 a. Rubicon Pt. periphyton biomass (chlorophyll *a*) 2000-2012. Monitoring data collected during July 2011-June 2012 highlighted in dash-outlined box.

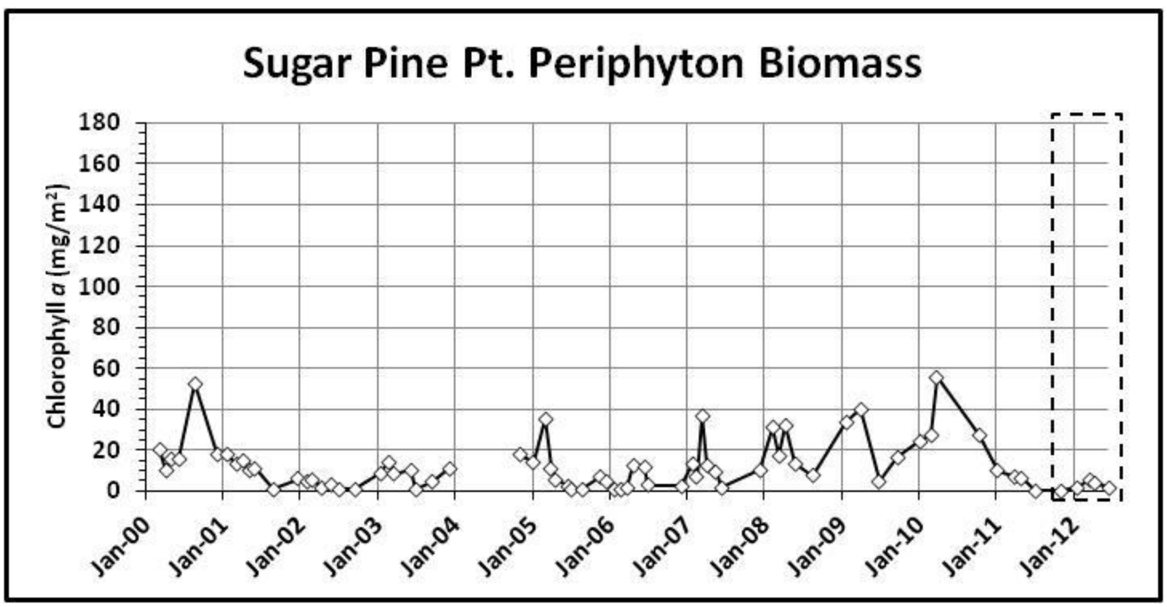

Figure 8 b. Sugar Pine Pt. periphyton biomass (chlorophyll *a*) 2000-2012. Monitoring data for July 2011-June 2012 highlighted in dash-outlined box.

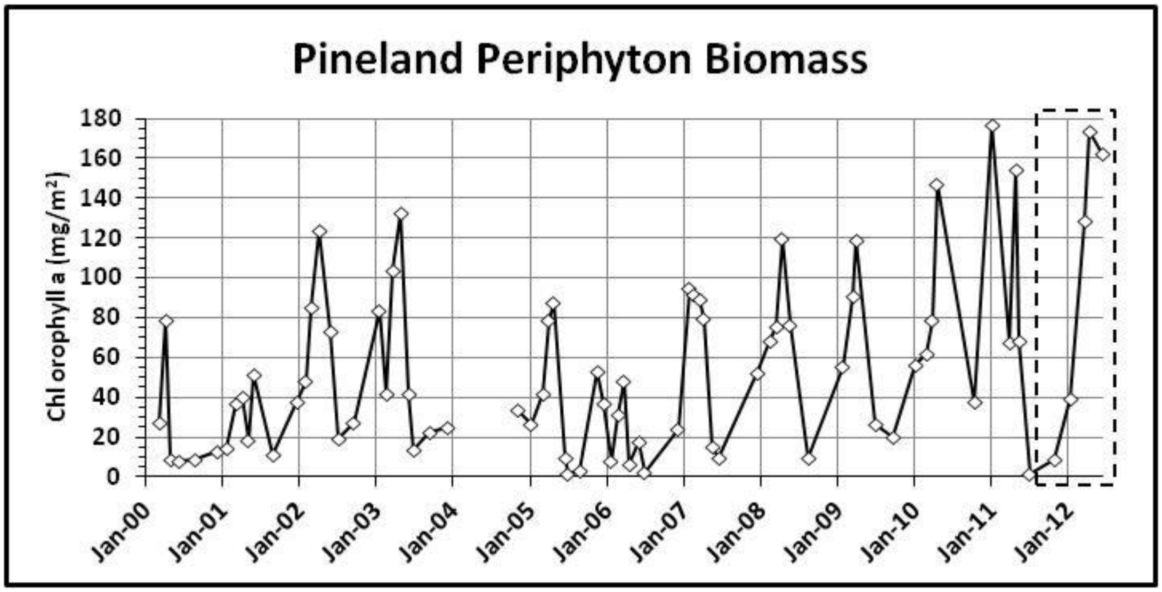

Figure 8 c. Pineland periphyton biomass (chlorophyll *a*) 2000-2012. Monitoring data for July 2011-June 2012 highlighted in dash-outlined box.

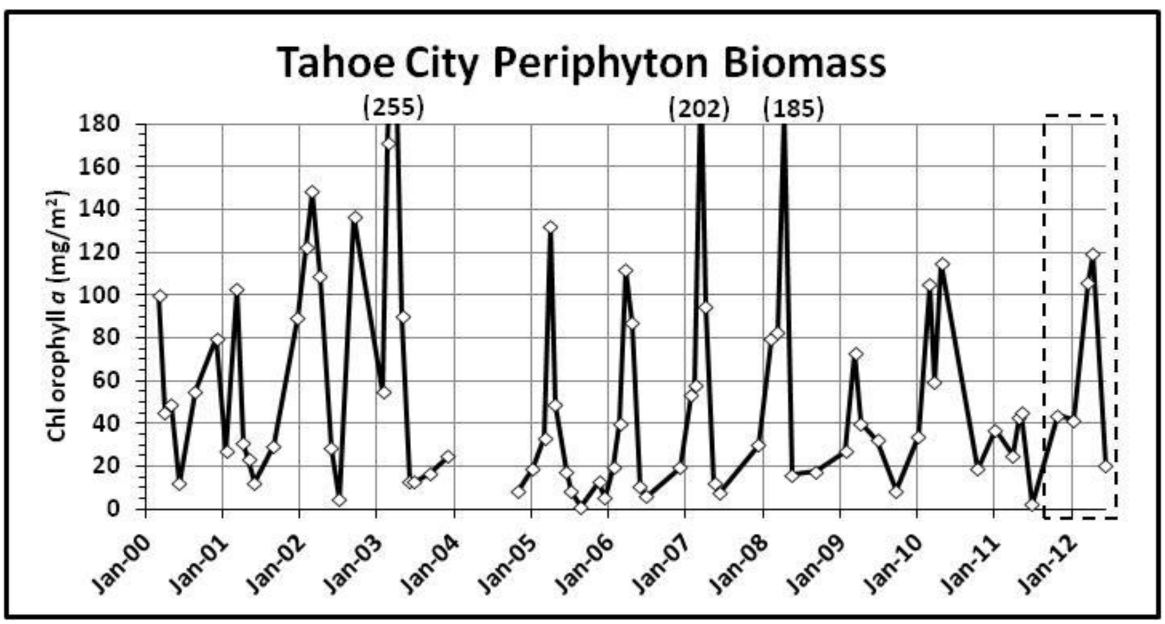

Figure 8 d. Tahoe City periphyton biomass (chlorophyll *a*) 2000-2012. Monitoring data for July 2011-June 2012 highlighted in dash-outlined box.

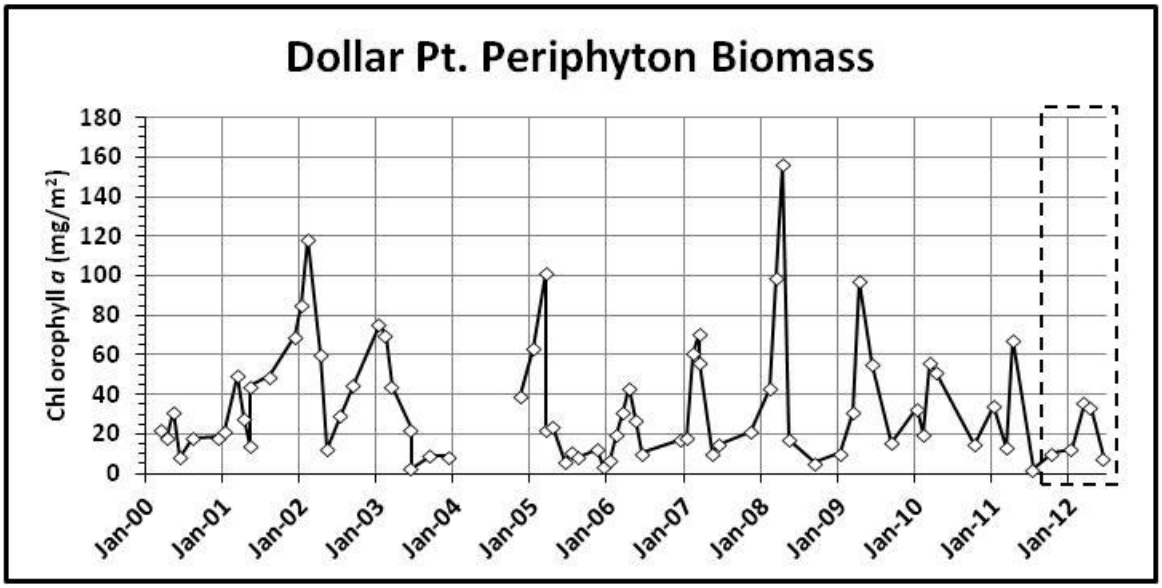

Figure 8 e. Dollar Pt. periphyton biomass (chlorophyll *a*) 2000-2012. Monitoring data for July 2011-June 2012 highlighted in dash-outlined box.

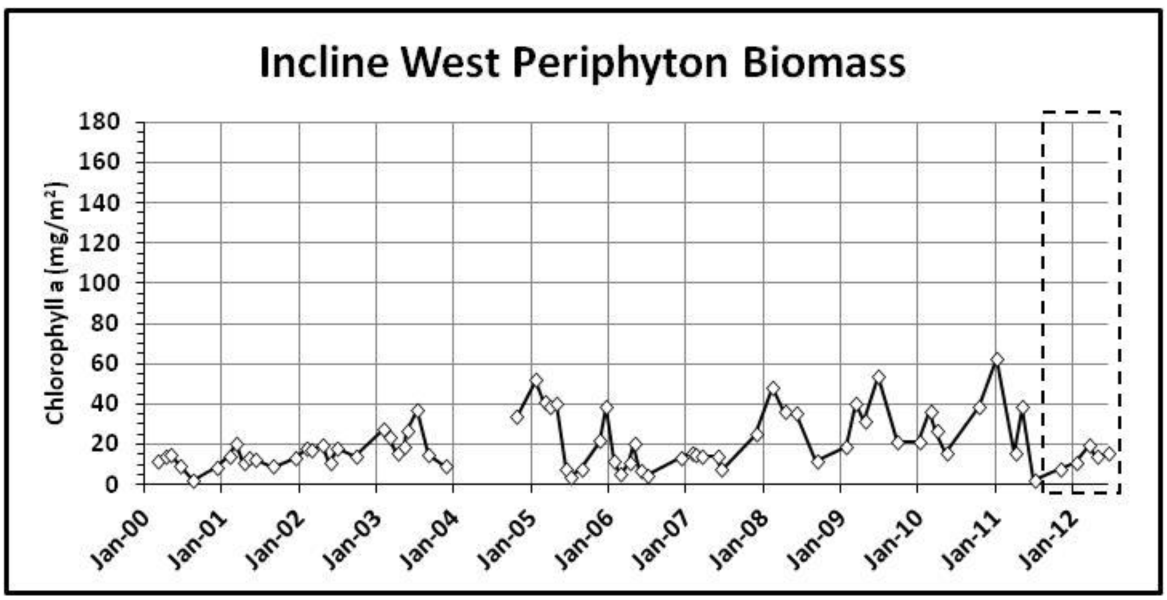

Figure 8 f. Incline West periphyton biomass (chlorophyll *a*) 2000-2012. Monitoring data for July 2011-June 2012 highlighted in dash-outlined box.

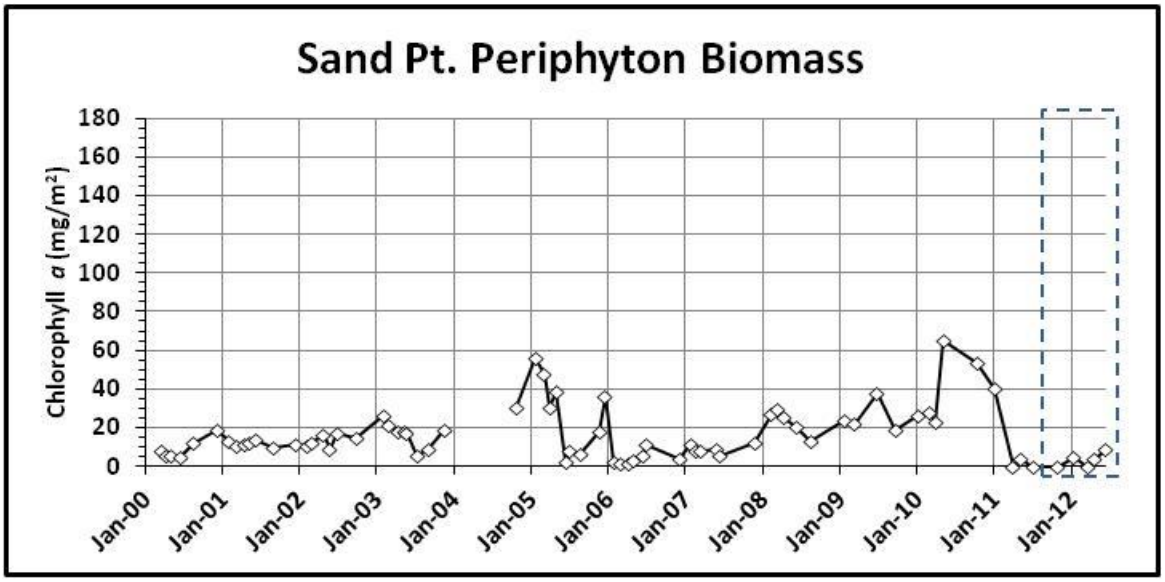

Figure 8 g. Sand Pt. periphyton biomass (chlorophyll *a*) 2000-2012. Monitoring data for July 2011-June 2012 highlighted in dash-outlined box.

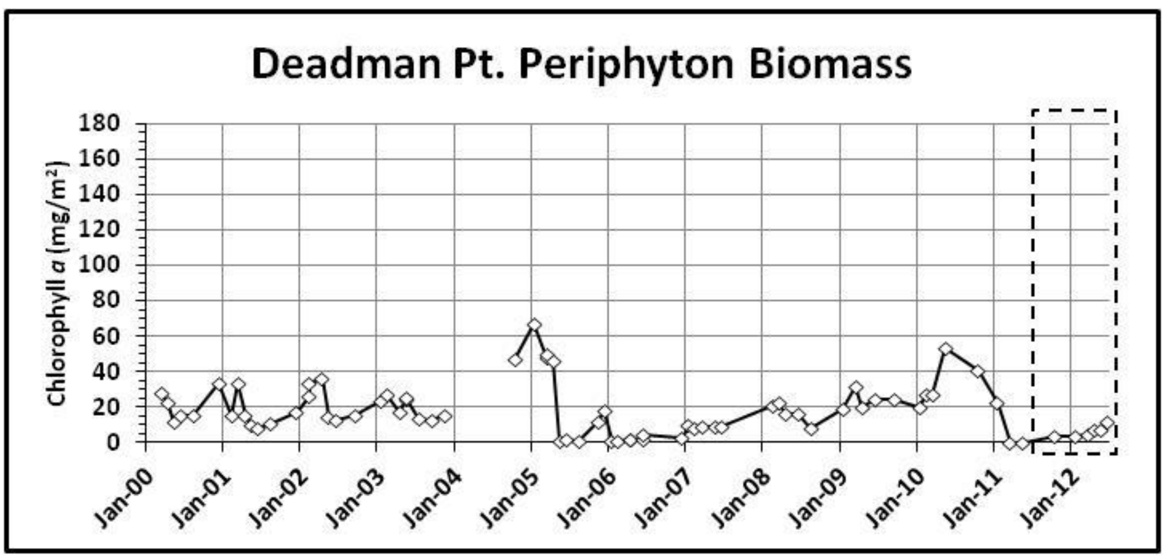

Figure 8 h. Deadman Pt. periphyton biomass (chlorophyll *a*) 2000-2012. Monitoring data for July 2011-June 2012 highlighted in dash-outlined box.

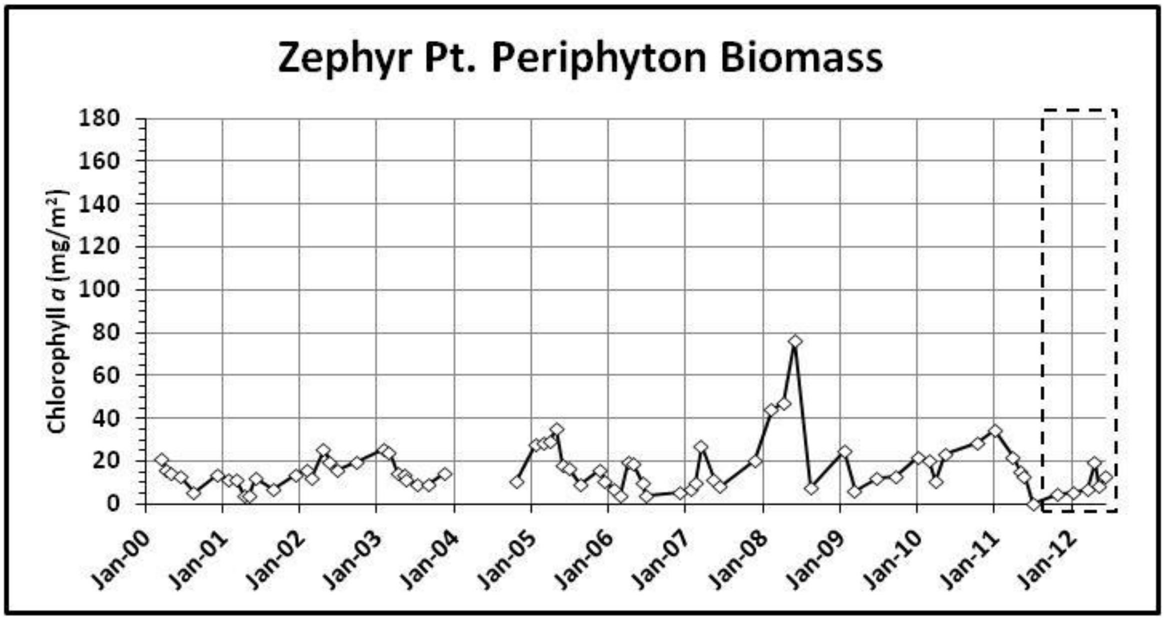

Figure 8 i. Zephyr Pt. periphyton biomass (chlorophyll *a*) 2000-2012. Monitoring data for July 2011-June 2012 highlighted in dash-outlined box.

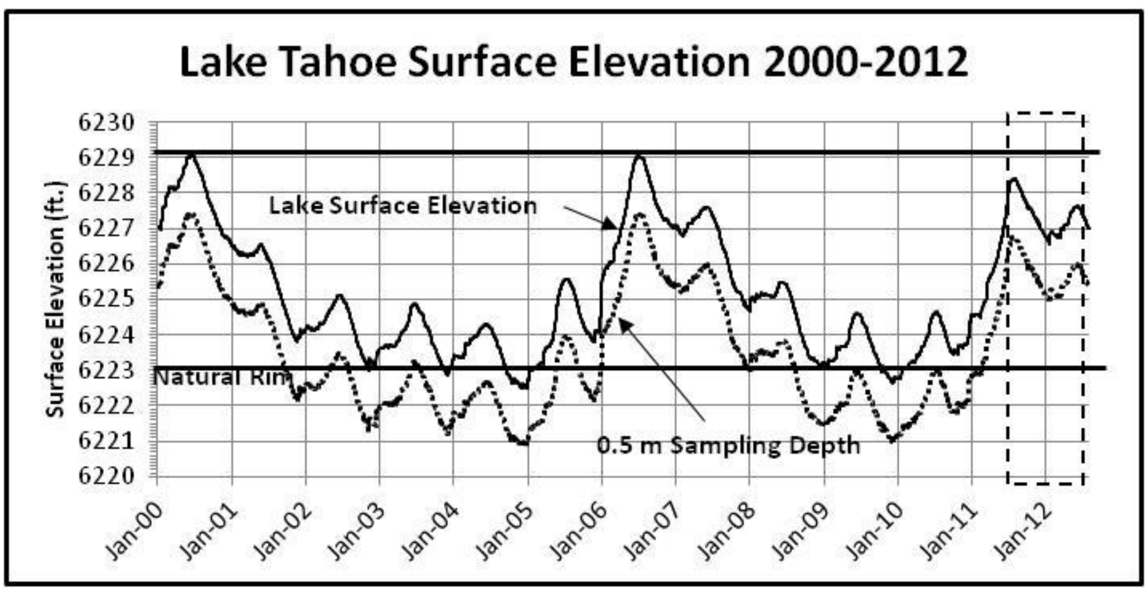

Figure 9. Fluctuation in Lake Tahoe surface elevation 1/1/00-8/1/12. Periphyton samples were typically collected during the period at a depth of 0.5m below the surface on natural rock substrata. The 0.5m sampling depth (shown as a dotted line) fluctuates with the lake surface elevation. The elevation of the natural rim of Lake Tahoe is 6223 ft. The top 6.1 ft. of the lake above the rim (to 6229.1 ft.) is operated as a reservoir. Lake level and sampling depth during the period July 1, 2011 to Aug. 1, 2012 is shown in the dash-outlined box.

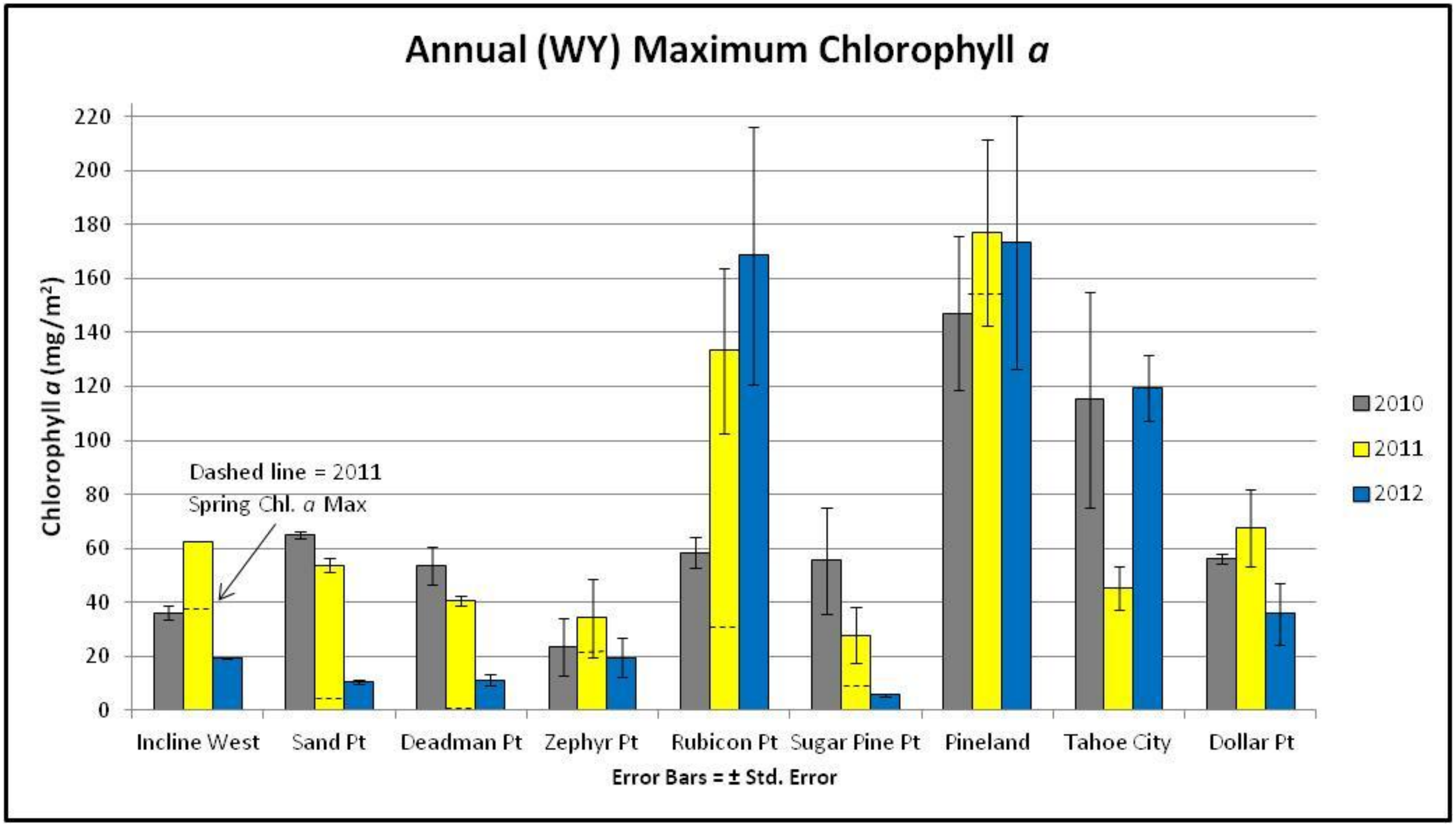

Figure 10. Maximum periphyton Chlorophyll *a* for Water Years 2010, 2011 and 2012 at the nine routine periphyton monitoring sites at 0.5m. Note, in WY 2011 (Oct. 1, 2010-Sept. 30, 2011), a significant lake level rise of nearly five feet occurred, (from 6223.46ft minimum surface elevation in October, 2010 to 6228.42 ft in August 2011). While biomass often peaks in the spring, during 2010-2011 peak biomass was observed at some sites in Oct. 2010 or Jan. 2011 associated with the low lake level. As the lake rose rapidly in 2011, little colonization of periphyton occurred on newly submerged substrate at many sites, and peak spring growth (shown by dashed lines) was lower than earlier in the year; however at Pineland, Tahoe City and Dollar Pt. the spring peak was near or at the annual max.

Expanded Monitoring 2012

While the nine routine sampling sites provide data from many different regions around the lake with differing levels of backshore development and disturbance, the limited number of these sites does not provide enough resolution to determine periphyton biomass on a whole-lake scale. For this reason an "expanded" synoptic sampling was done in the spring in which 45 additional sites along with the nine routine sites were monitored for level of periphyton growth. Table 8 presents the names and locations of these synoptic sites. This synoptic monitoring occurred during 4/3/12 – 5/12/12 and represents a "snap shot" of periphyton growth during the period when biomass was near maximum along much of the west shore. It is possible peaks in biomass occurred prior to this period at some South Shore sites (based on past patterns) and periphyton biomass at some east shore sites showed slight increases in biomass into June 2012 compared with values measured during the period.

During spring 2012, the 45 expanded sites were monitored visually while snorkeling. Measurements of filament length, % coverage, above and below water visual ranking, and observations on main algal types present were made. In addition biomass samples (chlorophyll *a* and AFDW were collected at 12 of the sites).

2012 Expanded Monitoring Results

Data collected for the expanded monitoring 2012 is summarized in Table 9. Figure 11 presents a map showing the general distribution of periphyton biomass (as Periphyton Biomass Index (PBI)) around the lake in spring 2012. Again, it is important to note that due to the issue of variable timing of growth and subsequent die-off of periphyton at various locations around the lake this synoptic data is best considered as supplemental to the routine seasonal monitoring. Conclusions related to the ability of a specific site to support periphyton should be tempered by these considerations.

Along the southwest shore, from Cascade Creek to Sugar Pine Pt. growth ranged from moderate to heavy in most areas with an area of light biomass from North Meeks Bay to Sugar Pine Pt. E. Areas of high biomass in this region included: Cascade Cr. (PBI=1.71, U/W rank or visual score=3.5), Rubicon Pt. (PBI=1.80, U/W Rank=4, chlorophyll *a*=74.15 mg/m^2), Gold Coast (PBI=1.80, U/W rank=4) and North Meeks Bay (PBI=1.28, U/W rank=3.5). Much of the periphyton biomass at these sites was due to stalked diatoms with filamentous green algae also present in areas of heavier growth from Rubicon Pt. to No. Meeks Bay.

Similarly, biomass ranged from moderate to heavy from Tahoma north to Brockway Springs with a few areas of light biomass interspersed. Areas of particularly heavy biomass included: Ward Cr. mouth (PBI=5.0, U/W rank=5, chlorophyll *a* = 165.58 mg/m^2), nearby Pineland (PBI=3.0, U/W rank=5, chlorophyll *a* = 173.32 mg/m^2), Tahoe City (PBI=1.60, U/W rank=4, chlorophyll *a* = 119.30 mg/m^2), Tahoe City Tributary

Table 8. Periphyton expanded monitoring locations.

	SITE	SITE NAME	LOCATION
WEST SHORE	A	Cascade Creek	N38 57.130; W120 04.615
	B	S. of Eagle Point	N38 57.607; W120 04.660
	C	E.Bay/Rubicon	N38 58.821; W120 05.606
	D	Gold Coast	N39 00.789; W120 06.796
	E	S. Meeks Point	N39 01.980; W120 06.882
	F	N. Meeks Bay	N39 02.475; W120 07.194
	G	Tahoma	N39 04.199; W120 07.771
	H	S. Fleur Du Lac	N39 05.957; W120 09.774
	I	Blackwood Creek	N39 06.411; W120 09.424
		Kaspian Pt.	(Point near Elizabeth Dr.)
	J	Ward Creek	N39 07.719; W120 09.304
	K	N. Sunnyside	N39 08.385; W120 09.135
	L	Tavern Point	N39 08.806; W120 08.628
	TCT	Tahoe City Tributary	(adjacent to T.C. Marina)
	M	TCPUD Boat Ramp	N39 10.819; W120 07.177
		Lake Forest Island	(end of Bristlecone St.)
	N	S. Dollar Point	N39 11.016; W120 05.888
	O	S. Dollar Creek	N39 11.794; W120 05.699
	P	Cedar Flat	N39 12.567; W120 05.285
	Q	Garwood’s	N39 13.486; W120 04.974
	R	Flick Point	N39 13.650; W120 04.155
	S	Stag Avenue	N39 14.212; W120 03.710
	T	Agatam Boat Launch	N39 14.250; W120 02.932
EAST SHORE	E1	South side of Elk Point	N38 58.965; W119 57.399
	E2	North Side of Elk Point	N38 59.284; W119 57.341
	E3	South Side of Zephyr Point	N38 59.956; W119 57.566
	E4	North Zephyr Cove	N39 00.920; W119 57.193
	E5	Logan Shoals	N39 01.525; W119 56.997
	E6	Cave Rock Ramp	N39 02.696; W119 56.935
	E7	South Glenbrook Bay	N39 04.896;W119 56.955
	E8	South Deadman Point	N39 05.998; W119 57.087
	E9	Skunk Harbor	N39 07.856; W119 56.597
	E10	Chimney Beach	N39 09.044; W119 56.008
	E11	Observation Point	N39 12.580; W119 55.861
NORTH SHORE	E12	Hidden Beach	N39 13.263; W119 55.832
	E13	Burnt Cedar Beach	N39 14.680; W119 58.132
		Incline Condo	N39 14.90; W119 59.63
		Old Incline West	(100 yds No. Incline West)
	E14	Stillwater Cove	N39 13.789; W120 00.020
	E15	North Stateline Point	N39 13.237; W120 00.193
	E16	Brockway Springs	N39 13.560; W120 00.829
	E17	Kings Beach Ramp Area	N39 14.009; W120 01.401
SOUTH SHORE	S1	Tahoe Keys Entrance	N38 56.398; W120 00.390
	S2	Kiva Point	N38 56.555; W120 03.203
		Timber Cove Rocks	(Rocks west T. Cove Pier)

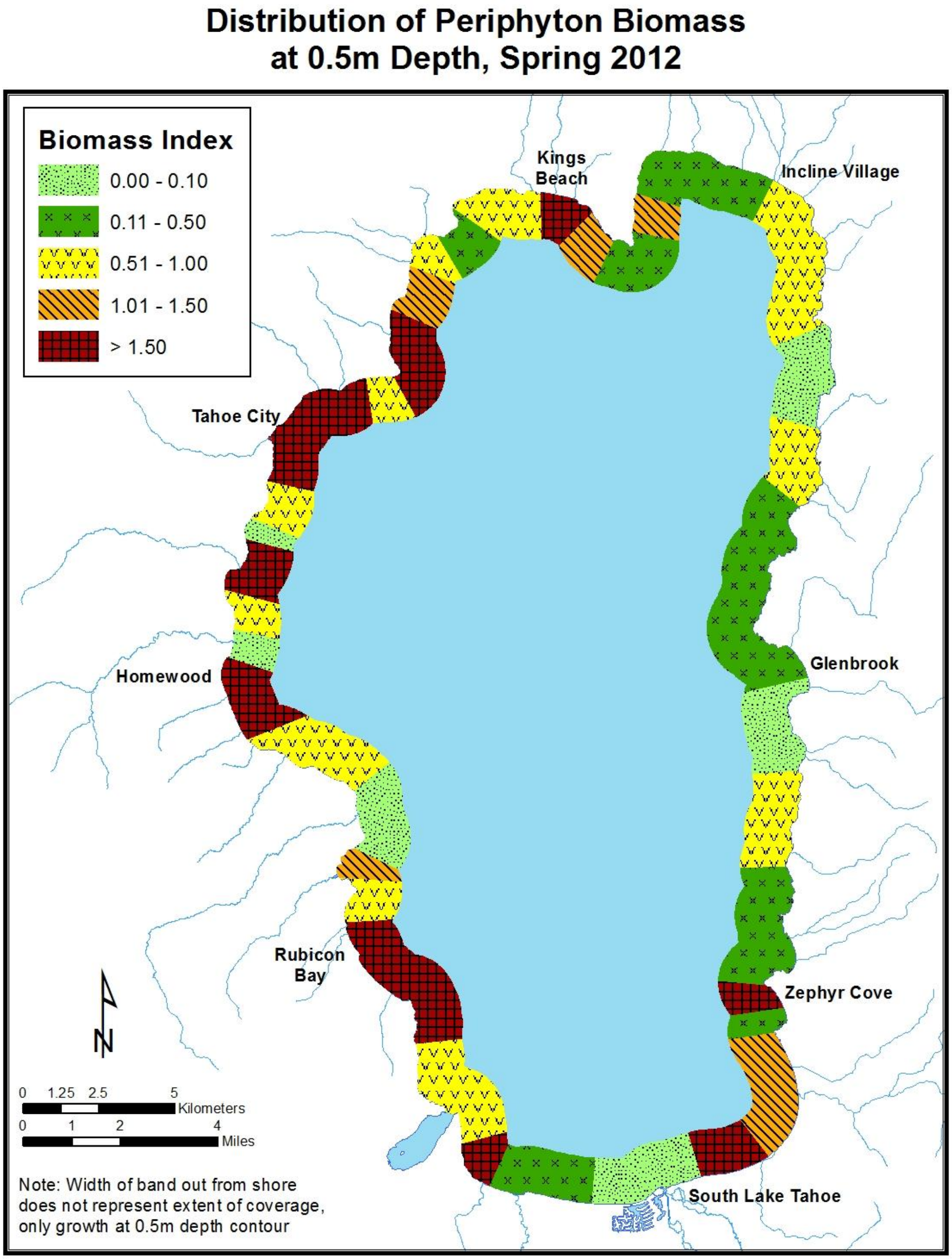

Figure 11. Extrapolated regional distribution of periphyton biomass measured as Biomass Index (Avg. Filament Length x % Area Covered with Algae) 4/3-5/12/12.

(PBI= 2.70, U/W rank=5), Tahoe City Boat Ramp (PBI=1.62, U/W rank=4), Lake Forest Island (PBI=3.15, U/W rank=5), Dollar Pt. (PBI=1.62,U/W rank=4, chlorophyll *a* =33.36 mg/m^2), So. Dollar Cr. (PBI=3.0, U/W rank=5, chlorophyll *a*=104.06 mg/m^2), Kings Beach (PBI=1.62, U/W rank=4), and Brockway Springs (PBI=1.3, U/W rank= 4, chlorophyll *a*= 33.94 mg/m^2). In most areas the heavy biomass was primarily due to stalked diatoms, some filamentous green algae were also interspersed at Pineland.

Areas with lightest growth between Cascade Cr. and Brockway Springs included Sugar Pine Pt. (PBI=0.09, U/W rank=2, chlorophyll *a*= 3.89 mg/m^2), the mouth of Blackwood Cr. (PBI=0.08, U/W rank=2) where small substrate is likely unfavorable for growth due to shifting (sand, gravel, small cobble) and North Sunnyside (PBI=0, U/W rank=1), where nearshore substrate may also be unfavorable (small cobble prone to tumbling in wave activity).

This was the first time in recent years that we have made observations near Lake Forest Island. A thick coverage of rocks with stalked diatoms was observed there. In several past years, significant accumulations of sloughed periphyton have washed up along shore in the Lake Forest area. Nearby production of biomass likely contributes to this accumulation of sloughed material onshore. Other conditions may need to occur however, to result in material washing up along the beach - since significant amounts of sloughed periphyton had not washed up onshore during several observations made at Lake Forest in 2012. Some conditions which might favor deposition of the sloughed material on the beach there may include lowered lake levels to concentrate sloughed material in the shallows and favorable wind/wave activity to wash onshore.

Between North Stateline Pt. and Zephyr Pt., periphyton biomass was generally light with a few regions of moderate to heavy growth. Areas of heavier growth within this region included: Stillwater Cove (PBI= 1.08, U/W rank= 3) and the Hidden Beach Inshore Site (PBI=1.53, U/W rank= 4). Areas of moderate growth in this region included:, Hidden Beach Offshore Site (PBI=0.56, U/W rank= 3), Observation Pt. (PBI=0.81, U/W rank=3.5), Chimney Beach (PBI=0.54, U/W rank= 3), and Cave Rock Boat Ramp (PBI=0.54, U/W rank=3, chlorophyll *a*=10.89 mg/m^2). Stalked diatoms appeared to be the primary contributor to biomass between North Stateline Pt. and Zephyr Pt. with a couple areas also having filamentous green algae.

Routine monitoring indicated biomass to still be increasing at some east shore locations in June after the period of the spring synoptic. For instance Incline West PBI increased to 0.96 in June, Sand Pt. increased to 0.42 and Deadman Pt. increased to 0.50. Again the synoptics represent essentially a “snap-shot” of biomass levels during the spring. The peaks in biomass for some east shore sites may not be represented in the synoptic mapping for 2012, but the general pattern of lower biomass along the east shore (even taking into account increased PBI at some east shore sites in June), would still occur.

In the southern portion of the lake from South Zephyr Pt. to Kiva Beach, the heaviest periphyton biomass was observed along portions of the southeast corner of the lake. Areas with heavier biomass in the southeast region included: South Zephyr Pt. (PBI=1.80, U/W rank=4), South Elk Pt. (PBI=1.44, U/W rank= 4), and Timber Cove

Rocks (PBI=1.80, U/W rank=4). Biomass was relatively light at both Tahoe Keys east entrance (PBI=0.08, U/W rank= 2, chlorophyll *a*= 1.88 mg/m^2) and Kiva Pt. (PBI=0.12, U/W rank= 3, chlorophyll *a*= 7.02 mg/m^2). However, in some past years biomass has peaked relatively early in the spring and this year's synoptic may not have captured the peak growths at these sites.

Overall, during the spring synoptic, WY 2012, periphyton biomass was moderate to heavy along the west and southeast shores, while growth was light to moderate along portions of the south, east and north shores. The periphyton appeared to be dominated by the stalked diatom *Gomphoneis herculeana* at most sites in the spring.

The development of moderate to heavy periphyton biomass in WY2012 for many of the west shore synoptic and routine sites is of interest, as this was a relatively low precipitation year, with less runoff than WY2011. As was discussed above for the routine site data, a combination of factors likely contributes to periphyton biomass patterns. These factors may include: nutrient inputs (surface runoff, enhanced inputs from urban/disturbed areas, groundwater, lake mixing/upwelling/ currents), lake level, substrate availability and wind/wave events which may affect periphyton loss from the rocks.

Table 9. Summary of 0.5m periphyton Chlorophyll *a*, Ash Free Dry Weight (AFDW), visual score, avg. filament length and % algal coverage, predominant algae present based on visual observations while snorkeling (FG=filamentous greens; SD=stalked diatoms; CY= blue green algae), for spring synoptic 2012. Note for chlorophyll *a* and AFDW, n=2 unless otherwise indicated. Visual score is a subjective ranking of the aesthetic appearance of algal growth (viewed underwater) where 1 is the least offensive and 5 is the most offensive. Biomass Index is Filament Length times % Algal Cover. "na" = not available or not collected; "nes" = not enough sample for analysis. Sampling depth and corresponding sampling elevation are also indicated.

Site	Site Name	Date	Sampling Depth/Elev (m/ ft)	Chl *a* (mg/m^2)	Std Dev (mg/m^2)	AFDW (g/m^2)	Std Dev (mg/m^2)	Above Visual Score	Below Visual Score	Fil. Length (cm)	Algal Cover. %	Biomass Index	Algal Type
A	Cascade Creek	4/9/12	0.5/6225.45					3	3.5	1.8	95	1.71	SD
B	S. of Eagle Point	4/9/12	0.5/6225.45					3	3	0.8	90	0.72	SD
C	E.Bay/Rubicon	4/9/12	0.5/6225.45					3	3	0.8	75	0.6	SD
	Rubicon Pt.	4/9/12	0.5/6225.45	74.15	22.21(n=3)	25.93	4.29(n=3)	4	4	2.0	90	1.80	SD,FG
D	Gold Coast	4/9/12	0.5/6225.45					3.5	4	2.0	90	1.8	SD,FG
E	S. Meeks Point	4/9/12	0.5/6225.45					3.5	3	1.0	90	0.90	SD
F	N. Meeks Bay	4/9/12	0.5/6225.45					3	3.5	1.5	85	1.28	SD,FG
	Sugar Pine Pt.	4/9/12	0.5/6225.45	3.89	2.04	3.57	(n=1)	2	2	0.1	90	0.09	SD
G	Tahoma	4/9/12	0.5/6225.45					2.5	3	1.3	60	0.78	SD
H	S. Fleur Du Lac	4/9/12	0.5/6225.45					3	4	2.0	90	1.80	SD,FG
I	Blackwood Creek	4/9/12	0.5/6225.45					1	2	0.1	80	0.08	SD
	Kaspian Pt.	4/9/12	0.5/6225.45					3	3	1.0	100	1.00	SD
J	Ward Creek	4/9/12	0.5/6225.45	165.58	115.68(n=3)	118.74	27.58 (n=3)	-	5	5.0	100	5.00	SD
	Pineland	4/9/12	0.5/6225.45	173.32	81.48(n=3)	115.14	47.36(n=3)	5	5	3.0	100	3.00	SD,FG
K	N. Sunnyside	4/9/12	0.5/6225.45					1	1	0	0	0	-
L	Tavern Pt.	4/9/12	0.5/6225.45					2	2.5	0.8	70	0.56	SD
	Tahoe City	4/11/12	0.5/6225.45	119.30	21.05(n=3)	94.16	14.96(n=3)	3	4	2.0	80	1.60	SD
TCT	Tahoe City Trib.	4/11/12	0.5/6225.45					4	5	3.0	90	2.70	SD
M	TCPUD Boat Ramp	4/11/12	0.5/6225.45					-	4	1.7	95	1.62	SD
	Lake Forest Island	4/11/12	0.5/6225.45					4	5	3.5	90	3.15	SD
N	S. Dollar Pt.	4/9/12	0.5/6225.45					2	2.5	0.8	80	0.64	SD
	Dollar Pt.	4/9/12	0.5/6225.45	33.36	8.44(n=3)	23.71	7.09(n=3)	3	4	1.8	90	1.62	SD
O	S. Dollar Creek	4/23/12	0.5/6225.58	104.06	24.81(n=3)	114.60	19.92(n=3)	4.5	5	3.0	100	3.00	SD
P	Cedar Flat	4/23/12	0.5/6225.58					3	3.5	1.3	90	1.17	SD
Q	Garwood's	4/11/12	0.5/6225.45	71.71	2.48	43.51	6.27	-	3.5	0.8	80	0.64	SD
Q	Garwood's	4/23/12	0.5/6225.58	32.55	10.18	15.07	5.19	2.5	3.0	0.4	60	0.24	SD
R	Flick Point	4/23/12	0.5/6225.58					2.5	2.5	0.5	50	0.25	SD

Site	Site Name	Date	Sampling Depth/Elev (m/ ft)	Chl *a* (mg/m^2)	Std Dev (mg/m^2)	AFDW (g/m^2)	Std Dev (mg/m^2)	Above Visual Score	Below Visual Score	Fil. Length (cm)	Algal Cover. %	Biomass Index	Algal Type
S	Stag Avenue	4/23/12	0.5/6225.58	29.78	6.86	16.37	2.06	3	3.5	0.8	80	0.64	SD
T	Agatam Boat R.	4/23/12	0.5/6225.58					-	3.5	1.0	70	0.70	SD
E17	Kings Beach	4/23/12	0.5/6225.58					3.5	4	1.8	90	1.62	SD
E16	Brockway Springs	4/23/12	0.5/6225.58	33.94	4.85	21.05	3.05	4	4	2.0	65	1.30	SD
E15	No. Stateline Point	4/20/12	0.5/6225.52					4	3.5	0.5	80	0.40	SD
E14	Stillwater Cove	4/20/12	0.5/6225.52					3	3	1.2	90	1.08	SD
	Old Incline West	4/20/12	0.5/6225.52	4.46	1.14	3.84	0.09	3	3	0.4	80	0.32	SD
	Incline West	4/20/12	0.5/6225.52	13.56	1.14	8.43	0.59	3.5	3.5	0.4	80	0.32	SD,CY,FG
	Incline Condo	4/20/12	0.5/6225.52	4.46	1.14	3.84	0.09	3	3	0.4	90	0.36	SD,CY
E13	Burnt Cedar Beach	4/20/12	0.5/6225.52					3.5	3.5	0.5	90	0.45	SD
E12	Hidden Beach offsh.	4/20/12	0.5/6225.52					3	3	0.8	70	0.56	SD
	Hidden Beach insh.	4/20/12	0.5/6225.52					3.5	4	1.7	90	1.53	SD
E11	Observation Point	4/20/12	0.5/6225.52					4	3.5	0.9	90	0.81	SD
	Sand Pt.	4/20/12	0.5/6225.52	3.96	0.31	3.99	1.50	2	2	0.1	70	0.07	SD
E10	Chimney Beach	4/20/12	0.5/6225.52					2.5	3	1.0	60	0.60	SD
E9	Skunk Harbor	4/20/12	0.5/6225.52					2	2	0.2	70	0.14	SD,FG
	Deadman Pt.	4/20/12	0.5/6225.52	19.53	10.45	4.49	0.60	2	2	0.2	60	0.12	FG
E8	So. Deadman Point	4/20/12	0.5/6225.52					3	3	0.6	70	0.42	SD
E8	So. Deadman Point	5/12/12	0.5/6225.88					3	3	0.4	80	0.32	SD
E7	So. Glenbrook Bay	4/20/12	0.5/6225.52					-	-	0.1	50	0.05	SD
E6	Cave Rock Ramp	5/12/12	0.5/6225.88	10.89	2.21	9.09	1.31	3	3	0.6	90	0.54	SD
E5	Lincoln Park	5/12/12	0.5/6225.88					3	3	0.6	80	0.48	-
E4	No. Zephyr Cove	5/12/12	0.5/6225.88					2.5	3	0.6	70	0.42	SD
E3	So. Zephyr Pt.	5/12/12	0.5/6225.88					2	4	2.0	90	1.80	SD
	Zephyr Pt.	5/11/12	0. 5/6225.86	8.67	1.05	5.90	0.60	2.5	2.5	0.4	80	0.32	
E2	No. Elk Pt.	5/12/12	0.5/6225.88					2.5	2.5	0.4	70	0.28	SD
E1	So. Elk Point	4/20/12	0.5/6225.52					3	4	1.6	90	1.44	SD
E1	So. Elk Point	5/12/12	0.5/6225.88	19.08	7.83	13.41	5.71	-	3.5	0.9	90	0.81	SD,FG
	Timber Cove Rock	4/3/12	0.5/6225.46	81.66	8.29	45.22	5.52	-	4	1.8	100	1.80	SD
S1	T. Keys Entrance	4/3/12	0.5/6225.46	1.88	0.66	0.00	(n=1)	3	2	0.2	40	0.08	SD
S2	Kiva Point	4/3/12	0.5/6225.46	7.02	1.42	4.18	1.58	2	3	0.2	60	0.12	SD

Summary Points for Periphyton Monitoring

1. **Very low periphyton biomass was present at 0.5m depth monitoring sites in the fall 2011 and early winter of WY 2012. During spring or early summer 2012 significant peaks in periphyton biomass occurred at several of the routine monitoring stations along the west shore, while biomass at sites along the north and east shores remained relatively low.**

2. **Heavy biomass developed at Rubicon Pt., Pineland and Tahoe City in WY 2012 despite relatively low WY precipitation and associated runoff. As has been indicated in previous reports a combination of factors likely contributes to periphyton biomass patterns. These factors may include: nutrient inputs (surface runoff, enhanced inputs from urban/disturbed areas, groundwater, lake mixing/upwelling/ currents), lake level, substrate availability and wind/wave events which may affect periphyton loss from the rocks. The growth in 2012 was also likely due to a combination of these factors, with some factors likely playing more of a role than others.**

3. **The results of the expanded synoptic monitoring during the spring of WY 2012, showed that periphyton biomass was heaviest at multiple sites along the west shore and in the southeast corner of the lake. Areas with the heaviest amounts of biomass during this spring intensive monitoring included: the Rubicon Pt. area, the area near Ward Cr. (Ward Cr. mouth and Pineland sites), the Tahoe City to Lake Forest area (Tahoe City, Tahoe City Tributary, Tahoe City Boat Ramp, Lake Forest Island), the Dollar Pt. area (Dollar Pt. and South Dollar Creek), Brockway Springs, and the southeast corner of the lake (South Zephyr Pt., South Elk Pt., and Timber Cove Rocks). The biomass in most areas was dominated by stalked diatom growth and in some areas filamentous green algae was also present. Again, it is important to note that due to the issue of variable timing of growth and subsequent die-off of periphyton at various locations around the lake this synoptic data is best considered as supplemental to the routine seasonal monitoring. Conclusions related to the ability of a specific site to support periphyton should be tempered by these considerations.**

4. **Along much of the north and east shores, periphyton biomass was generally light with a few regions of moderate to heavy growth during intensive spring synoptic monitoring. Areas of heavier growth within this region included: Stillwater Cove and the Hidden Beach Inshore Site along the north shore. Areas of moderate growth included: Hidden Beach Offshore Site, Observation Pt., Chimney Beach, and Cave Rock Boat Ramp on the east shore. Stalked diatoms appeared to be the primary contributor to biomass in this region also, with a couple areas also having filamentous green algae.**

5. **A very apparent trend in the long-term 2000-2012 monitoring data is the repeated significant peaks in spring periphyton biomass at sites the northwest portion of the lake (Pineland, Tahoe City and Dollar Pt.). In most years, much of this periphyton biomass was due to stalked diatoms and the period of lowest growth has tended to occur in the summer and fall. Rubicon Pt. has also had repeated spikes in growth since about 2007, however the spikes have not always occurred in the spring there.**

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Appendix Table 1.a. Precipitation amounts, N and P concentrations in wet deposition at the Ward Valley Lake Level Station 10/1/08-9/30/12. Shading indicates corrected data with significant difference between corrected value and initially presented value.

Samp. No.	Ward Valley Wet Collection Date-Time	Lake Level Precip. (in)	Precip. Form	Collector Type	Wet Bkt Amt. (in)	(Conc.) NO3-N (µg/l)	NH4-N (µg/l)	TKN (µg/l)	SRP (µg/l)	DP (µg/l)	TP (µg/l)	Notes
37	10/8/2008 11:40	1.29	R	WET	1.29	29	11	59	11	10	15	85
38	11/7/2008 10:45	3.77	R+S	WET	3.77	38	47	98	9	11	12	
39	11/14/2008 10:00	0.29	R	WET	0.29	94	98	450	3	4	5	
40	12/5/2008 9:30	0.21	R+S	WET	0.21	114	41	87	1	2	2	
41	12/15/2008 17:30	1.88e	S	WET	0.43+	72	63	247	6	24	67	86
42	12/17/2008 10:30	0.39	S	WET	0.39	36	29	46	1	2	10	
43	12/21/2008 12:00	1.67e	R+S	WET	0.37+	14	9	73	2	4	14	87
44	12/23/2008 14:50	1.07e	S	WET	0.6+	18	12	30	3	5	5	88
45	12/26/2008 12:30	2.35	S	WET	2.35	10	8	42	3	4	7	89
46	1/7/2009 17:15	0.86	S	WET	0.86	30	13	64	4	6	11	
47	1/28/2009 10:05	2.51	R+S	WET	2.51	118	17	9	1	2	3	
48	2/9/2009 17:15	1.01	S	WET	1.01	40	61	112	3	4	8	98
49	2/15/2009 12:15	0.68	S	WET	0.68	34	40	98	2	3	5	
50	2/16/2009 14:30	0.64	S	WET	0.64	14	13	6	2	3	3	
51	2/18/2009 13:15	0.64	S	WET	0.64	20	26	171	1	3	3	
52	2/26/2009 10:30	2.42	R+S	WET	2.42	23	17	25	2	4	5	
53	2/28/2009 13:15	0.28	R	WET	0.28	29	47	73	1	3	5	
54	3/3/2009 14:20	4.37	R+S+G	WET	4.37	22	41	48	5	4	10	99
55	3/4/2009 13:30	1.5	S	WET	1.39	10	15	11	1	2	2	100
56	3/9/2009 17:10	0.15	S	WET	0.15	129	141	477	2	3	6	
57	3/21/2009 14:00	0.52		WET	0.52	94	127	151	5	4	11	
58	3/23/2009 12:00	1.45	S	WET	0.66	41	35	80	2	2	6	101
59	4/3/2009 15:40	0.16	S+G	WET	0.16	79	121	161	7	2	22	111
60	4/17/2009 18:25	0.29	S	WET	0.29	134	140	264	11	17	22	
61	4/28/2009 10:00	0.41	S	WET	0.41	113	45	78	7	9	16	

Samp. No.	Ward Valley Wet Collection Date-Time	Lake Level Precip. (in)	Precip. Form	Collector Type	Wet Bkt Amt. (in)	(Conc.) NO3-N (µg/l)	NH4-N (µg/l)	TKN (µg/l)	SRP (µg/l)	DP (µg/l)	TP (µg/l)	Notes
62	5/5/2009 16:45	4.96	R	WET	4.96	40	57	96	2	3	3	
63	5/26/2009 12:00	0.1	R	WET	0.1	246	443	NA	9	40	147	112
64	6/5/2009 13:20	1.0e	R+H	WET	1.0e	NA	NA	NA	NA	NA	NA	113
65	6/9/2009 11:30	0.02	R	WET	0.02	30	38	76	1	2	3	114
66	6/19/2009 12:25	0.21	R	WET	0.21	21	124	429	7	11	18	
67	7/14/2009 9:50	0.12	R	WET	0.12	107	40	274	6	8	10	121
68	8/9/2009 11:30	0.11	R	WET	0.11	11	19	586	3	5	23	122
69	8/28/2009 12:20	0.01	R	WET	0.01	49	46	61	6	2	2	123
70	9/30/2009 16:40	T		WET	0.001	6	14	34	3	3	6	124
71	10/6/09 09:45	0.15	S	WET	0.15	150	181	313	17	26	61	140
72	10/14/09 17:40	4.24	R	WET	4.24	12	1	18	2	6	7	141
73	10/20/09 11:10	0.42	R+S	WET	0.04	47	43	49	1	3	3	142
	10/30/09 11:30	T		WET	0.00	NA	NA	NA	NA	NA	NA	143
74	11/11/09 11:00	0.02		WET	0.02	5	77	18	1	3	2	144
75	11/13/09 13:00	0.21	S	WET	0.21	110	80	99	3	3	5	
76	11/19/09 17:00	0.03	S	WET	0.03	10	9	24	2	3	4	145
77	11/23/09 10:20	0.87	R+S	WET	0.87	49	59	113	4	5	13	146
78	12/4/09 10:30	0.07	S	WET	0.07	40	44	66	1	3	5	147
79	12/7/09 17:15	1.44	S	WET	1.44	53	64	77	1	1	4	148
80	12/13/09 16:00	2.97	S	WET	2.97	22	11	46	1	2	2	149
81	12/15/09 11:15	0.03	S	WET	0.03	5	8	49	0	1	1	150
82	12/22/09 11:15	0.71	R+S	WET	0.71	45	36	NA	1	2	3	151
83	12/29/09 18:15	0.24	S	WET	0.24	60	21	74	1	2	9	152
84	1/5/10 16:50	0.54	R+S	WET	0.54	53	11	77	2	4	6	
85	1/7/10 12:00	0.01	R+S	WET	0.01	6	2	63	2	2	2	164
86	1/14/10 12:00	1.94	R+S	WET	1.94	34	10	121	1	3	3	
87	1/19/10 11:10	1.81	S	WET	1.81	7	10	43	1	1	3	165
88	1/21/10 10:30	1.26	S	WET	1.26	12	9	34	1	2	5	166
89	1/24/10 13:30	0.81	R+S	WET	0.76	22	12	46	1	4	4	167

Samp. No.	Ward Valley Wet Collection Date-Time	Lake Level Precip. (in)	Precip. Form	Collector Type	Wet Bkt Amt. (in)	(Conc.) NO3-N (µg/l)	NH4-N (µg/l)	TKN (µg/l)	SRP (µg/l)	DP (µg/l)	TP (µg/l)	Notes
90	1/27/10 10:30	1.39	R+S	WET	1.39	21	11	37	1	3	4	
91	2/2/10 10:30	0.03	S	WET	0.03	8	9	39	1	2	4	
92	2/10/10 10:20	0.71	S	WET	0.71	55	38	58	1	3	4	
93	2/17/10 09:10	0.01		WET	0.01	5	5	76	0	3	3	168
94	3/1/10 17:30	2.93	R+S	WET	2.93	30	19	46	1	2	2	
95	3/5/10 14:50	0.75	R+S	WET	0.75	66	110	148	1	2	6	
96	3/18/10 10:20	1.63	R+S	WET	1.63	24	19	36	2	4	5	
97	3/26/10 11:50	0.51	S	WET	0.51	197	350	432	7	8	39	
98	3/31/10 11:50	2.89	R+S	WET	2.89	71	182	245	3	5	94	169
99	4/2/10 16:30	0.61	R+S	WET	0.61	50	45	58	3	3	11	
100	4/5/10 11:30	1.45	S	WET	1.24	27	35	82	1	4	8	170
101	4/9/10 17:30	0.02e	R+S	WET	0.02e	NA	NA	NA	NA	NA	NA	171
102	4/13/10 13:00	0.54	S	WET	0.54	30	33	52	3	5	6	
103	4/25/10 11:00	0.57	S	WET	0.57	39	37	36	1	5	5	
104	4/29/10 17:30	2.34	S	WET	2.34	67	126	132	2	7	63	
105	5/12/10 11:00	1.03	S	WET	1.03	73	67	92	2	6	7	
106	5/21/10 13:00	0.31	S	WET	0.31	72	92	122	1	3	5	
107	5/28/10 16:05	1.58	S	WET	1.58	66	166	173	3	4	7	
	6/9/10 17:45	0.43	R	WET	0.43	49	20	100	1	5	5	
	6/26/10 20:35	0.14	R	WET	0.14	344	154	283	0	1	189	
1	8/3/10 10:25	0.01	R	WET	0.01	54	6	78	1	2	5	A1
2	8/10/10 16:30	0.91	R+H	WET	0.91	213	262	507	4	9	23	A2
3	8/30/10 16:50	0.08	R	WET	0.08	44	48	75	5	8	12	A3
	10/3/10 16:45	NA	R	D	NA							
4	10/4/10 09:20	0.70	R+DF	W+D	0.70	254	365	460	3	3	4	A18
5	10/5/10 16:15	0.60	R+S+DF	W+D	0.60	97	70	111	4	6	15	A19
6	10/8/10 11:20	0.16	R+DF	W+D	0.16	259	361	627	6	9	36	A19
7	10/19/10 14:35	0.46	R+DF	W+D	0.46	70	155	190	3	4	5	A20
8	10/25/10 17:20	7.21	RS	WET	7.21	17	46	35	2	7	9	A21

Samp. No.	Ward Valley Wet Collection Date-Time	Lake Level Precip. (in)	Precip. Form	Collector Type	Wet Bkt Amt. (in)	(Conc.) NO3-N (µg/l)	NH4-N (µg/l)	TKN (µg/l)	SRP (µg/l)	DP (µg/l)	TP (µg/l)	Notes
9	11/2/10 10:25	0.11	R	WET	0.11	17	23	52	3	6	6	A22
10	11/9/10 10:35	1.87	RS	WET	1.87	29	37	106	0	5	4	A23
11	11/15/10 16:50	0.40		WET	0.40	48	78	123	1	4	7	
12	11/21/10 17:45	2.02+	S	WET	2.02	60	82	106	2	5	7	A24
13	11/22/10 17:30	0.47+	S	WET	0.47	21	25	52	1	4	6	
14	11/23/10 19:10	1.00	S	WET	1.00	18	18	28	1	4	5	A25
15	11/28/10 13:00	0.97	S	WET	0.97	20	20	28	0	4	6	A26
16	12/6/10 17:15	2.38	RS	WET	2.38	48	9	28	2	8	11	
17	12/16/10 10:50	3.39	RS	WET	3.39	24	7	13	1	NA	4	A27
18	12/19/10 15:40	7.40	RS	WET	7.40	28	8	8	1	3	3	A28
19	12/20/10 13:10	0.66	S+DF	WET	0.66	43	16	54	2	4	6	A29
20	12/22/10 11:00	0.21	S+DF	WET	0.21	59	31	157	3	5	6	A30
21	12/28/10 10:30	0.51	RS	WET	0.51	23	14	70	1	3	7	A31
22	12/29/10 14:40	1.70	S	WET	1.70	10	6	85	0	8	8	A32
23	1/6/11 11:35	0.52	S	WET	0.52	19	12	25	3	4	5	
24	1/14/11 11:10	0.35	RS	WET	0.35	10	10	79	1	4	17	
25	2/3/11 10:30	0.49	S	WET	0.49	20	10	36	1	4	6	
26	2/16/11 16:00	1.43	S	WET	1.43	46	79	106	2	4	8	A47
27	2/17/11 12:10	0.66	S	WET	0.66	22	22	34	1	3	4	A48
28	2/18/11 11:40	1.17+	S	WET	1.17	12	21	25	1	3	3	A49
29	2/19/11 14:30	1.16	S	WET	1.17	37	14	36	1	3	4	A50
30	2/26/11 11:30	2.40e	S	WET	1.13+	29	17	33	1	3	5	A54
31	3/4/11 18:45	1.64	RS	WET	1.64	40	54	58	2	4	5	
32	3/9/11 10:00	2.22	RS	WET	2.22	23	23	39	2	5	6	
33	3/16/11 13:05	5.69	RS	WET	5.69	34	33	54	1	4	3	A55
35	3/19/11 11:35	1.71	S	WET	1.71	37	53	96	3	5	7	A56
36	3/20/11 16:50	1.48	S	WET	1.48	12	8	42	2	4	5	A57
37	3/24/11 11:00	1.01	S	WET	1.01	46	44	83	1	4	11	A58
36	3/25/11 14:15	1.27+	S	WET	1.27	15	17	41	1	5	34	A59

Samp. No.	Ward Valley Wet Collection Date-Time	Lake Level Precip. (in)	Precip. Form	Collector Type	Wet Bkt Amt. (in)	(Conc.) NO3-N (µg/l)	NH4-N (µg/l)	TKN (µg/l)	SRP (µg/l)	DP (µg/l)	TP (µg/l)	Notes
37	4/1/11 10:35	0.72	S	WET	0.72	21	34	78	1	2	8	
38	4/13/11 09:50	0.89	S	WET	0.89	132	NA	340	9	14	26	
39	4/22/11 13:35	1.98	RS	WET	1.98	92	183	247	4	7	13	A67
40	4/25/11 13:05	0.88	RS	WET	0.88	78	226	205	3	6	8	
41	5/16/11 17:10	1.28	RS	WET	1.28	81	125	132	4	9	13	
42	5/20/11 11:20	0.88	RSG	WET	0.88	55	55	68	4	6	8	
43	5/28/11 11:00	0.70	S	WET	0.70	187	326	344	8	13	21	
44	5/31/11 15:45	0.69	S	WET	0.69	34	53	56	2	6	7	
45	6/3/11 11:30	0.29	RS	WET	0.29	99	146	119	5	4	6	
46	6/10/11 11:30	1.60	RS	WET	1.69	25	34	69	3	3	3	
47	7/6/11 17:15	0.02+	R	WET	0.02+	20	44	141	8	6	9	A68
48	7/6/11 20:20	0.03	R	WET	0.03	41	44	199	5	6	18	A80
49	9/12/11 08:00	0.26	R	WET	0.26	221	276	582	20	26	40	A81
50	9/13/11 11:40	0.15e	R	WET	0.15e	204	323	437	10	14	15	A82
	9/20/11 10:30	T	NA	WET	0	NA	NA	NA	NA	NA	NA	A83
51	10/6/2011 18:25	2.23	R+S+DF	WET	2.23	39	50	95	4	8	9	A99
52	10/11/2011 9:50	0.66+	R+DF	WET	0.66+	23	40	56	2	2	4	A100
53	11/4/2011 17:15	0.63	S	WET	0.63	196	193	363	12	19	35	A101
54	11/10/2011 10:15	0.2	S	WET	0.2	19	26	28	4	8	11	
55	11/21/2011 15:10	0.41+	S	WET	0.41+	78	40	136	6	10	16	A102
	12/7/2011 11:00	T	S	WET	T	NA	NA	NA	NA	NA	NA	A103
56	1/18/2012 10:40	0.06	S	WET	0.06	18	12	28	1	7	7	A117
57	1/21/2012 15:10	4.67	R+S	WET	4.67	14	10	94	2	6	6	
58	1/24/2012 10:15	1.7	S	WET	1.7	20	14	77	1	6	7	A118
59	2/7/2012 10:10	0.16	R+S	WET	0.16	87	51	174	12	17	23	
60	2/10/2012 11:15	0.01	S	WET	0.01	4	5	130	1	3	4	A119
61	2/16/2012 11:00	0.66	S	WET	0.66	67	104	126	2	6	6	
62	2/24/2012 17:10	0.01	S	WET	0.01	2	3	47	1	4	6	A119
63	2/28/2012 10:00	0.88	S	WET	0.88	50	109	114	2	6	8	

Samp. No.	Ward Valley Wet Collection Date-Time	Lake Level Precip. (in)	Precip. Form	Collector Type	Wet Bkt Amt. (in)	(Conc.) NO3-N (µg/l)	NH4-N (µg/l)	TKN (µg/l)	SRP (µg/l)	DP (µg/l)	TP (µg/l)	Notes
64	2/29/2012 12:15	0.75+	S	WET	0.75+	29	63	86	2	5	13	A120
65	3/2/2012 10:30	0.34+	S	WET	0.34+	21	53	209	1	5	11	A121
66	3/7/2012 9:20	0.39	S	WET	0.39	67	57	110	2	6	17	A122
67	3/13/2012 17:20	0.02	S	WET	0.02	11	11	215	1	NA	4	A123
68	3/17/2012 17:50	5.77	R+S	WET	5.77	25	35	51	3	6	6	
69	3/20/2012 9:15	0.52	S	WET	0.52	32	38	157	3	6	7	
70	3/29/2012 11:30	1.47	R+S	WET	1.47	52	68	157	1	6	7	
71	4/3/2012 15:00	0.95	R+S	WET	0.95	58	113	147	2	6	16	
72	4/7/2012 16:30	0.3	R+S	WET	0.3	60	48	76	2	7	9	
73	4/20/2012 15:30	1.31	R+S	WET	1.31	57	96	99	2	5	7	
74	5/1/2012 10:05	1.47	R+S	WET	1.47	85	151	176	3	5	6	
75	5/30/2012 17:00	0.48	R+S	WET	0.48	139	407	948	1	6	67	
76	6/6/2012 9:40	0.81	R+S	WET	0.81	52	33	178	4	7	7	
77	7/24/2012 12:40	0.37	R+H	WET	0.37	353	646		16	30	47	A144
78	8/7/2012 10:50	0.01	R	WET	0.01	57	76	135	3	6	10	A145
79	8/24/2012 9:20	0.15	R	WET	0.15	482	378	572	4	6	34	A146
80	9/7/2012 10:20	0.15	R	WET	0.15	670	1083		21	29	42	A147

Appendix Table 1.b. Precipitation loads of N and P in wet deposition at the Ward Valley Lake Level Station 10/1/08-9/30/12. Shading indicates corrected data with significant difference between corrected value and initially presented value.

Samp. No.	Ward Valley Wet Collection Date-Time	Lake Level Precip. (in)	Precip. Form	Collector Type	Wet Bkt Amt. (in)	(Load) NO3-N (g/ha)	NH4-N (g/ha)	TKN (g/ha)	SRP (g/ha)	DP (g/ha)	TP (g/ha)	Notes
37	10/8/2008 11:40	1.29	R	WET	1.29	9.34	3.65	19.31	3.46	3.35	4.88	85
38	11/7/2008 10:45	3.77	R+S	WET	3.77	36.37	44.73	93.77	8.61	10.50	11.39	
39	11/14/2008 10:00	0.29	R	WET	0.29	6.89	7.24	33.18	0.23	0.31	0.36	
40	12/5/2008 9:30	0.21	R+S	WET	0.21	6.06	2.19	4.64	0.05	0.08	0.13	
41	12/15/2008 17:30	1.88e	S	WET	0.43+	7.91	6.92	26.95	0.66	2.60	7.27	86
42	12/17/2008 10:30	0.39	S	WET	0.39	3.61	2.83	4.57	0.09	0.25	0.95	
43	12/21/2008 12:00	1.67e	R+S	WET	0.37+	1.32	0.81	6.86	0.21	0.35	1.31	87
44	12/23/2008 14:50	1.07e	S	WET	0.6+	2.71	1.77	4.58	0.45	0.76	0.80	88
45	12/26/2008 12:30	2.35	S	WET	2.35	6.24	5.03	24.81	1.76	2.59	4.06	89
46	1/7/2009 17:15	0.86	S	WET	0.86	6.55	2.86	14.06	0.94	1.29	2.37	
47	1/28/2009 10:05	2.51	R+S	WET	2.51	75.48	10.75	NA	0.57	1.38	1.77	
48	2/9/2009 17:15	1.01	S	WET	1.01	10.33	15.75	28.79	0.70	1.12	2.06	98
49	2/15/2009 12:15	0.68	S	WET	0.68	5.94	6.82	16.94	0.35	0.59	0.86	
50	2/16/2009 14:30	0.64	S	WET	0.64	2.32	2.17	NA	0.26	0.50	0.55	
51	2/18/2009 13:15	0.64	S	WET	0.64	3.19	4.19	27.77	0.15	0.45	0.50	
52	2/26/2009 10:30	2.42	R+S	WET	2.42	13.97	10.15	15.26	1.39	2.61	3.17	
53	2/28/2009 13:15	0.28	R	WET	0.28	2.09	3.37	5.16	0.10	0.22	0.37	
54	3/3/2009 14:20	4.37	R+S+G	WET	4.37	24.21	44.99	53.59	5.01	4.04	11.45	99
55	3/4/2009 13:30	1.5	S	WET	1.39	3.69	5.14	NA	0.40	0.61	0.66	100
56	3/9/2009 17:10	0.15	S	WET	0.15	4.92	5.37	18.18	0.09	0.12	0.24	
57	3/21/2009 14:00	0.52		WET	0.52	12.35	16.83	19.88	0.60	0.57	1.48	
58	3/23/2009 12:00	1.45	S	WET	0.66	6.93	5.82	13.46	0.30	0.37	1.04	101
59	4/3/2009 15:40	0.16	S+G	WET	0.16	6.16	9.45	12.56	0.56	NA	1.69	111
60	4/17/2009 18:25	0.29	S	WET	0.29	9.85	10.33	19.41	0.83	1.25	1.62	
61	4/28/2009 10:00	0.41	S	WET	0.41	11.72	4.69	8.13	0.77	0.94	1.64	

Samp. No.	Ward Valley Wet Collection Date-Time	Lake Level Precip. (in)	Precip. Form	Collector Type	Wet Bkt Amt. (in)	(Load) NO3-N (g/ha)	NH4-N (g/ha)	TKN (g/ha)	SRP (g/ha)	DP (g/ha)	TP (g/ha)	Notes
62	5/5/2009 16:45	4.96	R	WET	4.96	50.92	72.39	120.34	2.54	3.88	3.93	
63	5/26/2009 12:00	0.1	R	WET	0.1	6.26	11.24	NA	0.23	1.02	3.72	112
64	6/5/2009 13:20	1.0e	R+H	WET	1.0e	NA	NA	NA	NA	NA	NA	113
65	6/9/2009 11:30	0.02	R	WET	0.02	1.20	1.50	3.01	0.02	0.06	0.12	114
66	6/19/2009 12:25	0.21	R	WET	0.21	1.13	6.60	22.87	0.38	0.61	0.94	
67	7/14/2009 9:50	0.12	R	WET	0.12	3.28	1.21	8.36	0.17	0.25	0.32	121
68	8/9/2009 11:30	0.11	R	WET	0.11	0.86	1.47	45.71	0.19	0.38	1.80	122
69	8/28/2009 12:20	0.01	R	WET	0.01	3.85	3.57	4.75	NA	0.14	0.12	123
70	9/30/2009 16:40	T		WET	0.001	0.44	1.11	2.68	0.21	0.19	0.44	124
71	10/6/09 09:45	0.15	S	WET	0.15	NA	NA	NA	NA	NA	NA	140
72	10/14/09 17:40	4.24	R	WET	4.24	12.62	0.95	19	1.93	6.55	7.93	141
73	10/20/09 11:10	0.42	R+S	WET	0.04	3.64	3.38	3.79	0.05	0.24	0.24	142
	10/30/09 11:30	T		WET	0.00	NA	NA	NA	NA	NA	NA	143
74	11/11/09 11:00	0.02		WET	0.02	0.36	5.98	1.38	0.07	0.22	0.19	144
75	11/13/09 13:00	0.21	S	WET	0.21	5.87	4.26	5.26	0.16	0.18	0.28	
76	11/19/09 17:00	0.03	S	WET	0.03	0.74	0.67	1.88	0.14	0.22	0.31	145
77	11/23/09 10:20	0.87	R+S	WET	0.87	10.75	13.07	25.02	0.80	1.02	2.86	146
78	12/4/09 10:30	0.07	S	WET	0.07	3.18	3.48	5.18	0.09	0.22	0.37	147
79	12/7/09 17:15	1.44	S	WET	1.44	19.31	23.33	28.19	0.41	0.45	1.58	148
80	12/13/09 16:00	2.97	S	WET	2.97	16.66	8.57	35.06	0.51	1.17	1.87	149
81	12/15/09 11:15	0.03	S	WET	0.03	0.35	0.61	3.80	0.02	0.10	0.07	150
82	12/22/09 11:15	0.71	R+S	WET	0.71	8.06	6.45	NA	0.12	0.39	0.50	151
83	12/29/09 18:15	0.24	S	WET	0.24	3.68	1.26	4.51	0.08	0.15	0.54	152
84	1/5/10 16:50	0.54	R+S	WET	0.54	7.28	1.45	10.60	0.22	0.51	0.89	
85	1/7/10 12:00	0.01	R+S	WET	0.01	0.45	0.19	4.92	0.16	0.19	0.14	164
86	1/14/10 12:00	1.94	R+S	WET	1.94	16.92	4.98	59.68	0.34	1.24	1.36	
87	1/19/10 11:10	1.81	S	WET	1.81	3.28	4.64	19.91	0.52	0.58	1.42	165
88	1/21/10 10:30	1.26	S	WET	1.26	3.99	2.84	10.85	0.22	0.69	1.48	166
89	1/24/10 13:30	0.81	R+S	WET	0.76	4.25	2.27	8.97	0.13	0.83	0.71	167

Samp. No.	Ward Valley Wet Collection Date-Time	Lake Level Precip. (in)	Precip. Form	Collector Type	Wet Bkt Amt. (in)	(Load) NO3-N (g/ha)	NH4-N (g/ha)	TKN (g/ha)	SRP (g/ha)	DP (g/ha)	TP (g/ha)	Notes
90	1/27/10 10:30	1.39	R+S	WET	1.39	7.36	3.86	13.16	0.24	1.09	1.29	
91	2/2/10 10:30	0.03	S	WET	0.03	0.65	0.72	3.01	0.05	0.19	0.31	
92	2/10/10 10:20	0.71	S	WET	0.71	9.99	6.87	10.43	0.16	0.56	0.72	
93	2/17/10 09:10	0.01		WET	0.01	0.38	0.37	5.91	0.00	0.20	0.27	168
94	3/1/10 17:30	2.93	R+S	WET	2.93	22.52	14.12	34.26	0.84	1.62	1.85	
95	3/5/10 14:50	0.75	R+S	WET	0.75	12.49	21.00	28.23	0.22	0.42	1.13	
96	3/18/10 10:20	1.63	R+S	WET	1.63	9.85	7.72	15.09	0.75	1.52	2.15	
97	3/26/10 11:50	0.51	S	WET	0.51	25.47	45.33	55.97	0.85	1.09	5.07	
98	3/31/10 11:50	2.89	R+S	WET	2.89	52.06	133.64	180.15	2.33	3.71	68.66	169
99	4/2/10 16:30	0.61	R+S	WET	0.61	7.75	6.93	9.05	0.42	0.54	1.74	
100	4/5/10 11:30	1.45	S	WET	1.24	8.36	10.91	25.97	0.29	1.19	2.37	170
101	4/9/10 17:30	0.02e	R+S	WET	0.02e	NA	NA	NA	NA	NA	NA	171
102	4/13/10 13:00	0.54	S	WET	0.54	4.12	4.56	7.14	0.37	0.69	0.78	
103	4/25/10 11:00	0.57	S	WET	0.57	5.66	5.29	5.22	0.17	0.68	0.77	
104	4/29/10 17:30	2.34	S	WET	2.34	39.64	75.01	78.19	0.94	4.23	37.52	
105	5/12/10 11:00	1.03	S	WET	1.03	19.15	17.54	24.06	0.53	1.65	1.73	
106	5/21/10 13:00	0.31	S	WET	0.31	5.63	7.27	9.64	0.09	0.20	0.37	
107	5/28/10 16:05	1.58	S	WET	1.58	26.67	66.81	69.33	1.28	1.77	2.65	
	6/9/10 17:45	0.43	R	WET	0.43	5.34	2.16	20.21	0.12	0.55	0.55	
	6/26/10 20:35	0.14	R	WET	0.14	12.24	5.43	10.07	0.02	0.04	6.72	
1	8/3/10 10:25	0.01	R	WET	0.01	4.14	0.44	6.10	0.07	0.19	0.41	A1
2	8/10/10 16:30	0.91	R+H	WET	0.91	48.53	60.56	117.08	0.94	1.53	4.76	A2
3	8/30/10 16:50	0.08	R	WET	0.08	3.33	3.77	3.35	0.37	0.65	0.97	A3
	10/3/10 16:45	NA	R	D	NA	NA	NA	NA	NA	NA	NA	
4	10/4/10 09:20	0.70	R+DF	W+D	0.70	45.23	64.91	81.76	0.48	0.49	0.76	A18
5	10/5/10 16:15	0.60	R+S+DF	W+D	0.60	14.74	10.61	16.85	0.62	0.98	2.24	A19
6	10/8/10 11:20	0.16	R+DF	W+D	0.16	10.53	14.66	25.48	0.23	0.38	1.48	A19
7	10/19/10 14:35	0.46	R+DF	W+D	0.46	8.18	18.14	22.14	0.37	0.47	0.58	A20
8	10/25/10 17:20	7.21	RS	WET	7.21	31.04	84.83	64.19	4.52	12.42	16.37	A21

Samp. No.	Ward Valley Wet Collection Date-Time	Lake Level Precip. (in)	Precip. Form	Collector Type	Wet Bkt Amt. (in)	(Load) NO3-N (g/ha)	NH4-N (g/ha)	TKN (g/ha)	SRP (g/ha)	DP (g/ha)	TP (g/ha)	Notes
9	11/2/10 10:25	0.11	R	WET	0.11	1.36	1.84	4.11	0.23	0.51	0.51	A22
10	11/9/10 10:35	1.87	RS	WET	1.87	13.98	17.47	50.34	0.21	2.34	1.90	A23
11	11/15/10 16:50	0.40		WET	0.40	4.83	7.88	12.47	0.09	0.45	0.67	
12	11/21/10 17:45	2.02+	S	WET	2.02	31.02	41.88	54.33	1.05	2.41	3.69	A24
13	11/22/10 17:30	0.47+	S	WET	0.47	2.54	2.97	6.16	0.08	0.52	0.71	
14	11/23/10 19:10	1.00	S	WET	1.00	4.66	4.63	7.00	0.17	1.11	1.27	A25
15	11/28/10 13:00	0.97	S	WET	0.97	4.85	4.97	7.01	0.11	1.00	1.46	A26
16	12/6/10 17:15	2.38	RS	WET	2.38	29.11	5.65	16.96	0.95	4.84	6.93	
17	12/16/10 10:50	3.39	RS	WET	3.39	21.00	5.61	11.54	0.97	NA	3.19	A27
18	12/19/10 15:40	7.40	RS	WET	7.40	52.95	14.91	14.12	2.54	6.37	5.21	A28
19	12/20/10 13:10	0.66	S+DF	WET	0.66	7.28	2.67	9.04	0.38	0.62	1.03	A29
20	12/22/10 11:00	0.21	S+DF	WET	0.21	3.14	1.65	8.38	0.16	0.28	0.35	A30
21	12/28/10 10:30	0.51	RS	WET	0.51	2.92	1.79	9.05	0.15	0.40	0.88	A31
22	12/29/10 14:40	1.70	S	WET	1.70	4.32	2.53	36.73	0.00	3.26	3.52	A32
23	1/6/11 11:35	0.52	S	WET	0.52	2.54	1.62	3.27	0.39	0.53	0.65	
24	1/14/11 11:10	0.35	RS	WET	0.35	0.86	0.93	7.05	0.12	0.36	1.49	
25	2/3/11 10:30	0.49	S	WET	0.49	2.47	1.22	4.52	0.18	0.50	0.73	
26	2/16/11 16:00	1.43	S	WET	1.43	16.71	28.87	38.49	0.66	1.37	2.97	A47
27	2/17/11 12:10	0.66	S	WET	0.66	3.66	3.66	5.67	0.15	0.53	0.69	A48
28	2/18/11 11:40	1.17+	S	WET	1.17	3.48	6.37	7.35	0.27	0.84	1.03	A49
29	2/19/11 14:30	1.16	S	WET	1.17	10.80	4.07	10.70	0.33	0.83	1.21	A50
30	2/26/11 11:30	2.40e	S	WET	1.13+	17.65	10.50	20.08	0.41	1.54	3.07	A54
31	3/4/11 18:45	1.64	RS	WET	1.64	16.53	22.46	24.29	0.76	1.68	1.95	
32	3/9/11 10:00	2.22	RS	WET	2.22	12.77	13.14	21.72	0.90	2.63	3.33	
33	3/16/11 13:05	5.69	RS	WET	5.69	48.68	47.92	78.39	1.97	5.82	4.93	A55
35	3/19/11 11:35	1.71	S	WET	1.71	16.27	22.82	41.57	1.48	2.15	3.23	A56
36	3/20/11 16:50	1.48	S	WET	1.48	4.47	2.85	15.80	0.85	1.40	1.75	A57
37	3/24/11 11:00	1.01	S	WET	1.01	11.69	11.41	21.20	0.35	1.11	2.71	A58
36	3/25/11 14:15	1.27+	S	WET	1.27	4.98	5.35	13.27	0.36	1.50	10.91	A59

Samp. No.	Ward Valley Wet Collection Date-Time	Lake Level Precip. (in)	Precip. Form	Collector Type	Wet Bkt Amt. (in)	(Load) NO3-N (g/ha)	NH4-N (g/ha)	TKN (g/ha)	SRP (g/ha)	DP (g/ha)	TP (g/ha)	Notes
37	4/1/11 10:35	0.72	S	WET	0.72	3.79	6.25	14.29	0.21	0.40	1.41	
38	4/13/11 09:50	0.89	S	WET	0.89	29.80	NA	76.93	1.95	3.09	5.90	
39	4/22/11 13:35	1.98	RS	WET	1.98	46.04	92.23	124.13	1.94	3.59	6.39	A67
40	4/25/11 13:05	0.88	RS	WET	0.88	17.50	50.54	45.74	0.61	1.32	1.73	
41	5/16/11 17:10	1.28	RS	WET	1.28	26.35	40.68	42.88	1.32	2.90	4.30	
42	5/20/11 11:20	0.88	RSG	WET	0.88	12.34	12.20	15.10	0.91	1.40	1.89	
43	5/28/11 11:00	0.70	S	WET	0.70	33.25	57.97	61.16	1.46	2.39	3.79	
44	5/31/11 15:45	0.69	S	WET	0.69	5.88	9.21	9.86	0.44	1.04	1.20	
45	6/3/11 11:30	0.29	RS	WET	0.29	7.30	10.78	8.74	0.34	0.30	0.41	
46	6/10/11 11:30	1.60	RS	WET	1.69	10.27	13.95	27.93	1.19	1.39	1.39	
47	7/6/11 17:15	0.02+	R	WET	0.02+	1.58	3.44	10.96	0.64	0.43	0.72	A68
48	7/6/11 20:20	0.03	R	WET	0.03	3.18	3.45	15.54	0.43	0.48	1.40	A80
49	9/12/11 08:00	0.26	R	WET	0.26	14.57	18.21	38.44	1.30	1.71	2.64	A81
50	9/13/11 11:40	0.15e	R	WET	0.15e	7.77	12.29	16.66	0.37	0.54	0.59	A82
	9/20/11 10:30	T	NA	WET	T	NA	NA	NA	NA	NA	NA	A83
51	10/6/2011 18:25	2.23	R+S+DF	WET	2.23	21.92	28.50	53.59	2.44	4.38	4.92	A99
52	10/11/2011 9:50	0.66	R+DF	WET	0.66	3.78	6.72	9.41	0.30	0.41	0.62	A100
53	11/4/2011 17:15	0.63	S	WET	0.63	31.33	30.84	58.03	1.91	3.08	5.56	A101
54	11/10/2011 10:15	0.2	S	WET	0.2	0.97	1.30	1.43	0.22	0.41	0.57	
55	11/21/2011 15:10	0.41+	S	WET	0.41+	8.12	4.15	14.15	0.66	1.03	1.67	A102
	12/7/2011 11:00	T	S	WET	T							A103
56	1/18/2012 10:40	0.06	S	WET	0.06	1.37	0.91	2.21	0.11	0.56	0.56	A117
57	1/21/2012 15:10	4.67	R+S	WET	4.67	16.16	12.37	111.35	2.16	6.63	6.63	
58	1/24/2012 10:15	1.7	S	WET	1.7	8.63	5.86	33.44	0.39	2.40	3.20	A118
59	2/7/2012 10:10	0.16	R+S	WET	0.16	3.53	2.06	7.06	0.49	0.70	0.92	
60	2/10/2012 11:15	0.01	S	WET	0.01	0.35	0.39	10.10	0.05	0.27	0.29	A119
61	2/16/2012 11:00	0.66	S	WET	0.66	11.25	17.38	21.14	0.38	1.04	0.99	
62	2/24/2012 17:10	0.01	S	WET	0.01	0.19	0.21	3.63	0.05	0.29	0.48	A119
63	2/28/2012 10:00	0.88	S	WET	0.88	11.20	24.29	25.40	0.41	1.25	1.87	

Samp. No.	Ward Valley Wet Collection Date-Time	Lake Level Precip. (in)	Precip. Form	Collector Type	Wet Bkt Amt. (in)	(Load) NO3-N (g/ha)	NH4-N (g/ha)	TKN (g/ha)	SRP (g/ha)	DP (g/ha)	TP (g/ha)	Notes
64	2/29/2012 12:15	0.75+	S	WET	0.75+	5.61	12.06	16.39	0.35	0.94	2.54	A120
65	3/2/2012 10:30	0.34+	S	WET	0.34+	1.85	4.58	18.06	0.12	0.40	0.94	A121
66	3/7/2012 9:20	0.39	S	WET	0.39	6.61	5.61	10.94	0.23	0.58	1.66	A122
67	3/13/2012 17:20	0.02	S	WET	0.02	0.88	0.89	16.80	0.05	0.27	0.31	A123
68	3/17/2012 17:50	5.77	R+S	WET	5.77	37.28	50.67	74.26	4.98	9.50	9.50	
69	3/20/2012 9:15	0.52	S	WET	0.52	4.26	5.08	20.75	0.36	0.86	0.94	
70	3/29/2012 11:30	1.47	R+S	WET	1.47	19.57	25.55	58.68	0.34	2.19	2.77	
71	4/3/2012 15:00	0.95	R+S	WET	0.95	14.09	27.38	35.42	0.44	1.34	3.95	
72	4/7/2012 16:30	0.3	R+S	WET	0.3	4.61	3.66	5.75	0.17	0.52	0.69	
73	4/20/2012 15:30	1.31	R+S	WET	1.31	18.97	31.85	32.83	0.68	1.65	2.17	
74	5/1/2012 10:05	1.47	R+S	WET	1.47	31.83	56.32	65.80	1.02	1.75	2.33	
75	5/30/2012 17:00	0.48	R+S	WET	0.48	16.98	49.59	115.58	0.11	0.76	8.21	
76	6/6/2012 9:40	0.81	R+S	WET	0.81	10.72	6.83	36.72	0.89	1.53	1.53	
77	7/24/2012 12:40	0.37	R+H	WET	0.37	33.03	60.40	NA	1.52	2.79	4.44	A144
78	8/7/2012 10:50	0.01	R	WET	0.01	4.46	5.90	10.52	0.27	0.46	0.81	A145
79	8/24/2012 9:20	0.15	R	WET	0.15	18.18	14.25	21.59	0.14	0.24	1.29	A146
80	9/7/2012 10:20	0.15	R	WET	0.15	25.07	40.53	NA	0.79	1.07	1.57	A147

Appendix Table 2.a. N and P concentrations in dry deposition at the Ward Valley Lake Level Station 9/17/08-10/5/12. Shading indicates corrected data with significant difference between corrected value and initially presented value.

Samp. No.	Ward Valley Dry Start Date-Time	Lake Level Collection Date-Time	Vol. Liters	Precip. Form	Collector Type	(Conc.) NO3-N (µg/l)	NH4-N (µg/l)	TKN (µg/l)	SRP (µg/l)	DP (µg/l)	TP (µg/l)	Notes
40	9/17/2008 10:15	10/8/2008 11:40	2.637	DF	DRY	4	5	531	4	6	11	
41	10/8/2008 11:40	10/20/2008 17:10	3.487	DF	DRY	3	11	194	20	26	26	91
42	10/20/2008 17:10	11/7/2008 10:45	3.5	DF	DRY	22	31	319	20	16	22	
43	11/7/2008 10:45	11/20/2008 10:45	3.807	DF	DRY	9	21	293	2	5	7	
44	11/20/2008 10:45	12/5/2008 9:30	2.917	DF	DRY	13	22	NA	3	5	6	92
45	12/5/2008 9:30	12/17/2008 10:30	4.206	DF+S	DRY	16	17	61	2	4	6	93
46	12/17/2008 10:30	12/23/2008 14:50	4.974	DF+S	DRY	12	13	71	4	6	8	94
47	12/23/2008 14:50	1/7/2009 17:15	2.939	DF	DRY	9	20	57	2	3	15	102
48	1/7/2009 17:15	1/15/2009 10:30	3.975	DF	DRY	5	9	33	1	3	13	103
49	1/15/2009 10:30	1/28/2009 10:05	3.105	DF	DRY	17	19	54	3	2	13	104
50	1/28/2009 10:05	2/5/2009 10:45	3.486	DF	DRY	9	18	75	2	13	13	105
51	2/5/2009 10:45	2/26/2009 10:30	3.901	DF	DRY	26	24	92	9	11	18	105
52	2/26/2009 10:30	3/9/2009 17:10	3.081	DF	DRY	21	32	82	2	4	11	
53	3/9/2009 17:10	3/20/2009 17:45	2.385	DF	DRY	16	15	60	2	2	11	
54	3/20/2009 17:45	4/3/2009 15:40	2.173	DF	DRY	21	17	49	4	9	23	
55	4/3/2009 15:40	4/17/2009 18:25	1.76	DF	DRY	44	40	144	4	8	22	
56	4/17/2009 18:25	4/28/2009 10:00	2.088	DF	DRY	27	12	271	3	9	24	115
57	4/28/2009 10:00	5/26/2009 12:00	2.048	DF	DRY	14	15	1099	23	31	113	113
58	5/26/2009 12:00	6/5/2009 13:20	3.907	DF	DRY	77	170	561	1	9	16	
59	6/5/2009 13:20	6/19/2009 12:25	2.743	DF	DRY	141	13	269	1	2	7	
60	6/19/2009 12:25	6/26/2009 12:30	3.048	DF	DRY	3	12	297	2	5	21	
61	6/26/2009 12:30	7/5/2009 11:00	2.705	DF	DRY	6	70	589	2	9	46	
62	7/5/2009 11:00	7/14/2009 9:50	2.552	DF	DRY	7	11	167	3	11	22	121
63	7/14/2009 9:50	7/22/2009 10:00	2.357	DF	DRY	8	25	400	2	3	14	125
64	7/22/2009 10:00	8/9/2009 11:30	2.798	DF	DRY	136	58	138	1	2	6	

Samp. No.	Ward Valley Dry Start Date-Time	Lake Level Collection Date-Time	Vol. Liters	Precip. Form	Collector Type	(Conc.) NO3-N (µg/l)	NH4-N (µg/l)	TKN (µg/l)	SRP (µg/l)	DP (µg/l)	TP (µg/l)	Notes
65	8/9/2009 11:30	8/28/2009 12:20	1.47	DF	DRY	11	3	1338	3	7	117	126
66	8/28/2009 12:20	9/9/2009 13:30	2.325	DF	DRY	11	7	313	3	5	11	
67	9/9/2009 13:30	9/22/2009 15:10		DF	DRY	C	C	C	C	C	C	127
68	9/22/2009 15:10	10/2/2009 10:45	3.013	DF	DRY	7	7	362	23	28	35	128
69	10/2/2009 10:45	10/12/2009 15:45	2.83	DF	DRY	7	1	300	1	6	26	153
70	10/12/2009 15:45	10/20/2009 11:10	4.3	DF+RS	DRY	14	14	305	7	9	9	154
71	10/20/2009 11:10	10/30/2009 11:30	3.568	DF+R?S?	DRY	17	3	137	4	5	8	155
72	10/30/2009 11:30	11/11/2009 11:00	3.287	DF	DRY	20	23	169	9	10	10	
73	11/11/2009 11:00	11/28/2009 11:30	3.571	DF	DRY	19	39	194	12	14	21	156
74	11/28/2009 11:30	12/15/2009 11:15	NA	DF	DRY	NA	NA	NA	NA	NA	NA	157
75	12/15/2009 11:15	1/7/2010 12:00	3.539	DF	DRY	31	19	63	2	3	27	158
76	1/7/2010 12:00	1/28/2010 10:00	4.46	DF	DRY	20	16	69	2	5	12	172
77	1/28/2010 10:00	2/4/2010 13:55	3.039	DF	DRY	21	17	51	3	5	10	
78	2/4/2010 13:55	2/17/2010 9:10	3.018	DF	DRY	17	17	99	2	5	11	
79	2/17/2010 9:10	3/1/2010 17:30	2.382	DF	DRY	28	17	91	2	3	12	
80	3/1/2010 17:30	3/18/2010 10:20	3.456	DF	DRY	36	53	142	3	6	21	
81	3/18/2010 10:20	3/26/2010 11:50	3.243	DF	DRY	16	22	73	5	6	29	
82	3/26/2010 11:50	4/9/2010 17:30	2.419	DF	DRY	37	51	134	3	7	17	
83	4/9/2010 17:30	4/29/2010 17:30	1.528	DF	DRY	62	75	368	1	9	32	
84	4/29/2010 17:30	5/15/2010 17:00	1.416	DF	DRY	30	3	189	2	6	34	A
	5/15/2010 17:00	6/1/2010 17:10	3.179	DF	DRY	34	27	120	2	4	15	B
	6/1/2010 17:10	6/26/2010 20:35	0.993	DF	DRY	C	C	C	C	C	C	C
1	6/26/2010 20:35	7/2/2010 10:40	3.03	DF	DRY	24	72	945	5	7	20	
2	7/2/2010 10:40	7/16/2010 10:30	1.918	DF	DRY	C	C	C	C	C	C	A4
3	7/16/2010 10:30	7/23/2010 13:55	2.664	DF	DRY	11	8	824	5	8	23	A5
4	7/23/2010 13:55	8/3/2010 10:25	2.295	DF	DRY	15	8	56	2	6	65	A15
5	8/3/2010 10:25	8/12/2010 12:00	2.81	DF	DRY	28	6	287	2	5	27	A6
6	8/16/2010 14:00	9/2/2010 16:55	1.576	DF	DRY	15	8	1661	3	7	100	A7

Samp. No.	Ward Valley Dry Start Date-Time	Lake Level Collection Date-Time	Vol. Liters	Precip. Form	Collector Type	(Conc.) NO3-N (µg/l)	NH4-N (µg/l)	TKN (µg/l)	SRP (µg/l)	DP (µg/l)	TP (µg/l)	Notes
7	9/2/2010 16:55	9/23/2010 10:40	1.755	DF	DRY	C	C	C	C	C	C	A8
	9/23/2010 10:40	10/14/2010 14:45	5.342	R+S+DF	DRY	13	7	805	2	7	31	A33
9	10/14/2010 14:45	10/22/2010 14:40	3.626	R+DF	DRY	25	30	382	4	6	8	A34
10	10/22/2010 14:40	11/2/2010 10:25	3.764	DF	DRY	3	7	485	6	6	23	A35
11	11/2/2010 10:25	11/17/2010 10:45	3.744	DF	DRY	18	58	346	7	11	10	A36
12	11/17/2010 10:45	12/1/2010 16:45	4.025	S+DF	DRY	43	62	277	5	5	10	A37
13	12/1/2010 16:45	12/22/2010 11:00	4.079	R+S+DF	DRY	22	18	28	3	4	22	A38
14	12/22/2010 11:00	1/6/2011 11:35	4.4	S+DF	DRY	12	18	18	3	6	12	A39
15	1/6/2011 11:35	1/14/2011 11:10	3.375	DF	DRY	21	41	72	1	4	5	A60
16	1/14/2011 11:10	1/24/2011 11:45	2.88	DF	DRY	14	28	98	4	6	23	
17	1/24/2011 11:45	2/13/2011 10:45	1.968	DF	DRY	28	19	108	7	10	98	A61
18	2/13/2011 10:45	3/4/2011 18:45	2.975	DF	DRY	48	8	74	2	4	19	
19	3/4/2011 18:45	3/18/2011 16:00	2.877	DF	DRY	35	29	144	5	7	18	
20	3/18/2011 16:00	4/13/2011 9:50	1.67	DF	DRY	96	55	190	1	5	48	
21	4/13/2011 9:50	4/25/2011 13:05	2.972	DF	DRY	47	57	116	2	5	11	
22	4/25/2011 13:05	5/16/2011 17:10	0.5	DF	DRY	C	C	C	C	C	C	A69
23	5/16/2011 17:10	6/15/2011 17:00	NA	DF	DRY	C	C	C	C	C	C	
24	6/15/2011 17:00	6/30/2011 16:10	3.345	DF	DRY	C	C	C	C	C	C	A70
25	6/30/2011 16:10	7/22/2011 17:45	0.902	DF	DRY	C	C	C	C	C	C	A84
26	7/22/2011 17:45	8/4/2011 14:45	2.4	DF	DRY	14	11	661	5	10	54	A85
27	8/4/2011 14:45	8/22/2011 17:45	1.822	DF	DRY	12	3	828	3	18	55	A86
28	8/22/2011 17:45	9/12/2011 8:00	2.288	DF+R	DRY-BULK	C	C	C	C	C	C	A87
29	9/12/2011 8:00	9/20/2011 10:30	3.55	DF+R	DRY-BULK	30	5	378	2	5	11	A88
30	9/20/2011 10:30	10/4/2011 16:00	2.91	DF+R	DRY-BULK	20	6	640	2	7	24	A89
31	10/4/2011 16:00	10/14/2011 12:20	4.046	DF+R	DRY-BULK	10	12	415	7	11	14	A104
32	10/14/2011 12:20	10/27/2011 11:00	3.3	DF	DRY	C	C	C	C	C	C	A105
33	10/27/2011 11:00	11/10/2011 10:15	3.47	DF	DRY	14	31	317	13	17	23	A106
34	11/10/2011 10:15	12/7/2011 11:15	NA	DF	DRY-BULK	C	C	C	C	C	C	A107
35	12/7/2011 11:15	12/21/2011 11:20	3.539	DF	DRY	11	6	236	1	7	9	A108

Samp. No.	Ward Valley Dry Start Date-Time	Lake Level Collection Date-Time	Vol. Liters	Precip. Form	Collector Type	(Conc.) NO3-N (µg/l)	NH4-N (µg/l)	TKN (µg/l)	SRP (µg/l)	DP (µg/l)	TP (µg/l)	Notes
36	12/21/2011 11:20	12/26/2011 15:10	3.502	DF	DRY	4	5	3	3	7	11	A109
37	12/26/2011 15:10	1/6/2012 18:00	2.84	DF	DRY	12	20	72	2	6	9	
38	1/6/2012 18:00	1/18/2012 10:40	3.037	DF	DRY	11	26	209	2	8	22	A124
39	1/18/2012 10:40	2/7/2012 10:10	2.48	DF	DRY	24	19	67	7	14	35	A125
40	2/7/2012 10:10	2/16/2012 11:00	2.854	DF	DRY	18	24	85	7	8	9	A126
41	2/16/2012 11:00	2/24/2012 17:10	2.824	DF	DRY	6	23	122	2	7	14	
42	2/24/2012 17:10	3/9/2012 10:30	2.906	DF	DRY	37	47	174	4	10	24	A127
43	3/9/2012 10:30	3/27/2012 10:30	2.127	DF	DRY	64	122	429	1	8	22	
44	3/27/2012 10:30	4/7/2012 16:30	2.292	DF	DRY	44	37	100	1	5	21	
45	4/7/2012 16:30	4/20/2012 15:30	2.14	DF	DRY		53	335	1	7	24	A132
46	4/20/2012 15:30	5/2/2012 18:10	2.007	DF	DRY	31	7	124	3	10	22	
47	5/2/2012 18:10	5/18/2012 10:45	1.125	DF	DRY	20	38	1503	24	40	98	A133
48	5/18/2012 10:45	5/30/2012 17:00	0.785	DF	DRY	C	C	C	C	C	C	A134
49	5/30/2012 17:00	6/15/2012 9:25	2.24	DF	DRY	26	20	NA	0	9	28	A135
50	6/15/2012 9:25	6/27/2012 9:45	2.15	DF	DRY	14	2	733	3	18	132	
51	6/27/2012 9:45	7/16/2012 10:00	0.725	DF	DRY	23	37	786	180	66	333	
52	7/16/2012 10:00	8/2/2012 12:10	1.9	DF	DRY	13	14	784	3	5	44	
53	8/2/2012 12:10	8/13/2012 14:20	2.285	DF	DRY	21	7	324	3	9	44	
54	8/13/2012 14:20	8/30/2012 17:40	1.841	DF	DRY	31	24	1033	2	9	63	
55	8/30/2012 17:40	9/12/2012 10:25	2.619	DF	DRY	40	7	306	5	8	17	
56	9/12/2012 10:25	9/21/2012 9:55	2.901	DF	DRY	19	12		0	5	11	
57	9/21/2012 9:55	10/5/2012 10:45	2.613	DF	DRY	14	7	82	1	6	21	

Appendix Table 2.b. N and P loads in dry deposition at the Ward Valley Lake Level Station 9/17/08-10/5/12. Shading indicates corrected data with significant difference between corrected value and initially presented value.

Samp. No.	Ward Valley Dry Start Date-Time	Lake Level Collection Date-Time	Vol. Liters	Precip. Form	Collector Type	(Conc.) NO3-N (g/ha)	NH4-N (g/ha)	TKN (g/ha)	SRP (g/ha)	DP (g/ha)	TP (g/ha)	Notes
40	9/17/2008 10:15	10/8/2008 11:40	2.637	DF	DRY	1.92	2.67	276.50	2.05	3.37	5.49	
41	10/8/2008 11:40	10/20/2008 17:10	3.487	DF	DRY	2.28	7.54	133.55	13.76	17.60	18.22	91
42	10/20/2008 17:10	11/7/2008 10:45	3.5	DF	DRY	15.38	21.23	220.39	13.82	10.73	15.47	
43	11/7/2008 10:45	11/20/2008 10:45	3.807	DF	DRY	6.63	16.13	220.45	1.53	3.67	5.04	
44	11/20/2008 10:45	12/5/2008 9:30	2.917	DF	DRY	7.69	12.70	NA	1.56	2.85	3.74	92
45	12/5/2008 9:30	12/17/2008 10:30	4.206	DF+S	DRY	13.68	13.84	50.91	1.31	3.06	5.11	93
46	12/17/2008 10:30	12/23/2008 14:50	4.974	DF+S	DRY	11.33	12.39	69.29	3.76	6.23	8.21	94
47	12/23/2008 14:50	1/7/2009 17:15	2.939	DF	DRY	5.44	11.79	32.97	1.32	1.98	8.98	102
48	1/7/2009 17:15	1/15/2009 10:30	3.975	DF	DRY	3.81	6.91	25.56	1.07	2.68	9.98	103
49	1/15/2009 10:30	1/28/2009 10:05	3.105	DF	DRY	10.52	11.82	33.35	1.94	1.52	8.15	104
50	1/28/2009 10:05	2/5/2009 10:45	3.486	DF	DRY	5.85	12.16	51.57	1.55	9.18	8.94	105
51	2/5/2009 10:45	2/26/2009 10:30	3.901	DF	DRY	19.75	18.42	70.60	6.61	8.41	14.15	105
52	2/26/2009 10:30	3/9/2009 17:10	3.081	DF	DRY	12.47	19.20	49.67	1.51	2.64	6.81	
53	3/9/2009 17:10	3/20/2009 17:45	2.385	DF	DRY	7.76	6.82	28.13	0.74	0.88	4.97	
54	3/20/2009 17:45	4/3/2009 15:40	2.173	DF	DRY	9.08	7.41	20.93	1.75	3.86	9.98	
55	4/3/2009 15:40	4/17/2009 18:25	1.76	DF	DRY	15.14	13.95	50.14	1.41	2.79	7.52	
56	4/17/2009 18:25	4/28/2009 10:00	2.088	DF	DRY	11.04	4.95	111.54	1.20	3.83	9.95	115
57	4/28/2009 10:00	5/26/2009 12:00	2.048	DF	DRY	5.46	5.99	444.18	9.43	12.52	45.49	113
58	5/26/2009 12:00	6/5/2009 13:20	3.907	DF	DRY	59.16	130.93	432.59	1.03	6.84	12.04	
59	6/5/2009 13:20	6/19/2009 12:25	2.743	DF	DRY	76.22	6.87	145.50	0.37	1.32	3.53	
60	6/19/2009 12:25	6/26/2009 12:30	3.048	DF	DRY	2.09	7.20	178.46	1.22	3.18	12.90	
61	6/26/2009 12:30	7/5/2009 11:00	2.705	DF	DRY	3.27	37.31	314.28	0.84	4.64	24.72	
62	7/5/2009 11:00	7/14/2009 9:50	2.552	DF	DRY	3.41	5.51	84.15	1.70	5.36	10.88	121
63	7/14/2009 9:50	7/22/2009 10:00	2.357	DF	DRY	3.57	11.69	186.06	1.15	1.42	6.67	125
64	7/22/2009 10:00	8/9/2009 11:30	2.798	DF	DRY	74.99	32.13	75.95	0.37	0.85	3.22	

Samp. No.	Ward Valley Dry Start Date-Time	Lake Level Collection Date-Time	Vol. Liters	Precip. Form	Collector Type	(Conc.) NO3-N (g/ha)	NH4-N (g/ha)	TKN (g/ha)	SRP (g/ha)	DP (g/ha)	TP (g/ha)	Notes
65	8/9/2009 11:30	8/28/2009 12:20	1.47	DF	DRY	3.09	0.84	388.11	0.91	2.04	33.96	126
66	8/28/2009 12:20	9/9/2009 13:30	2.325	DF	DRY	4.89	3.20	143.66	1.24	2.25	5.21	
67	9/9/2009 13:30	9/22/2009 15:10		DF	DRY	C	C	C	C	C	C	127
68	9/22/2009 15:10	10/2/2009 10:45	3.013	DF	DRY	4.40	4.45	215.40	13.77	16.81	20.68	128
69	10/2/2009 10:45	10/12/2009 15:45	2.83	DF	DRY	3.84	0.73	167.55	0.50	3.56	14.61	153
70	10/12/2009 15:45	10/20/2009 11:10	4.3	DF+RS	DRY	12.17	11.74	258.94	6.08	7.36	7.58	154
71	10/20/2009 11:10	10/30/2009 11:30	3.568	DF+R?S?	DRY	11.70	1.79	96.34	3.15	3.68	5.63	155
72	10/30/2009 11:30	11/11/2009 11:00	3.287	DF	DRY	12.94	14.97	109.42	6.10	6.19	6.19	
73	11/11/2009 11:00	11/28/2009 11:30	3.571	DF	DRY	13.69	27.15	136.88	8.43	9.76	14.54	156
74	11/28/2009 11:30	12/15/2009 11:15	NA	DF	DRY	NA	NA	NA	NA	NA	NA	157
75	12/15/2009 11:15	1/7/2010 12:00	3.539	DF	DRY	21.41	13.25	44.06	1.42	2.15	18.72	158
76	1/7/2010 12:00	1/28/2010 10:00	4.46	DF	DRY	17.50	13.96	60.35	1.59	4.06	10.40	172
77	1/28/2010 10:00	2/4/2010 13:55	3.039	DF	DRY	12.67	10.17	30.72	1.76	2.77	5.91	
78	2/4/2010 13:55	2/17/2010 9:10	3.018	DF	DRY	9.99	10.24	58.85	1.08	2.80	6.72	
79	2/17/2010 9:10	3/1/2010 17:30	2.382	DF	DRY	13.31	7.81	42.82	1.17	1.61	5.57	
80	3/1/2010 17:30	3/18/2010 10:20	3.456	DF	DRY	24.34	36.47	96.89	2.16	3.76	14.61	
81	3/18/2010 10:20	3/26/2010 11:50	3.243	DF	DRY	10.31	14.27	46.70	3.04	3.60	18.87	
82	3/26/2010 11:50	4/9/2010 17:30	2.419	DF	DRY	17.76	24.52	63.98	1.40	3.28	8.21	
83	4/9/2010 17:30	4/29/2010 17:30	1.528	DF	DRY	18.69	22.49	110.93	0.34	2.70	9.52	
84	4/29/2010 17:30	5/15/2010 17:00	1.416	DF	DRY	8.49	0.89	52.85	0.51	1.58	9.38	A
	5/15/2010 17:00	6/1/2010 17:10	3.179	DF	DRY	21.38	16.63	75.32	1.14	2.50	9.25	B
	6/1/2010 17:10	6/26/2010 20:35	0.993	DF	DRY	C	C	C	C	C	C	C
1	6/26/2010 20:35	7/2/2010 10:40	3.03	DF	DRY	14.15	43.11	565.03	3.15	4.29	11.77	
2	7/2/2010 10:40	7/16/2010 10:30	1.918	DF	DRY	C	C	C	C	C	C	A4
3	7/16/2010 10:30	7/23/2010 13:55	2.664	DF	DRY	5.72	4.24	432.96	2.83	4.24	12.08	A5
4	7/23/2010 13:55	8/3/2010 10:25	2.295	DF	DRY	6.57	3.73	25.30	0.93	2.53	29.36	A15
5	8/3/2010 10:25	8/12/2010 12:00	2.81	DF	DRY	15.52	3.36	159.31	1.25	2.76	14.84	A6
6	8/16/2010 14:00	9/2/2010 16:55	1.576	DF	DRY	4.51	2.61	516.47	0.92	2.22	31.02	A7

Samp. No.	Ward Valley Dry Start Date-Time	Lake Level Collection Date-Time	Vol. Liters	Precip. Form	Collector Type	(Conc.) NO3-N (g/ha)	NH4-N (g/ha)	TKN (g/ha)	SRP (g/ha)	DP (g/ha)	TP (g/ha)	Notes
7	9/2/2010 16:55	9/23/2010 10:40	1.755	DF	DRY	NA	NA	NA	NA	NA	NA	A8
	9/23/2010 10:40	10/14/2010 14:45	5.342	R+S+DF	DRY	C	C	C	C	C	C	A33
9	10/14/2010 14:45	10/22/2010 14:40	3.626	R+DF	DRY	9.73	3.26	251.00	2.53	3.74	4.99	A34
10	10/22/2010 14:40	11/2/2010 10:25	3.764	DF	DRY	2.21	5.07	360.00	4.34	4.81	17.17	A35
11	11/2/2010 10:25	11/17/2010 10:45	3.744	DF	DRY	13.34	42.62	255.49	5.01	8.32	7.40	A36
12	11/17/2010 10:45	12/1/2010 16:45	4.025	S+DF	DRY	33.77	49.58	219.68	3.75	3.66	7.58	A37
13	12/1/2010 16:45	12/22/2010 11:00	4.079	R+S+DF	DRY	17.64	14.17	22.67	2.17	3.23	17.62	A38
14	12/22/2010 11:00	1/6/2011 11:35	4.4	S+DF	DRY	10.73	15.40	15.73	2.54	4.83	10.72	A39
15	1/6/2011 11:35	1/14/2011 11:10	3.375	DF	DRY	14.01	27.22	47.86	0.91	2.48	3.31	A60
16	1/14/2011 11:10	1/24/2011 11:45	2.88	DF	DRY	7.85	15.65	55.62	2.45	3.18	13.23	
17	1/24/2011 11:45	2/13/2011 10:45	1.968	DF	DRY	10.77	7.50	41.86	2.64	3.83	38.06	A61
18	2/13/2011 10:45	3/4/2011 18:45	2.975	DF	DRY	28.31	4.94	43.47	0.93	2.37	10.96	
19	3/4/2011 18:45	3/18/2011 16:00	2.877	DF	DRY	19.80	16.65	81.75	3.09	4.22	10.04	
20	3/18/2011 16:00	4/13/2011 9:50	1.67	DF	DRY	31.70	17.99	62.75	0.45	1.64	15.87	
21	4/13/2011 9:50	4/25/2011 13:05	2.972	DF	DRY	27.85	33.58	67.80	0.93	3.09	6.54	
22	4/25/2011 13:05	5/16/2011 17:10	0.5	DF	DRY	NA	NA	NA	NA	NA	NA	A69
23	5/16/2011 17:10	6/15/2011 17:00	NA	DF	DRY	NA	NA	NA	NA	NA	NA	
24	6/15/2011 17:00	6/30/2011 16:10	3.345	DF	DRY	NA	NA	NA	NA	NA	NA	A70
25	6/30/2011 16:10	7/22/2011 17:45	0.902	DF	DRY	NA	NA	NA	NA	NA	NA	A84
26	7/22/2011 17:45	8/4/2011 14:45	2.4	DF	DRY	6.74	5.09	313.30	2.48	4.67	25.53	A85
27	8/4/2011 14:45	8/22/2011 17:45	1.822	DF	DRY	4.45	1.21	297.84	0.98	6.32	19.64	A86
28	8/22/2011 17:45	9/12/2011 8:00	2.288	DF+R	DRY-BULK	NA	NA	NA	NA	NA	NA	A87
29	9/12/2011 8:00	9/20/2011 10:30	3.55	DF+R	DRY-BULK	20.75	3.21	264.69	1.11	3.25	7.59	A88
30	9/20/2011 10:30	10/4/2011 16:00	2.91	DF+R	DRY-BULK	12.12	3.55	386.72	1.23	4.09	14.31	A89
31	10/4/2011 16:00	10/14/2011 12:20	4.046	DF+R	DRY-BULK	8.02	10.21	348.88	5.70	8.83	11.67	A104
32	10/14/2011 12:20	10/27/2011 11:00	3.3	DF	DRY							A105
33	10/27/2011 11:00	11/10/2011 10:15	3.47	DF	DRY	10.27	22.63	228.59	9.57	12.51	16.75	A106
34	11/10/2011 10:15	12/7/2011 11:15	NA	DF	DRY-BULK							A107
35	12/7/2011 11:15	12/21/2011 11:20	3.539	DF	DRY	7.84	4.39	173.43	0.50	5.22	6.80	A108

Samp. No.	Ward Valley Dry Start Date-Time	Lake Level Collection Date-Time	Vol. Liters	Precip. Form	Collector Type	(Conc.) NO3-N (g/ha)	NH4-N (g/ha)	TKN (g/ha)	SRP (g/ha)	DP (g/ha)	TP (g/ha)	Notes
36	12/21/2011 11:20	12/26/2011 15:10	3.502	DF	DRY	3.26	3.58	2.41	1.98	5.16	7.63	A109
37	12/26/2011 15:10	1/6/2012 18:00	2.84	DF	DRY	7.12	11.71	42.69	1.20	3.65	5.11	
38	1/6/2012 18:00	1/18/2012 10:40	3.037	DF	DRY	6.70	16.24	131.76	1.29	5.08	13.67	A124
39	1/18/2012 10:40	2/7/2012 10:10	2.48	DF	DRY	12.24	9.68	34.72	3.73	7.16	17.98	A125
40	2/7/2012 10:10	2/16/2012 11:00	2.854	DF	DRY	10.74	14.32	50.65	4.43	4.96	5.33	A126
41	2/16/2012 11:00	2/24/2012 17:10	2.824	DF	DRY	3.54	13.26	71.44	1.20	4.18	8.17	
42	2/24/2012 17:10	3/9/2012 10:30	2.906	DF	DRY	22.27	28.62	105.08	2.47	5.96	14.71	A127
43	3/9/2012 10:30	3/27/2012 10:30	2.127	DF	DRY	28.38	53.83	189.31	**0.50**	3.55	9.68	
44	3/27/2012 10:30	4/7/2012 16:30	2.292	DF	DRY	20.77	17.52	47.65	0.32	2.22	10.07	
45	4/7/2012 16:30	4/20/2012 15:30	2.14	DF	DRY		23.57	148.65	0.51	3.17	10.74	A132
46	4/20/2012 15:30	5/2/2012 18:10	2.007	DF	DRY	12.81	3.11	51.47	1.14	4.03	9.11	
47	5/2/2012 18:10	5/18/2012 10:45	1.125	DF	DRY	4.62	8.80	351.07	5.65	9.35	22.99	A133
48	5/18/2012 10:45	5/30/2012 17:00	0.785	DF	DRY							A134
49	5/30/2012 17:00	6/15/2012 9:25	2.24	DF	DRY	12.23	9.36		0.11	4.03	13.11	A135
50	6/15/2012 9:25	6/27/2012 9:45	2.15	DF	DRY	6.28	0.90	327.17	1.31	8.17	58.74	
51	6/27/2012 9:45	7/16/2012 10:00	0.725	DF	DRY	3.51	5.54	118.35	C	9.90	50.08	
52	7/16/2012 10:00	8/2/2012 12:10	1.9	DF	DRY	5.25	5.60	309.29	1.16	1.82	17.49	
53	8/2/2012 12:10	8/13/2012 14:20	2.285	DF	DRY	10.03	3.54	153.87	1.50	4.37	20.71	
54	8/13/2012 14:20	8/30/2012 17:40	1.841	DF	DRY	11.72	9.26	394.63	0.61	3.30	24.07	
55	8/30/2012 17:40	9/12/2012 10:25	2.619	DF	DRY	21.72	4.02	166.40	2.96	4.08	9.35	
56	9/12/2012 10:25	9/21/2012 9:55	2.901	DF	DRY	11.17	7.20		0.27	2.99	6.35	
57	9/21/2012 9:55	10/5/2012 10:45	2.613	DF	DRY	7.61	4.01	44.66	0.61	3.34	11.35	

Appendix Table 3.a. Precipitation amounts, N and P concentrations in bulk deposition collected in Snow Tube collector at the Mid-lake Buoy (TB-1) Station 9/16/08-9/28/12. Shading indicates corrected data with significant difference between corrected value and initially presented value.

No.	Mid-lake (TB-1) Start Date-Time	Snow Tube Collection Date-Time	Precip. (in.)	Precip. Form	Collector Type	(Conc.) NO3-N (µg/l)	NH4-N (µg/l)	TKN (µg/l)	SRP (µg/l)	DP (µg/l)	TP (µg/l)	Notes
12	9/16/2008 10:00	10/8/2008 10:40	0.46	R	ST	C	C	C	C	C	C	84
	10/8/2008 10:40	10/17/2008 10:30	0		ST	NA	NA	NA	NA	NA	NA	
13	10/17/2008 10:30	11/7/2008 9:45	1.05	R+S	ST	337	164	372	29	36	53	
14	11/7/2008 9:45	11/21/2008 10:22	0.12	R	ST	359	179	NA	6	11	NA	
15	11/21/2008 10:22	12/5/2008 8:31	0.12	R+S	ST	163	105	192	4	6	7	95
16	12/5/2008 8:31	1/6/2009 10:47	0.99	R+S	ST	265	88	297	10	14	24	97
	1/6/2009 10:47	1/19/2009 9:45	0		ST	NA	NA	NA	NA	NA	NA	
17	1/19/2009 9:45	1/28/2009 9:50	1.01	R+S	ST	171	114	154	5	5	8	
	1/28/2009 9:50	2/4/2009 15:47	0		ST	NA	NA	NA	NA	NA	NA	
18	2/4/2009 15:47	2/20/2009 8:15	0.12	S	ST	52	40	172	2	3	7	106
19	2/20/2009 8:15	3/10/2009 9:48	1.48	R+S	ST	95	90	159	4	4	6	
	3/10/2009 9:48	3/20/2009 10:55	T		ST	NA	NA	NA	NA	NA	NA	
20	3/20/2009 10:55	4/10/2009 9:50	0.36	S	ST	559	254	618	8	19	47	
21	4/10/2009 9:50	5/15/2009 14:10	NA		ST	257	230	340	10	15	26	116
	5/15/2009 14:10	6/11/2009 9:12	0.42	R+H?	ST	C	C	C	C	C	C	117
	6/11/2009 9:12	6/18/2009 10:55	T		ST	NA	NA	NA	NA	NA	NA	118
	6/18/2009 10:55	6/25/2009 9:45	0		ST	NA	NA	NA	NA	NA	NA	
	6/25/2009 9:45	7/2/2009 10:05	0		ST	NA	NA	NA	NA	NA	NA	
22	7/2/2009 10:05	7/13/2009 9:50	0.08	R	ST	C	C	C	C	C	C	129
	7/13/2009 9:50	7/21/2009 9:55	0		ST	NA	NA	NA	NA	NA	NA	
	7/21/2009 9:55	7/30/2009 7:25	0		ST	NA	NA	NA	NA	NA	NA	
	7/30/2009 7:25	8/7/2009 8:35	T		ST	NA	NA	NA	NA	NA	NA	
	8/7/2009 8:35	8/25/2009 9:10	T		ST	NA	NA	NA	NA	NA	NA	
23	8/25/2009 9:10	9/22/2009 9:26	0.01	R	ST	34	35	115	15	19	18	130

No.	Mid-lake (TB-1) Start Date-Time	Snow Tube Collection Date-Time	Precip. (in.)	Precip. Form	Collector Type	(Conc.) NO3-N (µg/l)	NH4-N (µg/l)	TKN (µg/l)	SRP (µg/l)	DP (µg/l)	TP (µg/l)	Notes
24	9/22/2009 9:26	10/21/09 11:56	0.12+	R+S	ST	206	160	NA	9	21	NA	159
	10/21/09 11:56	10/30/09 14:01	T		ST	NA	NA	NA	NA	NA	NA	
	10/30/09 14:01	11/10/09 08:15	0		ST	NA	NA	NA	NA	NA	NA	
25	11/10/09 08:15	11/24/09 08:20	0.25	R+S	ST	534	251	446	21	22	45	160
26	11/24/09 08:20	12/3/09 11:27	0.01	S	ST	144	101	185	3	6	9	161
27	12/3/09 11:27	12/17/09 15:17	0.85	S	ST	191	183	402	18	20	38	
28	12/17/09 15:17	1/4/10 09:15	0.15	R+S	ST	122	46	135	2	5	5	162
29	1/4/10 09:15	1/14/10 11:57	0.62	R+S	ST	270	130	428	8	10	15	
30	1/14/10 11:57	1/26/10 13:28	0.53	R+S	ST	203	112	275	9	13	12	
31	1/26/10 13:28	2/2/10 08:43	T	T	ST	NA	NA	NA	NA	NA	NA	
32	2/2/10 08:43	2/17/10 16:18	0.24	S	ST	134	85	NA	3	5	5	173
33	2/17/10 16:18	2/25/10 09:40	0.55		ST	136	70	191	4	4	6	
34	2/25/10 09:40	3/16/10 08:36	1.24	R+S	ST	109	60	181	2	4	6	
35	3/16/10 08:36	3/26/10 09:05	NA	S	ST	NA	NA	NA	NA	NA	NA	
36	3/26/10 09:05	4/13/10 09:30	0.54	R+S	ST	313	78	794	5	10	26	
37	4/13/10 09:30	5/7/10 13:26	0.64	R+S	ST	336	252	607	9	15	49	
38	5/7/10 13:26	6/3/10 09:37	0.48	S	ST	520	570	970	5	12	20	
1	6/3/10 09:37	7/2/10 08:05	0.04	R	ST	C	C	C	C	C	C	A10
2	7/2/10 08:05	7/20/10 10:35	0.01	R	ST	C	C	C	C	C	C	A11
	7/20/10 10:35	8/3/10 09:30	0		ST	NA	NA	NA	NA	NA	NA	
3	8/3/10 09:30	8/12/10 09:50	0.08	R	ST	186	20	502	5	15	71	A12
	8/12/10 09:50	8/31/10 10:30	0		ST	NA	NA	NA	NA	NA	NA	
	8/31/10 10:30	9/9/10 09:40	T	R	ST	NA	NA	NA	NA	NA	NA	
	9/9/10 09:40	9/22/10 09:15	0		ST	NA	NA	NA	NA	NA	NA	
4	9/22/10 09:15	10/13/10 09:40	1.67	R	ST	504	535	940	39	48	83	A40
5	10/13/10 09:40	10/20/10 15:24	0.36+	R	ST	127	139	137	6	9	12	A41
6	10/20/10 15:24	11/9/10 09:02	0.07	R+S	ST	21	13	232	0	3	3	A42
	11/9/10 09:02	11/17/10 07:25	NA	NA	NA	NA	NA	NA	NA	NA	NA	A43
	11/17/10 07:25	12/1/10 10:45	NA	NA	NA	NA	NA	NA	NA	NA	NA	A44

	Mid-lake (TB-1)	Snow Tube				(Conc.)						
	Start	Collection	Precip.	Precip.	Collector	NO3-N	NH4-N	TKN	SRP	DP	TP	
No.	Date-Time	Date-Time	(in.)	Form	Type	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	Notes
	12/1/10 10:45	12/15/10 13:50	NA	NA	NA	NA	NA	NA	NA	NA	NA	A45
7	12/15/10 13:50	1/4/11 09:57	2.73+	R+S	ST	44	20	63	2	4	6	A46
8	1/4/11 09:57	2/11/11 11:07	0.14	RS	ST	50	7	106	1	4	6	A62
	2/11/11 11:07	3/1/11 08:30	NA		ST	NA	NA	NA	NA	NA	NA	A63
9	3/1/11 08:30	3/28/11 09:55	2.89	RS	ST	54	45	153	1	2	4	A64
	3/28/11 09:55	4/22/11 10:15	NA		ST	NA	NA	NA	NA	NA	NA	A71
10	4/22/11 10:15	6/7/11 14:35	2.36+	RS	ST	140	160	387	4	4	10	A72
11	6/7/11 14:35	7/2/11 12:25	0.30	RS	ST	NA	NA	NA	NA	NA	NA	A73
12	7/2/11 12:25	7/23/11 11:22	0.29	R	ST	C	C	C	C	C	C	A90
	7/23/11 11:22	8/4/11 11:10	0		ST	NA	NA	NA	NA	NA	NA	
	8/4/11 11:10	8/26/11 10:30	0		ST	NA	NA	NA	NA	NA	NA	
	8/26/11 10:30	9/8/11 10:02	0		ST	NA	NA	NA	NA	NA	NA	
13	9/8/11 10:02	9/21/11 09:13	0.03	R	ST	150	109	313	8	13	24	A91
14	9/21/11 09:13	10/12/11 15:12	0.17+	RS	ST	111	66	271	7	14	31	A110
	10/12/11 15:12	10/27/11 10:48	0		ST	NA	NA	NA	NA	NA	NA	
15	10/27/11 10:48	11/16/11 09:46	.0025	S	ST	63	48	138	1	5	7	A111
	11/16/11 09:46	12/9/11 09:54	0		ST	NA	NA	NA	NA	NA	NA	
	12/9/11 09:54	12/27/11 10:39	0		ST	NA	NA	NA	NA	NA	NA	
-	12/27/11 10:39	1/5/12 09:09	0		ST	NA	NA	NA	NA	NA	NA	
	1/5/12 09:09	1/13/12 09:35	0		ST	NA	NA	NA	NA	NA	NA	
	1/13/12 09:35	1/26/12 09:50			ST	NA	NA	NA	NA	NA	NA	A128
16	1/13/12 09:35	1/30/12 10:05	2.72	RS	ST	154	54	182	3	11	15	
17	1/30/12 10:05	2/16/12 16:28	0.01	S	ST	16	14	78	1	5	5	A129
	2/16/12 16:28	3/9/12 13:10	T	S	ST	NA	NA	NA	NA	NA	NA	
18	3/9/12 13:10	3/20/12 11:15	0.94	RS	ST	172	184	325	10	16	27	
19	3/20/12 11:15	4/3/12 10:20	0.24	RS	ST	134	153	514	4	10	13	A130
20	4/3/12 10:20	4/20/12 09:25	0.02	RS	ST	31	21	106	1	5	8	A136
21	4/20/12 09:25	5/11/12 10:00	0.18	RS	ST	180	128	354	0	6	74	A137
22	5/11/12 10:00	6/5/12 09:45	0.33	RS	ST	365	425	1434	15	31	125	A138

No.	Mid-lake (TB-1) Start Date-Time	Snow Tube Collection Date-Time	Precip. (in.)	Precip. Form	Collector Type	(Conc.) NO3-N (µg/l)	NH4-N (µg/l)	TKN (µg/l)	SRP (µg/l)	DP (µg/l)	TP (µg/l)	Notes
	6/5/12 09:45	7/2/12 09:25	0		ST	NA	NA	NA	NA	NA	NA	
23	7/2/12 09:25	7/24/12 13:06	0.05	RH	ST	345	235	695	23	41	NA	A149
	7/24/12 13:06	8/6/12 14:09	0		ST	NA	NA	NA	NA	NA	NA	
24	8/6/12 14:09	8/17/12 09:25	0.01	R	ST	99	78	407	7	11	13	
	8/17/12 09:25	8/27/12 09:26	0		ST	NA	NA	NA	NA	NA	NA	
25	8/27/12 09:26	9/11/12 11:35	0.11	R	ST	244	183	NA	4	8	13	A150
	9/11/12 11:35	9/28/12 10:28	0		ST	NA	NA	NA	NA	NA	NA	

Appendix Table 3.b. Precipitation amounts, N and P loads in bulk deposition collected in Snow Tube collector at the Mid-lake Buoy (TB-1) Station 9/16/08-9/28/12. Shading indicates corrected data with significant difference between corrected value and initially presented value.

No.	Mid-lake (TB-1) Start Date-Time	Snow Tube Collection Date-Time	Precip. (in.)	Precip. Form	Collector Type	(Conc.) NO3-N (g/ha)	NH4-N (g/ha)	TKN (g/ha)	SRP (g/ha)	DP (g/ha)	TP (g/ha)	Notes
12	9/16/2008 10:00	10/8/2008 10:40	0.46	R	ST	C	C	C	C	C	C	84
	10/8/2008 10:40	10/17/2008 10:30	0		ST	NA	NA	NA	NA	NA	NA	
13	10/17/2008 10:30	11/7/2008 9:45	1.05	R+S	ST	89.97	43.82	99.18	7.68	9.51	14.06	
14	11/7/2008 9:45	11/21/2008 10:22	0.12	R	ST	10.94	5.44	NA	0.19	0.34	NA	
15	11/21/2008 10:22	12/5/2008 8:31	0.12	R+S	ST	25.17	16.20	29.66	0.61	0.95	1.05	95
16	12/5/2008 8:31	1/6/2009 10:47	0.99	R+S	ST	66.55	22.18	74.57	2.45	3.43	6.08	97
	1/6/2009 10:47	1/19/2009 9:45	0		ST	NA	NA	NA	NA	NA	NA	
17	1/19/2009 9:45	1/28/2009 9:50	1.01	R+S	ST	43.80	29.22	39.63	1.39	1.20	1.99	
	1/28/2009 9:50	2/4/2009 15:47	0		ST	NA	NA	NA	NA	NA	NA	
18	2/4/2009 15:47	2/20/2009 8:15	0.12	S	ST	8.02	6.14	26.58	0.35	0.52	1.03	106
19	2/20/2009 8:15	3/10/2009 9:48	1.48	R+S	ST	35.89	33.89	59.60	1.36	1.52	2.22	
	3/10/2009 9:48	3/20/2009 10:55	T		ST	NA	NA	NA	NA	NA	NA	
20	3/20/2009 10:55	4/10/2009 9:50	0.36	S	ST	51.14	23.21	56.55	0.72	1.71	4.32	
21	4/10/2009 9:50	5/15/2009 14:10	NA		ST	NA	NA	NA	NA	NA	NA	116
	5/15/2009 14:10	6/11/2009 9:12	0.42	R+H?	ST	C	C	C	C	C	C	117
	6/11/2009 9:12	6/18/2009 10:55	T		ST	NA	NA	NA	NA	NA	NA	118
	6/18/2009 10:55	6/25/2009 9:45	0		ST	NA	NA	NA	NA	NA	NA	
	6/25/2009 9:45	7/2/2009 10:05	0		ST	NA	NA	NA	NA	NA	NA	
22	7/2/2009 10:05	7/13/2009 9:50	0.08	R	ST	C	C	C	C	C	C	129
	7/13/2009 9:50	7/21/2009 9:55	0		ST	NA	NA	NA	NA	NA	NA	
	7/21/2009 9:55	7/30/2009 7:25	0		ST	NA	NA	NA	NA	NA	NA	
	7/30/2009 7:25	8/7/2009 8:35	T		ST	NA	NA	NA	NA	NA	NA	
	8/7/2009 8:35	8/25/2009 9:10	T		ST	NA	NA	NA	NA	NA	NA	
23	8/25/2009 9:10	9/22/2009 9:26	0.01	R	ST	5.35	5.41	17.88	2.35	2.97	2.77	130

No.	Mid-lake (TB-1) Start Date-Time	Snow Tube Collection Date-Time	Precip. (in.)	Precip. Form	Collector Type	(Conc.) NO3-N (g/ha)	NH4-N (g/ha)	TKN (g/ha)	SRP (g/ha)	DP (g/ha)	TP (g/ha)	Notes
24	9/22/2009 9:26	10/21/09 11:56	0.12+	R+S	ST	6.27	4.87	NA	0.27	0.63	NA	159
	10/21/09 11:56	10/30/09 14:01	T		ST	NA	NA	NA	NA	NA	NA	
	10/30/09 14:01	11/10/09 08:15	0		ST	NA	NA	NA	NA	NA	NA	
25	11/10/09 08:15	11/24/09 08:20	0.25	R+S	ST	82.34	38.71	68.79	3.16	3.34	6.98	160
26	11/24/09 08:20	12/3/09 11:27	0.01	S	ST	22.21	15.55	28.52	0.45	0.86	1.34	161
27	12/3/09 11:27	12/17/09 15:17	0.85	S	ST	41.23	39.55	86.69	3.90	4.21	8.15	
28	12/17/09 15:17	1/4/10 09:15	0.15	R+S	ST	18.76	7.01	20.81	0.38	0.76	0.81	162
29	1/4/10 09:15	1/14/10 11:57	0.62	R+S	ST	42.52	20.48	67.43	1.21	1.54	2.37	
30	1/14/10 11:57	1/26/10 13:28	0.53	R+S	ST	27.36	15.12	36.97	1.28	1.70	1.55	
31	1/26/10 13:28	2/2/10 08:43	T	T	ST	NA	NA	NA	NA	NA	NA	
32	2/2/10 08:43	2/17/10 16:18	0.24	S	ST	20.63	13.07	NA	0.45	0.72	0.82	173
33	2/17/10 16:18	2/25/10 09:40	0.55		ST	18.94	9.82	26.68	0.54	0.61	0.83	
34	2/25/10 09:40	3/16/10 08:36	1.24	R+S	ST	34.21	19.02	57.03	0.57	1.25	1.83	
35	3/16/10 08:36	3/26/10 09:05	NA	S	ST	NA	NA	NA	NA	NA	NA	
36	3/26/10 09:05	4/13/10 09:30	0.54	R+S	ST	42.94	10.65	108.92	0.65	1.43	3.54	
37	4/13/10 09:30	5/7/10 13:26	0.64	R+S	ST	54.58	40.95	98.64	1.54	2.51	7.95	
38	5/7/10 13:26	6/3/10 09:37	0.48	S	ST	63.40	69.45	118.24	0.58	1.52	2.46	
1	6/3/10 09:37	7/2/10 08:05	0.04	R	ST	C	C	C	C	C	C	A10
2	7/2/10 08:05	7/20/10 10:35	0.01	R	ST	C	C	C	C	C	C	A11
	7/20/10 10:35	8/3/10 09:30	0		ST	NA	NA	NA	NA	NA	NA	
3	8/3/10 09:30	8/12/10 09:50	0.08	R	ST	28.62	3.02	77.33	0.70	2.35	10.98	A12
	8/12/10 09:50	8/31/10 10:30	0		ST	NA	NA	NA	NA	NA	NA	
	8/31/10 10:30	9/9/10 09:40	T	R	ST	NA	NA	NA	NA	NA	NA	
	9/9/10 09:40	9/22/10 09:15	0		ST	NA	NA	NA	NA	NA	NA	
4	9/22/10 09:15	10/13/10 09:40	1.67	R	ST	213.77	226.75	398.62	16.58	20.31	35.11	A40
5	10/13/10 09:40	10/20/10 15:24	0.36+	R	ST	24.75	27.01	27.67	1.14	1.34	2.36	A41
6	10/20/10 15:24	11/9/10 09:02	0.07	R+S	ST	3.26	1.98	35.69	0.07	0.43	0.53	A42
	11/9/10 09:02	11/17/10 07:25	NA	NA	NA	NA	NA	NA	NA	NA	NA	A43
	11/17/10 07:25	12/1/10 10:45	NA	NA	NA	NA	NA	NA	NA	NA	NA	A44

No.	Mid-lake (TB-1) Start Date-Time	Snow Tube Collection Date-Time	Precip. (in.)	Precip. Form	Collector Type	(Conc.) NO3-N (g/ha)	NH4-N (g/ha)	TKN (g/ha)	SRP (g/ha)	DP (g/ha)	TP (g/ha)	Notes
	12/1/10 10:45	12/15/10 13:50	NA	NA	NA	NA	NA	NA	NA	NA	NA	A45
7	12/15/10 13:50	1/4/11 09:57	2.73+	R+S	ST	30.75	13.63	44.03	1.41	2.78	4.06	A46
8	1/4/11 09:57	2/11/11 11:07	0.14	RS	ST	7.78	1.11	16.33	0.17	0.57	1.00	A62
	2/11/11 11:07	3/1/11 08:30	NA		ST	NA	NA	NA	NA	NA	NA	A63
9	3/1/11 08:30	3/28/11 09:55	2.89	RS	ST	39.50	32.97	112.64	0.67	1.81	2.95	A64
	3/28/11 09:55	4/22/11 10:15	NA		ST	NA	NA	NA	NA	NA	NA	A71
10	4/22/11 10:15	6/7/11 14:35	2.36+	RS	ST	83.77	95.97	231.89	2.58	2.42	5.78	A72
11	6/7/11 14:35	7/2/11 12:25	0.30	RS	ST	NA	NA	NA	NA	NA	NA	A73
12	7/2/11 12:25	7/23/11 11:22	0.29	R	ST	C	C	C	C	C	C	A90
	7/23/11 11:22	8/4/11 11:10	0		ST	NA	NA	NA	NA	NA	NA	
	8/4/11 11:10	8/26/11 10:30	0		ST	NA	NA	NA	NA	NA	NA	
	8/26/11 10:30	9/8/11 10:02	0		ST	NA	NA	NA	NA	NA	NA	
13	9/8/11 10:02	9/21/11 09:13	0.03	R	ST	23.07	16.83	48.17	1.16	2.04	3.75	A91
14	9/21/11 09:13	10/12/11 15:12	0.17+	RS	ST	17.04	10.18	41.72	1.08	2.19	4.76	A110
	10/12/11 15:12	10/27/11 10:48	0		ST	NA	NA	NA	NA	NA	NA	
15	10/27/11 10:48	11/16/11 09:46	.0025	S	ST	9.69	7.47	21.23	0.17	0.76	1.14	A111
	11/16/11 09:46	12/9/11 09:54	0		ST	NA	NA	NA	NA	NA	NA	
	12/9/11 09:54	12/27/11 10:39	0		ST	NA	NA	NA	NA	NA	NA	
-	12/27/11 10:39	1/5/12 09:09	0		ST	NA	NA	NA	NA	NA	NA	
	1/5/12 09:09	1/13/12 09:35	0		ST	NA	NA	NA	NA	NA	NA	
	1/13/12 09:35	1/26/12 09:50			ST	NA	NA	NA	NA	NA	NA	A128
16	1/13/12 09:35	1/30/12 10:05	2.72	RS	ST	106.26	37.16	125.91	2.03	7.48	10.47	
17	1/30/12 10:05	2/16/12 16:28	0.01	S	ST	2.43	2.16	12.01	0.18	0.72	0.81	A129
	2/16/12 16:28	3/9/12 13:10	T	S	ST	NA	NA	NA	NA	NA	NA	
18	3/9/12 13:10	3/20/12 11:15	0.94	RS	ST	41.02	43.99	77.56	2.33	3.83	6.41	
19	3/20/12 11:15	4/3/12 10:20	0.24	RS	ST	20.62	23.58	79.23	0.59	1.57	1.95	A130
20	4/3/12 10:20	4/20/12 09:25	0.02	RS	ST	4.76	3.25	16.31	0.14	0.76	1.24	A136
21	4/20/12 09:25	5/11/12 10:00	0.18	RS	ST	27.78	19.66	54.62	0.07	0.96	11.36	A137
22	5/11/12 10:00	6/5/12 09:45	0.33	RS	ST	30.57	35.60	120.16	1.22	2.63	10.45	A138

No.	Mid-lake (TB-1) Start Date-Time	Snow Tube Collection Date-Time	Precip. (in.)	Precip. Form	Collector Type	(Conc.) NO3-N (g/ha)	NH4-N (g/ha)	TKN (g/ha)	SRP (g/ha)	DP (g/ha)	TP (g/ha)	Notes
	6/5/12 09:45	7/2/12 09:25	0		ST	NA	NA	NA	NA	NA	NA	
23	7/2/12 09:25	7/24/12 13:06	0.05	RH	ST	53.16	36.15	107.12	NA	6.36	NA	A149
	7/24/12 13:06	8/6/12 14:09	0		ST	NA	NA	NA	NA	NA	NA	
24	8/6/12 14:09	8/17/12 09:25	0.01	R	ST	15.30	12.02	62.73	1.05	1.71	1.95	
	8/17/12 09:25	8/27/12 09:26	0		ST	NA	NA	NA	NA	NA	NA	
25	8/27/12 09:26	9/11/12 11:35	0.11	R	ST	37.55	28.27	77.37	0.56	1.16	1.98	A150
	9/11/12 11:35	9/28/12 10:28	0		ST	NA	NA	NA	NA	NA	NA	

Appendix Table 4.a. N and P concentrations in dry-bulk deposition (buoy bucket) at Mid-lake Buoy (TB-1) Station 9/16/08-10/8/12
Shading indicates corrected data with significant difference between corrected value and initially presented value.

Samp. No.	Mid-lake (TB-1) Start Date-Time	Dry-Bulk Collection Date-Time	Vol. Liters	Precip. Form	Collector Type	(Conc.) NO3-N (µg/l)	NH4-N (µg/l)	TKN (µg/l)	SRP (µg/l)	DP (µg/l)	TP (µg/l)	Notes
30	9/16/2008 10:00	10/8/2008 10:40	0.535	DF+R	DRY-BULK	488	355	1435	3	7	28	80
31	10/8/2008 10:40	10/17/2008 10:30	0.695	DF	DRY-BULK	130	85	179	1	5	9	
32	10/17/2008 10:30	11/7/2008 9:45	1.33	DF+R+S	DRY-BULK	228	294	420	6	6	8	
33	11/7/2008 9:45	11/21/2008 10:22	1.515	DF+R	DRY-BULK	95	82	290	3	3	5	
34	11/21/2008 10:22	12/5/2008 8:31	1.268	DF+R+S	DRY-BULK	153	136	165	2	4	3	
35	12/5/2008 8:31	1/6/2009 10:47	0.6	DF +R+S	DRY-BULK	247	124	387	7	9	32	97
36	1/6/2009 10:47	1/19/2009 9:45	1.381	DF	DRY-BULK	102	64	114	1	2	2	107
37	1/19/2009 9:45	1/28/2009 9:50	2.348	DF +R+S	DRY-BULK	36	12	173	0	2	2	
38	1/28/2009 9:50	2/4/2009 15:47	2.875	DF	DRY-BULK	33	25	41	1	2	2	
39	2/4/2009 15:47	2/20/2009 8:15	1.27	DF+S	DRY-BULK	73	66	163	2	3	7	
40	2/20/2009 8:15	3/10/2009 9:48	1.463	DF +R+S	DRY-BULK	76	87	126	2	2	4	108
41	3/10/2009 9:48	3/20/2009 10:55	1.77		DRY-BULK	59	72	140	2	2	6	
42	3/20/2009 10:55	4/10/2009 9:50	0.5	DF+S	DRY-BULK	363	346	446	10	11	13	109
43	4/10/2009 9:50	5/15/2009 14:10	0.5	DF+S	DRY-BULK	426	447	420	7	12	42	119
44	5/15/2009 14:10	6/11/2009 9:12	0.5	DF+R+H?	DRY-BULK	C	C	C	C	C	C	120
45	6/11/2009 9:12	6/18/2009 10:55	1.469	DF+T	DRY-BULK	82	85	103	4	5	7	
46	6/18/2009 10:55	6/25/2009 9:45	0.775	DF	DRY-BULK	142	303	409	5	7	21	
47	6/25/2009 9:45	7/2/2009 10:05	1.072	DF	DRY-BULK	103	95	165	4	6	16	
48	7/2/2009 10:05	7/13/09 09:50	0.500	DF+R	DRY-BULK	C	C	C	C	C	C	131A
49	7/13/09 09:50	7/21/2009 9:55	0.622	DF	DRY-BULK	C	C	C	C	C	C	132
50	7/21/2009 9:55	7/30/2009 7:25	0.51	DF	DRY-BULK	173	48	333	6	19	51	133
51	7/30/2009 7:25	8/7/2009 8:35	0.5	DF	DRY-BULK	527	806	1284	14	25	42	134
52	8/7/2009 8:35	8/25/2009 9:10	0.5	DF+T	DRY-BULK	241	128	462	8	11	48	135
53	8/25/2009 9:10	9/10/2009 9:30	0.5	DF	DRY-BULK	200	111	312	7	11	25	135
54	9/10/2009 9:30	9/22/2009 9:26	0.5	DF	DRY-BULK	469	859	72	1	5	11	136
55	9/22/2009 9:26	10/21/09 11:56	0.378	DF+R+S	DRY-BULK	695	258	733	4	18	46	163

Samp. No.	Mid-lake (TB-1) Start Date-Time	Dry-Bulk Collection Date-Time	Vol. Liters	Precip. Form	Collector Type	(Conc.) NO3-N (µg/l)	NH4-N (µg/l)	TKN (µg/l)	SRP (µg/l)	DP (µg/l)	TP (µg/l)	Notes
56	10/21/09 11:56	10/30/09 14:01	1.444	DF+T	DRY-BULK	69	45	58	3	5	7	
57	10/30/09 14:01	11/10/09 08:15	1.302	DF	DRY-BULK	128	228	220	2	5	9	
58	11/10/09 08:15	11/24/09 08:20	1.320	DF+S+R	DRY-BULK	584	1148	1524	14	17	26	
59	11/24/09 08:20	12/3/09 11:27	1.088	DF+S	DRY-BULK	116	101	368	2	3	6	
60	12/3/09 11:27	12/17/09 15:17	2.383	DF+S	DRY-BULK	62	61	113	2	2	5	
61	12/17/09 15:17	1/4/10 09:15	1.478	DF+R+S	DRY-BULK	44	35	227	0	2	4	
62	1/4/10 09:15	1/14/10 11:57	2.500	DF+R+S	DRY-BULK	40	5	NA	0	2	4	
63	1/14/10 11:57	1/26/10 13:28	2.328	DF+R+S	DRY-BULK	37	18	37	1	2	4	
64	1/26/10 13:28	2/2/10 08:43	2.498	DF+T	DRY-BULK	30	17	40	1	3	3	
65	2/2/10 08:43	2/17/10 16:18	1.511	DF+S	DRY-BULK	102	55	150	1	5	9	174
66	2/19/10 11:32	2/25/10 09:40	2.810	DF	DRY-BULK	35	17	89	2	2	6	
67	2/25/10 09:40	3/16/10 08:36	1.121	DF+R+S	DRY-BULK	164	149	226	2	5	15	
68	3/16/10 08:36	3/26/10 09:05	1.200	DF+S	DRY-BULK	95	197	234	3	4	7	
69	3/26/10 09:05	4/13/10 09:30	0.500	DF+R+S	DRY-BULK	467	112	915	16	20	38	175
70	4/13/10 09:30	5/7/10 13:26	0.500	DF+R+S	DRY-BULK	448	35	526	30	39	65	176
71	5/7/10 13:26	6/3/10 09:37	0.500	DF+S	DRY-BULK	340	270	673	21	21	41	177
1	6/3/10 9:37	7/2/10 8:05	0.5	DF+R	DRY-BULK	300	194	1123	21	127	NA	A13
2	7/2/10 8:05	7/20/10 10:35	0.5	DF+R	DRY-BULK	219	27	870	31	39	155	A14
3	7/20/10 10:35	8/3/10 9:30	0.5	DF	DRY-BULK	204	96	235	2	11	46	A14
4	8/3/10 9:30	8/12/10 9:50	0.365	DF+R	DRY-BULK	745	928	1541	7	15	34	
5	8/12/10 9:50	8/31/10 10:30	0.5	DF	DRY-BULK	246	21	499	7	11	41	A14
6	8/31/10 10:30	9/9/10 9:40	0.5	DF+T	DRY-BULK	322	671	935	10	12	24	A16
7	9/9/10 9:40	9/22/10 9:15	0.5	DF	DRY-BULK	433	802	1126	2	5	15	A17
8	9/22/10 09:15	10/13/10 09:40	1.895	DF+R	DRY-BULK	396	372	465	12	17	29	
9	10/13/10 9:40	10/20/10 15:24	2.192	DF+R	DRY-BULK	103	172	296	2	4	4	
10	10/20/10 15:24	11/9/10 9:02	0.47	DF+R+S	DRY-BULK	496	386	960	5	13	26	
11	11/9/10 9:02	11/17/10 7:25	1.76	DF+S?	DRY-BULK	57	30	46	1	4	4	
12	11/17/10 7:25	12/1/10 10:45	0.735	DF+S	DRY-BULK	220	202	343	3	5	8	
13	12/1/10 10:45	12/15/10 13:50	2.351	DF+R+S	DRY-BULK	81	19	33	2	3	3	

Samp. No.	Mid-lake (TB-1) Start Date-Time	Dry-Bulk Collection Date-Time	Vol. Liters	Precip. Form	Collector Type	(Conc.) NO3-N (µg/l)	NH4-N (µg/l)	TKN (µg/l)	SRP (µg/l)	DP (µg/l)	TP (µg/l)	Notes
14	12/15/10 13:50	1/4/11 9:57	0.958	DF+R+S	DRY-BULK	90	19	36	2	3	7	
15	1/4/11 9:57	2/11/11 11:07	0.275	DF+R+S	DRY-BULK	46	463	352	17	18	27	
16	2/11/11 11:07	3/1/11 8:30	0.833	S	DRY-BULK	119	118	179	2	5	10	
17	3/1/11 8:30	3/28/11 9:55	1.77	DF+R+S	DRY-BULK	111	98	116	2	4	9	A65
18	3/28/11 9:55	4/22/11 10:15	0.5	DF+R+S	DRY-BULK	488	555	1030	10	16	27	A74
19	4/22/11 10:15	6/7/11 14:35	2.14	DF+R+S	DRY-BULK	180	133	243	14	15	22	A75
20	6/7/11 14:35	7/2/11 12:25	0.5	DF+R+S	DRY-BULK	189	87	NA	34	61	131	A76
21	7/2/11 12:25	7/23/11 11:22	0.5	DF+R+S	DRY-BULK	129	189	579	32	63	149	A92
22	7/23/11 11:22	8/4/11 11:10	0.5	DF	DRY-BULK	323	376	886	8	25	93	A93
23	8/4/11 11:10	8/26/11 10:30	0.5	DF	DRY-BULK	134	73	312	8	14	52	A94
24	8/26/11 10:30	9/8/11 10:02	0.5	DF	DRY-BULK	228	215	288	3	10	19	A95
25	9/8/11 10:02	9/21/11 9:13	0.433	DF+R	DRY-BULK	642	93	979	4	9	15	
26	9/21/11 9:13	10/12/11 15:12	0.5	DF+R+S	DRY-BULK	822	575	991	5	12	28	
27	10/12/11 15:12	10/27/11 10:48	1.090	DF	DRY-BULK	189	167	186	1	5	7	
28	10/27/11 10:48	11/16/11 09:46	0.375	DF+S	DRY-BULK	603	736	1209	26	33	58	
29	11/16/11 09:46	12/9/11 09:54	0.500	DF+S	DRY-BULK	176	80	272	4	8	26	A113
30	12/9/11 09:54	12/27/11 10:39	1.220	DF	DRY-BULK	137	59	181	3	6	21	
31	12/27/11 10:39	1/5/12 08:50	1.812	DF	DRY-BULK	35	16	53	1	5	4	
32	1/5/12 08:50	1/13/12 09:35	2.182	DF	DRY-BULK	20	23	49	1	6	7	
33	1/13/12 09:35	1/26/12 09:50	2.955	DF+R+S	DRY-BULK	64	69	193	2	8	8	
34	1/26/12 09:50	2/16/12 16:28	0.685	DF+S	DRY-BULK	174	233	307	3	7	19	
35	2/16/12 16:28	3/9/12 13:10	0.690	DF+S	DRY-BULK	229	285	262	4	8	13	
36	3/9/12 13:10	3/20/12 11:15	2.193	DF+R+S	DRY-BULK	43	94	152	2	5	6	
37	3/20/12 11:15	4/3/12 10:20	0.500	DF+R+S	DRY-BULK	334	504	589	4	9	24	A131
38	4/3/12 10:20	4/20/12 09:25	0.415	DF+R+S	DRY-BULK	248	326	453	8	13	14	
39	4/20/12 09:25	5/11/12 10:00	0.500	DF+R+S	DRY-BULK	258	240	516	6	11	31	A139
40	5/11/12 10:00	6/5/12 09:45	0.500	DF+R+S	DRY-BULK	368	110	698	27	45	136	A140
41	6/5/12 09:45	7/2/12 09:25	0.500	DF	DRY-BULK	129	69	599	20	29	104	A141
42	7/2/12 09:25	7/24/12 13:06	0.500	DF+R+H	DRY-BULK	459	325	759	7	34	96	A151

Samp. No.	Mid-lake (TB-1) Start Date-Time	Dry-Bulk Collection Date-Time	Vol. Liters	Precip. Form	Collector Type	(Conc.) NO3-N (µg/l)	NH4-N (µg/l)	TKN (µg/l)	SRP (µg/l)	DP (µg/l)	TP (µg/l)	Notes
43	7/24/12 13:06	8/6/12 14:09	0.500	DF	DRY-BULK	400	449	668	2	7	29	A152
44	8/6/12 14:09	8/17/12 09:25	0.415	DF+R	DRY-BULK	545	403	672	4	9	16	
45	8/17/12 09:25	8/27/12 09:26	0.500	DF	DRY-BULK	359	482	560	4	9	16	A153
46	8/27/12 09:26	9/11/12 11:35	0.500	DF+R	DRY-BULK	658	665	758	5	10	22	A154
47	9/11/12 11:35	9/28/12 10:28	0.500	DF	DRY-BULK	403	437	610	5	8	26	A154
48	9/28/12 10:28	10/8/12 09:08	0.500	DF	DRY-BULK	120	143		1	4	15	

Appendix Table 4.b. N and P loads in dry-bulk deposition (buoy bucket) at the Mid-lake Buoy (TB-1) Station 9/16/08-10/8/12. Shading indicates corrected data with significant difference between corrected value and initially presented value.

Samp. No.	Mid-lake (TB-1) Start Date-Time	Dry-Bulk Collection Date-Time	Vol. Liters	Precip. Form	Collector Type	(Conc.) NO3-N (g/ha)	NH4-N (g/ha)	TKN (g/ha)	SRP (g/ha)	DP (g/ha)	TP (g/ha)	Notes
30	9/16/2008 10:00	10/8/2008 10:40	0.535	DF+R	DRY-BULK	51.56	12.65	51.16	0.10	0.25	1.01	80
31	10/8/2008 10:40	10/17/2008 10:30	0.695	DF	DRY-BULK	17.41	12.65	51.16	0.10	0.25	1.01	
32	10/17/2008 10:30	11/7/2008 9:45	1.33	DF+R+S	DRY-BULK	17.76	11.68	24.57	0.19	0.75	1.17	
33	11/7/2008 9:45	11/21/2008 10:22	1.515	DF+R	DRY-BULK	59.76	77.27	110.23	1.59	1.68	2.16	
34	11/21/2008 10:22	12/5/2008 8:31	1.268	DF+R+S	DRY-BULK	28.40	24.66	86.75	0.95	0.82	1.46	
35	12/5/2008 8:31	1/6/2009 10:47	0.6	DF +R+S	DRY-BULK	38.24	34.13	41.27	0.51	1.01	0.70	97
36	1/6/2009 10:47	1/19/2009 9:45	1.381	DF	DRY-BULK	29.25	14.64	45.83	0.78	1.10	3.78	107
37	1/19/2009 9:45	1/28/2009 9:50	2.348	DF +R+S	DRY-BULK	27.83	17.57	30.97	0.19	0.42	0.59	
38	1/28/2009 9:50	2/4/2009 15:47	2.875	DF	DRY-BULK	16.49	5.65	80.16	0.21	1.01	0.86	
39	2/4/2009 15:47	2/20/2009 8:15	1.27	DF+S	DRY-BULK	18.99	13.97	23.10	0.39	1.15	1.23	
40	2/20/2009 8:15	3/10/2009 9:48	1.463	DF +R+S	DRY-BULK	18.19	16.50	40.85	0.48	0.84	1.83	108
41	3/10/2009 9:48	3/20/2009 10:55	1.77		DRY-BULK	21.88	25.12	36.38	0.59	0.72	1.17	
42	3/20/2009 10:55	4/10/2009 9:50	0.5	DF+S	DRY-BULK	20.65	25.20	49.07	0.63	0.76	1.95	109
43	4/10/2009 9:50	5/15/2009 14:10	0.5	DF+S	DRY-BULK	35.83	34.14	43.97	1.02	1.12	1.30	119
44	5/15/2009 14:10	6/11/2009 9:12	0.5	DF+R+H?	DRY-BULK	41.99	44.06	41.47	0.71	1.18	4.13	120
45	6/11/2009 9:12	6/18/2009 10:55	1.469	DF+T	DRY-BULK	C	C	C	C	C	C	
46	6/18/2009 10:55	6/25/2009 9:45	0.775	DF	DRY-BULK	23.76	24.76	29.74	1.04	1.35	2.16	
47	6/25/2009 9:45	7/2/2009 10:05	1.072	DF	DRY-BULK	21.70	46.35	62.48	0.79	1.00	3.28	
48	7/2/2009 10:05	7/13/09 09:50	0.500	DF+R	DRY-BULK	21.82	20.16	34.80	0.85	1.32	3.35	131A
49	7/13/09 09:50	7/21/2009 9:55	0.622	DF	DRY-BULK	C						132
50	7/21/2009 9:55	7/30/2009 7:25	0.51	DF	DRY-BULK	C	C	C	C	C	C	133
51	7/30/2009 7:25	8/7/2009 8:35	0.5	DF	DRY-BULK	17.41	4.79	33.47	0.57	1.87	5.12	134
52	8/7/2009 8:35	8/25/2009 9:10	0.5	DF+T	DRY-BULK	52.03	79.53	126.69	1.38	2.46	4.10	135
53	8/25/2009 9:10	9/10/2009 9:30	0.5	DF	DRY-BULK	23.81	12.61	45.61	0.75	1.06	4.70	135
54	9/10/2009 9:30	9/22/2009 9:26	0.5	DF	DRY-BULK	19.76	10.95	30.80	0.67	1.09	2.48	136
55	9/22/2009 9:26	10/21/09 11:56	0.378	DF+R+S	DRY-BULK	51.82	19.23	54.67	0.33	1.31	3.42	163

Samp. No.	Mid-lake (TB-1) Start Date-Time	Dry-Bulk Collection Date-Time	Vol. Liters	Precip. Form	Collector Type	(Conc.) NO3-N (g/ha)	NH4-N (g/ha)	TKN (g/ha)	SRP (g/ha)	DP (g/ha)	TP (g/ha)	Notes
56	10/21/09 11:56	10/30/09 14:01	1.444	DF+T	DRY-BULK	19.54	12.72	16.67	0.83	1.32	1.93	
57	10/30/09 14:01	11/10/09 08:15	1.302	DF	DRY-BULK	32.96	58.59	56.58	0.46	1.19	2.31	
58	11/10/09 08:15	11/24/09 08:20	1.320	DF+S+R	DRY-BULK	152.09	298.96	397.08	3.76	4.49	6.66	
59	11/24/09 08:20	12/3/09 11:27	1.088	DF+S	DRY-BULK	24.83	21.76	79.02	0.34	0.73	1.20	
60	12/3/09 11:27	12/17/09 15:17	2.383	DF+S	DRY-BULK	29.12	28.72	53.27	0.85	1.17	2.17	
61	12/17/09 15:17	1/4/10 09:15	1.478	DF+R+S	DRY-BULK	12.83	10.28	66.20	0.13	0.63	1.08	
62	1/4/10 09:15	1/14/10 11:57	2.500	DF+R+S	DRY-BULK	19.60	2.71		0.22	1.09	2.13	
63	1/14/10 11:57	1/26/10 13:28	2.328	DF+R+S	DRY-BULK	16.92	8.24	16.91	0.31	1.13	1.81	
64	1/26/10 13:28	2/2/10 08:43	2.498	DF+T	DRY-BULK	14.73	8.16	19.51	0.34	1.49	1.64	
65	2/2/10 08:43	2/17/10 16:18	1.511	DF+S	DRY-BULK	30.47	16.38	44.68	0.41	1.49	2.62	174
66	2/19/10 11:32	2/25/10 09:40	2.810	DF	DRY-BULK	19.25	9.45	49.32	0.88	1.21	3.28	
67	2/25/10 09:40	3/16/10 08:36	1.121	DF+R+S	DRY-BULK	36.26	32.99	50.10	0.40	1.02	3.38	
68	3/16/10 08:36	3/26/10 09:05	1.200	DF+S	DRY-BULK	22.51	46.69	55.30	0.70	0.96	1.71	
69	3/26/10 09:05	4/13/10 09:30	0.500	DF+R+S	DRY-BULK	46.09	11.07	90.26	1.57	1.93	3.73	175
70	4/13/10 09:30	5/7/10 13:26	0.500	DF+R+S	DRY-BULK	44.18	3.42	51.89	2.96	3.82	6.41	176
71	5/7/10 13:26	6/3/10 09:37	0.500	DF+S	DRY-BULK	33.58	26.67	66.46	2.05	2.09	4.05	177
1	6/3/10 9:37	7/2/10 8:05	0.5	DF+R	DRY-BULK	C	C	C	C	C	C	A13
2	7/2/10 8:05	7/20/10 10:35	0.5	DF+R	DRY-BULK	21.62	2.66	85.83	3.06	3.80	15.29	A14
3	7/20/10 10:35	8/3/10 9:30	0.5	DF	DRY-BULK	20.17	9.46	23.16	0.18	1.10	4.50	A14
4	8/3/10 9:30	8/12/10 9:50	0.365	DF+R	DRY-BULK	53.66	66.83	111.01	0.49	1.10	2.42	
5	8/12/10 9:50	8/31/10 10:30	0.5	DF	DRY-BULK	24.24	2.07	49.21	0.65	1.13	4.02	A14
6	8/31/10 10:30	9/9/10 9:40	0.5	DF+T	DRY-BULK	31.75	66.22	92.24	0.99	1.23	2.33	A16
7	9/9/10 9:40	9/22/10 9:15	0.5	DF	DRY-BULK	42.68	79.11	111.15	0.16	0.52	1.50	A17
8	9/22/10 09:15	10/13/10 09:40	1.895	DF+R	DRY-BULK	148.16	139.26	174.08	4.31	6.24	10.74	
9	10/13/10 9:40	10/20/10 15:24	2.192	DF+R	DRY-BULK	44.34	74.45	128.05	0.97	1.61	1.75	
10	10/20/10 15:24	11/9/10 9:02	0.47	DF+R+S	DRY-BULK	45.98	35.79	89.03	0.42	1.23	2.37	
11	11/9/10 9:02	11/17/10 7:25	1.76	DF+S?	DRY-BULK	19.85	10.38	16.10	0.24	1.41	1.41	
12	11/17/10 7:25	12/1/10 10:45	0.735	DF+S	DRY-BULK	31.87	29.32	49.77	0.46	0.67	1.20	
13	12/1/10 10:45	12/15/10 13:50	2.351	DF+R+S	DRY-BULK	37.47	8.60	15.51	0.84	1.29	1.43	

Samp. No.	Mid-lake (TB-1) Start Date-Time	Dry-Bulk Collection Date-Time	Vol. Liters	Precip. Form	Collector Type	(Conc.) NO3-N (g/ha)	NH4-N (g/ha)	TKN (g/ha)	SRP (g/ha)	DP (g/ha)	TP (g/ha)	Notes
14	12/15/10 13:50	1/4/11 9:57	0.958	DF+R+S	DRY-BULK	16.99	3.51	6.84	0.30	0.64	1.40	
15	1/4/11 9:57	2/11/11 11:07	0.275	DF+R+S	DRY-BULK							
16	2/11/11 11:07	3/1/11 8:30	0.833	S	DRY-BULK	19.50	19.38	29.42	0.37	0.78	1.66	
17	3/1/11 8:30	3/28/11 9:55	1.77	DF+R+S	DRY-BULK	38.63	34.40	40.37	0.63	1.40	3.24	A65
18	3/28/11 9:55	4/22/11 10:15	0.5	DF+R+S	DRY-BULK	48.18	54.74	101.61	1.01	1.62	2.66	A74
19	4/22/11 10:15	6/7/11 14:35	2.14	DF+R+S	DRY-BULK							A75
20	6/7/11 14:35	7/2/11 12:25	0.5	DF+R+S	DRY-BULK	18.69	8.60	NA	3.37	6.02	12.95	A76
21	7/2/11 12:25	7/23/11 11:22	0.5	DF+R+S	DRY-BULK	12.70	18.64	57.10	3.13	6.20	14.71	A92
22	7/23/11 11:22	8/4/11 11:10	0.5	DF	DRY-BULK	31.86	37.13	87.38	0.76	2.49	9.18	A93
23	8/4/11 11:10	8/26/11 10:30	0.5	DF	DRY-BULK	13.19	7.24	30.82	0.81	1.36	5.15	A94
24	8/26/11 10:30	9/8/11 10:02	0.5	DF	DRY-BULK	22.51	21.18	28.45	0.34	1.00	1.91	A95
25	9/8/11 10:02	9/21/11 9:13	0.433	DF+R	DRY-BULK	54.86	7.94	83.63	0.35	0.79	1.29	
26	9/21/11 9:13	10/12/11 15:12	0.5	DF+R+S	DRY-BULK	81.11	56.72	97.76	0.51	1.22	2.75	
27	10/12/11 15:12	10/27/11 10:48	1.090	DF	DRY-BULK	40.70	35.97	39.97	0.15	1.07	1.60	
28	10/27/11 10:48	11/16/11 09:46	0.375	DF+S	DRY-BULK	44.60	54.51	89.50	1.94	2.47	4.32	
29	11/16/11 09:46	12/9/11 09:54	0.500	DF+S	DRY-BULK	17.38	7.86	26.84	0.36	0.76	2.59	A113
30	12/9/11 09:54	12/27/11 10:39	1.220	DF	DRY-BULK	33.00	14.31	43.50	0.71	1.56	5.13	
31	12/27/11 10:39	1/5/12 08:50	1.812	DF	DRY-BULK	12.37	5.78	19.12	0.48	1.77	1.44	
32	1/5/12 08:50	1/13/12 09:35	2.182	DF	DRY-BULK	8.73	9.75	21.26	0.39	2.40	3.07	
33	1/13/12 09:35	1/26/12 09:50	2.955	DF+R+S	DRY-BULK	37.36	39.99	112.34	1.06	4.69	4.87	
34	1/26/12 09:50	2/16/12 16:28	0.685	DF+S	DRY-BULK	23.55	31.47	41.45	0.43	1.01	2.60	
35	2/16/12 16:28	3/9/12 13:10	0.690	DF+S	DRY-BULK	31.24	38.81	35.67	0.56	1.09	1.72	
36	3/9/12 13:10	3/20/12 11:15	2.193	DF+R+S	DRY-BULK	18.80	40.63	65.95	0.69	2.14	2.80	
37	3/20/12 11:15	4/3/12 10:20	0.500	DF+R+S	DRY-BULK	33.00	49.73	58.12	0.43	0.88	2.41	A131
38	4/3/12 10:20	4/20/12 09:25	0.415	DF+R+S	DRY-BULK	20.31	26.71	37.13	0.63	1.09	1.12	
39	4/20/12 09:25	5/11/12 10:00	0.500	DF+R+S	DRY-BULK	25.49	23.66	50.90	0.59	1.11	3.05	A139
40	5/11/12 10:00	6/5/12 09:45	0.500	DF+R+S	DRY-BULK	36.35	10.89	68.91	2.67	4.41	13.44	A140
41	6/5/12 09:45	7/2/12 09:25	0.500	DF	DRY-BULK	12.71	6.76	59.10	1.96	2.82	10.29	A141
42	7/2/12 09:25	7/24/12 13:06	0.500	DF+R+H	DRY-BULK	45.28	32.06	74.93	0.74	3.40	9.46	A151

Samp. No.	Mid-lake (TB-1) Start Date-Time	Dry-Bulk Collection Date-Time	Vol. Liters	Precip. Form	Collector Type	(Conc.) NO3-N (g/ha)	NH4-N (g/ha)	TKN (g/ha)	SRP (g/ha)	DP (g/ha)	TP (g/ha)	Notes
43	7/24/12 13:06	8/6/12 14:09	0.500	DF	DRY-BULK	39.48	44.31	65.91	0.22	0.70	2.82	A152
44	8/6/12 14:09	8/17/12 09:25	0.415	DF+R	DRY-BULK	53.80	39.81	66.27	0.40	0.88	1.61	
45	8/17/12 09:25	8/27/12 09:26	0.500	DF	DRY-BULK	35.39	47.60	55.26	0.36	0.85	1.55	A153
46	8/27/12 09:26	9/11/12 11:35	0.500	DF+R	DRY-BULK	64.94	65.62	74.80	0.54	0.96	2.13	A154
47	9/11/12 11:35	9/28/12 10:28	0.500	DF	DRY-BULK	39.79	43.11	60.24	0.51	0.82	2.61	A154
48	9/28/12 10:28	10/8/12 09:08	0.500	DF	DRY-BULK	11.84	14.14		0.07	0.43	1.52	

Table 5.a. N and P concentrations in dry-bulk deposition (buoy bucket) at the Northwest Buoy (TB-4) Station 9/16/08-10/8/12. Shading indicates corrected data with significant difference between corrected value and initially presented value.

	Buoy TB-4 Start Date-Time	Dry-Bulk Collection Date-Time	Vol. Liters	Precip. Form	Collector Type	(Conc.) NO3-N (µg/l)	NH4-N (µg/l)	TKN (µg/l)	SRP (µg/l)	DP (µg/l)	TP (µg/l)	Notes
30	9/16/2008 9:35	10/8/2008 10:15	0.5	DF+R	DRY-BULK	453	343	558	7	11	22	82
31	10/8/2008 10:15	10/17/2008 10:12	0.965	DF	DRY-BULK	C	C	C	C	C	C	96
32	10/17/2008 10:12	11/7/2008 9:25	1.46	DF+R+S	DRY-BULK	154	567	672	4	6	7	
33	11/7/2008 9:25	11/21/2008 10:10	0.925	DF+R	DRY-BULK	155	174	326	2	3	5	
34	11/21/2008 10:10	12/5/2008 8:12	1.36	DF+R+S	DRY-BULK	157	138	212	2	4	5	
35	12/5/2008 8:12	1/6/2009 10:27	0.371	DF +R+S	DRY-BULK	448	291	546	11	14	34	97
36	1/6/2009 10:27	1/19/2009 9:26	1.085	DF	DRY-BULK	113	72	108	2	2	9	107
37	1/19/2009 9:26	1/28/2009 9:33	2.156	DF +R+S	DRY-BULK	25	12	21	1	2	2	
38	1/28/2009 9:33	2/4/2009 13:04	2.409	DF	DRY-BULK	38	36	37	0	2	2	
39	2/4/2009 13:04	2/20/2009 7:59	1.158	DF+S	DRY-BULK	84	89	91	2	3	NA	
40	2/20/2009 7:59	3/10/2009 9:33	1.01	DF +R+S	DRY-BULK	74	97	162	2	2	6	
41	3/10/2009 9:33	3/20/2009 10:55	1.483		DRY-BULK	76	94	388	2	3	4	
42	3/20/2009 10:55	4/10/2009 9:50	0.505	DF+S	DRY-BULK	375	378	548	9	9	22	110
43	4/10/2009 9:50	5/15/2009 14:33	0.5	DF+S	DRY-BULK	553	854	934	10	11	49	119
44	5/15/2009 14:33	6/11/2009 9:00	0.5	DF+R+H?	DRY-BULK	992	681	1604	7	18	37	120
45	6/11/2009 9:00	6/18/2009 10:30	1.26	DF+R	DRY-BULK	111	109	199	4	5	7	137
46	6/18/2009 10:30	6/25/2009 9:25	0.575	DF	DRY-BULK	148	347	492	3	6	17	
47	6/25/2009 9:25	7/2/2009 9:45	1.362	DF	DRY-BULK	82	53	128	1	2	11	
48	7/2/2009 9:45	7/13/2009 9:25	0.5	DF+R	DRY-BULK	243	314	561	16	22	46	135
49	7/13/2009 9:25	7/21/2009 9:30	0.696	DF	DRY-BULK	159	117	217	2	6	13	
50	7/21/2009 9:30	7/30/2009 7:10	0.5	DF	DRY-BULK	190	127	379	1	5	16	138
51	7/30/2009 7:10	8/7/2009 8:20	0.5	DF	DRY-BULK	297	955	1152	3	6	13	139
52	8/7/2009 8:20	8/25/2009 8:50	0.5	DF	DRY-BULK	218	113	318	7	9	20	135
53	8/25/2009 8:50	9/10/2009 9:10	0.5	DF	DRY-BULK	174	89	278	2	6	20	135
54	9/10/2009 9:10	9/22/2009 9:11	0.5	DF	DRY-BULK	330	399	861	4	9	15	135

	Buoy TB-4 Start Date-Time	Dry-Bulk Collection Date-Time	Vol. Liters	Precip. Form	Collector Type	(Conc.) NO3-N (µg/l)	NH4-N (µg/l)	TKN (µg/l)	SRP (µg/l)	DP (µg/l)	TP (µg/l)	Notes
55	9/22/2009 9:11	10/21/2009 11:37	1.025	DF+R+S	DRY-BULK	325	511	393	2	8	22	
56	10/21/2009 11:37	10/30/2009 14:46	1.061	DF+T	DRY-BULK	71	70	81	3	4	7	
57	10/30/2009 14:46	11/10/2009 7:55	1.28	DF	DRY-BULK	107	282	311	2	3	5	
58	11/10/2009 7:55	11/24/2009 8:04	1.28	DF+S+R	DRY-BULK	287	464	664	12	14	27	164
59	11/24/2009 8:04	12/3/2009 11:08	1.335	DF+S	DRY-BULK	100	55	218	2	3	10	
60	12/3/2009 11:08	12/17/2009 14:58	2.089	DF+S	DRY-BULK	62	51	362	1	3	5	
61	12/17/2009 14:58	1/4/2010 9:35	1.766	DF+R+S	DRY-BULK	90	33	61	1	3	8	
62	1/4/2010 9:35	1/14/2010 11:40	2.363	DF+R+S	DRY-BULK	43	9	49	0	2	2	
63	1/14/2010 11:40	1/26/2010 13:10	2.944	DF+R+S	DRY-BULK	27	10	35	1	3	5	
64	1/26/2010 13:10	2/2/2010 8:25	2.335	DF+T	DRY-BULK	34	18	44	1	2	5	
65	2/2/2010 8:25	2/17/2010 12:28	1.48	DF+S	DRY-BULK	95	54	43	1	3	4	
66	2/19/2010 11:45	2/25/2010 9:10	3.051	DF	DRY-BULK	24	20	50	1	6	2	
67	2/25/2010 9:10	3/16/2010 8:17	0.905	DF+R+S	DRY-BULK	181	213	206	1	5	7	
68	3/16/2010 8:17	3/26/2010 8:40	1.178	DF+S	DRY-BULK	102	219	316	7	4	4	
69	3/26/2010 8:40	4/13/2010 9:10	0.513	DF+R+S	DRY-BULK	386	132	864	11	13	49	
70	4/13/2010 9:10	5/7/2010 14:00	0.5	DF+R+S	DRY-BULK	507	107	866	6	21	31	176
71	5/7/2010 14:00	6/3/2010 9:18	0.5	DF+S	DRY-BULK	345	465	643	41	55	58	176
1	6/3/2010 9:18	7/2/2010 8:20	0.5	DF+R	DRY-BULK	253	40	1045	48	65	NA	A13
2	7/2/2010 8:20	7/20/2010 10:16	0.5	DF+R	DRY-BULK	137	27	544	22	30	70	A9
3	7/20/2010 10:16	8/3/2010 9:07	0.5	DF	DRY-BULK	192	136	226	2	8	25	A14
4	8/3/2010 9:07	8/12/2010 10:14	0.485	DF+R	DRY-BULK	697	175	2085	24	30	47	
5	8/12/2010 10:14	8/31/2010 14:05	0.5	DF	DRY-BULK	235	17	523	6	9	33	A14
6	8/31/2010 14:05	9/9/2010 9:20	0.685	DF+R	DRY-BULK	254	288	367	3	6	11	A13
7	9/9/2010 9:20	9/22/2010 8:55	0.32	DF	DRY-BULK	583	621	1465	3	7	15	A9
8	9/22/2010 8:55	10/13/2010 9:40	1.232	DF+R	DRY-BULK	496	538	793	2	10	16	A14
9	10/13/2010 9:40	10/20/2010 15:24	2.374	DF+R	DRY-BULK	112	138	204	2	3	C	
10	10/20/2010 15:24	11/9/2010 9:02	0.818	DF+R+S	DRY-BULK	303	375	315	1	7	22	A14
11	11/9/2010 9:02	11/17/2010 7:25	1.515	DF+S?	DRY-BULK	70	36	88	1	3	4	

	Buoy TB-4 Start Date-Time	Dry-Bulk Collection Date-Time	Vol. Liters	Precip. Form	Collector Type	(Conc.) NO3-N (µg/l)	NH4-N (µg/l)	TKN (µg/l)	SRP (µg/l)	DP (µg/l)	TP (µg/l)	Notes
12	11/17/2010 7:25	12/1/2010 10:45	1.131	DF+S	DRY-BULK	154	159	264	1	4	15	
13	12/1/2010 10:45	12/15/2010 13:50	2.775	DF+R+S	DRY-BULK	57	15	18	1	3	3	
14	12/15/2010 13:50	1/4/2011 9:40	1.35	DF+R+S	DRY-BULK	93	25	134	1	2	3	
15	1/4/2011 9:40	2/11/2011 10:46	0.5	DF+R+S	DRY-BULK	639	283	454	7	8	28	
16	2/11/2011 10:46	3/1/2011 8:48	0.627	S	DRY-BULK	143	139	176	2	5	33	
17	3/1/2011 8:48	3/28/2011 9:25	1.828	DF+R+S	DRY-BULK	114	96	144	2	4	9	
18	3/28/2011 9:25	4/22/2011 9:19	0.5	DF+R+S	DRY-BULK	501	717	1013	11	19	50	
19	4/22/2011 9:19	6/7/2011 15:08	1.869	DF+R+S	DRY-BULK	168	147	182	11	11	15	
20	6/7/2011 15:08	7/2/2011 11:45	0.5	DF+R+S	DRY-BULK	171	68	581	16	46	65	A66
21	7/2/2011 11:45	7/23/2011 10:54	0.5	DF+R	DRY-BULK	151	92	569	17	38	110	
22	7/23/2011 10:54	8/4/2011 10:25	0.5	DF	DRY-BULK	254	315	382	7	16	48	
23	8/4/2011 10:25	8/26/2011 10:05	0.5	DF	DRY-BULK	82	78	193	5	10	24	A77
24	8/26/2011 10:05	9/8/2011 9:19	0.5	DF	DRY-BULK	187	206	478	4	10	25	A78
25	9/8/2011 9:19	9/21/2011 9:33	0.5	DF+R	DRY-BULK	187	250	1015	4	9	13	A79
26	9/21/2011 9:33	10/12/2011 15:37	0.5	DF+R+S	DRY-BULK	754	672	895	2	8	16	A96
27	10/12/2011 15:37	10/27/2011 10:31	0.892	DF	DRY-BULK	256	251	253	1	5	7	
28	10/27/2011 10:31	11/16/2011 10:06	0.5	DF+S	DRY-BULK	375	630	887	15	21	57	A115
29	11/16/2011 10:06	12/9/2011 15:56	0.5	DF+S	DRY-BULK	137	62	128	2	7	18	A116
30	12/9/2011 15:56	12/27/2011 10:20	0.777	DF	DRY-BULK	212	146	526	4	8	13	
31	12/27/2011 10:20	1/5/2012 8:50	1.812	DF	DRY-BULK	41	21	107	1	4	5	
32	1/5/2012 8:50	1/13/2012 9:20	2.13	DF	DRY-BULK	39	35	123	1	6	7	
33	1/13/2012 9:20	1/26/2012 9:15	3.542	DF+R+S	DRY-BULK	NA	NA	164	NA	NA	NA	
34	1/26/2012 9:15	2/16/2012 16:10	0.525	DF+S	DRY-BULK	224	310	361	3	8	36	
35	2/16/2012 16:10	3/9/2012 13:25	0.45	DF+S	DRY-BULK	331	465	361	5	9	13	
36	3/9/2012 13:25	3/20/2012 11:32	2.645	DF+R+S	DRY-BULK	46	104	136	2	5	9	
37	3/20/2012 11:32	4/3/2012 10:00	0.405	DF+R+S	DRY-BULK	428	688	373	5	10	23	A131
38	4/3/2012 10:00	4/20/2012 9:05	0.315	DF+R+S	DRY-BULK	457	655	644	5	9	40	
39	4/20/2012 9:05	5/11/2012 9:18	0.5	DF+R+S	DRY-BULK	359	441	NA	7	13	31	A142

	Buoy TB-4 Start Date-Time	Dry-Bulk Collection Date-Time	Vol. Liters	Precip. Form	Collector Type	(Conc.) NO3-N (µg/l)	NH4-N (µg/l)	TKN (µg/l)	SRP (µg/l)	DP (µg/l)	TP (µg/l)	Notes
40	5/11/2012 9:18	6/5/2012 8:55	0.5	DF+R+S	DRY-BULK	419	105	459	32	39	151	A143
41	6/5/2012 8:55	7/2/2012 9:25	0.5	DF	DRY-BULK	130	66	NA	12	NA	NA	A141
42	7/2/2012 9:00	7/24/2012 13:40	0.5	DF+R+H	DRY-BULK	561	910	2313	220	270	348	A155
43	7/24/2012 13:40	8/6/2012 14:44	0.5	DF	DRY-BULK	200	206	441	4	10	24	A154
44	8/6/2012 14:44	8/17/2012 8:54	0.5	DF+R	DRY-BULK	533	462	827	4	17	17	A156
45	8/17/2012 8:54	8/27/2012 9:07	0.5	DF	DRY-BULK	253	238	463	5	9	19	A154
46	8/27/2012 9:07	9/11/2012 12:27	0.5	DF+R	DRY-BULK	458	404	NA	7	11	27	A154
47	9/11/2012 12:27	9/28/2012 10:28	0.5	DF	DRY-BULK	369	314	NA	5	9	NA	A154
48	9/28/2012 10:05	10/8/2012 8:52	0.88	DF	DRY-BULK	210	244		1	5	5	

Appendix Table 5.b. N and P loads in dry-bulk deposition (buoy bucket) at the Northwest Buoy (TB-4) Station 9/16/08-10/8/12. Shading indicates corrected data with significant difference between corrected value and initially presented value.

	Buoy TB-4 Start Date-Time	Dry-Bulk Collection Date-Time	Vol. Liters	Precip. Form	Collector Type	(Conc.) NO3-N (g/ha)	NH4-N (g/ha)	TKN (g/ha)	SRP (g/ha)	DP (g/ha)	TP (g/ha)	Notes
30	9/16/2008 9:35	10/8/2008 10:15	0.5	DF+R	DRY-BULK	44.72	33.83	55.02	0.71	1.07	2.17	82
31	10/8/2008 10:15	10/17/2008 10:12	0.965	DF	DRY-BULK	C	C	C	C	C	C	96
32	10/17/2008 10:12	11/7/2008 9:25	1.46	DF+R+S	DRY-BULK	44.42	163.49	193.72	1.14	1.84	1.93	
33	11/7/2008 9:25	11/21/2008 10:10	0.925	DF+R	DRY-BULK	28.37	31.81	59.47	0.43	0.61	0.89	
34	11/21/2008 10:10	12/5/2008 8:12	1.36	DF+R+S	DRY-BULK	42.19	37.16	56.86	0.64	1.16	1.33	
35	12/5/2008 8:12	1/6/2009 10:27	0.371	DF +R+S	DRY-BULK	32.78	21.31	40.01	0.81	1.04	2.52	97
36	1/6/2009 10:27	1/19/2009 9:26	1.085	DF	DRY-BULK	24.27	15.32	23.09	0.34	0.37	1.93	107
37	1/19/2009 9:26	1/28/2009 9:33	2.156	DF +R+S	DRY-BULK	10.76	5.28	9.13	0.43	1.06	1.06	
38	1/28/2009 9:33	2/4/2009 13:04	2.409	DF	DRY-BULK	18.07	17.02	17.53	0.21	0.88	1.11	
39	2/4/2009 13:04	2/20/2009 7:59	1.158	DF+S	DRY-BULK	19.18	20.42	20.90	0.36	0.77	NA	
40	2/20/2009 7:59	3/10/2009 9:33	1.01	DF +R+S	DRY-BULK	14.67	19.38	32.29	0.36	0.50	1.18	
41	3/10/2009 9:33	3/20/2009 10:55	1.483		DRY-BULK	22.13	27.64	113.56	0.59	0.91	1.09	
42	3/20/2009 10:55	4/10/2009 9:50	0.505	DF+S	DRY-BULK	37.33	37.72	54.65	0.88	0.88	2.22	110
43	4/10/2009 9:50	5/15/2009 14:33	0.5	DF+S	DRY-BULK	54.53	84.25	92.13	0.95	1.09	4.79	119
44	5/15/2009 14:33	6/11/2009 9:00	0.5	DF+R+H?	DRY-BULK	97.88	67.21	158.31	0.73	1.81	3.61	120
45	6/11/2009 9:00	6/18/2009 10:30	1.26	DF+R	DRY-BULK	27.50	27.08	49.41	0.95	1.16	1.85	137
46	6/18/2009 10:30	6/25/2009 9:25	0.575	DF	DRY-BULK	16.81	39.37	55.82	0.36	0.71	1.90	
47	6/25/2009 9:25	7/2/2009 9:45	1.362	DF	DRY-BULK	21.96	14.30	34.53	0.36	0.67	3.01	
48	7/2/2009 9:45	7/13/2009 9:25	0.5	DF+R	DRY-BULK	24.00	30.94	55.36	1.57	2.16	4.57	135
49	7/13/2009 9:25	7/21/2009 9:30	0.696	DF	DRY-BULK	21.84	16.03	29.78	0.22	0.77	1.76	
50	7/21/2009 9:30	7/30/2009 7:10	0.5	DF	DRY-BULK	18.74	12.52	37.44	0.11	0.45	1.59	138
51	7/30/2009 7:10	8/7/2009 8:20	0.5	DF	DRY-BULK	29.29	94.27	113.64	0.31	0.64	1.24	139
52	8/7/2009 8:20	8/25/2009 8:50	0.5	DF	DRY-BULK	21.51	11.12	31.35	0.64	0.87	1.96	135
53	8/25/2009 8:50	9/10/2009 9:10	0.5	DF	DRY-BULK	17.21	8.78	27.44	0.22	0.60	1.97	135
54	9/10/2009 9:10	9/22/2009 9:11	0.5	DF	DRY-BULK	32.55	39.39	84.95	0.42	0.93	1.44	135

	Buoy TB-4 Start Date-Time	Dry-Bulk Collection Date-Time	Vol. Liters	Precip. Form	Collector Type	(Conc.) NO3-N (g/ha)	NH4-N (g/ha)	TKN (g/ha)	SRP (g/ha)	DP (g/ha)	TP (g/ha)	Notes
55	9/22/2009 9:11	10/21/2009 11:37	1.025	DF+R+S	DRY-BULK	65.81	103.42	79.51	0.45	1.62	4.55	
56	10/21/2009 11:37	10/30/2009 14:46	1.061	DF+T	DRY-BULK	14.89	14.59	16.98	0.66	0.90	1.48	
57	10/30/2009 14:46	11/10/2009 7:55	1.28	DF	DRY-BULK	27.12	71.16	78.61	0.45	0.86	1.25	
58	11/10/2009 7:55	11/24/2009 8:04	1.28	DF+S+R	DRY-BULK	72.53	117.32	167.82	2.91	3.50	6.92	164
59	11/24/2009 8:04	12/3/2009 11:08	1.335	DF+S	DRY-BULK	26.23	14.42	57.35	0.48	0.90	2.53	
60	12/3/2009 11:08	12/17/2009 14:58	2.089	DF+S	DRY-BULK	25.61	21.11	149.32	0.47	1.15	2.04	
61	12/17/2009 14:58	1/4/2010 9:35	1.766	DF+R+S	DRY-BULK	31.54	11.57	21.28	0.24	1.07	2.68	
62	1/4/2010 9:35	1/14/2010 11:40	2.363	DF+R+S	DRY-BULK	19.97	4.03	22.87	0.21	0.73	0.86	
63	1/14/2010 11:40	1/26/2010 13:10	2.944	DF+R+S	DRY-BULK	15.73	5.76	20.61	0.40	1.79	2.99	
64	1/26/2010 13:10	2/2/2010 8:25	2.335	DF+T	DRY-BULK	15.88	8.30	20.35	0.31	0.84	2.52	
65	2/2/2010 8:25	2/17/2010 12:28	1.48	DF+S	DRY-BULK	27.87	15.66	12.68	0.33	0.91	1.10	
66	2/19/2010 11:45	2/25/2010 9:10	3.051	DF	DRY-BULK	14.37	12.07	30.09	0.54	3.77	1.29	
67	2/25/2010 9:10	3/16/2010 8:17	0.905	DF+R+S	DRY-BULK	32.24	38.11	36.74	0.24	0.82	1.26	
68	3/16/2010 8:17	3/26/2010 8:40	1.178	DF+S	DRY-BULK	23.70	51.02	73.52	1.63	0.87	0.87	
69	3/26/2010 8:40	4/13/2010 9:10	0.513	DF+R+S	DRY-BULK	39.05	13.36	87.48	1.13	1.34	4.91	
70	4/13/2010 9:10	5/7/2010 14:00	0.5	DF+R+S	DRY-BULK	50.01	10.56	85.41	0.60	2.05	3.05	176
71	5/7/2010 14:00	6/3/2010 9:18	0.5	DF+S	DRY-BULK	34.03	45.84	63.48	4.00	5.40	5.68	176
1	6/3/2010 9:18	7/2/2010 8:20	0.5	DF+R	DRY-BULK	C	C	C	C	C	C	A13
2	7/2/2010 8:20	7/20/2010 10:16	0.5	DF+R	DRY-BULK	13.49	2.64	53.69	2.15	3.00	6.86	A9
3	7/20/2010 10:16	8/3/2010 9:07	0.5	DF	DRY-BULK	18.93	13.44	22.31	0.18	0.83	2.51	A14
4	8/3/2010 9:07	8/12/2010 10:14	0.485	DF+R	DRY-BULK	66.70	16.74	199.54	2.30	2.89	4.50	
5	8/12/2010 10:14	8/31/2010 14:05	0.5	DF	DRY-BULK	23.19	1.65	51.57	0.56	0.92	3.22	A14
6	8/31/2010 14:05	9/9/2010 9:20	0.685	DF+R	DRY-BULK	34.30	38.88	49.66	0.40	0.80	1.43	A13
7	9/9/2010 9:20	9/22/2010 8:55	0.32	DF	DRY-BULK	36.85	39.22	92.51	0.21	0.45	0.96	A9
8	9/22/2010 8:55	10/13/2010 9:40	1.232	DF+R	DRY-BULK	120.52	130.75	192.81	0.61	2.48	3.83	A14
9	10/13/2010 9:40	10/20/2010 15:24	2.374	DF+R	DRY-BULK	52.64	64.51	95.58	0.84	1.31	C	
10	10/20/2010 15:24	11/9/2010 9:02	0.818	DF+R+S	DRY-BULK	48.98	60.48	50.86	0.22	1.14	3.52	A14
11	11/9/2010 9:02	11/17/2010 7:25	1.515	DF+S?	DRY-BULK	21.06	10.82	26.25	0.20	1.01	1.31	

	Buoy TB-4 Start Date-Time	Dry-Bulk Collection Date-Time	Vol. Liters	Precip. Form	Collector Type	(Conc.) NO3-N (g/ha)	NH4-N (g/ha)	TKN (g/ha)	SRP (g/ha)	DP (g/ha)	TP (g/ha)	Notes
12	11/17/2010 7:25	12/1/2010 10:45	1.131	DF+S	DRY-BULK	34.46	35.44	58.99	0.30	0.89	3.29	
13	12/1/2010 10:45	12/15/2010 13:50	2.775	DF+R+S	DRY-BULK	31.38	8.09	9.93	0.74	1.69	1.86	
14	12/15/2010 13:50	1/4/2011 9:40	1.35	DF+R+S	DRY-BULK	24.78	6.54	35.71	0.36	0.41	0.91	
15	1/4/2011 9:40	2/11/2011 10:46	0.5	DF+R+S	DRY-BULK							
16	2/11/2011 10:46	3/1/2011 8:48	0.627	S	DRY-BULK	17.68	17.18	21.75	0.28	0.62	4.09	
17	3/1/2011 8:48	3/28/2011 9:25	1.828	DF+R+S	DRY-BULK	40.96	34.60	51.94	0.74	1.34	3.35	
18	3/28/2011 9:25	4/22/2011 9:19	0.5	DF+R+S	DRY-BULK	49.46	70.71	99.93	1.12	1.90	4.95	
19	4/22/2011 9:19	6/7/2011 15:08	1.869	DF+R+S	DRY-BULK							
20	6/7/2011 15:08	7/2/2011 11:45	0.5	DF+R+S	DRY-BULK	16.86	6.67	57.33	1.60	4.51	6.44	A66
21	7/2/2011 11:45	7/23/2011 10:54	0.5	DF+R	DRY-BULK	14.87	9.12	56.19	1.68	3.77	10.85	
22	7/23/2011 10:54	8/4/2011 10:25	0.5	DF	DRY-BULK	25.02	31.08	37.68	0.65	1.58	4.71	
23	8/4/2011 10:25	8/26/2011 10:05	0.5	DF	DRY-BULK	8.08	7.66	19.09	0.54	0.96	2.41	A77
24	8/26/2011 10:05	9/8/2011 9:19	0.5	DF	DRY-BULK	18.42	20.35	47.21	0.38	0.94	2.46	A78
25	9/8/2011 9:19	9/21/2011 9:33	0.5	DF+R	DRY-BULK	18.41	24.71	100.13	0.36	0.91	1.24	A79
26	9/21/2011 9:33	10/12/2011 15:37	0.5	DF+R+S	DRY-BULK	74.41	66.35	88.28	0.22	0.79	1.58	A96
27	10/12/2011 15:37	10/27/2011 10:31	0.892	DF	DRY-BULK	45.11	44.22	44.55	0.16	0.82	1.26	
28	10/27/2011 10:31	11/16/2011 10:06	0.5	DF+S	DRY-BULK	36.96	62.13	87.56			5.61	A115
29	11/16/2011 10:06	12/9/2011 15:56	0.5	DF+S	DRY-BULK	13.52	6.16	12.68	0.22	0.70	1.77	A116
30	12/9/2011 15:56	12/27/2011 10:20	0.777	DF	DRY-BULK	32.48	22.38	80.73	0.56	1.28	2.04	
31	12/27/2011 10:20	1/5/2012 8:50	1.812	DF	DRY-BULK	14.66	7.57	38.13	0.32	1.44	1.66	
32	1/5/2012 8:50	1/13/2012 9:20	2.13	DF	DRY-BULK	16.38	14.88	51.84	0.57	2.47	2.99	
33	1/13/2012 9:20	1/26/2012 9:15	3.542	DF+R+S	DRY-BULK	29.25	44.04	114.63	0.80	5.19	4.54	
34	1/26/2012 9:15	2/16/2012 16:10	0.525	DF+S	DRY-BULK	23.19	32.13	37.38	0.35	0.84	3.76	
35	2/16/2012 16:10	3/9/2012 13:25	0.45	DF+S	DRY-BULK	29.39	41.32	45.51	0.48	0.82	1.12	
36	3/9/2012 13:25	3/20/2012 11:32	2.645	DF+R+S	DRY-BULK	23.90	54.08	71.20	0.83	2.58	4.83	
37	3/20/2012 11:32	4/3/2012 10:00	0.405	DF+R+S	DRY-BULK	34.20	54.99	29.82	0.43	0.81	1.80	A131
38	4/3/2012 10:00	4/20/2012 9:05	0.315	DF+R+S	DRY-BULK	28.37	40.71	63.06	0.34	0.54	2.50	
39	4/20/2012 9:05	5/11/2012 9:18	0.5	DF+R+S	DRY-BULK	35.36	43.51	70.76	0.70	1.29	3.05	A142

	Buoy TB-4 Start Date-Time	Dry-Bulk Collection Date-Time	Vol. Liters	Precip. Form	Collector Type	(Conc.) NO3-N (g/ha)	NH4-N (g/ha)	TKN (g/ha)	SRP (g/ha)	DP (g/ha)	TP (g/ha)	Notes
40	5/11/2012 9:18	6/5/2012 8:55	0.5	DF+R+S	DRY-BULK	41.37	10.36	45.26	3.18	3.83	14.87	A143
41	6/5/2012 8:55	7/2/2012 9:25	0.5	DF	DRY-BULK	12.87	6.49	26.31	1.14	1.44	5.27	A141
42	7/2/2012 9:00	7/24/2012 13:40	0.5	DF+R+H	DRY-BULK							A155
43	7/24/2012 13:40	8/6/2012 14:44	0.5	DF	DRY-BULK	19.75	20.33	43.51	0.40	0.94	2.34	A154
44	8/6/2012 14:44	8/17/2012 8:54	0.5	DF+R	DRY-BULK	52.63	45.57	81.57	0.40	1.71	1.71	A156
45	8/17/2012 8:54	8/27/2012 9:07	0.5	DF	DRY-BULK	24.99	23.48	45.67	0.47	0.85	1.83	A154
46	8/27/2012 9:07	9/11/2012 12:27	0.5	DF+R	DRY-BULK	45.23	39.89	67.07	0.69	1.11	2.62	A154
47	9/11/2012 12:27	9/28/2012 10:28	0.5	DF	DRY-BULK	36.41	30.94	39.98	0.51	0.91	2.34	A154
	9/28/2012 10:05	10/8/2012 8:52	0.88	DF	DRY-BULK	210.49	243.81		0.68	4.63	5.25	

Table Legend:
Precipitation Form: (S=snow; R=rain; DF= dry fall (Dry deposition); H=hail; G=graupel; NA=information on type not available; T=trace of precip.)
Collector Type: (ST= 8 in. dia. Snow tube; TBG= 8 in. dia. Electrically heated tipping bucket rain and snow gauge; Wet= Aerochem Metrics Wet Bucket; Dry= Dry-Bulk bucket with 4 liter deionized water added, placed in dry-side of Aerochem Metrics sampler; Dry-Bulk= Aerochem Metrics bucket with reduced side height, filled with 4 liters of deionized H2O)
pH: (NES= not enough sample); C= sample contaminated; NA= not measured.
Nutrient Concentrations: (C= sample contamination; NA= Not available or not enough sample for analysis; note units are micrograms/liter; TBA= data not yet available).

Table Notes (Covering samples collected Oct. 2008 to July 2010)
(80) 85ml of sample +450ml deionized water, small spider in sample, possible contamination; (81) obvious ash in sample, more than bucket at TB-1; (82) 10ml of precip + 490 ml deionized water to process; (83) bucket dry, added 500ml deionized water to process, much particulate debris in sample, likely bird feces; (84) small dead spider in ST sample, possible contamination; (85) many aspen leaves in dry bucket, possible contamination; (86) Aerochem Metrics Wet/Dry sampler malfunctioned, dry bucket caught at 10-12" of snow, most of this was removed from over dry bucket and dry bucket left out since lacking replacement, used estimate of precipitation during period as SNOTEL Ward #3 precip 12/15 + Ward #3 precip. 12/17) /1.5) - WLL precip. 12/17; (87) Aerochem Metrics Wet/Dry sampler malfunctioned again, Dry bucket caught much of snow, estimate precip amount as Ward #3/1.5; (88) Aerochem Metrics Wet/Dry sampler malfunctioned again – replaced the complete sampler with newer Aerochem sampler on loan from CARB, estimated precip as SNOTEL Ward #3/1.5; (89) Aerochem Metrics lid stuck over dry-side after storm, snow about 1.5 ft above wet bucket rim, collected in second cleaned bucket and combined samples for processing; (90) 1 aspen leaf in sample; many aspen leaves on dry bucket screen, a few leaves in water, possible contamination; (92) Aerochem Metrics sampler malfunctioned during the storm, dry side caught a portion of wet precip., approx 10-12 inches of snow over dry bucket on 12/15/08 was swept off bucket and not collected; (93) Aerochem Metrics sampler malfunctioned again, collected much Wet precip this period, – replaced the complete sampler with newer Aerochem sampler on loan from CARB; (94) Aerochem Metrics lid frozen over dry side portion of the period, i.e. until 12/26/08, 1230; (95) 100ml of sample + 400ml deionized water added to process; (96) medium-sized dead spider in sample, likely contamination; (97) rough conditions when sampled; (98) snow accumulated about 5 inches above Wet bucket rim, Aerochem lid frozen over Dry-side so some dry deposition in Wet

bucket; (99) snow 2-3 inches above bucket rim, compacted; (100) snow 1 foot above bucket rim, compacted down, Aerochem lid stuck over Dry-side, so some dry deposition in Wet bucket; (101) snow 4-5 inches above bucket rim, compacted; (102) placed out wet bucket with 500ml deionized water during this period as field blank, bird feces on Aerochem sensor caused lid to cover Dry side for portion of period and expose wet field blank, combined the field blank water (500ml) with Dry-side (3475ml) for analysis as Dry sample; (103) small amount sample spilled; (104) filter dirty with road dust; (105) lid stuck over dry-side a portion of collection period, Wet caught some Dry deposition, dry side water frozen portion of the period, heater not plugged in; (106) 96ml precip + 404ml deionized water; (107) sample sat for 8 days chilled before processing; (108) small rip in bucket bag during transport, possible contamination from particles on bag falling into sample, sample knocked over during processing, volume likely slightly off; (109) 250ml Dry-Bulk sample + 250 ml of deionized water to process; (110) 150ml sample + 355ml deionized water; (111) 255ml sample + 245ml deionized water; (112) precipitation associated with thunderstorm previous night; (113) Aerochem sampler unplugged this period due to heater malfunction, heavy precipitation likely hail and rain associated with intense thunderstorm on 6/2/09 and possibly on other days, Dry bucket caught all wet and dry deposition this period; (114) 39ml of sample + 216ml of deionized water added for processing; (115) Dry bucket out for unusually long period, Aerochem sensor overheating this period; (116) leak in ST bag corner, many bugs in sample, volume not measured; (117) bird feces in sample, sample contaminated; (118) trace of precip from isolated thunderstorms; (119) dry-bulk bucket sat for very long period on buoy, dry, added 500ml deionized water to process; (120) precipitation from thunderstorms during period, bucket dry, added 500ml deionized water; (121) trees cut down near station possibly producing debris during pd.; (121) trees cut down near station during pd., opened canopy and possibly produced debris; (122) 185ml sample + 315ml DIW to process; (123) 23ml sample + 477ml DIW to process; (124) 2ml sample + 498ml DIW to process; (125) dead fly in sample, possible contamination; (126) much orange-yellow debris in dry bucket from either construction activity or tree cutting on property; (127) dead bee and many aspen leaves in sample, probable contamination, not processed; (128) significant new construction on land near station, trees to south of site removed, backhoe excavating, workers trying to control dust using hose spray; (129) pieces of unknown organic debris in ST sample, possible contamination; (130) 5ml sample + 500ml DIW to process; (131) probable contamination; (132) many small black bugs in sample; (133) possible contaminant on bucket rim; (134) 262ml sample + 238ml DIW; (135) bucket dry added 500ml DIW to process; (136) 80ml sample + 420ml DIW; (137) small amt of sample spilled in transit, estimate 125 ml, accounted for in final volume; (138) 162ml sample + 338 ml DIW to process; (139) 235ml sample + 265ml DIW; (140) excavation for new house adjacent to weather station ongoing, workers trying to control dust with spray hose, atmospheric deposition filter very dirty; (141) strong wet storm, moisture from typhoon Parma merged with strong low pressure system, strong winds also with it; (142) power off to station during portion of the storm, dry bucket caught much precipitation, 60ml sample + 440ml deionized water; (143) power off to station, dry bucket caught small amount of precipitation; (144) 25ml of sample + 475 ml deionized water; (145) 37ml precipitation + 463ml deionized water; (146) very strong winds with start of this storm; (147) 114 ml sample + 391ml deionized water; (148) approximately 2 ft. of snow, used second bucket to core and collect top snow; (149) snow approximately 1 ft. above rim, blocking movement of A.M. lid back over wet bucket; (150) 45ml of sample + 455ml deionized water; (151) Aerochem Metrics lid frozen over dry bucket when arrived, released; (153) 2 aspen leaves in sample; (154) power off to station during portion of period, dry bucket caught most of the precipitation, many aspen leaves in sample; (155) power out to station, dry collected all precipitation, small amount; (156) dry bucket water frozen with small amt. of snow on screen, placed out bucket with heater; (157) estimated date bucket changed, heater was broken, sample contaminated and discarded, no sample, date of collection not shown in field book, this most likely data/time; (158) many wind-blown particulates in dry bucket; (159) hole in ST, part of sample leaked; (160) 205ml sample + 295ml deionized water to process; (161) 12ml sample + 488ml deionized water to process; (162) 120ml sample + 380ml deionized water; (163) significant rain and winds this period; (164) very windy during period, filter very dirty with brown silt, 205ml sample + 295 ml deionized water; (164) 14ml precip. + 486ml deionized water; (165) snow accumulated 6-8 inches above rim, compacted down with lid, first in series of El Nino storms, pushed by strong jet stream; (166) approx. 10 inches snow above rim, cored down with one bucket to top of lower bucket, then removed both, melted and combined water, windy storm; (167) Aerochem Metrics lid stuck over wet bucket at end of storm, some snow in dry bucket; (168) 23ml sample + 477ml deionized water; (169) snow 5 inches above bucket rim; (170) snow to bucket rim; (171) wet bucket spilled, estimate 40ml in sample; (172) had added 1 liter additional deionized water on 1/24/10, dry bucket also caught some wet precip when Aerochem Metrics lid stuck over wet bucket during portion of period; (173) 198ml precip +302ml deionized water; (174) NASA working on buoy 2/17 – 2/19, bucket removed during this period; (175) 280ml sample + 220ml deionized water; (176) bucket dry, added 500ml deionized water to process; (177) trace of precip in dry bucket, added 500ml deionized water to process; (A) portion of sample spilled, load will be underestimate; (B) added 2 liters deionized water during period, small amount sample spilled in transit; (C) many pine needle seeds and sprouts in sample, sample contaminated.

Table Notes (Covering samples collected August 2010 to October 2012)
(A1)Small amount of precipitation from thunderstorms, 20ml sample + 480 ml deionized water; (A2) localized thunderstorm on 8/7/10 which caused rise on Ward Cr.; (A3) 125ml precipitation + 375 ml deionized water; (A4) much pollen and large dead crane fly in dry sample, possible contamination, not used for loading; (A5) dry bucket had much pollen, small amount of sample spilled in transit; (A6) removed Aerochem Metrics sampler on 8/12/10 12:00 to paint tower; (A7) thunderstorm this period, Dry bucket had much debris and dust, still construction on property and unpaved road, thunderstorm this period also, construction may have led to unusual silt resuspension, don't use data for loading, also approximate start time when Aerochem Metrics station back up and running; (A8) couple aspen leaves, much debris, silt and organic matter in sample, grading and logging on property during period, don't use this sample; (A9) much pollen and a few very small bugs in dry bucket; (A10) 32ml + 468ml deionized water, much pollen, many dead bugs in ST; (11) added 495ml deionized water to 5ml of sample; (12) 70ml of precipitation from thunderstorms added to 430ml of deionized water; (13) dry bucket out for very long period, 500ml deionized water to process; (A14) bucket dry, 500ml deionized water added to process; (A15) bucket dry, much pollen, 500 ml deionized water added to process; (A16) 220ml sample + 280ml deionized water;(A17) 10ml of sample + 490ml deionized water; (A18) no power to station, contractor disconnected power cord both Wet and Dry buckets open this period, lid removed; (A19)Aerochem Metrics lid removed, Wet + Dry buckets exposed during period; (A20) Aerochem Metrics lid over Wet part of period, shifted manually over Dry at 10/18/10 at 0900; (A21) 10/22/10 1440 extension cord connected to station, Aerochem Metrics working properly during storm, storm mostly rain from intense rain/ tropical moisture event; (A22) 185ml sample + 320ml deionized water; (A23) 2 aspen leaves in sample; (A24) bucket collected 11/20/10 13:25 with snow 3-4 inches above rim, was combined with bucket collected 11/21/10 17:45 with snow 10-12 inches above rim, snow compacted down for both, melt water added together, lid stuck over dry so bucket collected some dry deposition also, very cold; (A25) very cold arctic low pressure system with gusty winds, about 15-18 inches of snow from storm, snow may have blown off over-topped snow, only ½ inch snow above rim of bucket, area more open now due to removal of trees near the lake on the property; (A26) snow 3-4 inches above rim, compacted down; (A27) very wet storm with much rain at lower elevations, heavy snow, approximately 1 foot at end of storm; (A28) much water in bucket, snow also accumulated 1 inch above rim, strong winds had blown snow roof off Aerochem Metrics lid, rain and snow this storm, stationary low pressure system merging cold air and tropical moisture from near Hawaii, power off to station, Wet side open; (A29) Wet bucket collected some dry deposition, windy this period; (A30) power off, ground-fault interrupter tripped during storm, Wet caught some Dry deposition; (A31) Dry bucket may have caught some precipitation; (A32) snow 1 ½ feet above rim bucket compacted down, heavy wet snow from strong storm; (A33) no power to station, contractor removed disconnected power cord, both Wet and Dry buckets open this period, lid removed 10/3/10, dry bucket caught precipitation during storm 10/2/10; Wet + Dry buckets exposed during period; (A34) Dry bucket open during period until10/18/10 0900 when manually shifted lid to cover, Dry closed the rest of the period; (A35) many aspen leaves in Dry bucket; (A36) Dry bucket had ice in it, no heater in place; (A37) snow and ice accumulated on screen over Dry bucket, no heater in place; (A38) power was cut to station sometime during period, estimate 12/15/10, ground fault interrupter tripped, likely in heavy snow or rain, lid loose over dry during power outage; (A39) Dry bucket frozen with some snow on it, connected heater to timer for next Dry collection; (A40) precip rain from thunderstorms; (A41) ST leaked, 61 ml caught in another bag, added 268ml deionized water to 232ml sample remaining in ST;(A42) 55ml sample + 445 ml deionized H_2O; (A43) ST bag had leak, re-sealed and placed back out; (A44) ST bag leaked, sample lost; (A45) no ST in place this period; (A46) ST had a leak, some sample lost, amount low, ST cap gone; (A47) snow accumulated 6-8 inches above rim, compacted down; (A48) snow accumulated ~4 inches above rim; (A49) ~2 feet new light snow at station, compacted into bucket; (A50) snow accumulated ~4 inches above rim, compacted down; (A51-53) no notes; (A54) 1 wet bucket spilled, ~2 feet snow accumulated, collected snow by coring down to wet bucket with another wet bucket, precip spilled out of one bucket in transit to the lab, estimated amount by using SNOTEL Ward 3 precipitation accumulated during period 3.6 inches of water divided by 1.5 (approximate factor Ward #3 is greater than Lower Ward Valley station; (A55)~15 inches new snow; (A56) snow accumulated 1 ft. above rim, used 2nd bucket to core down to bucket in sampler; (57) used clean bucket to core approximately 1 foot to wet bucket in sampler, combined buckets; (58) snow 1 inch above bucket rim; (A59) used 2nd bucket to core down to bucket in sampler, strong windy storm with heavy snow, bucket likely did not collect all snow due to strong winds which may have blown snow from top of sample away; (A60) Dry bucket frozen on surface portion of the period; (A61) much silt in sample; (A62) 117ml of precip + 383ml deionized water; (A63) no ST cap, bag blew upwards preventing collection of precip; (A64) no cap, but ST still collected precip; (A65) small pc of green organic matter in TB Dry; (A66) bucket dry, added 500ml deionized water to process; (A67) last storm very windy; (A68) power cut to station, house which had been source of power is being torn down, dry bucket caught most of the precipitation, 29ml of sample + 471ml deionized water; (A69) 145 ml of sample + 355 ml deionized water; (A70) much pollen and organic matter in sample; (A71) no ST or ST cap out this period; (A72) ST may have leaked; (A73) ST had many dead flies in it, measured volume and discarded water; (A74) bucket dry, added 500ml deionized water to process; (A75) bucket may have gone dry during portion of the period; (A76) dry bucket had trace of precipitation in it, much pollen in dry bucket; (A77) 50ml of sample + 450ml deionized water; (A78) bucket may have gone dry during portion of the period; (A79) 285 ml sample + 215ml deionized sample; (80) 56ml sample + 444ml deionized water, manually switched lid back over wet bucket, had switched over dry bucket at 1715 with onset of precipitation, power to station out, house which was source of power has been torn

down; (A81) lid on Aerochem Metrics sampler removed 9/11/11 at 1505 prior to thunderstorms (1730-1930) – note there was heavy rain and Tahoe Vista from thunderstorms, a few sprinkles occurred the previous day and were caught in the dry bucket, after changing wet bucket, left lid off sampler; (A82) collected precip from wet bucket and left out, collected in new 250 HDPE bottle rinsed 4-5 times with sample; (A83) no precipitation or trace, had evaporated; (A84) much silt and pollen in sample, roadhouse demolished now, 1 aspen leaf in sample, diluted 60ml of filtered water with 180ml of deionized water due to very slow filtration; raw water was not diluted; (A85) bucket very dirty, still much construction on property, may be stirring up dust; (A86) many particles on filter; (A87) dry bucket lid had been removed from Aerochem sampler the previous day 9/11/11 at 1505, so dry bucket also caught precip 9/11/11 1730-1930; (A88) Aerochem Metrics lid removed so Dry bucket caught some precipitation as did Wet bucket; (A89) Dry bkt collected after about ½ hour of rain, replaced with Wet bucket, still no power to station; (A90) many small black bugs in ST sample, added 242 ml of sample to 258ml deionized water; (A91) ST had 22ml or precip to which added 478ml deionized water; (A92) bucket dry although precip during period, added 500ml to process, much pollen in sample; (A93) 48ml sample + 452ml deionized water; (A94) bucket dry, added 500ml deionized water to process, many plastic flakes; (A95) bucket dry, added 500ml deionized water to process; (A96) bucket dry added 500ml deionized water to process, much pollen; (A97) bucket dry, added 500ml deionized water to process; (A98) 190 ml sample + 310ml deionized water; (x) additional 2 liters deionized water added, small amount spilled in transit; (z) pine needles, seeds, sprouts in sample, contamination, long collection period, don't use sample; (y) many pieces of organic matter in sample, don't use; (v) bucket out long period, sample caught wet and dry, unable to separate wet contribution from dry in calculations, use Wet bucket estimates of Wet+ Dry during collection periods ending 10/3/10 16:45, 10/4/10 09:20, 10/5/10 16:15; 10/8/10 11:20, do not use 10/14/10 dry sample; (w) in calculation of loading and loading rate, subtracted the contribution from the wet sample collected 10/19/11 to estimate the dry contribution; (A99) no power to station yet, has been raining about ½ hour, collected dry bucket which had collected initial part of storm, replaced with wet bucket, at end of storm, wet bucket exposed to dry deposition for about 3-4 hours prior to collection an placement of new dry bucket on 10/6/11 at 18:25; (A100) replaced dry bucket with wet bucket at 1025 on 10/10/11 after 0.01-0.02 inches of precipitation, replaced dry bucket after storm on 10/11/11 0950; (101) station now hooked up to power from the adjoining property, Wet/Dry sampler worked this storm; (A102) Wet bucket may not have caught all precipitation, Dry may have caught second storm; (A103) trace amount of snow, bucket dry; (A104) Dry bucket replaced with Wet during portion of period when rain occurring (Wet placed 10/10/11 10:25-10/11/11 09:50), Dry caught small amount of precipitation at beginning of storm (~0.01-0.02 inches); Dry bucket had about 10-15 aspen leaves in it, probable contamination, power to station now from adjoining property; (A106) no heater in place, Dry bucket water frozen; (A107) Dry bucket may have caught precipitation from second of two storms, many old aspen leaves and pine needles from wind storms, water discolored, probable contamination; (A108) no heater, bucket frozen; (109) bucket partially thawed around edges, placed out bucket with heater in it; (A110) pin-hole leak in ST corner, volume likely low; (A111) 1 small dead gnat in sample, added 4ml sample to 496ml deionized water to process; (A112) bucket dry, added 500ml deionized water to process; (A113) Dry-Bulk bucket dry, added 500ml deionized water to process; (A114) trace of precipitation in Dry-Bulk bucket, added 500ml deionized water to process, many plastic flakes; (A115) 165ml sample added to 335ml deionized water; (A116) Dry-Bulk bucket dry, added 500ml deionized water to process; (117) added 395 ml deionized water to 105ml of sample; (A118) snow 2 inches above bucket rim, compacted down; (A119) added 490 ml deionized water to 10ml sample to process; (A120) snow 3 inches above rim, very windy, blowing snow off top of bucket; (A121) dry bucket may have caught some precipitation; (A122) sample very dirty with silt; (A123) added 465ml deionized water to 35ml of sample; (A124) dry bucket partially frozen; (A125) dry bucket frozen, heater removed during pd.; (A126) dry bucket had small amount of ice; (A127) dry bucket partially frozen part of period; dry bucket may have caught some precipitation this period; exchanged Aerochem Metrics motor with serviced motor from NADP program; (A128) rough lake conditions, couldn't change ST, left out, much rain and snow during period; (A129) added 490 ml deionized water to 10 ml of sample to process; (A130) added 300ml of deionized water to 200ml of sample and processed; (A131) very windy storm during period; (A132) small amount of sample spilled from Dry bucket; (A133) many seeds and sprouts in bucket water; (A134) bird feces on dry bucket bug screen, contaminated, discarded; (A135) pollen in sample; (A136) 15ml of sample + 485 ml deionized water for processing; (A137) 145 ml sample + 355ml deionized water to process; (A138) many small bugs in ST sample, possible contamination; (A139) bucket dry although precipitation during period, added 500ml deionized water to process; (A140) 145 ml sample + 355ml deionized water, many plastic flakes in dry bucket sample; (A141) bucket dry, added 500ml deionized water to process; (A142) bucket dry, added 500ml DIW to process; (A143) 215ml sample +285 ml deionized water to process; (A144) thunderstorms on 7/23/12 early AM to evening, filtration filter very dirty with silt and pollen; (A145) added 485ml deionized water to 15 ml of sample, precipitation from thunderstorms; (A146) precipitation from thunderstorms; (A147) filtration filter very dirty with brown silt; (A148) bucket sat out for long period, much pollen and wind-blown debris in bucket, some small bugs; (A149) 45 ml sample + 455ml deionized water to process; (150) 90 ml sample + 410ml deionized water; (A151) 50ml sample + 450ml deionized water; (A152) 75ml sample + 425ml deionized water; (A153) bucket dry, added 500ml deionized water to process; (A154) bucket dry, added 500ml deionized water to process; (A155) 95ml sample + 405ml deionized water; (A156) 145ml sample + 355ml deionized water;