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September 4, 2013

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

Mr. Leicher,

This draft report provides a summary of the 2013 in-lake water quality sampling and the in-lake plant, shoreline iris and downstream wetland plant surveys. I am still awaiting laboratory results from the August 29th sampling. I will update this report when those data are received.

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,

A handwritten signature in black ink, appearing to read "Wendy C. Gendron". The signature is written in a cursive, flowing style.

Wendy C. Gendron, CLM
Aquatic Ecologist/President

In-Lake Sampling

Dry weather in-lake sampling was conducted on April 17, June 25 and August 29, 2013. In-situ water depth profiles 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.

The temperature and DO profiles suggest that the lake was completely mixed in April and was weakly thermally stratified in August. Concentrations of DO were consistent throughout the water column in April and suggest a well oxygenated environment. August DO concentrations rapidly drop at eight feet water depth. Concentrations were below the desirable level for fish (5-6 mg/L) at ten feet depth in August (4.4 mg/L). DO was extremely low below 12 feet. 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 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 1. Bare Hill Pond Water Depth Profiles 2013

BHP-1						
April 17, 2013				August 29, 2013		
Depth (ft)	Temp (C)	DO (mg/L)		Depth (ft)	Temp (C)	DO (mg/L)
0	14.08	11.62		0	23.17	8.42
2	13.95	11.97		2	23.2	8.29
4	13.59	12.19		4	23.19	8.27
				4.5	23.19	2.66
BHP-2						
April 17, 2013				August 29, 2013		
Depth (ft)	Temp (C)	DO (mg/L)		Depth (ft)	Temp (C)	DO (mg/L)
0	12.3	12.16		0	23.12	8.36
2	12.29	12.19		2	23.18	8.35
4	12.18	12.21		4	23.19	8.34
6	12.09	12.18		6	23.19	8.32
8	11.95	12.19		8	23.16	8.15
10	11.26	12.21		10	22.67	4.43
12	11.13	11.93		12	22.19	1.74
14	10.7	11.76		14	20.9	0.32
16	10.46	11.51		16	18.07	0.2
18	10.35	11.33		18	18.04	0.18
20	10.22	11.08		20	13.46	0.17
22	10.08	10.87		22	11.94	0.15
				23	11.74	0.13

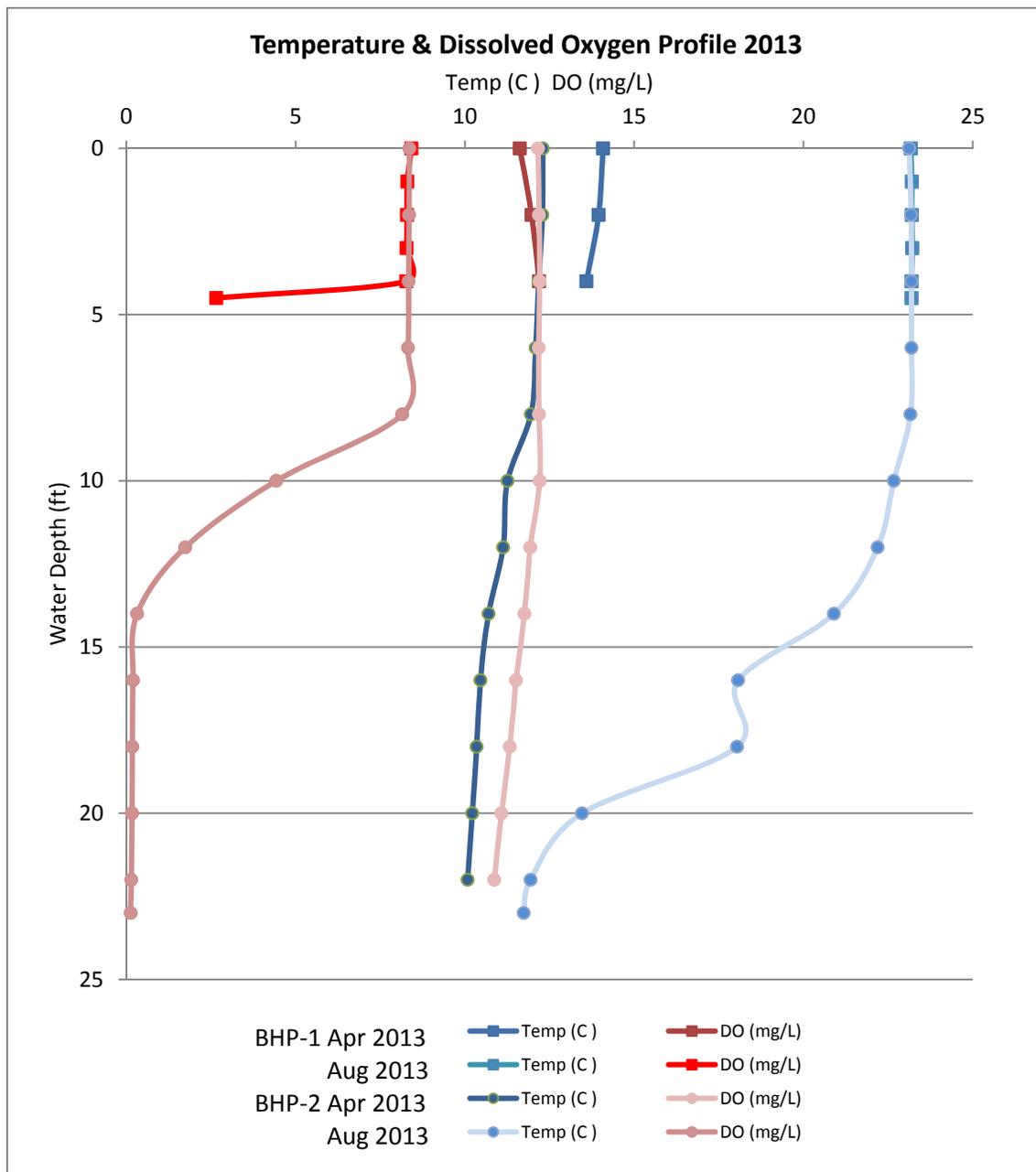


Figure 1. 2013 Temperature and Dissolved Oxygen Profiles.

Table 2 provides phosphorus and other water quality variables measured during the surveys. Overall, 2013 phosphorus concentrations are comparable to previous years and are generally lower than samples collected prior to 2009. April 2013 surface total phosphorus was twice as high as June. However, dissolved concentrations in this sample were below detection and suggest that the phosphorus available for immediate algal uptake is low. Figure 2 shows the in-lake measured phosphorus at the deep location (BHP-2) for both surface and bottom samples. Secchi disk transparency in 2013 was lower than 2010, 2005 and 2004 but comparable to 2007 (Figure 3).

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			
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	0.020	<5	
BHP-1S	6/25/2013	18:45	0.013	0.014	<5	4.5 (bottom)
BHP-2S	8/29/2013	17:50	TBD	TBD	TBD	6.5
BHP-2B	8/29/2013	18:10	TBD	TBD	TBD	
BHP-1S	8/29/2013	18:25	TBD	TBD	TBD	4.5 (bottom)

NA = not available, problem with laboratory analysis

"Bottom" indicates the Secchi disk reached the pond bottom

TBD = to be determined; awaiting laboratory results

2S = Deep hole surface sample; 2B = Deep hole bottom sample; 1S = shallow surface sample

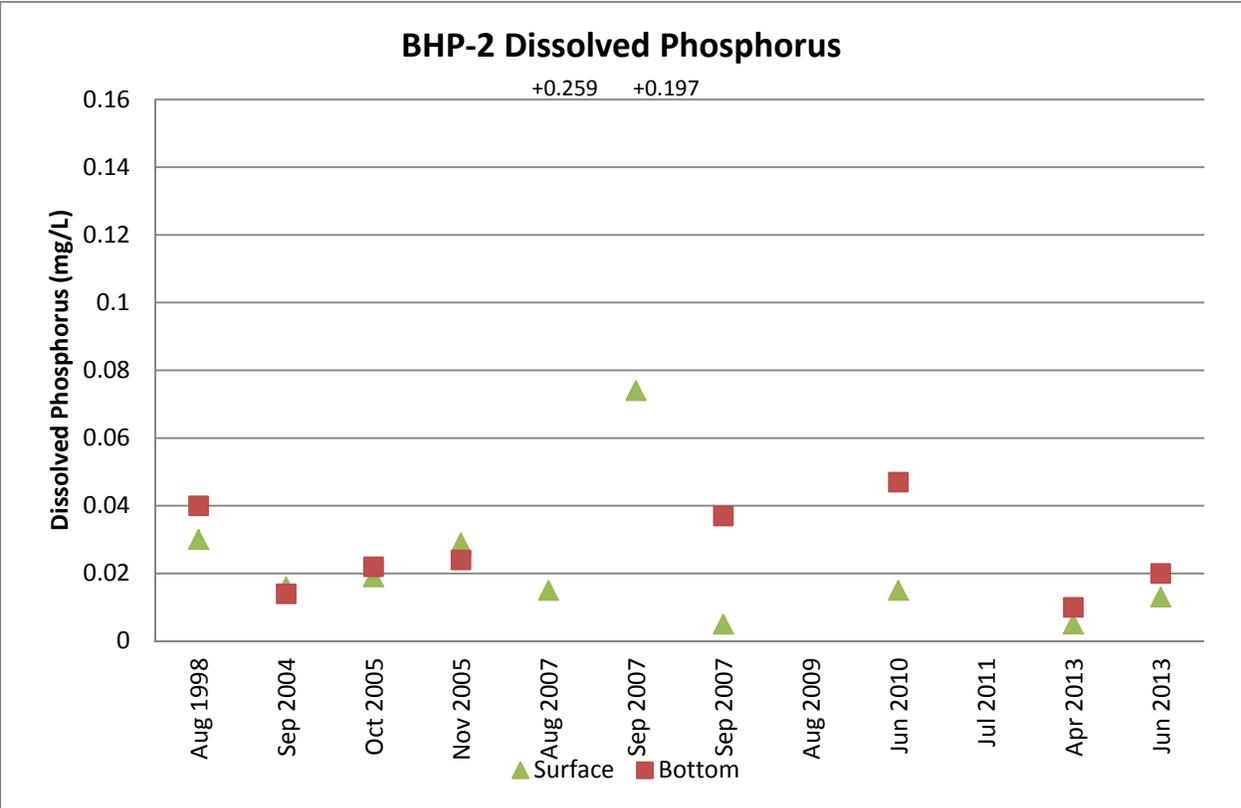
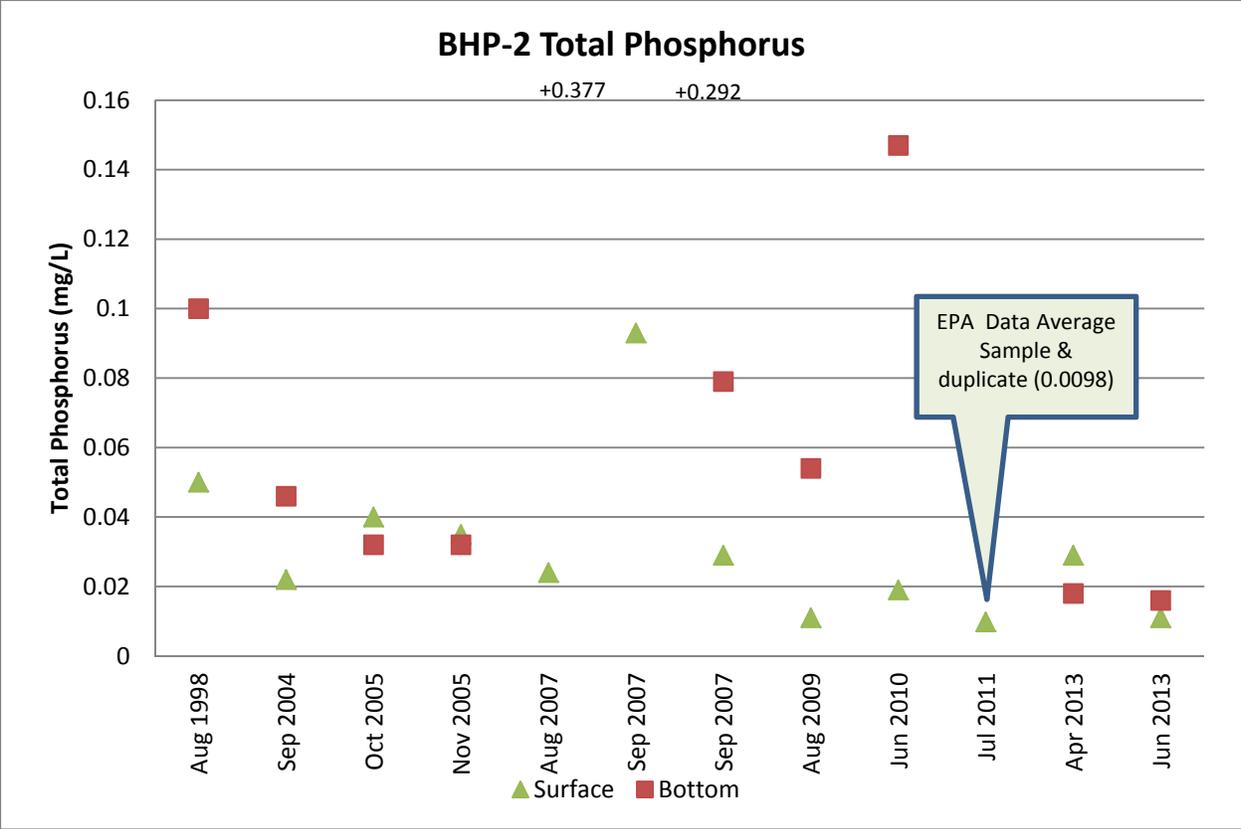


Figure 2. BHP-2 Total and Dissolved Phosphorus Concentrations

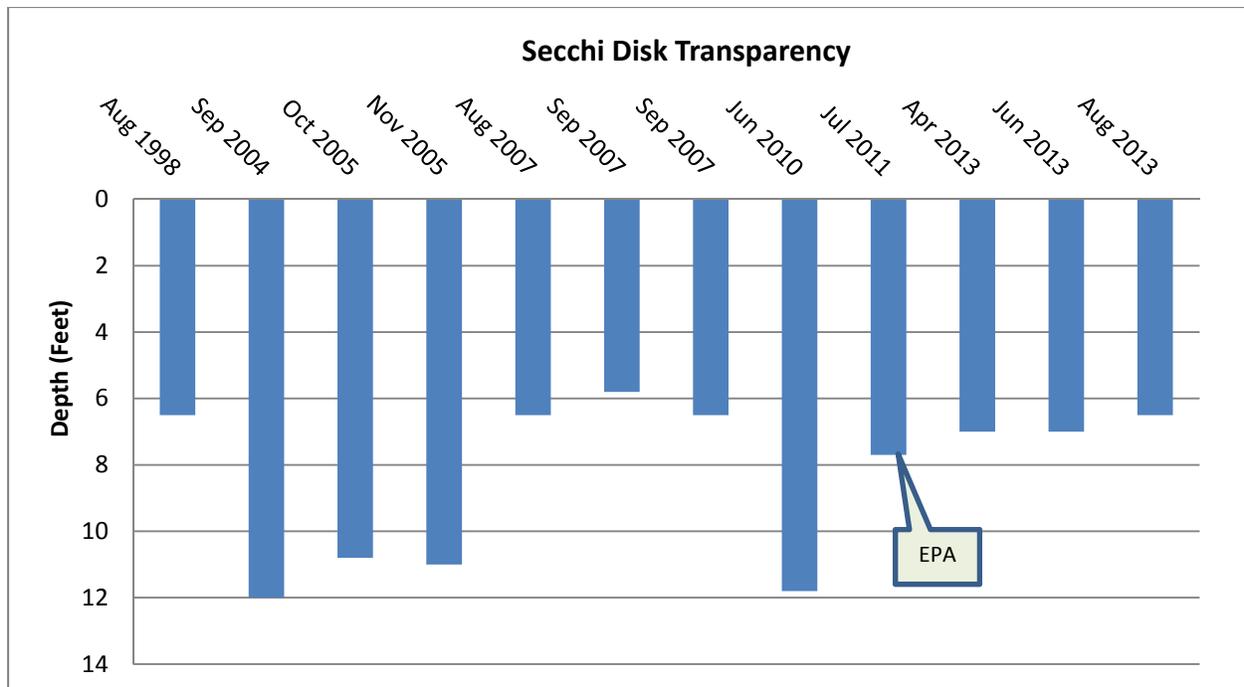


Figure 3. Bare Hill Pond (BHP-2) Secchi Disk Transparency

In-lake Plant Survey

We conducted a plant survey on August 24, 2013. We used the same methods employed during the previous surveys conducted in 1998, 2001, 2004, 2007 and 2010. 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.

2013 data are comparable to 2010, although no statistical analysis was performed. The most obvious difference occurred at six locations which showed an increase in plant coverage within the drawdown zone (<5 feet water depth). Points A-4 through A-7, B-10 and E-1 showed an increase in cover by more than one rank (i.e, increase by 2 or more categories). Biovolume at these points showed either no change (A-5, A-6 and E-1) or an increase by one category (A-4, A-7 and B-10). The three points that showed an increase in 2013 were dominated by bladderwort (*Utricularia sp.*), macro alga chara and *Vallisneria americana*. *Vallisneria*, commonly referred to as wild celery or tape grass, is a newly encountered species within the survey transect. This native plant was observed in the pond on prior visits but has not been observed at the survey points in the past. Two survey points showed a reduction (by three

categories) in cover from 2010 data (C-1 and E-3). There were no species shifts between years at these locations. Point C-1 was still dominated by the invasive fanwort (*Cabomba caroliniana*) and E-3 was dominated by a macro alga. Chara, the macro alga, was identified as *Nitella*, also a macro alga, in previous surveys. Chara and Nitella are very similar in appearance. Chara can retain calcium carbonate in the cells giving it a crusty appearance. This alga is commonly called muskgrass because it gives off an odor when crushed. There is little ecological difference between the two algae, both are eaten by waterfowl and both thrive and may become a nuisance under high nutrient conditions.

Figures 4 and 5 provide a transect point summary for plant cover and biovolume for the 2013. Figures 6-8 provide a graphical representation of survey water depth, plant cover and biovolume for all survey years.

Plant composition in 2013 was also similar to 2010, with muskgrass, water nymph, filamentous algae and fanwort encountered most frequently (Figure 9). The only obvious difference was less Robbins pondweed in 2013.

Table 3 (continued). Bare Hill Pond Macrophyte Survey Data 2010

Point	Depth (ft)	Cover	Biomass	Species Relative Composition (%)														
				Mh	Cc	Prob	Cd	No	FG	Chara	Nsp	Nv	Usp	Bs	Pspir	Spar	Va	Psp
C-6	12.5	1	1		100													
C-7	12.4	1	1		100													
C-8	7.2	2	2	10	40				10								40	
D-1	4.5	4	1					10		80	10							
D-2	4.9	5	1					20		70				10				
D-3	4.5	5	1							100								
D-4	4.5	5	1							70		20		10				
D-5	4.5	5	1		10					60	10			20				
D-6	4.7	5	1							50	30			20				
D-7	4.9	4	1					10		60	30							
D-8	5.1	5	1							40	60							
D-9	5.2	5	1							20	80							
D-10	5.9	5	1								100							
D-11	5.9	5	1								90				10			
D-12	6.1	5	1		10	70												20
D-13	9.6	4	2		100													
E-1	4.7	5	1							100								
E-2	5.9	2	1								90				10			
E-3	6.2	1	1								100							
E-4	7.5	4	1					70	10		20							
E-5	8.3	4	2	30	60				10									
E-6	9.2	4	2	70	20				10									
E-7	11.5	4	2	10	90													
E-8	>11.5	4	2	10	90													
				Mh	Cc	Prob	Cd	No	FG	Chara	Nsp	Nv	Usp	Bs	Pfine	Spar	Va	Pamp
			Frequency of Occurrence	10	23	6	15	25	21	42	38	10	10	12	4	0	17	2

Table 3 (continued). Bare Hill Pond Macrophyte Survey Data 2010

Legend:

FG – filamentous algae

Bs – *Brasenia schreberi* (watershield)

Cc – *Cabomba caroliniana* (fanwort)

Cd - *Ceratophyllum demersum* (coontail)

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

Chara – *Chara* (muskgrass)

Nsp - *Najas* sp. (waterynymph)

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

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

Pspir - *Potamogeton spirillus* (spiral pondweed)

Psp – *Potamogeton* spp. (pondweeds)

Pro – *Potamogeton robbinsii* (Robbins pondweed)

Spa – *Sparganium* sp. (*bur-reed*)

Utr – *Utricularia* spp. (bladderwort)

Va - *Vallisneria Americana* (tapegrass)

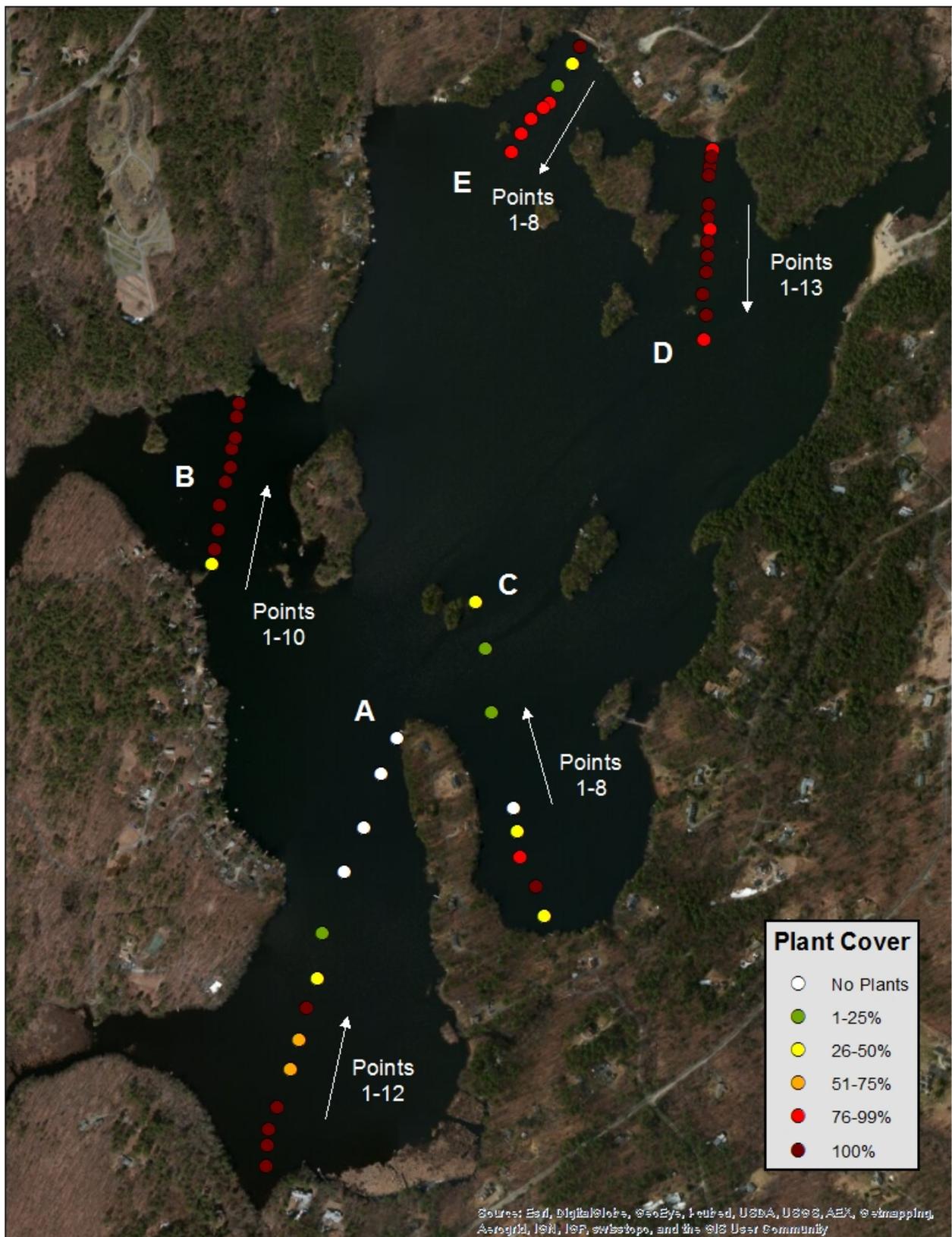


Figure 4. Bare Hill Pond 2013 Macrophyte Coverage.

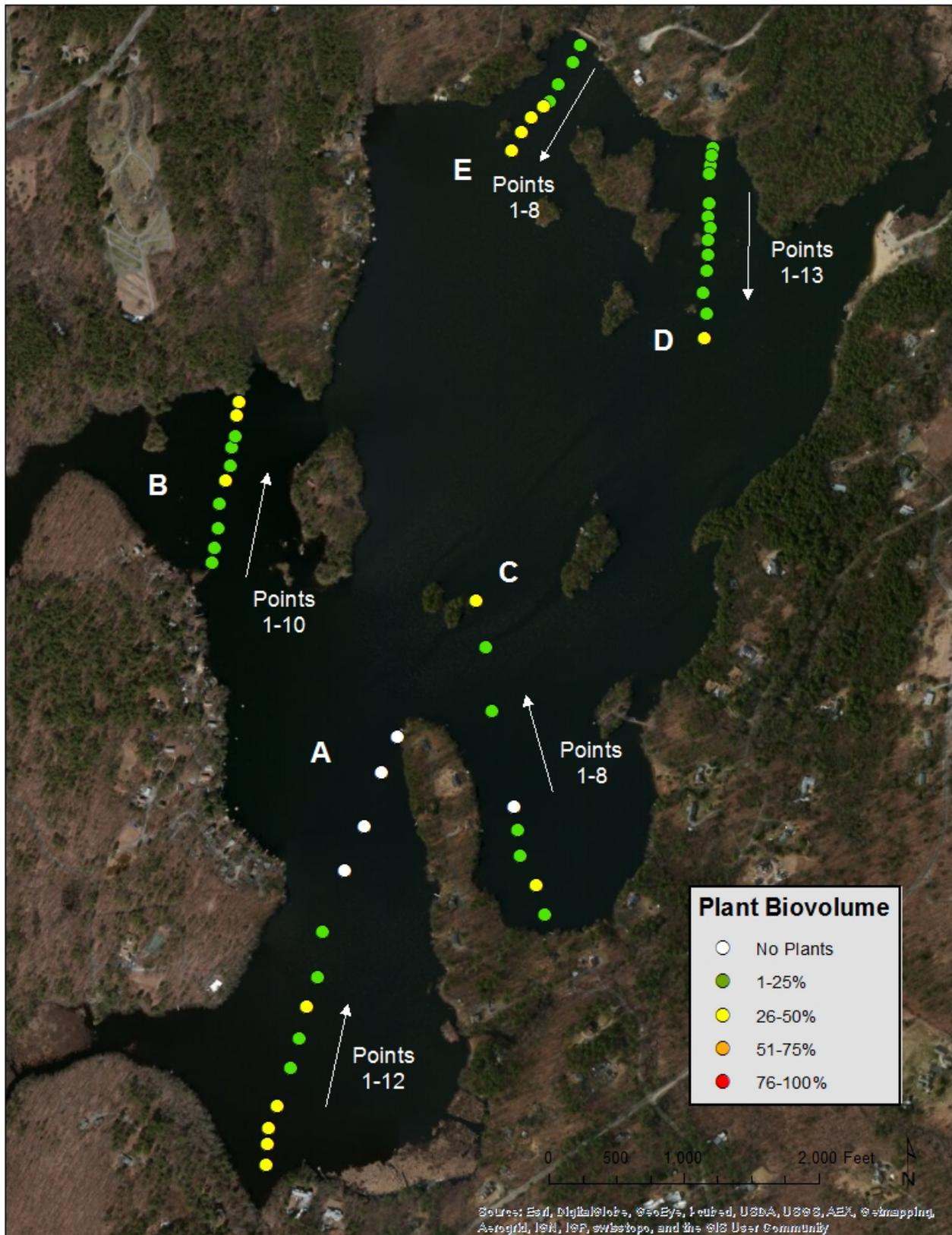


Figure 5. Bare Hill Pond 2013 Macrophyte Biovolume.

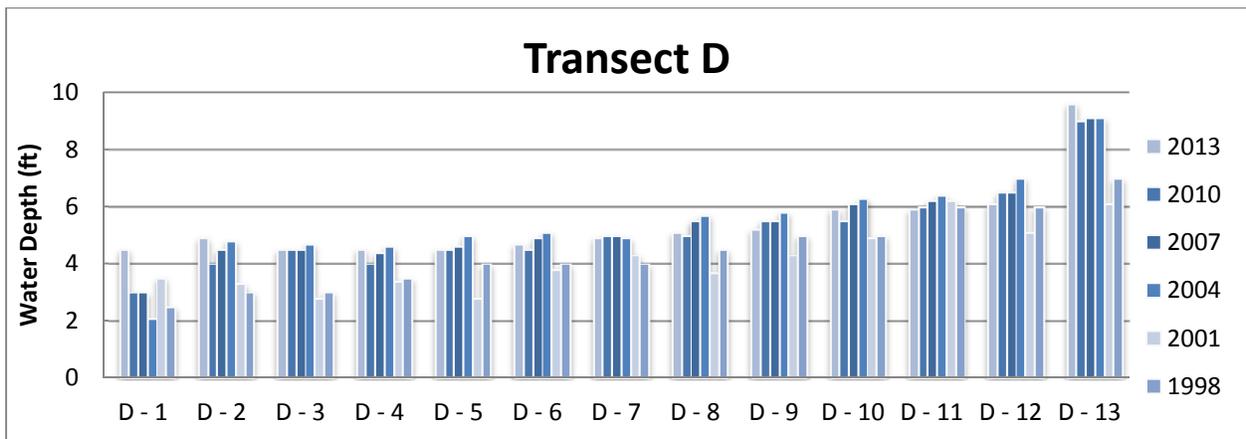
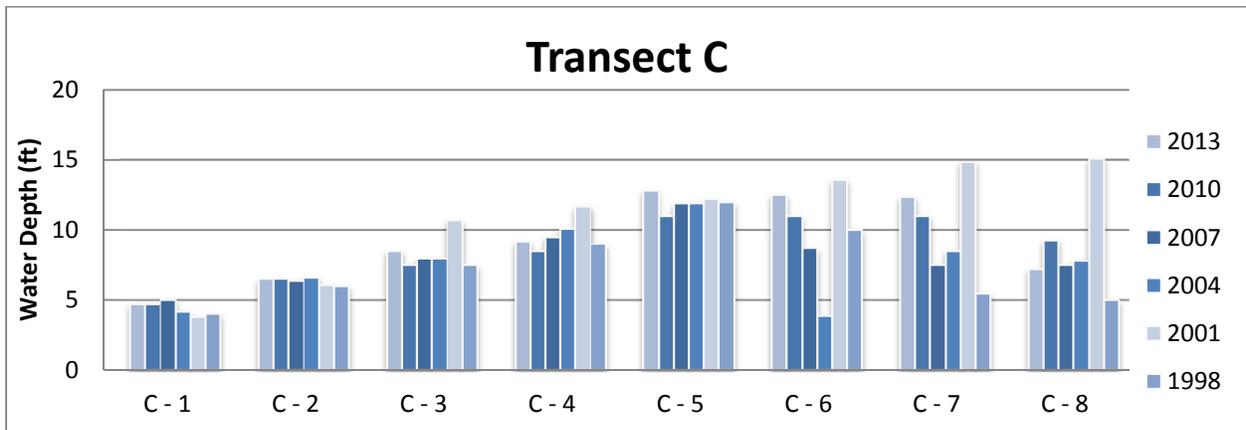
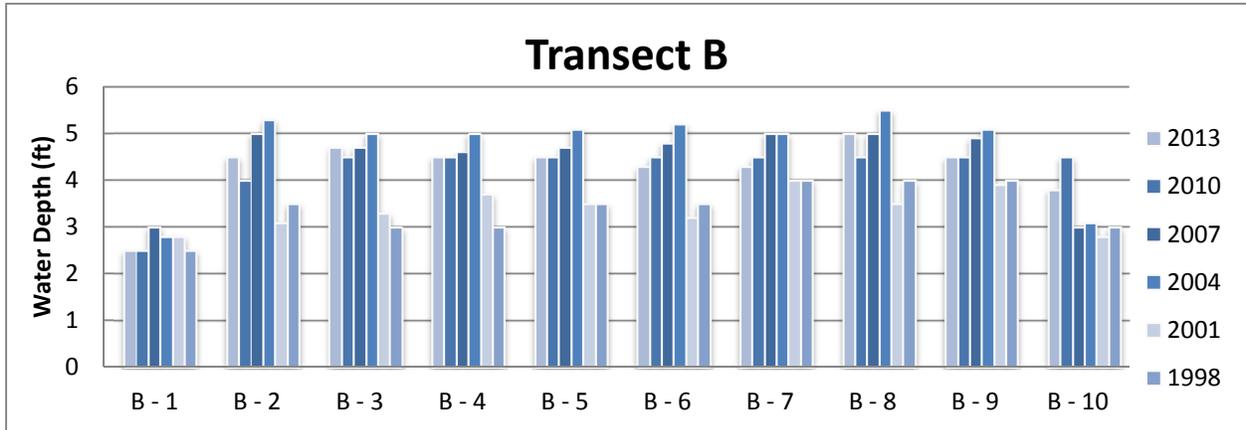
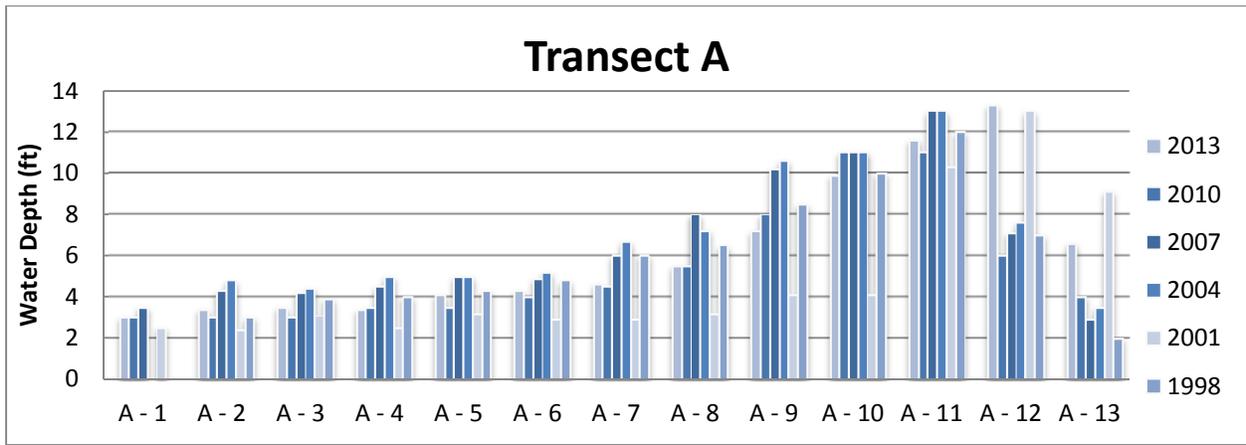


Figure 6. Bare Hill Pond Water Depth

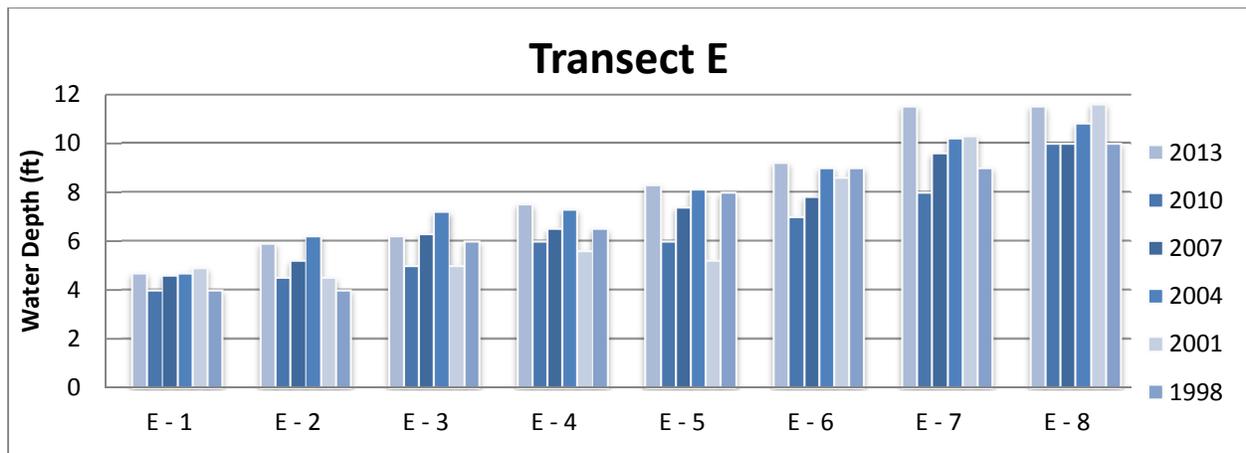


Figure 6 (continued). Bare Hill Pond Water Depth

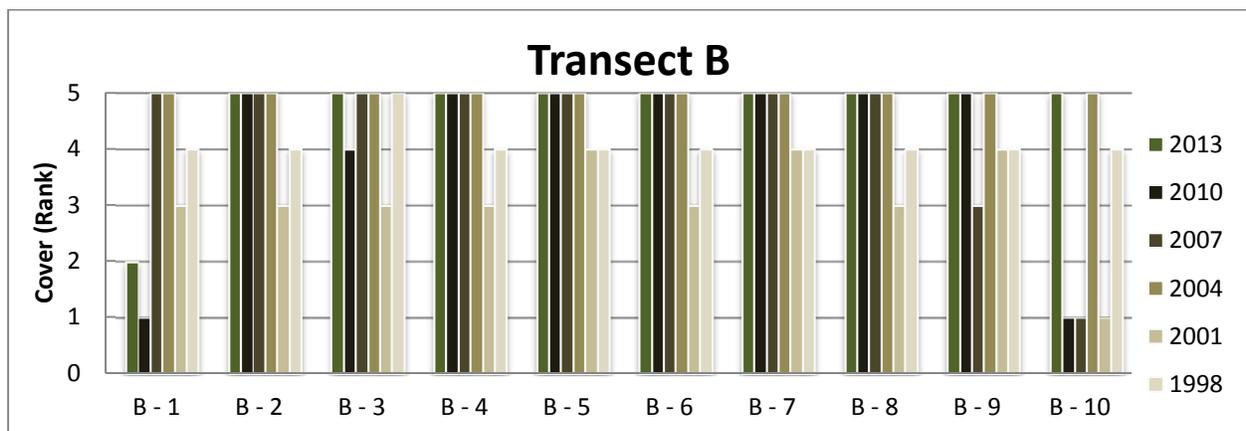
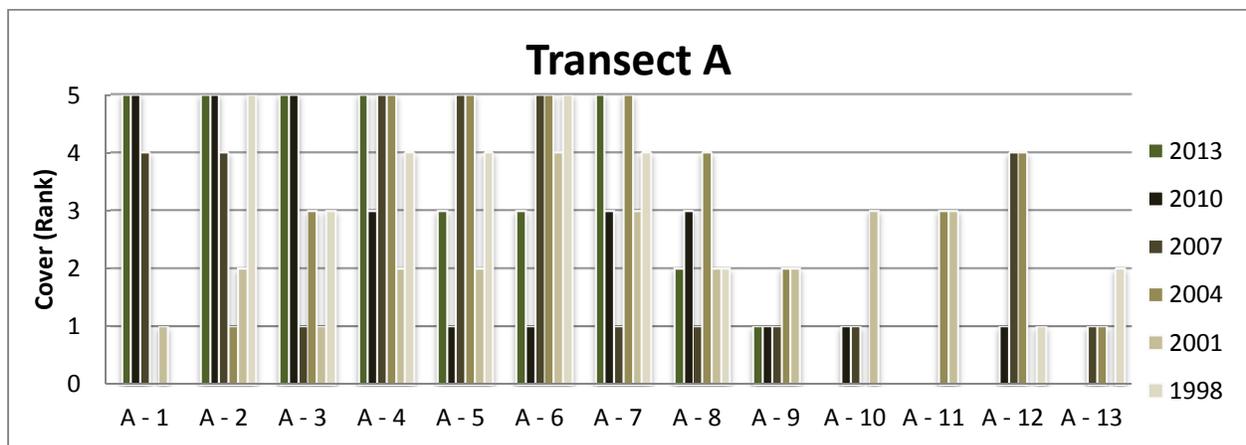


Figure 7. Bare Hill Pond Macrophyte Cover

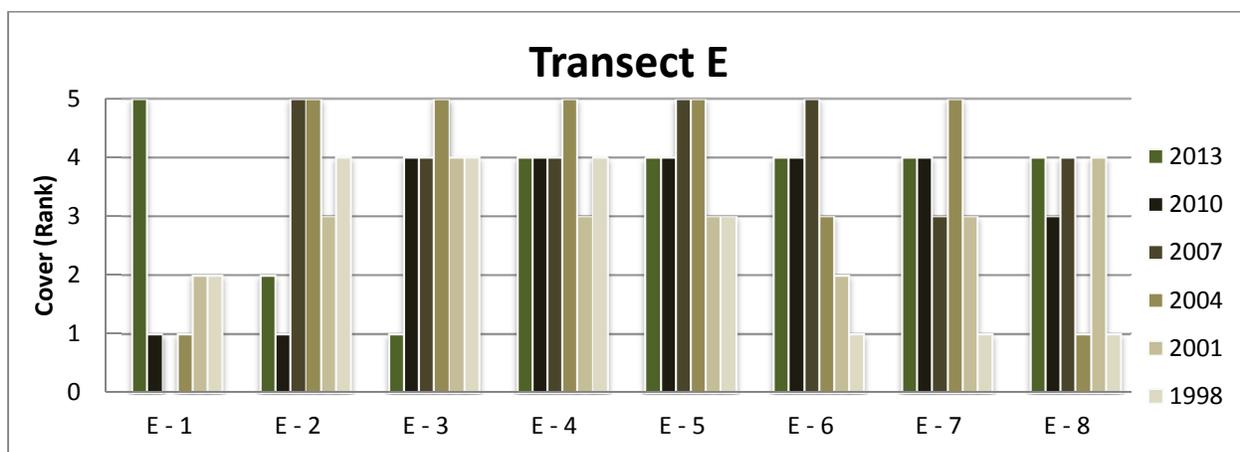
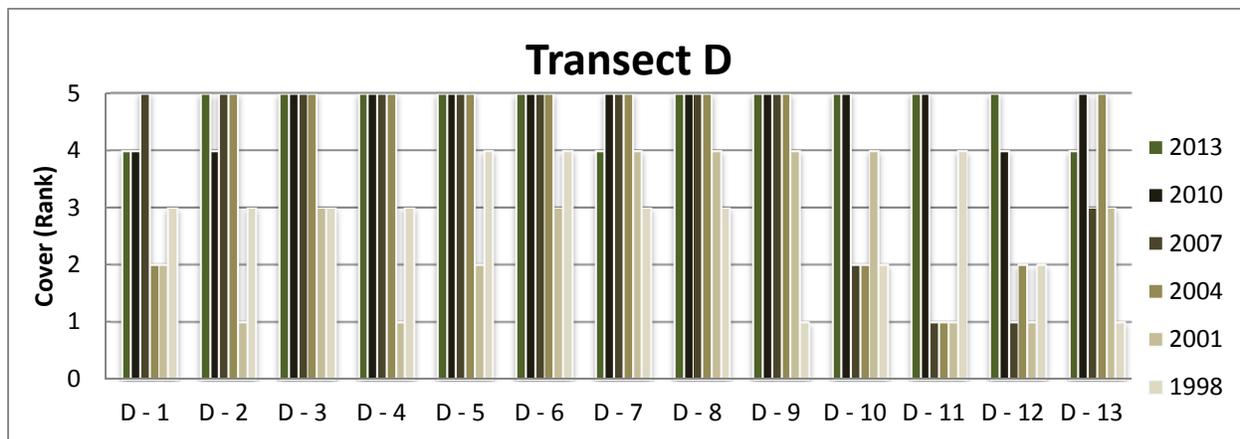
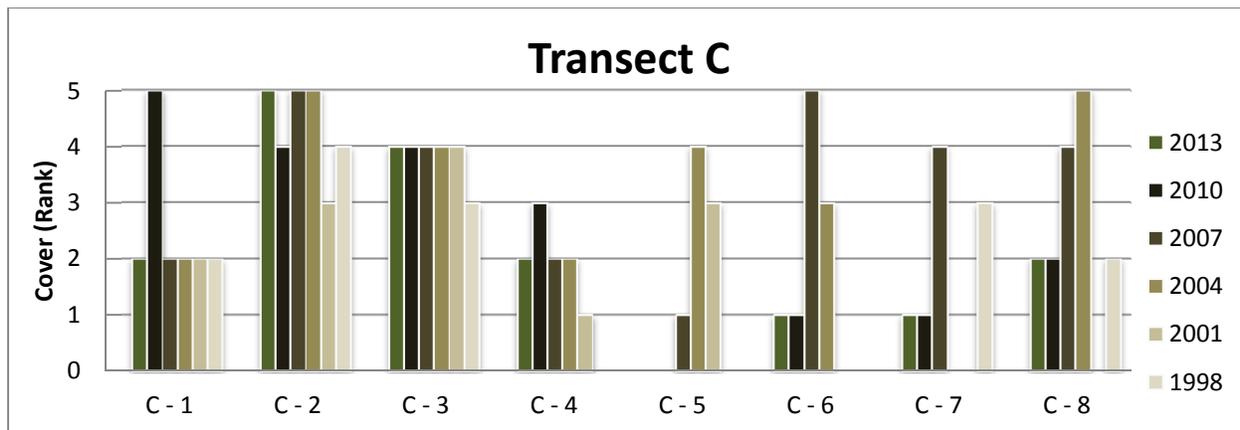


Figure 7 (continued). Bare Hill Pond Macrophyte Cover

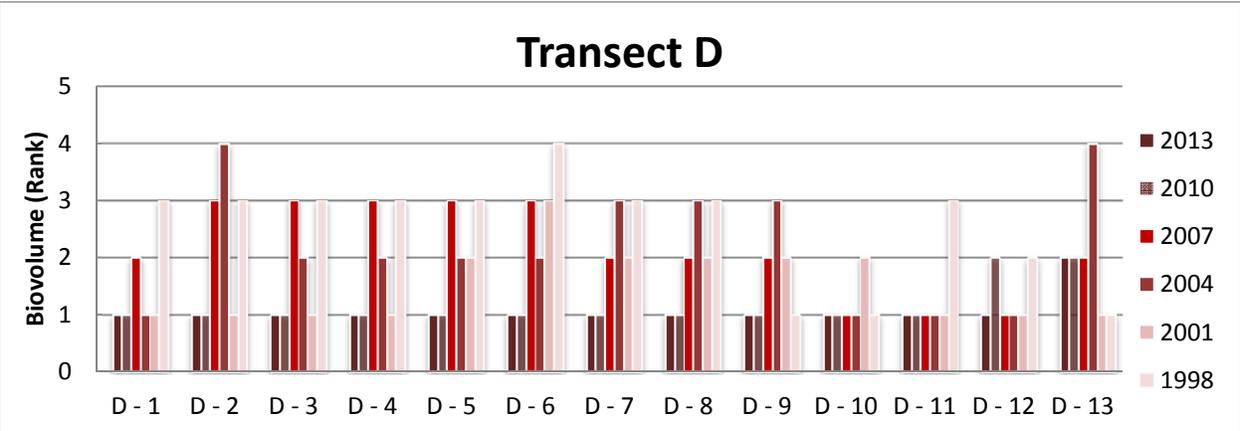
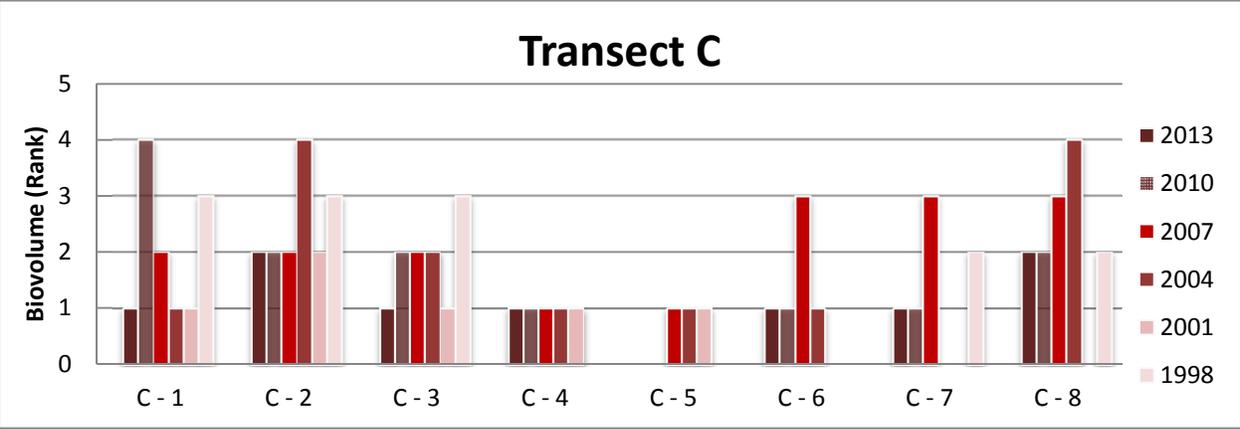
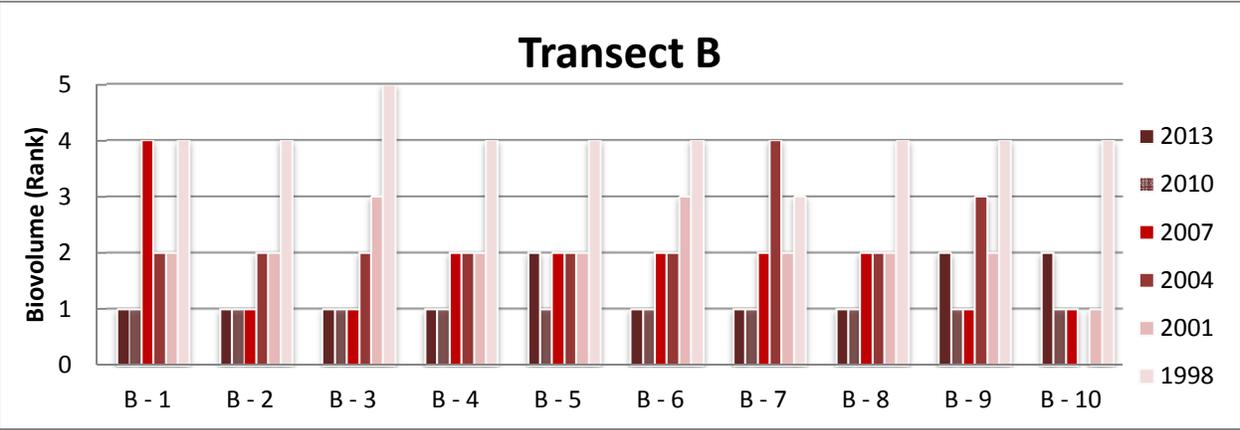
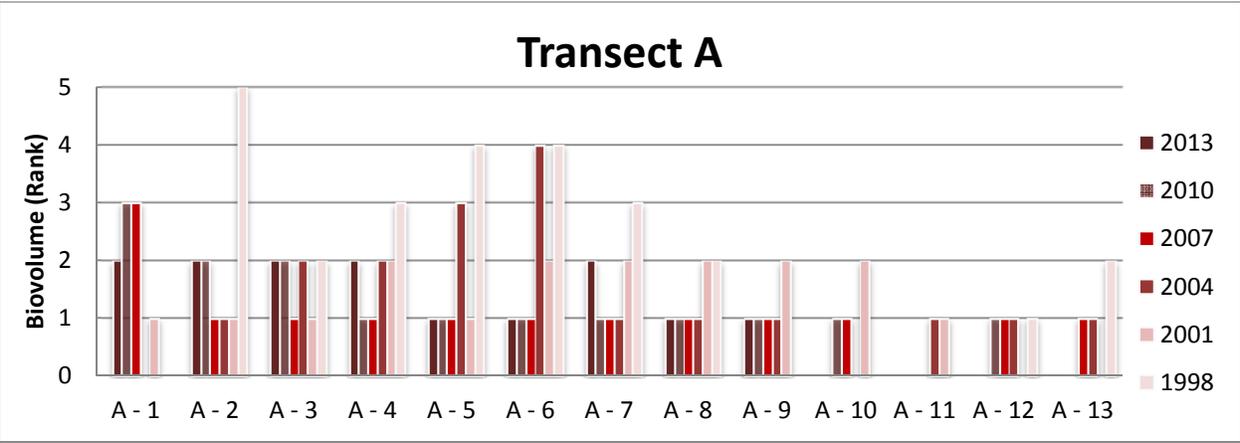


Figure 8. Bare Hill Pond Macrophyte Biovolume

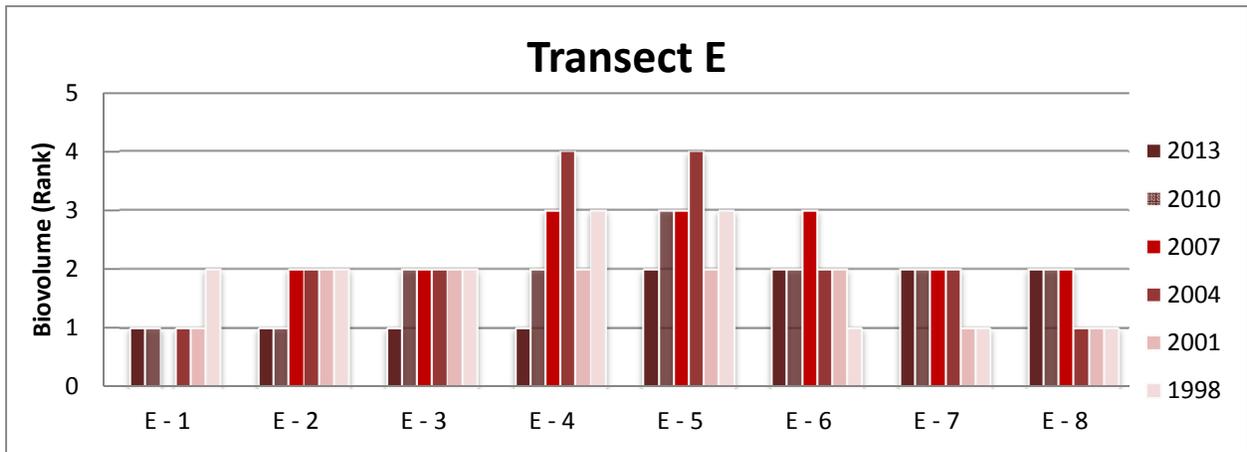


Figure 8 (continued). Bare Hill Pond Macrophyte Biovolume

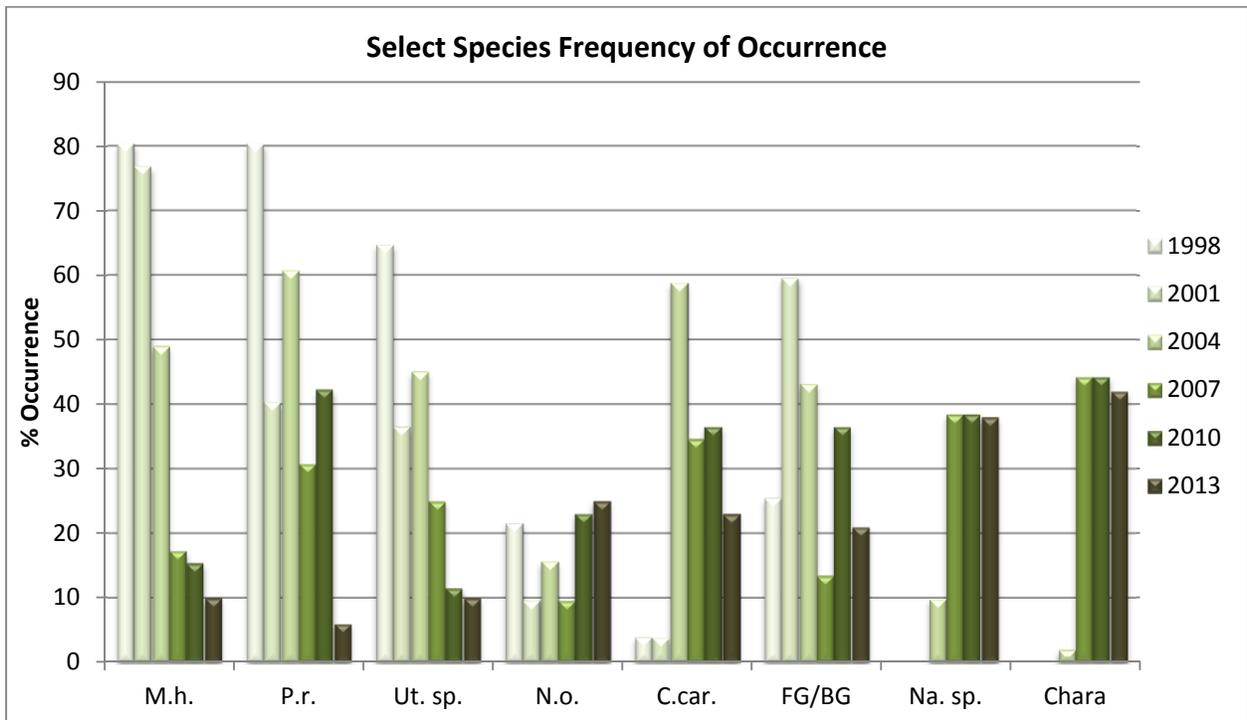


Figure 9. Select Plant Species Frequency of Occurrence

Shoreline Iris Survey

In addition to the plant survey described above, we mapped the lateral extent of yellow iris (*Iris pseudacorus*) along the lake shoreline. The purpose of the survey was to document presence/absence along the shoreline. These data can be compared to future surveys to evaluate the relative spread, if any, over time. Yellow iris is an invasive species that can outcompete native shoreline plants, reducing diversity and habitat value.

Iris was present predominately along the western and southern shoreline (Figure 10). Iris also was observed in front of the cattail stands on the northern end of the lake. Iris was generally limited to water depths of less than three feet.

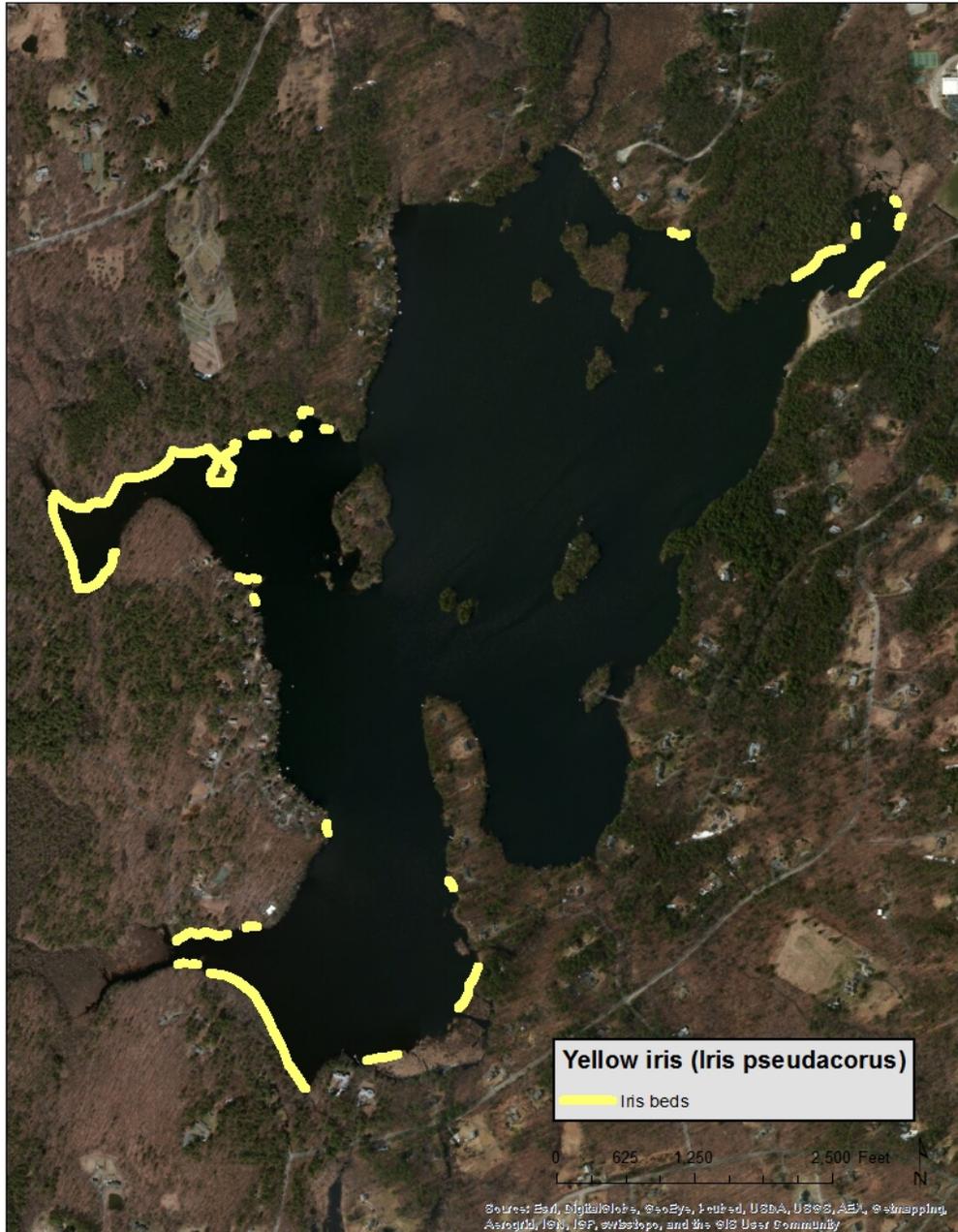


Figure 10. Bare Hill Pond 2013 Iris Bed Locations

Northern Wetland Observations

Wetland plants downstream of the dam were documented on August 24, 2013. A wetland scientist recorded plants using the same methodology used by ENSR in 2001 (MADEP Handbook: *Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetlands Protection Act*). The wetland scientist attempted to relocate the original plots established in 2001, however the plots and wooden stakes were not found during the 2013 visit. It is believed the general area of the original plots were located however, based on identifiable descriptions, photographs and notes provided during the 2001 survey.

Generally, the two plots had higher diversity than reported in 2001. The surveys conducted in 2001 were performed in November which may have limited the ability to detect all herbaceous plants that may have been present earlier in the year. Of concern, however, is the presence of cattails (*Typha latifolia*) in both 2013 plots. Cattails were not encountered during the 2001 survey at either of the plots north of the dam. The recorded presence of cattails by the wetland scientist is consistent with anecdotal reports by residents that cattail are becoming more abundant. Cattails, although native, can form a dense monoculture reducing vegetation diversity and wildlife habitat value. It is unclear if the increase in abundance of this species is related to the drawdown as it spreads rapidly even in areas with no artificial water level manipulation. It has become such a nuisance that many wetland mitigation manuals are no longer recommending planting this species in created or restored wetlands. Data sheets for both the 2013 and 2001 are provided below.

2013 FIELD REPORT: VEGETATION SAMPLING SHEET

Site Name: Bare Hill Pond
 Location: Harvard, Massachusetts
 Transect No. One
 Community Type: Scrub-Shrub Wetland
 Soil Type: Muck and sands and gravel

Weather: Overcast, 75°F
 Date: August 29, 2013
 Plot Size: 30-ft radius, Plot 1
 Observers: Julia Stearns
 Photographs: Yes (Log Photos 1 and 2)

General Description of the Vegetation Sample Station: Plot 1

Vegetation sample Plot 1 is located in the scrub-shrub wetland community approximately 100 ft. north of the dam at the northern end of the pond. Access to the sample plot is from the service road to the dam off Willow Road. Efforts were made to relocate the original plot established in 2001, however the plot and wooden stake were not found during the 2013 visit. It is believed the general area of the original Plot 1 was located based on identifiable descriptions and data collected during the 2001 survey. The general location of Plot 1 was located based on identifiable descriptions and data collected during the 2001 survey. The newly established Plot 1 was marked in the field with pink surveyors ribbon and staked with an orange colored rebar. A fringe of flood plain forest occurs along the eastern edge of the sample plot. A small seasonal stream enters the plot from the east and flows west and a windfall is situated along the western portion of the plot. The estimated plant cover in Plot 1 is over 80 percent. The sample plot was photographed during the survey, see Photos 1 and 2 of the attached Photographic Log.

Species List with Estimated Cover and Abundance Rankings for Dominants

Cover Estimates: 1 – 5%; 6-15%; 16—25%; 26-50%; 51-75%; 76-95%

Frequency of Occurrence Scale: 5 = Abundant; 4 = Frequent; 3 = Occasional; 2 = Infrequent; and 1 = Rare

	Species Name	Abundance	Estimated Cover
Trees:	Red Maple (<i>Acer rubrum</i>)	3	26-50%
	White Pine (<i>Pinus strobes</i>)	2	6-15%
	White Oak (<i>Quercus alba</i>)	1	1-5%
Shrubs:	Sweet Pepperbush (<i>Clethra alnifolia</i>)	4	26-50%
	Arrowwood (<i>Viburnum dentatum</i>)	2	6-15%
	Black Chokeberry (<i>Aronia melanocarpa</i>)	3	26-50%
	Multiflora Rose (<i>Rosa multiflora</i>)	2	6-15%
	Swamp Rose (<i>Rosa palustris</i>)	1	1-5%
Herbaceous:	Cat-tail (<i>Typha latifolia</i>)	5	16-25%
	Wool-grass (<i>Scirpus cyperinus</i>)	3	16-25%
	Purple loosestrife (<i>Lythrum salicaria</i>)	3	6-15%
	Royal fern (<i>Osmunda regalis</i>)	2	6-15%
	False nettle (<i>Boehmeria cylindrica</i>)	2	6-15%
	Slender-leaved goldenrod (<i>Solidago tenuifolia</i>)	2	6-15%
	Sensitive fern (<i>Onoclea sensibilis</i>)	3	6-15%
	Jewelweed (<i>Impatiens capensis</i>)	3	6-15%
	Upright Sedge (<i>Carex stricta</i>)	3	6-15%
	Arrow Arrum (<i>Peltandra virginica</i>)	1	1-5%
	Water Parsnip (<i>Sium suave</i>)	2	1-5%

Soil consists of approximately 3-4 inches of black muck over sand and gravel. Soil was saturated with free standing water recorded within 1 inch of the soil surface.



2001 FIELD REPORT: VEGETATION SAMPLING SHEET

Site Name: Bare Hill Pond
Location: Harvard, Massachusetts
Transect No. One
Community Type: Scrub-Shrub Wetland
Soil Type: Muck and sands and gravel
Weather: Cloudy, Lt. Wind, 55-60 ° F
Date: November 14, 2001
Plot Size: 30-ft. radius, Plot 1
Observers: Don Schall
Photographs: Yes (Figure 1)

General Description of the Vegetation Sample Station:

Vegetation sample plot is located in the scrub-shrub wetland community approximately 100 ft. north of the dam at the northern end of the pond. Access to the sample plot is from the service road to the dam off Willow Road. A narrow fringe of flood plain forest occurs along the edge of the sample plot. The estimated plant cover in the sample plot is over 60 percent. The sample plot was photographed during the survey performed on November 14, 2001.

Species List with Estimated Cover and Abundance Rankings for Dominants
Cover Estimates: 1 - 5%; 6-15%; 16-25%; 25-50% 51-75%; 76-95%; and 96-100%
Frequency of Occurrence Scale: 5 = Abundant; 4 = Frequent; 3 = Occasional; 2 = Infrequent; and 1 = Rare

	Species Name	Abundance	Estimated Cover
Trees:	Red Maple (<i>Acer rubrum</i>)	5	16-25%
	White Pine (<i>Pinus strobus</i>)	4	6-15%
	Black Gum (<i>Nyssa sylvatica</i>)	3	6-15%
Saplings:	Red Maple (<i>Acer rubrum</i>)	4	Included in Tree Cover
Shrubs:	Sweet Pepperbush (<i>Clethra alnifolia</i>)	5	51-75%
	HB Blueberry (<i>Vaccinium corymbosum</i>)	4	6-15%
	Arrowwood (<i>Viburnum dentatum</i>)	4	6-15%
	Swamp Azalea (<i>Rhododendron viscosum</i>)	3	6-15%
	Black Chokeberry (<i>Aronia melanocarpa</i>)	3	1-5%
Vines:	Wild Grape (<i>Vitis sp.</i>)	3	1-5%
Herbaceous:			
	Wool-grass (<i>Scirpus cyperinus</i>)	4	6-15%
	Soft Rush (<i>Juncus effusus</i>)	4	6-15%
	Cinnamon Fern (<i>Osmunda cinnamomea</i>)	4	6-15%

Sample plot is subject to spring floods and backwater flooding due to a beaver dam at the culvert under Route 110. Dam material was recently removed from the culvert. Standing deadwood is present in the scrub-shrub wetland due to past flooding. A windfall red maple occurs in the sample plot. Soil consists of approximately 3 inches of black muck over sands and gravel. Soil was saturated with free water recorded 8 inches below the soil surface. Signs of past flooding were evident at the base of standing trees and exposed boulders.

2013 FIELD REPORT: VEGETATION SAMPLING SHEET

Site Name: Bare Hill Pond
 Location: Harvard, Massachusetts
 Transect No. One
 Community Type: Scrub-Shrub Wetland
 Soil Type: Muck and sands

Weather: Overcast, 75°F
 Date: August 29, 2013
 Plot Size: 30-ft radius, Plot 2
 Observers: Julia Stearns
 Photographs: Yes (Photos 3 and 4)

General Description of the Vegetation Sample Station: Plot 2

Vegetation sample Plot 2 is located in the scrub-shrub wetland community approximately 500 ft. north of the dam at the northern end of the pond. Access to the sample plot is from the service road to the dam off Willow Road. Efforts were made to relocate the original plot established in 2001, however the plot and wooden stake were not found during the 2013 visit. The general location of Plot 2 was located based on identifiable descriptions and data collected during the 2001 survey. Plot 2 was marked in the field with pink surveyors ribbon and staked with an orange colored rebar. A fringe of flood plain forest occurs along the eastern edge of the sample plot. The 2013 estimated plant cover was over 90 percent. The sample plot was photographed during the survey and photos are provided in the Photograph Log (photos 3 and 4).

Species List with Estimated Cover and Abundance Rankings for Dominants

Cover Estimates: 1 – 5%; 6-15%; 16—25%; 26-50%; 51-75%; 76-95%

Frequency of Occurrence Scale: 5 = Abundant; 4 = Frequent; 3 = Occasional; 2 = Infrequent; and 1 = Rare

	Species Name	Abundance	Estimated Cover
Trees:	Red Maple (<i>Acer rubrum</i>)	3	16-25%
	White Pine (<i>Pinus strobes</i>)	2	6-15%
Shrubs:	Maleberry (<i>Lyonia ligustrina</i>)	3	16-25%
	Black Alder (<i>Ilex verticillata</i>)	2	1-5%
	Swamp Rose (<i>Rosa palustris</i>)	3	16-25%
	Meadowsweet (<i>Spiraea latifolia</i>)	3	16-25%
Herbaceous:	Cat-tail (<i>Typha latifolia</i>)	5	51-75%
	Upright Sedge (<i>Carex stricta</i>)	5	51-75%
	Wool-grass (<i>Scirpus cyperinus</i>)	5	26-50%
	Purple loosestrife (<i>Lythrum salicaria</i>)	4	26-50%
	Rice cutgrass (<i>Leersia oryzoides</i>)	3	6-15%
	Water Purslane (<i>Ludwigia palustris</i>)	2	1-5%
	Marsh Fern (<i>Thelypteris palustris</i>)	3	6-15%
	Sedge (<i>Carex</i> sp.)	3	6-15%
	Arrow Arrum (<i>Peltandra virginica</i>)	2	1-5%
Water Parsnip (<i>Sium suave</i>)	2	1-5%	

Soil consists of approximately 8 inches of black muck over sand and gravel. Soil was saturated to the soil surface and small areas of surface wasere observed amongst the vegetation.



2001 FIELD REPORT: VEGETATION SAMPLING SHEET

Site Name: Bare Hill Pond	Weather: Cloudy, Lt. Wind, 55-60 ° F
Location: Harvard, Massachusetts	Date: November 14, 2001
Transect No. One	Plot Size: 30-ft. radius, Plot 2
Community Type: Scrub-Shrub Wetland	Observers: Don Schall
Soil Type: Muck and sands and gravel	Photographs: Yes (Figure 2)

General Description of the Vegetation Sample Station:

Vegetation sample plot is located in the scrub-shrub wetland community approximately 500 ft. north of the dam at the northern end of the pond. Access to the sample plot is from the service road to the dam off Willow Road. A narrow fringe of flood plain forest occurs along the edge of the sample plot. The estimated plant cover in the sample plot is over 60 percent. The sample plot was photographed during the survey performed on November 14, 2001.

Species List with Estimated Cover and Abundance Rankings for Dominants

Cover Estimates: 1 - 5%; 6-15%; 16-25%; 25-50%; 51-75%; 76-95%; and 96-100%
 Frequency of Occurrence Scale: 5 = Abundant; 4 = Frequent; 3 = Occasional; 2 = Infrequent; and 1 = Rare

	Species Name	Abundance	Estimated Cover
Trees:	Red Maple (<i>Acer rubrum</i>)	5	16-25%
	White Pine (<i>Pinus strobus</i>)	4	6-15%
Saplings:	Absent		
Shrubs:	Sweet Pepperbush (<i>Clethra alnifolia</i>)	5	16-25%
	HB Blueberry (<i>Vaccinium corymbosum</i>)	4	16-25%
	Black Alder (<i>Ilex verticillata</i>)	4	6-15%
	Swamp rose (<i>Rosa palustris</i>)	3	1-5%
Vines:	Absent		
Herbaceous:		5	16-25%
	Wool-gGrass (<i>Scirpus cyperinus</i>)		
	Tussock Sedge (<i>Carex stricta</i>)	5	26-50%
	Sedge (<i>Carex</i> sp.)	3	6-15%
	Purple Loosestrife (<i>Lythrum salicaria</i>)	3	1-5%
	Canada Bluejoint Grass (<i>Calamagrostis canadensis</i>)	4	1-5%
	Burreed (<i>Sparganium</i> sp.)	4	6-15%
	Water Purslane (<i>Ludwigia palustris</i>)	3	1-5%

Sample plot is subject to spring floods and backwater flooding due to a beaver dam at the culvert under Route 110. Standing deadwood is present in the scrub-shrub wetland due to past flooding. Soil consists of approximately 8 inches of black muck over sands and gravel. Soil was saturated with free water recorded 2 inches below the soil surface.

2013 PHOTOGRAPHIC LOG

Client Name: Town of Harvard	Site Location: Bare Hill Pond Willow Road, Harvard, MA	Project No.
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Photo No. 1	Date: 8/29/2013
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Direction Photo Taken: West

Description:
Plot 1, marked with orange-staked rebar visible in center of photograph, windfall to the west.



Photo No. 2	Date: 8/29/2013
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Direction Photo Taken: East

Description:
Plot 1, seasonal visible at lower right corner of photograph.



2013 PHOTOGRAPHIC LOG

Client Name:
Town of Harvard, MA

Site Location:
Bare Hill Pond, Willow Road, Harvard, MA

Project No.

Photo No.
3

Date:
8/29/2013

Direction Photo Taken: North

Description:

Plot 2, marked with orange-staked rebar visible in center of photograph. .



Photo No.
4

Date:
8/29/2013

Direction Photo Taken: West

Description:

Plot 2





Figure 7. Vegetation sample plot No. 1 in the scrub / shrub emergent wetland below the dam, sampled on November 14, 2001.



Figure 8. Vegetation sample plot No. 2 in the scrub / shrub emergent wetland below the dam, sampled on November 14, 2001.