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September 3, 2014

Bare Hill Pond Watershed Management Committee
Bruce Leicher
Town of Harvard
99 Ann Lee Road
Harvard, MA 01451

Mr. Leicher,

This final report provides a summary of the 2014 in-lake water quality sampling and plant survey. Please let me know if you have any questions or comments regarding this report. I look forward to assisting the Committee with continuing improvements and outreach activities for Bare Hill Pond.

Sincerely,

W C Gendron

Wendy C. Gendron, CLM
Aquatic Ecologist

In-Lake Sampling

Dry weather in-lake sampling was conducted on May 21, June 11 and July 16, 2014. In-situ water depth profile measurements of temperature, dissolved oxygen (DO), pH and specific conductivity were recorded at two locations: shallow south basin BHP-1 and the deep hole in the north basin BHP-2. These data are presented in Table 1. Figure 1 provides a graphical representation of temperature and DO data for the deep station (BHP-2).

The temperature and DO profiles suggest that the lake began to thermally stratify in May and was weakly stratified by July. Concentrations of DO in May were consistent throughout the water column until a depth of ten feet and then began to decline with increased depth. A similar pattern was observed in June and July with July experiencing a rapid decline in DO below ten feet. Concentrations were below the desirable level for fish (5 - 6 mg/L) at and below 13 feet in July. These data are consistent with prior year's data. The surface pH level is neutral to slightly basic at the surface and becomes more acidic with water depth. Specific conductivity is generally within a desirable range (<200 us/cm); values above 200 us/cm can be indicative of elevated dissolved pollutants and high productivity. It is common to have increased conductivity near the water-sediment interface where suspended solids increase conductivity. Surface and mid depth values were comparable between the two stations.

Table 2 provides phosphorus, total suspended solids and water clarity (measured by Secchi disk transparency) values during the surveys. Surface total phosphorus concentrations were low (<0.02 mg/L) with the exception of BHP-1 in June which had a concentration of 0.031 mg/L. Dissolved phosphorus at this station on this day was below the detection limit (0.010 mg/L). The concentration at the deep station was low (0.011 mg/L) on the same day. Given that the dissolved phosphorus at this station and low total phosphorus at the other station, it is unlikely that this value represents an increase in overall phosphorus in the lake. All other surface values were below 0.02 mg/L. Surface phosphorus concentrations in 2014 were comparable to 2013 and have remained low since 2009. Phosphorus in bottom samples were also relatively low in 2014 with values <0.03 mg/L. There is a pattern of increased surface dissolved phosphorus through the summer at the deep station, which was also observed in 2013. Dissolved phosphorus remained low in 2014 with values below detection in May and June. Dissolved phosphorus was detectable in July but was low (0.015 mg/L) at the deep sampling station. Figure 2 illustrates phosphorus concentrations at the deep station (BHP-2) for both surface and bottom samples in 2014 and prior years.

Secchi disk transparency in 2014 was variable. Values in May and July were comparable to August 2013 (6.0 and 6.5 feet). The lake was exceptionally clear in June when the Secchi disk transparency reading was 9.5 feet (Figure 3).

Table 1. Bare Hill Pond Water Depth Profiles 2014

BHP-1								
May 21, 2014			June 11, 2014			7/16/2014		
Depth (ft)	Temp (C)	DO (mg/L)	Depth (ft)	Temp (C)	DO (mg/L)	Depth (ft)	Temp (C)	DO (mg/L)
0	21.0	8.93	0	23.0	8.34	0	26.9	7.64
2	21.1	8.98	2	23.0	8.30	2	26.9	7.66
4	18.9	9.14	4	23.0	8.29	4	26.2	7.12
5.5	18.9	7.59	5	23.0	7.96	5	25.8	5.74
BHP-2								
Depth (ft)	Temp (C)	DO (mg/L)	Depth (ft)	Temp (C)	DO (mg/L)	Depth (ft)	Temp (C)	DO (mg/L)
0	20.3	9.2	0	22.7	8.43	0	26.5	7.93
2	20.3	9.3	2	22.8	8.39	2	26.9	7.88
4	20.2	9.3	4	22.8	8.39	4	26.7	7.94
6	20.1	9.29	6	22.8	8.40	6	26.6	7.54
8	19.7	9.28	8	22.4	8.23	8	26.5	7.27
10	18.4	9.26	10	19.7	7.82	10	26.2	6.69
12	17.9	8.39	12	17.7	5.73	12	25.5	5.13
14	14.3	6.92	14	16.5	4.07	14	23.3	1.34
16	12.4	6.02	16	14.9	2.31	16	18.7	0.51
18	11.9	5.09	18	13.1	1.61	18	15.9	0.63
20	11.5	4.26	20	11.9	0.89	20	13.2	0.52
22	11.1	2.4	22	11.3	0.29	22	11.9	0.50
23.5	10.8	1.04	23	11.0	0.16	23	11.7	0.49

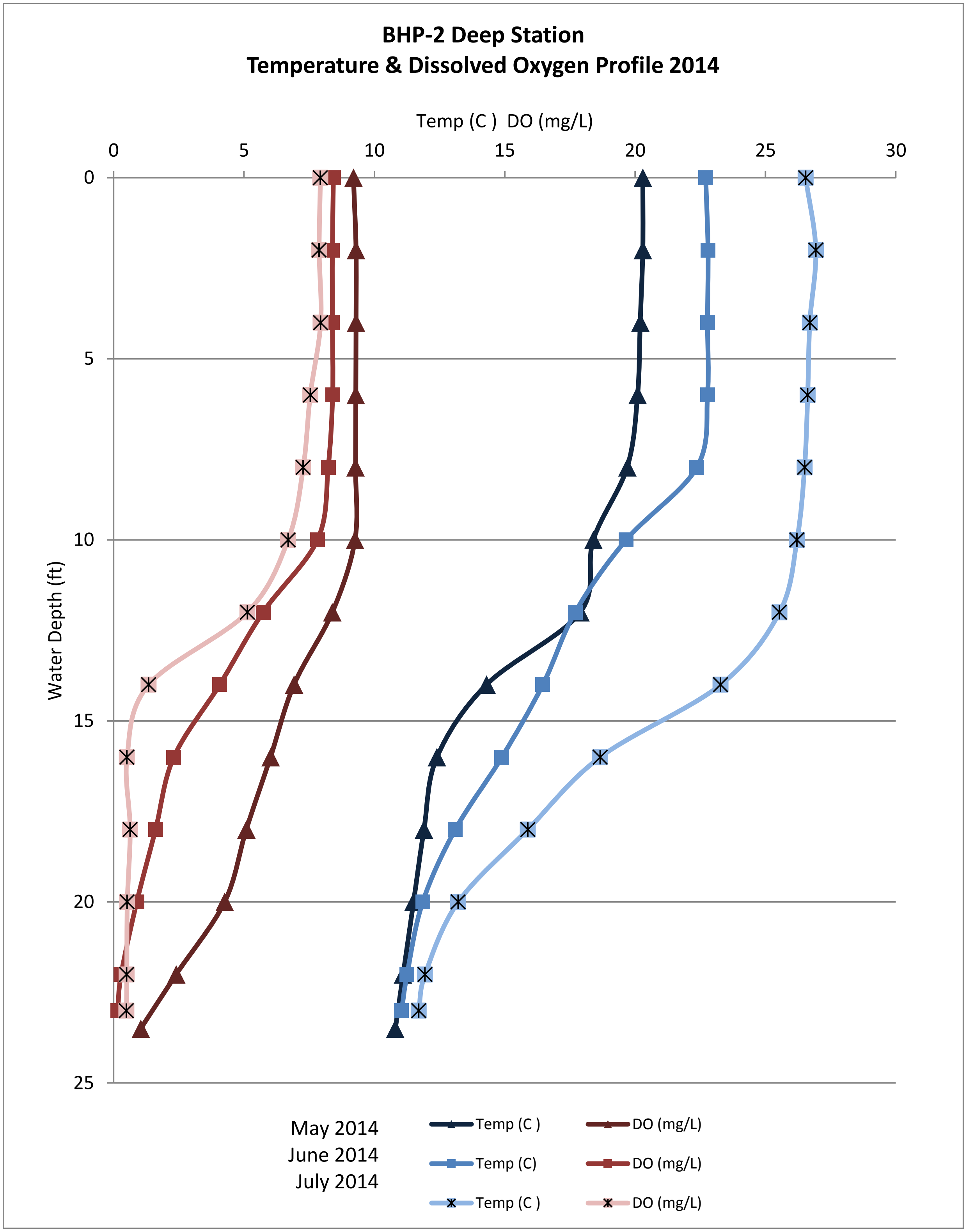


Figure 1. 2014 Temperature and Dissolved Oxygen Profiles.

Table 2. Bare Hill Pond In-lake Water Quality Data.

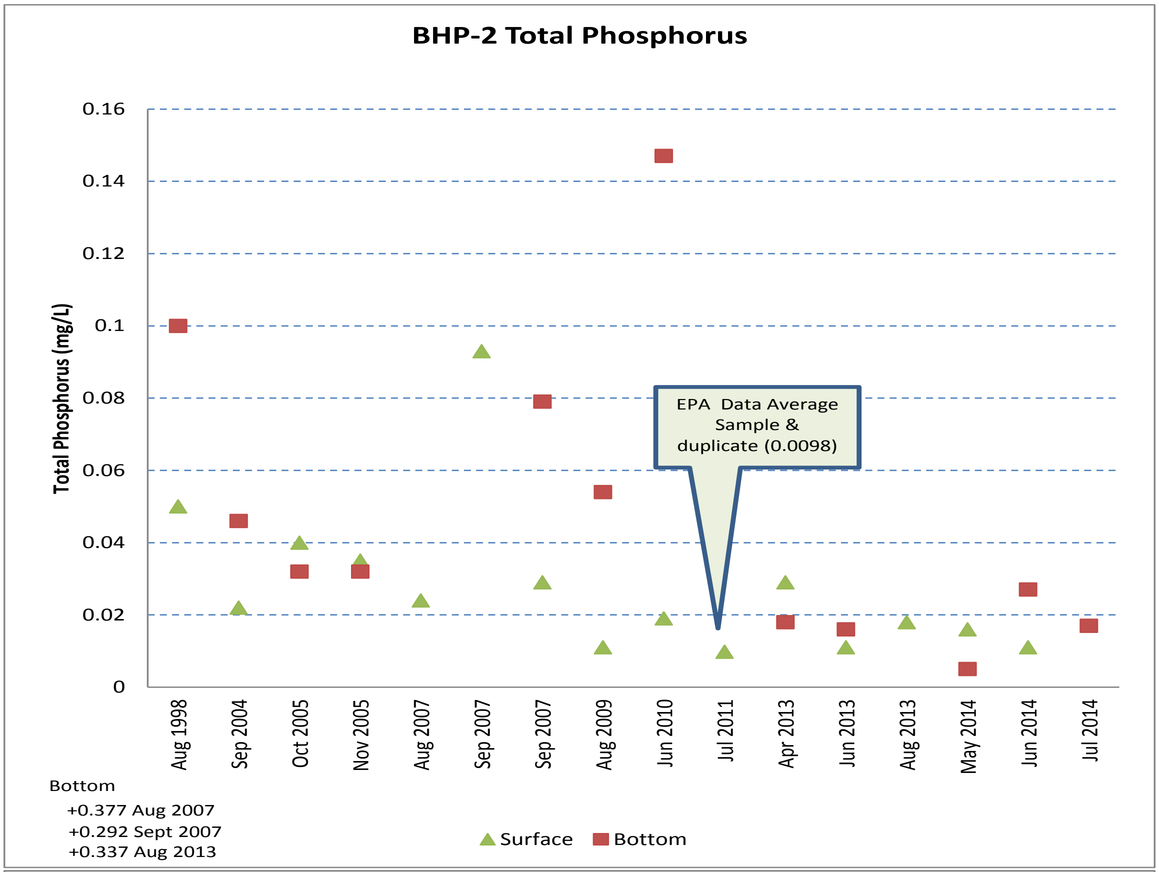
Station	Date	Time	TP (mg/L)	DP (mg/L)	TSS (mg/L)	Secchi (ft)
2S	9/16/2004	11:01	0.022	0.016		12
2B	9/16/2004	11:04	0.046	0.014		
1S	9/16/2004	8:59	0.022	0.022		
1B	9/16/2004	9:01	0.022	0.022		
2S	10/4/2005	12:50	0.040	0.019		10.8
2B	10/4/2005	13:11	0.032	0.022		
1S	10/4/2005	12:25	0.027	0.019		8.7 (bottom)
1B	10/4/2005	12:29	0.032	0.022		
2S	11/3/2005	12:50	0.035	0.029		11
2B	11/3/2005	13:06	0.032	0.024		
1S - Duplicate	11/3/2005	11:25	0.024	0.024		
1S	11/3/2005	11:25	0.029	0.024		
1B	11/3/2005	11:29	0.051	0.024		
BHP-BK	8/28/2007	9:30	<0.010	<0.010		
BHP-2S	8/28/2007	13:14	0.024	0.015		6.5
BHP-2B	8/28/2007	13:15	0.377	0.259		
BHP-1S-DUP	8/28/2007	12:11	0.024	<0.010		
BHP-1S	8/28/2007	12:10	0.031	0.01		4.5 (bottom)
BHP-1B	8/28/2007	12:12	0.039	0.016		
BHP-2S	9/7/2007	14:01	0.093	0.074		5.8
BHP-2B	9/7/2007	14:02	0.292	0.197		
BHP-1S	9/7/2007	13:10	0.091	0.086		4.5 (bottom)
BHP-1B	9/7/2007	13:11	0.092	0.069		
BHP-2S	9/20/2007	9:30	0.029	<0.010		6.5
BHP-2B	9/20/2007	9:32	0.079	0.037		
BHP-1S	9/20/2007	9:10	0.037	0.018		4.8 (bottom)
BHP-1B	9/20/2007	9:11	0.037	<0.010		
2S	8/30/2009	15:15	0.011	NA	<5	
2B	8/30/2009	15:00	0.054	NA	51	
2S	6/21/2010	19:15	0.019	0.015	1	11.8
2B	6/21/2010	19:15	0.147	0.047	14	
1S	6/21/2010	18:48	0.022	0.015	0.5	11.5
BH01 (EPA; close to BHP-1S)	7/19/2011	14:29	0.007			
BHP02 (EPA)	7/19/2011	14:48	0.0056			
BHP03 (EPA; close to BHP-2S)	7/19/2011	15:06	0.0086			
BHP030 (EPA; Dup of BHP03)	7/19/2011	15:06	0.011			
BHP04 (EPA)	7/19/2011	15:15	0.012			

Table 2. Bare Hill Pond In-lake Water Quality Data (continued).

Station	Date	Time	TP (mg/L)	DP (mg/L)	TSS (mg/L)	Secchi (ft)
BHP-2S	4/17/2013	17:30	0.029	<0.01	<5	7
BHP-2B	4/17/2013	17:20	0.018	<0.02	<5	
BHP-1S	4/27/2013	17:55	0.020	<0.02	<5	4.5 (bottom)
BHP-2S	6/25/2013	18:15	0.011	0.013	<5	7
BHP-2B	6/25/2013	18:20	0.016	0.02	<5	
BHP-1S	6/25/2013	18:45	0.013	0.014	<5	4.5 (bottom)
BHP-2S	8/29/2013	17:50	0.018	0.021	<5	6.5
BHP-2B	8/29/2013	18:10	0.337	0.225	21	
BHP-1S	8/29/2013	18:25	0.012	0.016	<5	4.5 (bottom)
BHP-2S	5/21/2014	18:55	0.016	0.005	<5	6
BHP-2B	5/21/2014	19:00	0.005	0.005	<5	
BHP-1S	5/21/2014	19:05	0.012	0.005	<5	5.5
BHP-2S	6/11/2014	18:00	0.011	<0.010	<5	9.5
BHP-2B	6/11/2014	18:05	0.027	<0.010	10	
BHP-1S	6/11/2014	17:40	0.031	<0.010	<5	4.5 (bottom)
BHP-2S	7/16/2014	17:40	0.017	0.015	<5	6.5
BHP-2B	7/16/2014	18:13	0.017	0.017	18	
BHP-1S	7/16/2014	18:30	<0.010	<0.010	<5	5 (bottom)

TSS = Total Suspended Solids
NA = not available, problem with laboratory analysis

"Bottom" indicates the Secchi disk reached the pond bottom



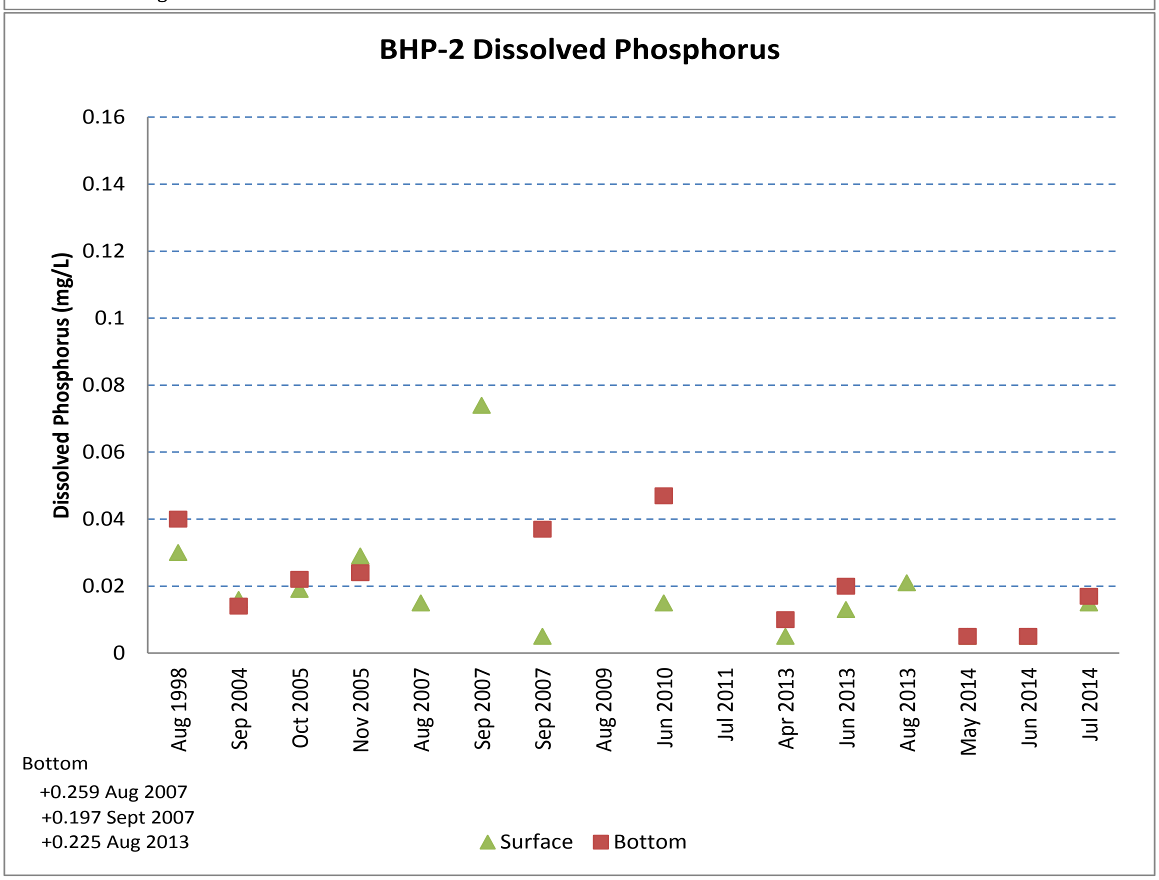


Figure 2. BHP-2 Total and Dissolved Phosphorus Concentrations

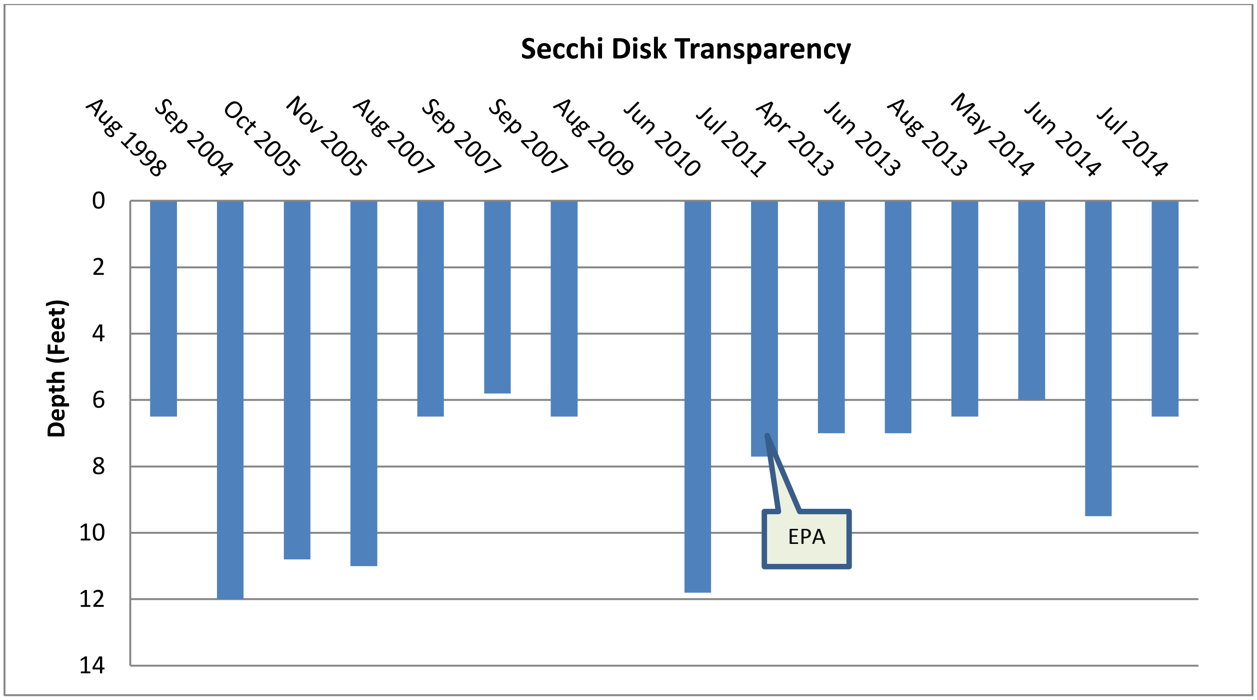


Figure 3. Bare Hill Pond (BHP-2) Secchi Disk Transparency

Quality Control - Sample Precision and Detection of Change

Precision is the degree of similarity of two or more subsamples (replicate or duplicate samples) and is used as measure of agreement among measurements and variability. Poor precision can indicate inconsistent field techniques and/or laboratory analysis. This measurement may also include natural variability depending on how the two samples were collected, whether they are spilt samples (dividing one sample into two bottles) or replicates (collecting consecutive water samples). Precision is calculated by taking the difference between the two samples and dividing the absolute difference by the average of the two samples and multiplying by 100 to yield a percentage. The result is called the relative percent difference (RPD)

The process of sample collection and analysis can introduce variability in the sample. Although one sample is collected and split into two clean bottles for duplicates, microscopic particles in the sample may not separate evenly between the two bottles. Additionally, the extra steps at the laboratory can introduce a small amount of phosphorus. This is even more likely when analyzing dissolved phosphorus due to the extra step of filtering.

Phosphorus values measured at Bare Hill Pond are very low and are close to the method detection limit (MDL), which is generally 0.01 mg/L for Bare Hill Pond samples. Precision decreases rapidly the closer the measurement is to the MDL. Ideally samples should be five times the value of the MDL in order to calculate an accurate RPD. Bare Hill Pond samples are much lower than five times this value therefore the RPD could be unnecessarily inflated. Samples with RPD values above 25% should be viewed with caution.

Over the years, scientist have collected three in-lake duplicate samples since 2004 (additional watershed duplicates were evaluated but not discussed here). The absolute difference between these paired samples ranged from 0.002 and 0.007 mg/L, with RPD ranging from 19 to 25%. Any given sample should be viewed as if the actual value could be 25% higher or lower than its reported value. Figure 4 presents BHP-2 surface total phosphorus samples with 25% of the reported value represented as a bar around the sample. Samples where the bar does not overlap others are likely a true difference. Other differences could be explained by sampling and laboratory variability.

Several dissolved phosphorus results were reported by the laboratory higher than total phosphorus. Theoretically this cannot occur, as dissolved phosphorus is a portion of the total phosphorus in the sample. However as discussed above, the variability between samples could account for this reporting difference. The absolute difference between the total and dissolved phosphorus in samples when DP is greater than TP ranged from 1 to 4 ppb. Variability is expected to be higher within the DP samples given that concentrations are even lower, and closer to the MDL and the extra step during analysis. The laboratory reported an analytical RPD for DP of 22% for the August 2013 sampling, which had the largest difference between total and dissolved values.

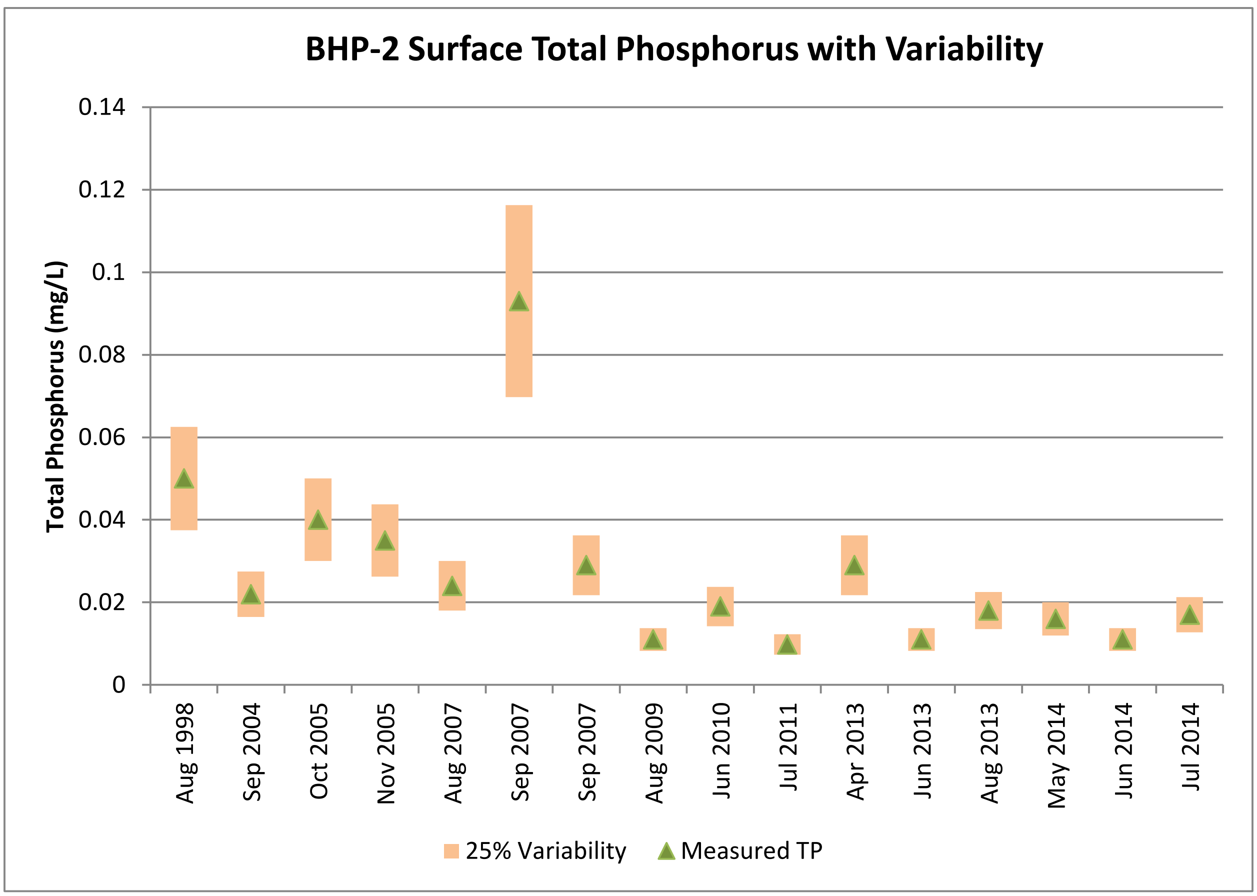


Figure 4. Bare Hill Pond (BHP-2) Surface Total Phosphorus and Variability

In-lake Plant Survey

We conducted a plant survey on August 31, 2014. We used the same methods employed during the previous surveys conducted in 1998, 2001, 2004, 2007, 2010 and 2013. We mapped pond aquatic vegetation along the five transects (A through E) established in 1998. Each transect was divided into a series of observation points and were located using Global Positioning System (GPS). The latitude and longitude position of each sample point was recorded. A total of 52 points were assessed during the survey.

The plant survey focused on macroscopic fully submerged (e.g., milfoil), floating-leaved (e.g., pond lily), and/or free floating plants (e.g., duckweed). At each transect point, we recorded the percent cover of all plants, the percent biovolume (as measured by the amount of the water column filled with plants) using a semi-quantitative (0-5) ranking system. A rank of 0 represented 0% cover/biovolume. A rank of 1 corresponded to 1 - 25% cover/biovolume; 2 = 26 - 50%; 3 = 51 - 75%; 4 = 76 - 99; and 5 = 100%. Species observed in each transect were identified and assigned a percent of composition of all species present. Water depth was also recorded at each transect point. These data are presented in Table 3.

The 2014 data are comparable to 2013, although no statistical analysis was performed. There were relatively equal number of points where plant coverage was higher or lower in 2014 than in 2013. Eleven points (21% of the survey points) had higher coverage in 2014 and ten points (19%) had lower coverage in 2014. Biovolumes in 2014 were slightly higher, with 13 locations exhibiting higher biomass in 2014 than 2013 (25% of points surveyed) and nine locations exhibiting lower biovolumes in 2014 (17%). Generally a shift by two or more ranks (e.g. 1 to a 3) is required before statistical significance is reportable. All changes in biovolume were one rank (Table 4) and do not represent a significant change.

While these numbers are not significantly different, it is interesting to note where these differences occurred and which plant species were dominant at these locations during 2014 vs 2013. Transect/points A-4, A-5 & A-6 (all within the drawdowns zone <5.0’ water depth) were dominated by the invasive fanwort (*Cabomba caroliniana*) and the native floating leaved plant watershield (*Brasenia schreberi*) in 2014. These locations were dominated by native bladderwort (*Utricularia sp*.) in 2013. Bladderwort is a free floating species that lacks roots. Fanwort or bladderwort also dominated transect/points B-2, B-3 and D-1 through D-5 (within the drawdown zone <5.0 feet) in 2014. These areas were previously dominated by the macro alga *chara* (muskgrass) in 2013. The shift from low growing *chara* and free floating bladderwort to fanwort and watershield may explain some of the perceived increase in plant growth in 2014. A shift from invasive, but low growing water nymph (*Najas minor*) in 2013 to the tall growing invasive variable-leaf milfoil (*Myriophyllum heterophyllum*) at E-3 (6.5 feet water depth) may have also contributed to residents’ complaints regarding perceived increased plant growth.

Figures 4 and 5 provide a transect point summary for plant cover and biovolume for the 2014 data. Figures 6 through 8 provide a graphical representation of survey water depth, plant cover and biovolume for all survey years. Plant composition in 2014 showed fewer encounters with low growing species such as muskgrass, water nymph and filamentous algae and more frequent encounters with fanwort (Figure 9). This may also help explain the increased growth reported by residents.

In terms of evaluating these data in respect to drawdown, there is no evidence to suggest a drastic increase in plant growth occurred in absence of the 2013 - 2014 winter water level drawdown. However, fanwort regained dominance in select drawdown zones and residents made note of an increase in general plant growth. It is expected that the presence/abundance of fanwort will increase next summer if a winter water level drawdown is not implemented.

Although not captured during the point-intercept plant survey, many of the areas also appeared to have more floating plants this season. While the winter water level drawdown would provide control of fanwort, drawdown is not expected to have significant plant control benefits on the floating leaved forms like water lilies and watershield. Measurable changes in phosphorus concentrations were not observed in 2014 and there is no evidence to suggest that phosphorus will increase with or without a drawdown in 2014 - 2015.

Table 3. Bare Hill Pond Macrophyte Survey Data 2014

Point	Water Depth (ft)	Cover	Bio-vol	Mh	Cc	Pr	Cd	No	FG	Ch	Nm	Nv	Usp	Bs	Ps	Sp	Va	Psp	Pc	Nf	Iso	Ec
A-1	3.5	5	2	10	20		40	30														
A-2	3.7	5	2	20	40			10	10		10			10								
A-3	4	5	1		10		30		10			20		20					10			
A-4	4	5	3	10	25	5	20	10			10		5	10				5				
A-5	4.5	5	1		40		10				10		10	30								
A-6	4.5	5	1		50		30				5		10	5								
A-7	5.5	2	1				35		5				60									
A-8	5.5	1	1				30		70													
A-9	7.5	0	0																			
A-10	10	1	1						100													
A-11	12	0	0																			
A-12	13.5	0	0																			
A-13	6	1	1										100									
B-1	4.5	3	1	10	20			10					20				40					
B-2	4.5	5	2	5	60			10			10		5	5						5		
B-3	4.8	5	2		80			10					10									
B-4	5	5	1		5					60	30			5								
B-5	5	5	2		30			5		20	5						40					
B-6	5	5	1		10			10		30			5		5		40					
B-7	5	5	1		5			20		60							15					
B-8	5	5	1		10					40			10		10		30					
B-9	5	4	1		20			40						10			30					
B-10	4.5	5	1		20			20				10		40			5			5		

Table 3. Bare Hill Pond Macrophyte Survey Data 2014 (continued).

Point	Water Depth (ft)	Cover	Bio-vol	Mh	Cc	Pr	Cd	No	FG	Ch	Nm	Nv	Usp	Bs	Ps	Sp	Va	Psp	Pc	Nf	Iso	Ec
C-1	6.5	2	1		60	20							20									
C-2	8	5	2			100																
C-3	9	5	2		30	30	20						5					20				
C-4	10	1	1		100																	
C-5	13	0	0																			
C-6	12	1	1		100																	
C-7	12.5	1	1		100																	
C-8	6	3	1		30												40				30	
D-1	4.5	5	2	10	60			20										5			5	
D-2	4.5	5	2	20	40			10		10	5		5	5							5	
D-3	4.5	5	2	10	20			5		20		5		40								
D-4	4.5	5	2	10	40					20	10			20								
D-5	4.5	5	1				5			70				15	10							
D-6	4.8	5	1							75			5	20								
D-7	4.8	5	1							90											10	
D-8	4	3	1							50											50	
D-9	5.5	5	1		20					20											10	50
D-10	6	3	1		20					40												40
D-11	6	3	1		20					20			10								50	
D-12	8	5	2		20	80																
D-13	9	4	1		50		40											10				

Table 3. Bare Hill Pond Macrophyte Survey Data 2014 (continued).

Point	Water Depth (ft)	Cover	Bio-vol	Mh	Cc	Pr	Cd	No	FG	Ch	Nm	Nv	Usp	Bs	Ps	Sp	Va	Psp	Pc	Nf	Iso	Ec
E-1	4.5	3	2	30	20																50	
E-2	5.5	5	1							50											50	
E-3	6.5	5	2	60	30																10	
E-4	7	3	1	40	50										10							
E-5	7.5	4	1	20	40	40																
E-6	8	4	1	30	50	20																
E-7	10	4	2		70	15	10								5							
E-8	10	4	2		90										10							
Frequency of Occurrence				14	38	8	11	14	5	16	9	3	15	14	6	0	8	4	1	2	10	2

Legend:

FG – filamentous algae

Bs – *Brasenia schreberi* (watershield)

Cc – *Cabomba caroliniana* (fanwort)

Cd - *Ceratophyllum demersum* (coontail)

Ch – *Chara* (muskgrass)

Ec – Elodea canadensis (waterweed)

Iso – *Isoetes* (quillwort)

Mh – *Myriophyllum heterophyllum* (variable-leaf milfoil)

Nf – *Najas flexilis* (slender naiad)

Nm - *Najas minor* (waternymph)

No – *Nymphaea odorata* (white-flower waterlily)

Nv – *Nuphar variegata* (yellow-flower waterlily)

Pc - *Potamogeton crispus* (curly-leaf pondweed)

Ps - *Potamogeton spirillus* (spiral pondweed)

Psp – *Potamogeton* spp. (pondweeds)

Pr – *Potamogeton robbinsii* (Robbins pondweed)

Sp – Sparganium sp. *(bur-reed)*

Usp – *Utricularia* spp. (bladderwort)

Va - *Vallisneria americana* (tapegrass)

Table 4. Bare Hill Pond Macrophyte Cover, Biovolume and Dominant Species Data 2014 vs 2013.

	Cover			Biomass			Dominant Plant	
	2014	2013	14 vs 13	2014	2013	14 vs 13	2014	2013
A - 1	5	5	0	2	2	0		
A - 2	5	5	0	2	2	0		
A - 3	5	5	0	1	2	(1)		
A - 4	5	5	0	3	2	1	Cc/Cd	Usp
A - 5	5	3	2	1	1	0	Cc/Bs	Usp
A - 6	5	3	2	1	1	0	Cc/Cd	Usp
A - 7	2	5	(3)	1	2	(1)		
A - 8	1	2	(1)	1	1	0		
A - 9	0	1	(1)	0	1	(1)		
A - 10	1	0	1	1	0	1	FG	none
A - 11	0	0	0	0	0	0		
A - 12	0	0	0	0	0	0		
A - 13	1	0	1	1	0	1	Usp	none
B - 1	3	2	1	1	1	0	Va	Nm/Cd
B - 2	5	5	0	2	1	1	Cc	Chara
B - 3	5	5	0	2	1	1	Cc	Chara
B - 4	5	5	0	1	1	0		
B - 5	5	5	0	2	2	0	Va/Cc	Va
B - 6	5	5	0	1	1	0		
B - 7	5	5	0	1	1	0		
B - 8	5	5	0	1	1	0		
B - 9	4	5	(1)	1	2	(1)		
B - 10	5	5	0	1	2	(1)	Bs	Va
C - 1	2	2	0	1	1	0		
C - 2	5	5	0	2	2	0	Prob	Cd
C - 3	5	4	1	2	1	1	Cc/Prob	Prob
C - 4	1	2	(1)	1	1	0		
C - 5	0	0	0	0	0	0		
C - 6	1	1	0	1	1	0		
C - 7	1	1	0	1	1	0		
C - 8	3	2	1	1	2	(1)	Cc/Iso	Va/Cc
D - 1	5	4	1	2	1	1	Cc	Chara
D - 2	5	5	0	2	1	1	Cc	Chara
D - 3	5	5	0	2	1	1	Bs	Chara
D - 4	5	5	0	2	1	1	Cc	Chara
D - 5	5	5	0	1	1	0		
D - 6	5	5	0	1	1	0		
D - 7	5	4	1	1	1	0	Chara	Chara
D - 8	3	5	(2)	1	1	0		

Table 4. Bare Hill Pond Macrophyte Cover, Biovolume and Dominant Species Data 2014 vs 2013 (continued).

	Cover			Biomass			Dominant Plant	
	2014	2013	14 vs 13	2014	2013	14 vs 13	2014	2013
D - 9	5	5	0	1	1	0		
D - 10	3	5	(2)	1	1	0		
D - 11	3	5	(2)	1	1	0		
D - 12	5	5	0	2	1	1	Prob	Prob
D - 13	4	4	0	1	2	(1)		
E - 1	3	5	(2)	2	1	1	Iso	Chara
E - 2	5	2	3	1	1	0	Chara/Iso	Nm
E - 3	5	1	4	2	1	1	Mh	Nm
E - 4	3	4	(1)	1	1	0		
E - 5	4	4	0	1	2	(1)		
E - 6	4	4	0	1	2	(1)		
E - 7	4	4	0	2	2	0		
E - 8	4	4	0	2	2	0	Cc	Cc
Number of Sample Locations Higher in 2014			11			13		
Number of Sample Locations Lower in 2014			10			9		

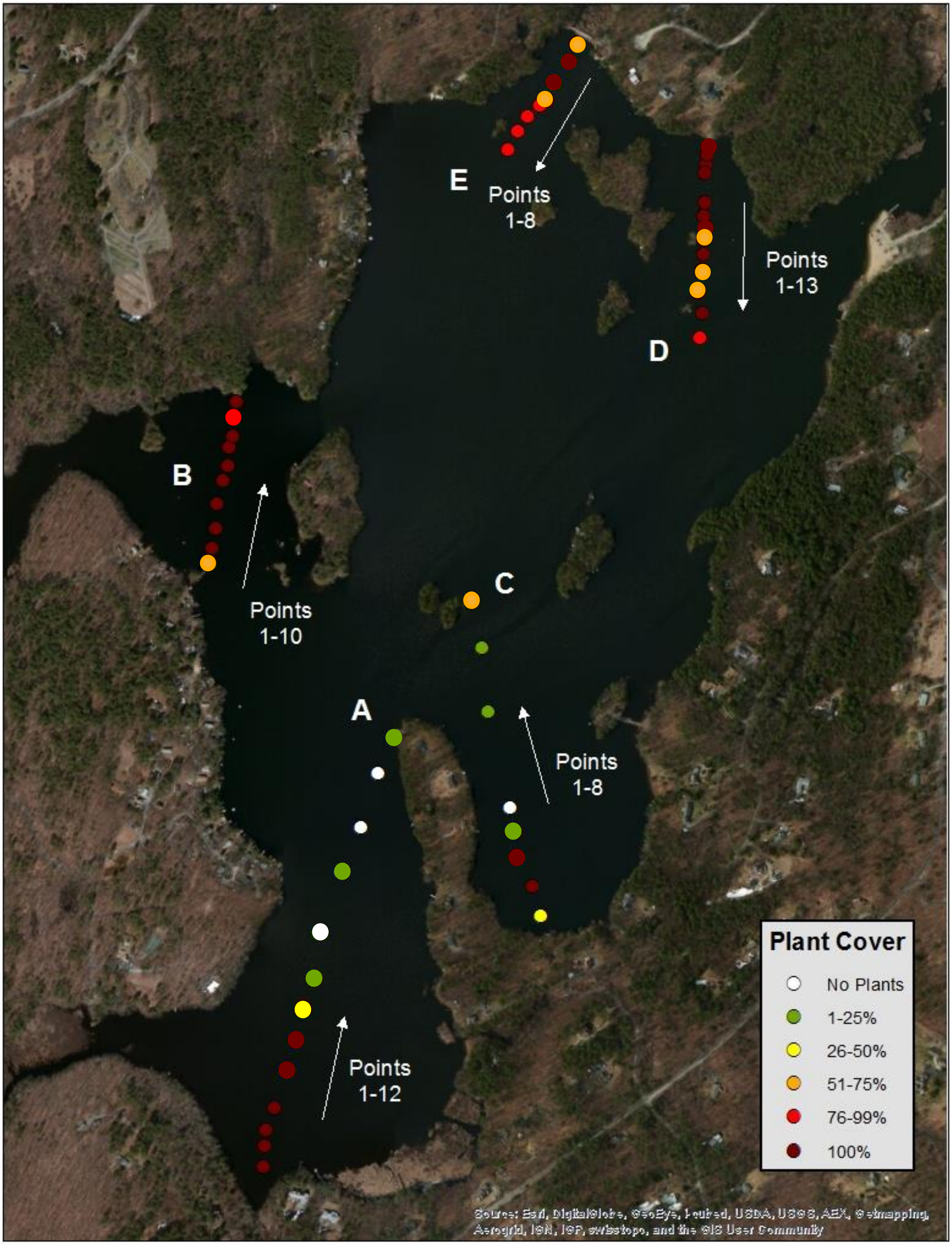


Figure 4. Bare Hill Pond 2014 Macrophyte Cover

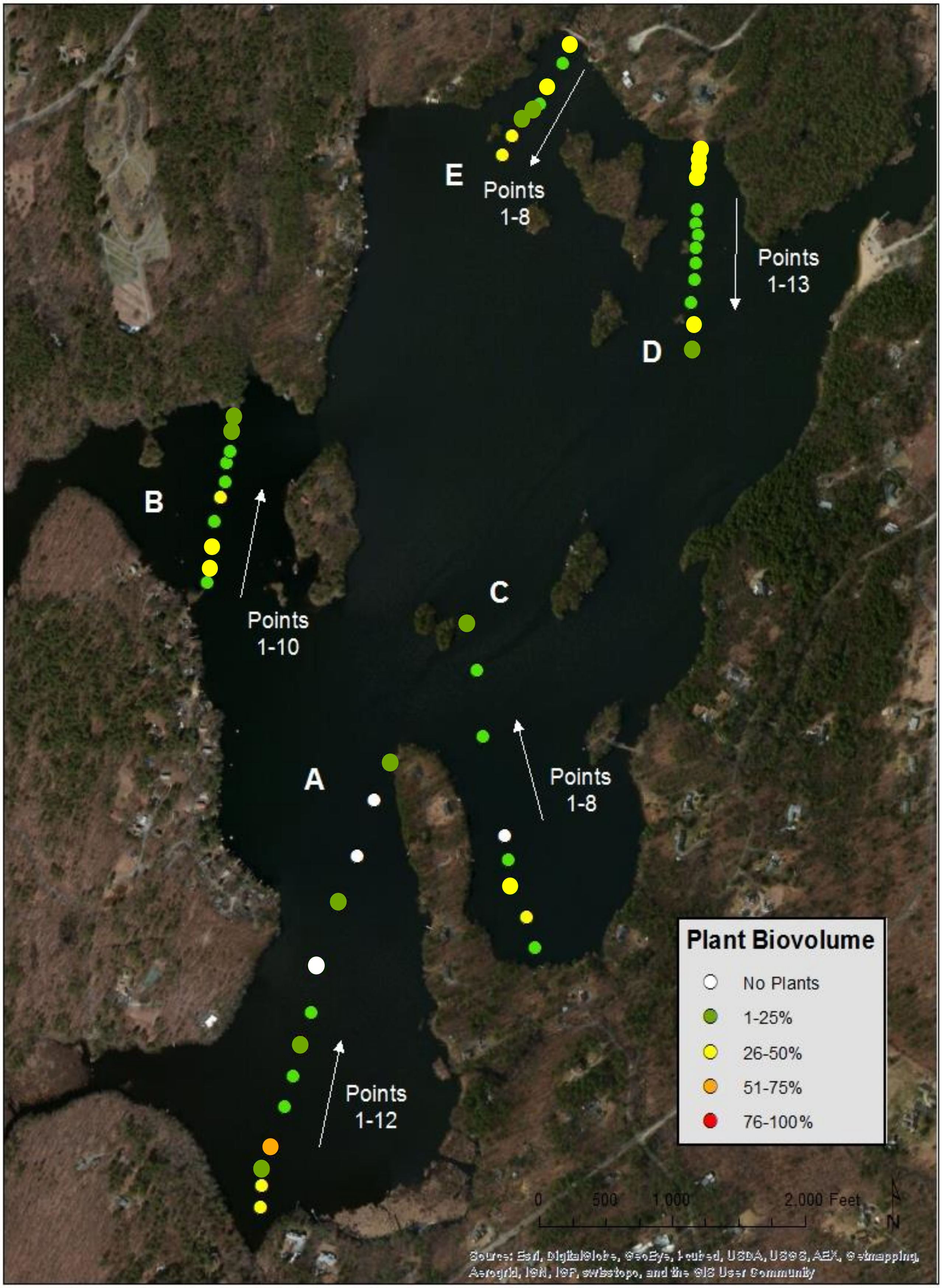


Figure 5. Bare Hill Pond 2014 Macrophyte Biovolume.

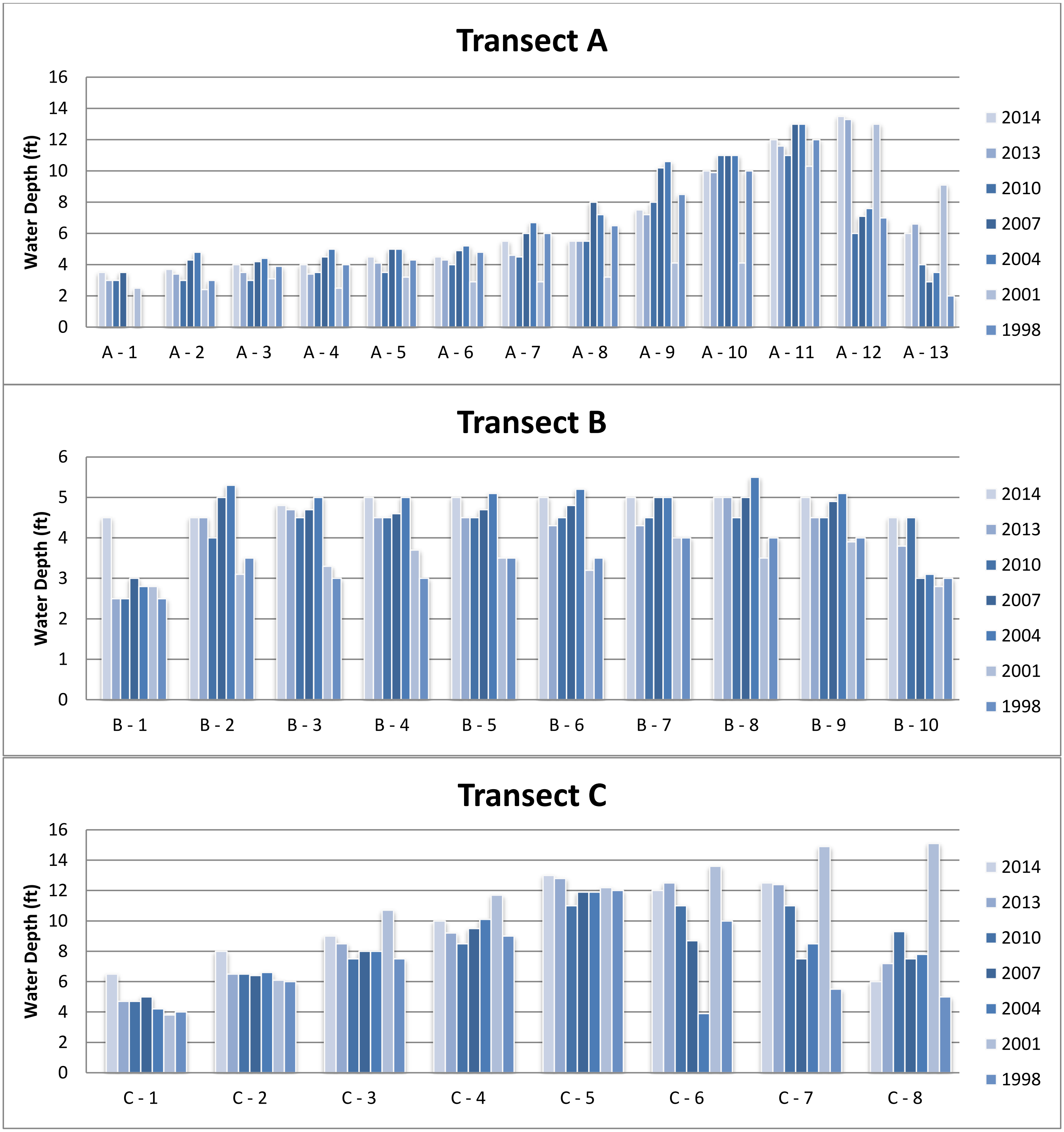
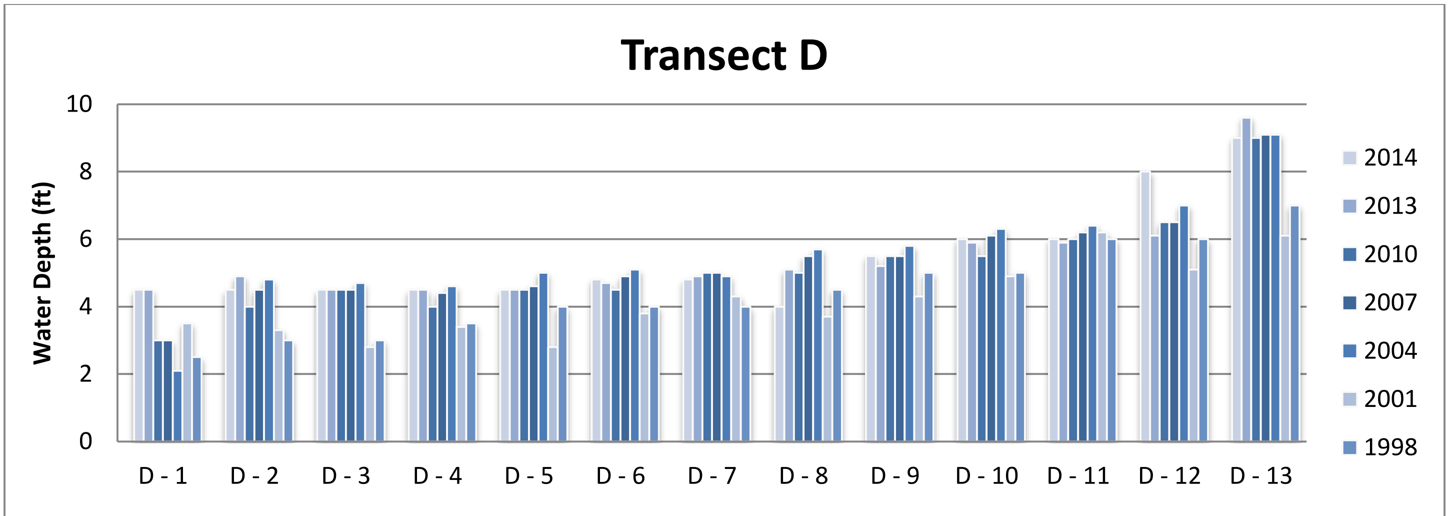


Figure 6. Bare Hill Pond Water Depth



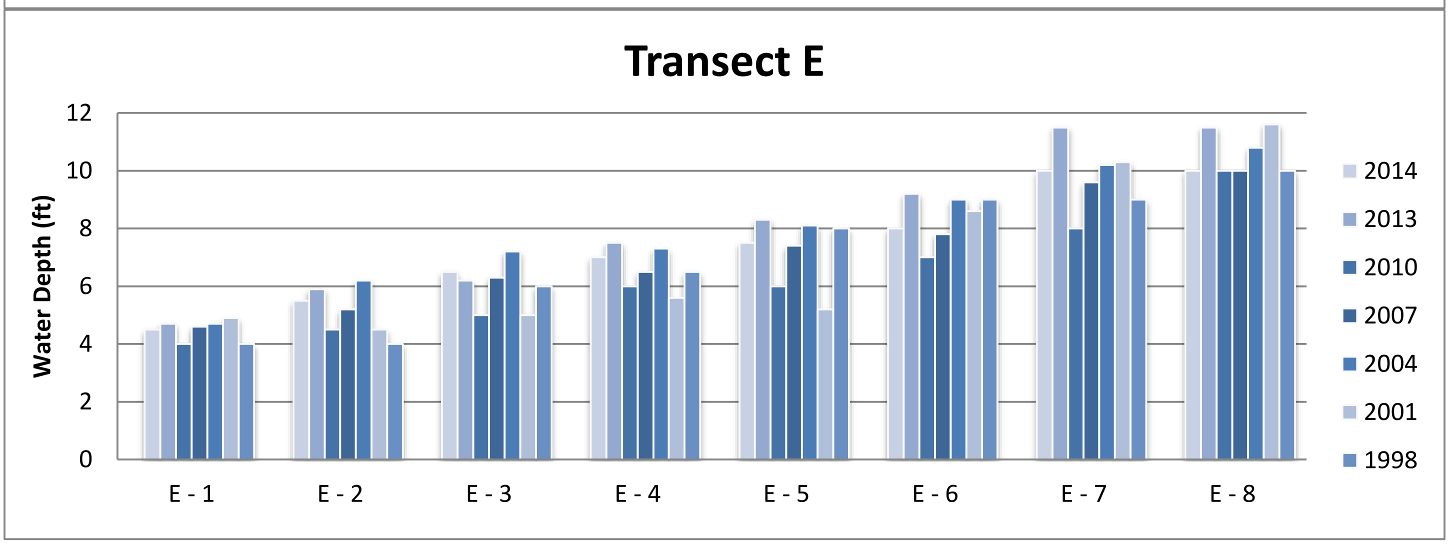


Figure 6. Bare Hill Pond Water Depth (continued)

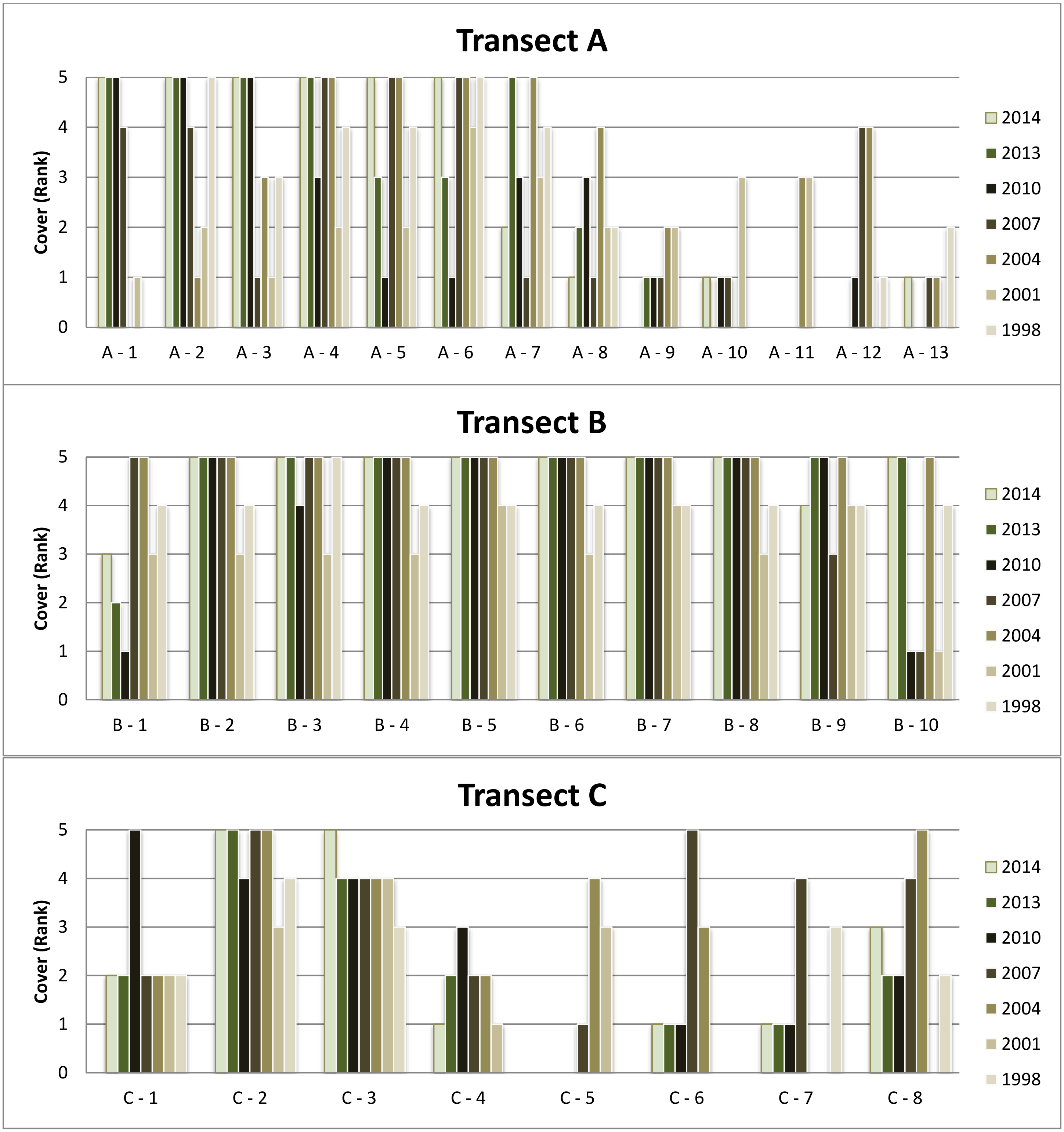
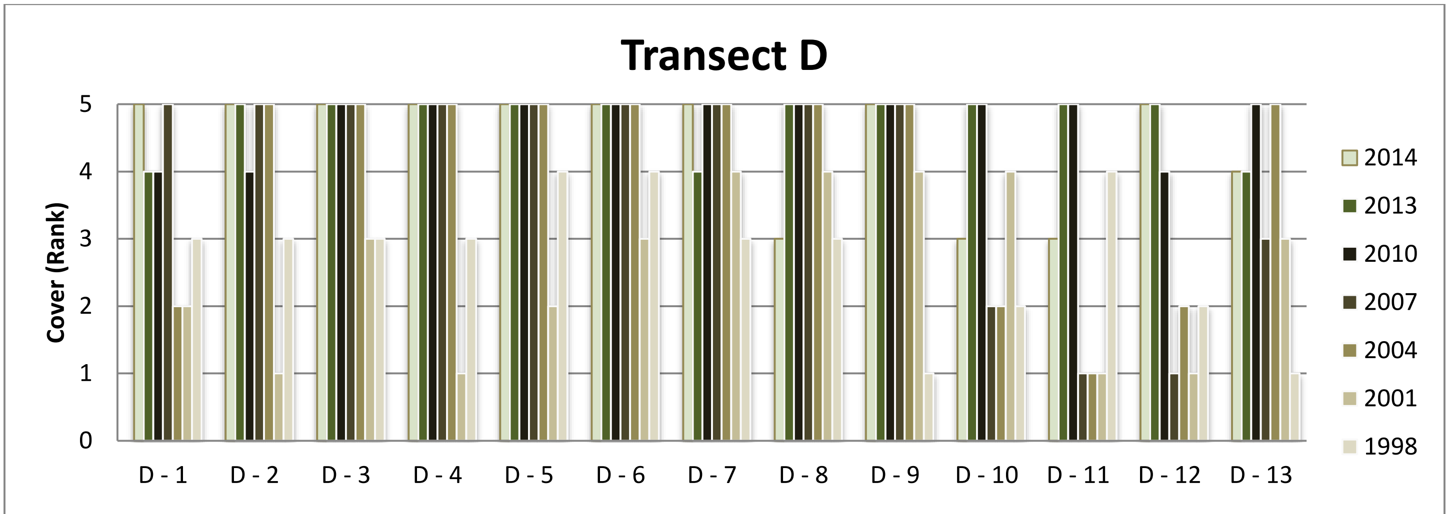


Figure 7. Bare Hill Pond Macrophyte Cover.



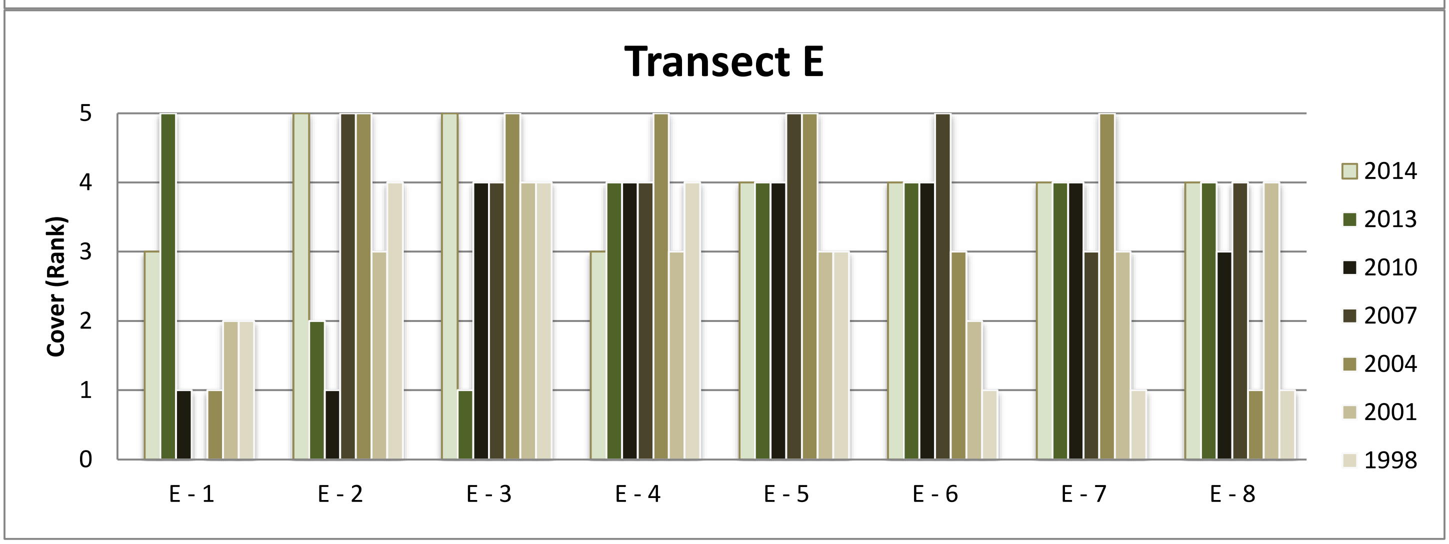


Figure 7. Bare Hill Pond Macrophyte Cover (continued).

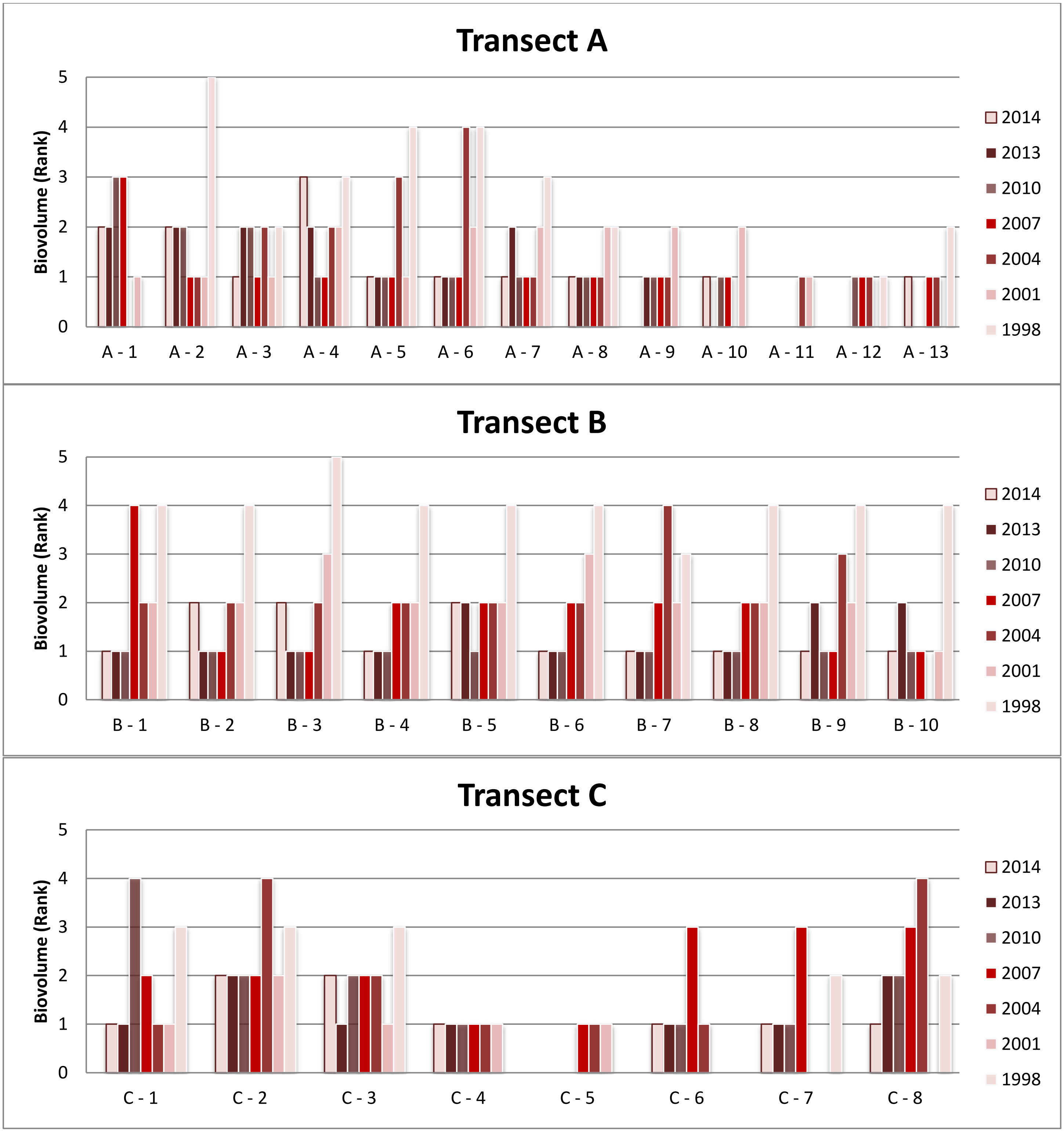


Figure 8. Bare Hill Pond Macrophyte Biovolume

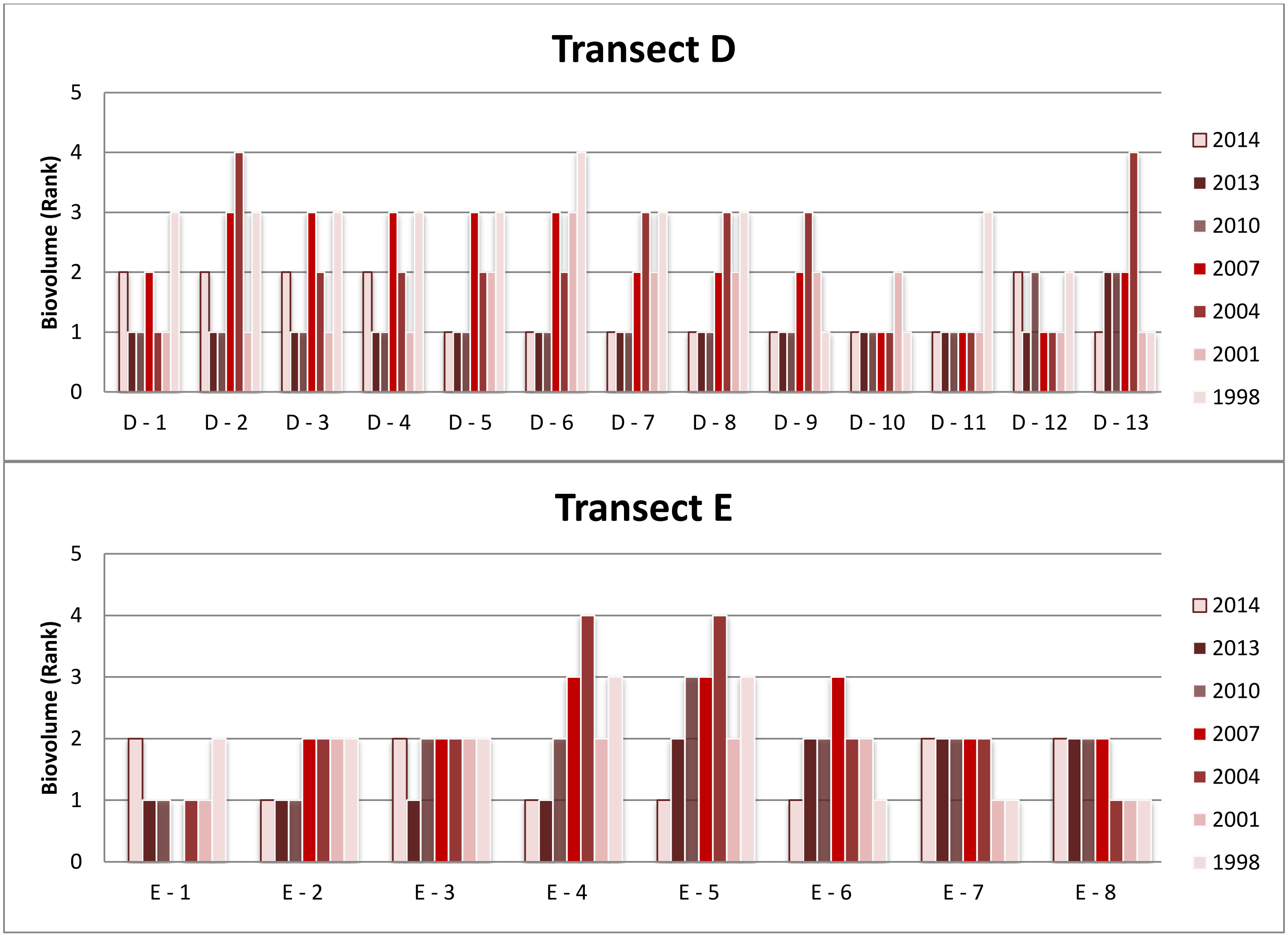


Figure 8 (continued). Bare Hill Pond Macrophyte Biovolume

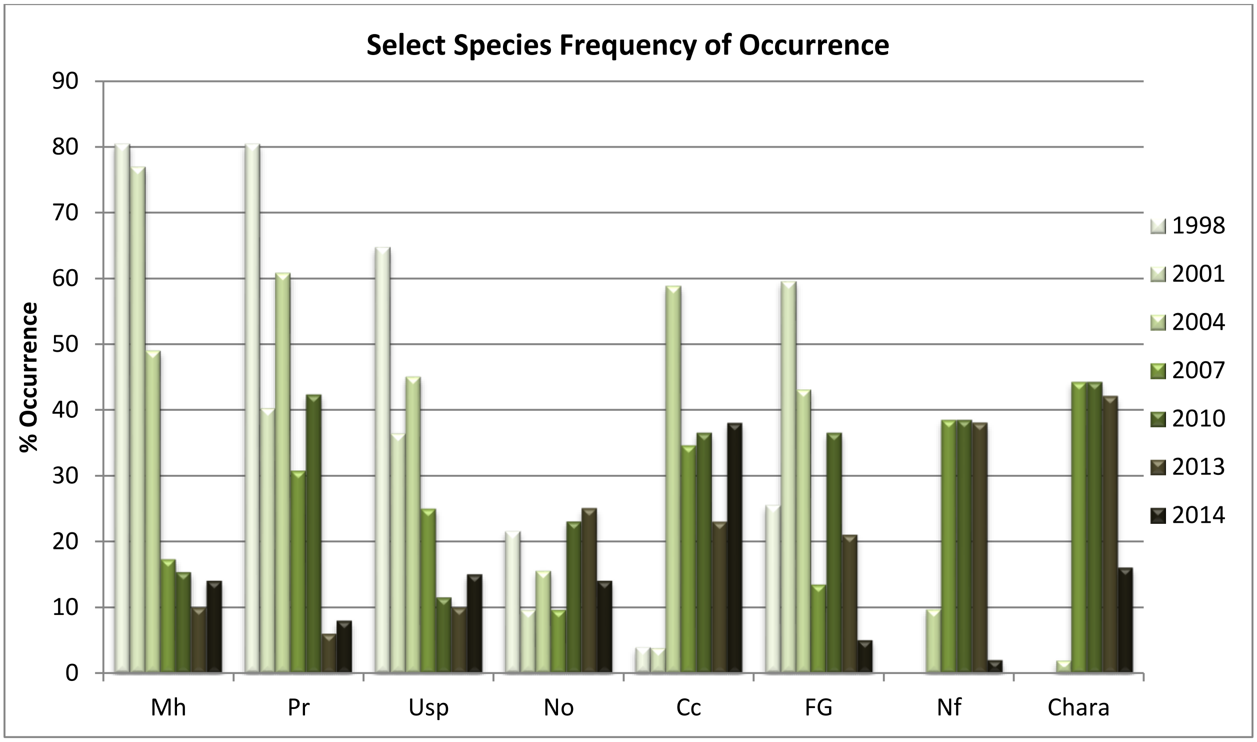


Figure 9. Select Plant Species Frequency of Occurrence