Beecher Lake AIS Control Project

(ACEI-073-10.1)

Final Report

Marinette Co. LWCD
1926 Hall Avenue
Marinette, WI 54143

January, 2015

PROJECT AREA

Beecher Lake is located in the Township of Beecher (T36N, R20E, S28) in Marinette County, Wisconsin. The lake actually consists of two separate lakes, Beecher Lake and Upper Lake that are connected by a narrow channel. Locally the combined lakes are referred to as Beecher Lake. The lakes drain to the Pike River, an Outstanding Resource Water and State designated Wild River (figure 1).

The Upper Lake basin covers 21 acres with a maximum depth of 18 feet. The Beecher Lake basin covers 35 acres with a maximum depth of 47 feet. A dam on the outlet of Beecher Lake maintains a head of six feet and controls the water level in both basins. Water quality is typically good with moderate to darkly stained water and low relatively phosphorus concentrations. A water quality study conducted in 1996-97 found the lakes consistently in the mesotrophic range.

AQUATIC PLANT COMMUNITY & INVASIVE SPECIES

Beecher Lake has a well-developed and diverse aquatic plant community with an average floristic quality index of 34.7. The maximum rooting depth varies from 7 to 12 feet due to variations in water level and water clarity. Water clarity varies considerably from year-to-year based on the volume of tannin stained runoff from the lakes 2,800 acre watershed.

Eurasian Water Milfoil (EWM) was discovered in Beecher and Upper Lakes in June 2007. Plant samples were collected and verified by the Freckman Herbarium at UW-Stevens Point. A cursory survey of the lake in October 2007 found EWM was primarily limited to the Beecher lake basin with moderate to dense stands covering more than 6.5 acres.

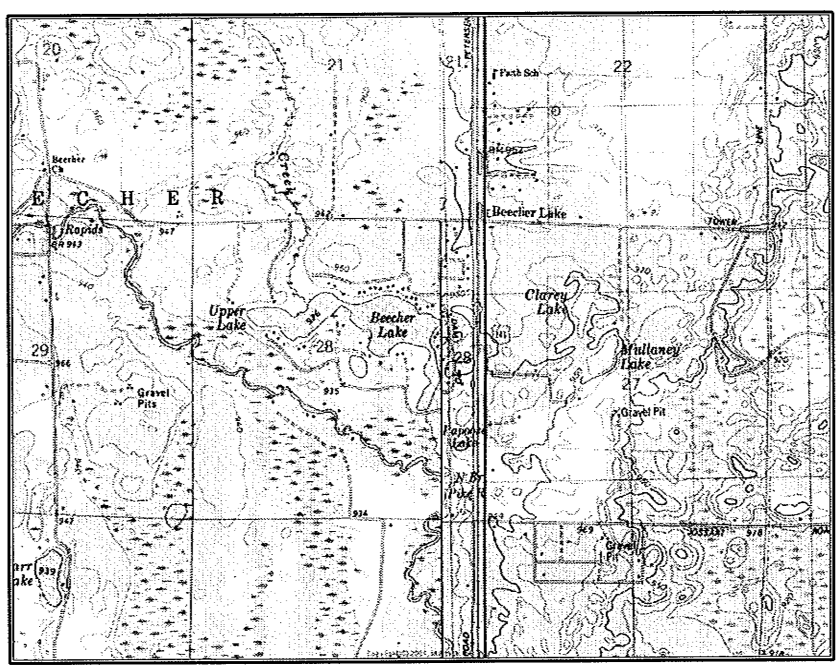

Figure 1. Beecher and Upper Lakes

AQUATIC PLANT MANAGEMENT EFFORTS

In response to the discovery of EWM, the Beecher Lake District applied for and received Wisconsin AIS Control Grant funding in March 2008 to develop an aquatic plant management plan to address the newly discovered EWM infestation. Concurrent with the EWM planning efforts the District worked with the DNR and Marinette County Land & Water Conservation Division (LWCD) to treat EWM in the spring of 2008 and 2009 with mixed results.

The WDNR approved Aquatic Plant Management Plan for Beecher Lake was completed in January 2010. The plan calls for the selective control of Eurasian water milfoil and restoration of the native plant community. Recommendations included modification of the Beecher Lake dam to allow for periodic winter drawdown of Beecher and Upper Lakes to achieve long-term control of EWM. In the interim the plan recommended the use of early-season herbicide treatment with 2,4-D to selectively control EWM along with hand pulling to control scattered EWM.

PROJECT GOALS AND OBJECTIVES

The Aquatic Invasive Species Control Gant (ACEI-073-10.1) was awarded to the Beecher Lake District in 2010 with the goal of implementing the recently approved EWM management plan for Beecher and Upper Lakes.

The proposal called for implementing a four-year multi-faceted strategy to prevent Eurasian water milfoil domination in Beecher Lake and preserve the diverse aquatic plant community. The approved EWM management strategy included the judicious use of selective aquatic herbicides, a winter drawdown to evaluate its effectiveness as a management tool, hand pulling of isolated plants, and the use of biocontrol agents where applicable. Routine aquatic plant monitoring was included to track changes in the frequency and density of EWM and evaluate impacts to the native plant community.

PROJECT RESULTS

All elements of the project have been completed as proposed. As is typical, unforeseen events and variations in the effectiveness of management activities required deviations from the original schedule and changes to the EWM management program.

Aquatic Plant Monitoring

Whole-lake point-intercept surveys of both lake basins were conducted in the summer of 2008, 2013, and 2014 according to WDNR protocols using 100 foot (30 meter) point spacing. More intensive surveys of four representative areas were conducted in 2010, 2011 and 2012 using a 50-foot (15 meter) point spacing to document the effects of winter drawdown on the lakes aquatic plant community.

All aquatic plant survey data was entered into EXCEL spreadsheets provided by the Wisconsin DNR to evaluate aquatic plant surveys. The spreadsheets were modified to calculate total aquatic plant and individual species frequency and abundance by depth and sediment type. Aquatic plant survey data was also entered into GIS and used to create distribution maps for each plant species.

Areas supporting dense EWM were mapped in the fall of each year to track changes in the community and help plan for subsequent herbicide treatments. GIS shape files of all EWM reconnaissance data were created for mapping and analysis.

Aquatic plant survey and mapping data can be found in Appendix A. All aquatic plant data and GIS shapefiles have been transmitted electronically to the WDNR.

Aquatic Plant Genetic Testing

Samples of milfoil from Beecher and Upper Lakes were genetically tested in 2008, 2013, and 2014. Results indicate that the EWM in both lake basins has not hybridized with northern watermilfoil (*M. sibeicum*) or Whorled watermilfoil (*M. verticillatum*), both of which are native to Beecher and Upper Lakes and can still be found in some areas.

Winter Drawdown

The Beecher Lake dam consists of a fixed weir spillway with a width of 24.5 feet. There are no gates or valves for water level control. The winter drawdown was completed using siphons made from 6-inch pvc pipe and fittings available at most hardware or plumbing supply stores (figure 2). Each siphon consists of a 6-foot tall riser pipe, priming port, and intake pipe with anti-backflow valve and trash guard (figure 3). Strips of rigid foam insulation are fastened to the intake pipes to provide flotation. Intake pipes are joined using rubber couplers so they remain flexible as the water level drops and can be extended as needed. To prime the siphon, a tight fitting expansion plug is installed on the outlet end and water is pumped through the 2" priming pipe until the

Figure 2. Siphons are constructed using 6" PVC pipe and fittings.

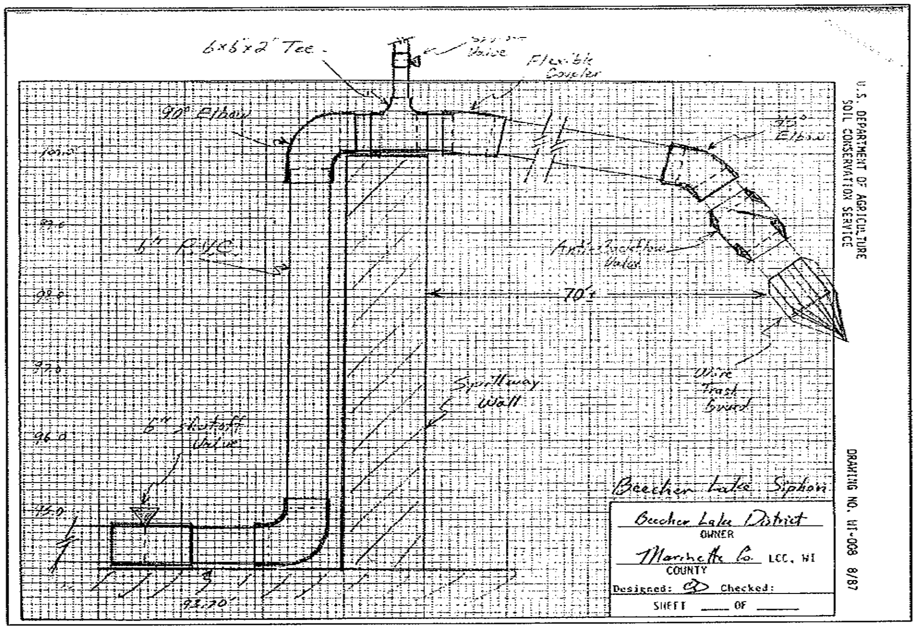

Figure 3. Beecher Lake siphon design.

siphon is completely full of water. When full, the ball valve on the priming pipe is closed and the plug is removed from the outlet.

A single siphon tube was installed in Beecher Lake in the summer of 2010 to demonstrate proof-of-concept. The test was successful and the siphon operated for two weeks without interruption. A drawdown of the lake using four siphon tubes was attempted in September 2010. Good progress was made and a two-foot water level change was achieved by mid-September. Unfortunately, a late season storm dropped nearly 4.5 inches of rain on the surrounding area and the lake quickly refilled. The drawdown attempt was abandoned on October 5, 2010 when it became obvious that the drawdown could not be completed in a timely manner to protect reptiles and amphibians.

A second drawdown attempt was made in 2011 with the installation of four 80-foot long siphons on August 27 (figure 4). The water level fell rapidly and three siphons were extended to 120 feet on September 9. The lake elevation if front of the dam was 4.4 feet below full pool on September 18. By early October the water level was 5.0 feet below full pool, where it was maintained by two siphons (figure 5). Both siphons were removed on December 28 and the lake was allowed to begin refilling. Water levels in the lake rose slowly throughout the winter, returning to normal before ice-out in the spring of 2012.

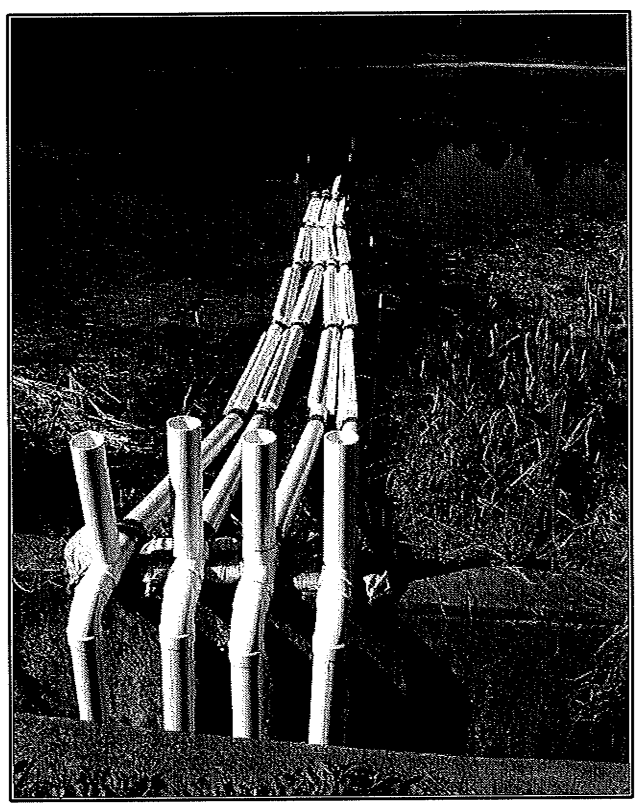

Figure 4. Siphons installed at the Beecher Lake Dam.

Figure 5. Five foot water level drawdown at the Beecher Lake Dam.

Although the siphons were effective during warm weather, they were difficult to maintain during the winter as the pipes became encased in ice and frozen mud. While continuous flow prevented ice formation in the pipes, any interruption in flow during sub-zero weather allowed the intake pipes to freeze solid in a matter of hours. These factors severely limit the utility of siphons for winter drawdown purposes.

While the drawdown was successful in moving water over the dam it failed to achieve the expected water level reduction in Beecher and Upper Lakes. The Beecher Lake dam is located on Beecher Creek approximately 1,300 feet downstream from the lakes natural outlet. While the siphons did lower the water level near the dam, a build-up of sediment in the creek bed between the dam and the lake prevented the main body of the lake from draining sufficiently. A survey of the dewatered lake bed in December showed that the water level near the dam was 5 feet below full pool while 1,300 feet away, the water level in the main body of Beecher and Upper Lakes was only 2.5 feet below full pool.

Unfortunately, the winter of 2011/12 was also exceptionally warm and less than three inches of frost penetration was achieved before snow effectively insulated the sediment. As a result, acceptable EWM control was not achieved in most areas of the lake. In fact, it appears that a non-lethal drawdown may have actually stimulated increased EWM growth. A detailed aquatic plant survey conducted after the drawdown showed a 94% increase in

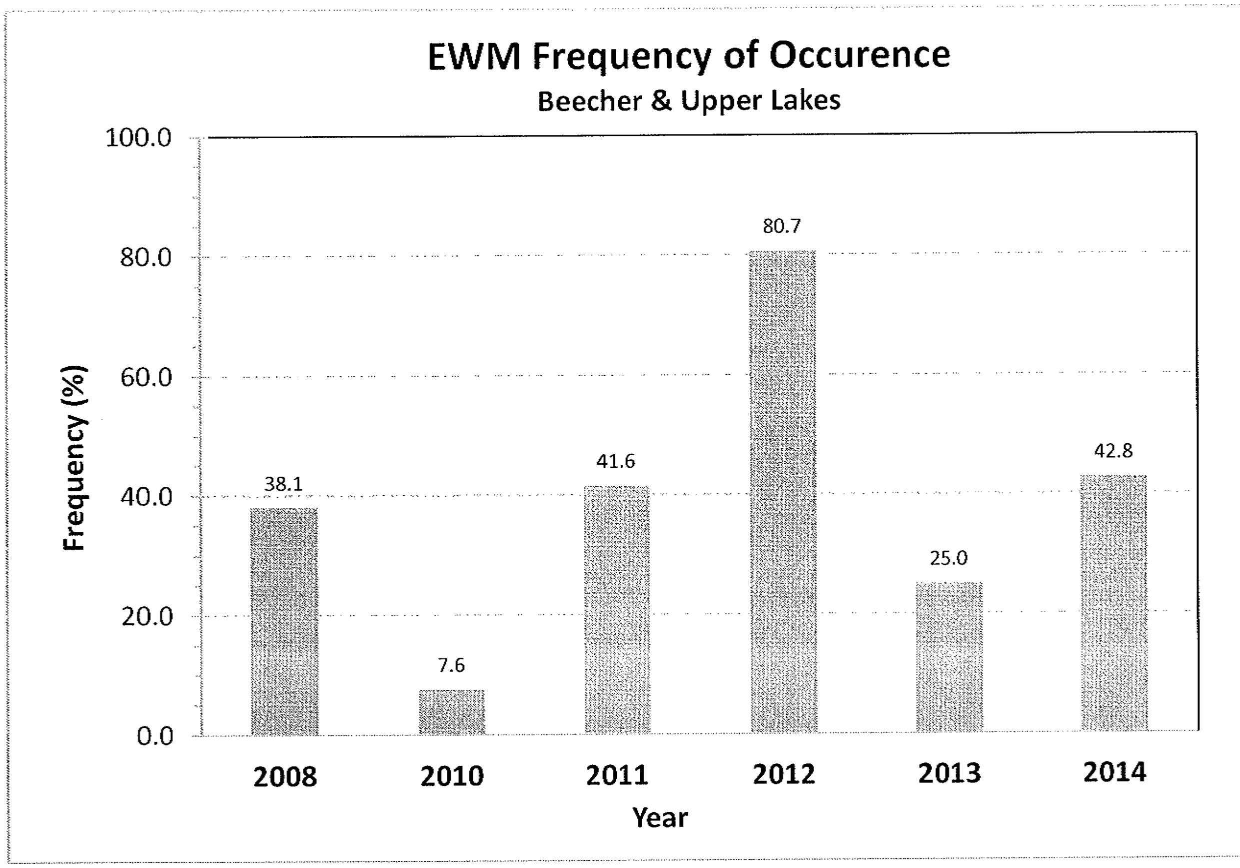

Figure 6. EWM Frequency during the project period.

the frequency of EWM (figure 6). The one exception was the south arm of the lake near the dam where the drawdown was complete and the sediment was exposed for a much longer period of time. In this area EWM control was nearly complete and recolonization has been slow. As a result of this attempt, winter drawdown was abandoned as a management tool until the factors limiting its use can be resolved.

Aquatic Herbicide Use

Shortly after its discovery in June, 2007 approximately 6.5 acres of moderate to dense EWM was mapped along the north and east shores of the Beecher Lake basin. By the fall of 2007 EWM had expanded to cover nearly 9.5 acres. Over the next several years, multiple herbicide treatments were conducted with mixed results (figure 6).

2008

In June of 2008 nearly 14.6 acres was treated with Navigate 2,4-D at a rate of 100 lbs/acre. Due to an early spring and scheduling conflicts with the applicator, the treatment occurred later than desired and EWM was dense and already nearing the surface. Success was limited and a whole-lake point intercept survey conducted in August found EWM at 39% of sample points shallower than the maximum rooting depth. A significant amount of herbicide damage was noted on plants in the treatment areas. Fall EWM reconnaissance showed nearly 13 acres of dense EWM.

2009

An early season treatment of 14.6 acres was conducted in the spring of 2009 using Navigate 2,4-D at a rate of 150 lbs/acre. This treatment was much more successful than the previous year and dense EWM declined by more than 75 percent to 3.1 acres. Although no aquatic plant survey was conducted in 2009, a drastic reduction in EWM was noted throughout the lake.

A lake-wide decline in watershield (*Brassenia schreberi*) was also noted in the fall of 2009. The decline in watershield was confirmed in 2010 with a 25% drop in frequency of occurrence. By 2011 watershield had declined by nearly 78% from its high in 2009. In hindsight, it appears the 2009 "spot treatment" resulted in an unintended whole-lake treatment. A back calculation shows an estimated lake-wide 2,4-D concentration of 381 ug/l ae, which is higher than the target concentration in subsequent whole-lake treatments.

2010

2010 was the first year of the AIS control project. In early spring approximately 5.8 acres was treated with Navigate 2,4-D at a rate of 150 lbs/acre. A partial lake survey completed in late summer showed that, as a result of aggressive management, EWM frequency of occurrence fell to 7.6%, an 80% reduction from its high in 2008.

2011

No herbicide treatment was conducted in 2011 and EWM expanded significantly, with frequency of occurrence increasing from 7.6% to 41.6%. The expansion was not even however and all of the increase came from the Beecher Lake basin.

A winter drawdown for EWM control was completed in the winter of 2011/12.

2012

In an effort to evaluate the effects of the previous winter drawdown, no herbicides were used in the spring of 2012. Unfortunately, as discussed above, unforeseen technical issues and uncooperative weather greatly reduced drawdown effectiveness and EWM expanded significantly.

An aquatic plant survey conducted in late August showed that EWM frequency of occurrence had increased to 83.5%. By the fall of 2012 dense EWM covered more than 11 acres of Beecher and Upper Lakes.

2013

In an attempt to control the rapidly expanding EWM population, a whole-lake treatment using Dow DMA-4 (liquid 2,4-D) was conducted on May 17, 2013. The herbicide was applied to the EWM infested areas with a lake wide target concentration of 335 ug/l. Post-treatment herbicide residuals were monitored at seven different sites at 1, 2, 3, 5, 8, 10, 15, and 22 days after treatment (DAT) as part of a whole lake treatment study in a cooperative effort with the WDNR and US Army Corps of Engineers. Results show the average herbicide concentration in Upper Lake at 7 DAT was 232 ug/l. The average herbicide concentration for Beecher Lake during at 7 DAT was 377 ug/l, indicating some flushing of herbicide from Upper Lake (upstream basin) into Beecher Lake (downstream basin).

An aquatic plant survey conducted on July 18, 2013 showed an overall reduction in EWM frequency of occurrence of 69%. However, the results were not even distributed throughout the lakes (figure 7). Beecher Lake saw an 84% reduction in EWM while EWM frequency in Upper Lake was only reduced by 35%. While the treatment was initially viewed as a success, EWM reconnaissance in September of 2013 showed a strong resurgence in EWM growth with moderate to dense EWM beds covering more than 9.6 acres of the lake and scattered plants throughout the littoral zone.

2014

A second whole lake treatment was conducted on June 4, 2014 using Dow DMA-4 (liquid 2,4-D). The relatively late treatment date was the result of a very late start to the growing season. The target concentration was increased to 375 ug/l in an effort to improve EWM control. An aquatic plant survey conducted on August 20, 2014 showed a 71% increase in EWM frequency in the lakes. However, as in 2013, the treatment was more successful in Beecher Lake than in Upper Lake (figure 7). Like the previous year, the whole lake treatment initially appeared successful but there was a similar resurgence of EWM in late summer.

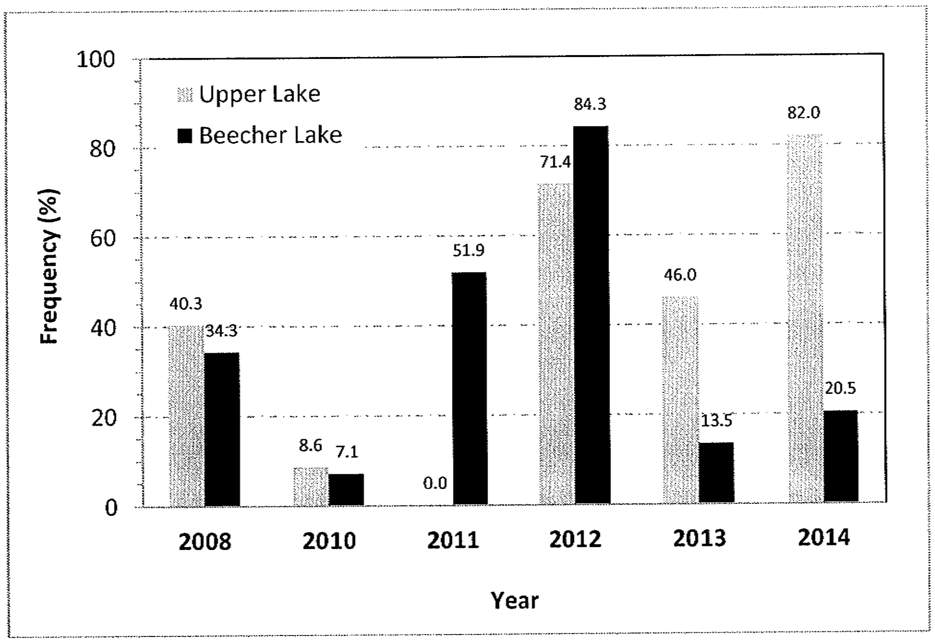

Figure 7. EWM frequency by lake basin.

Manual EWM Harvesting

The Marinette County LWCD received an AIS control grant (ACEI-112-12) in 2012 to fund the construction and operation of a hydraulic conveyor system for diver-assisted hydraulic harvesting of EWM. The project called for using the harvester on Little Newton, Thunder, and Beecher/Upper Lakes from 2012 through 2016. Due to construction delays the harvester was not operational until the summer of 2013.

Diver assisted hydraulic harvesting is a very precise management tool, ideal for selectively removing scattered EWM plants and small colonies. However, it's also labor intensive and not well suited for managing large dense stands of EWM.

While the harvester was used with excellent results on Little Newton and Thunder Lakes, the winter drawdown and herbicide treatments did not sufficiently reduce the EWM population to a level where hydraulic harvesting would be effective on Beecher Lake. As a result, the hydraulic harvester was not deployed on Beecher and Upper Lakes during the grant period.

Evaluate potential for milfoil Weevil control of EWM

The native milfoil weevil (*Euhrychiopsis lecontei*) feeds on native and Eurasian watermilfoil and is suspected in the natural decline in EWM in some unmanaged lakes. The weevil has also been reared and stocked in lakes as a control method.

The project proposal called for weevil reconnaissance to assess whether the native weevils could be found in sufficient numbers to effect EWM population in Beecher and Upper Lakes. Milfoil weevil reconnaissance was completed in 2010, 2012 and 2014 along the north and west shore of Upper Lake and near the Beecher Lake dam. Both of these areas have supported abundant EWM adjacent to shorelines with natural vegetation where milfoil weevils can overwinter. During the reconnaissance meristematic tissue and the top foot or two of actively growing plants were collected and observed with a hand lens for adult milfoil weevils and entrance/exit holes in the plant stems. No milfoil weevils were found and no collapsing or declining EWM plants were noted during the project period.

DISCUSSION & RECOMMENDATIONS

The primary goal of the AIS control project was to use winter drawdown as the primary means of EWM control with limited use of aquatic herbicides. While largely unsuccessful, the failures taught us a lot about the behavior of EWM in Beecher and Upper Lakes and how to manage it in the future.

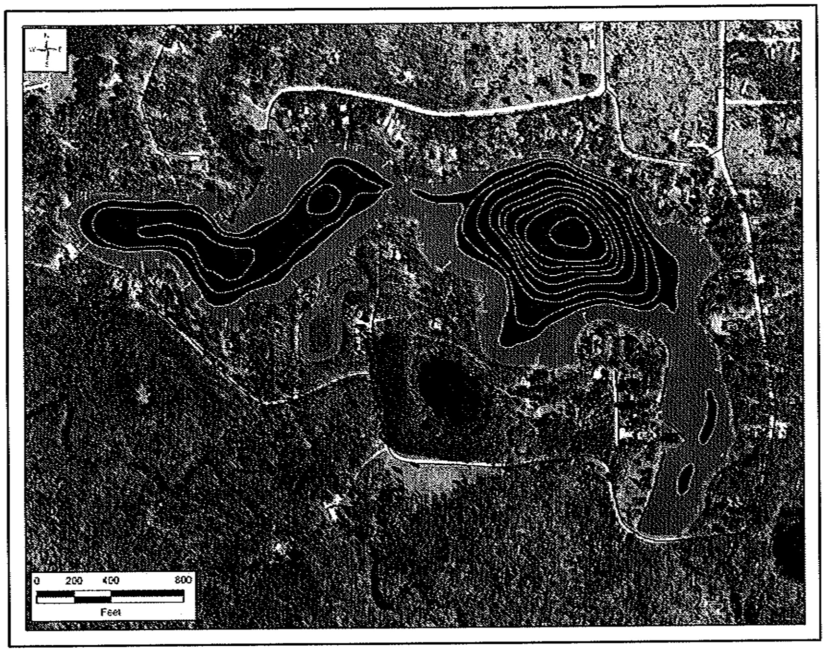

Figure 8. Area exposed by a 5-foot winter drawdown of Beecher Lake.

Winter drawdown

It was clear from the two drawdown attempts that more work is needed before winter drawdown is a viable EWM management tool on Beecher Lake. While it is technically feasible to conduct a drawdown using only siphons, experience shows they are not effective during wet years and too difficult to maintain during the winter months.

If winter drawdown is to be used as an effective management tool it will be necessary to modify the Beecher Lake dam to simplify the drawdown process. The installation of a drain pipe and valve through the Beecher Lake dam would allow for maintenance-free water level control as needed.

It will also be necessary to dredge a channel from the main body of the lake to the dam. This will greatly increase the maximum drawdown in the main lake basins, from the current 2.5 feet to 5.5 feet below full pool. When the maximum drawdown is achieved more than 76% of the littoral zone will be subject to freezing conditions and EWM control (figure 8).

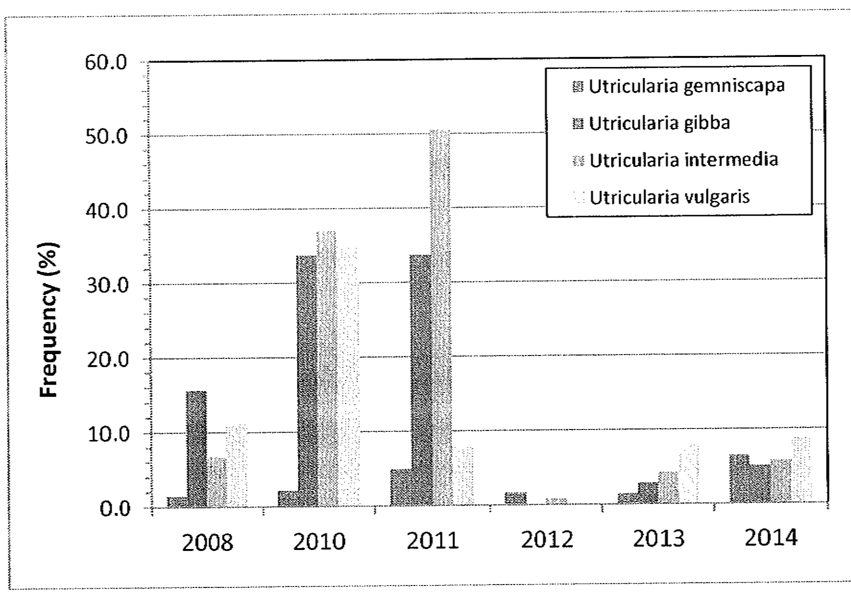

Figure 9. Changes in Urtricularia frequency of occurrence in response to the winter drawdown.

Although the winter drawdown did not result in sufficient sediment freezing for EWM control, there was a noticeable impact on several native plant species. Dominant species including coontail (Ceratophyllum demersum), and stonewort (Nitella sp.) declined in frequency while Bushy pondweed (Najas flexilis), muskgrass (Char a sp.) and variable pondweed

(Potamogeton graminaeus) increased. As a group, the bladderworts experienced significant declines following the winter drawdown (figure 9).

Aquatic herbicide use

Since the discovery of EWM in 2007, the Beecher Lake District has relied on the routine use of aquatic herbicides for EWM control. The result of these efforts has been mixed at best.

The whole-lake treatments conducted in 2013 and 2014 appeared promising at first but the effects were short lived. The 2013 treatment resulted in the greatest measured reduction in EWM frequency (69%). However, the apparent success seems to be, at least in part, a product of the timing of the aquatic plant survey. When the 2013 plant survey was conducted on July 18th EWM appeared to be well controlled and few plants were topped out. However, when the lake was re-visited in late August, EWM was topped out and had expanded to cover nearly 9.6 acres of the lake. In 2014 the treatment also appeared successful through the early summer. However, there was again a noticeable rebound in EWM by years end. When the aquatic plant survey was conducted on August 20 there was actually a measured increase in EWM frequency from the previous year (figure 6).

Both whole-lake treatments resulted in better EWM control in the Beecher Lake basin and little or no control in the Upper Lake basin (figure 7). This may be due to increased flushing and dilution of the herbicide. The lake inlet is located adjacent to the boat landing on the north shore of Upper Lake. Flow from the creek likely follows the north shore of Upper Lake through the narrow channel between the two lake basins. EWM in this area of Upper Lake has consistently been difficult to control through chemical means.

The most successful herbicide treatment for EWM control was actually the 2009 "spot treatment" using Navigate 2,4-D at 150 lbs/ac. Navigate is a granular herbicide which may have resulted in the active ingredient staying in place for a longer period of time. As discussed earlier, the 2009 treatment may have resulted in an unintentional whole-lake treatment at a higher lake-wide concentration than seen in 2013 or 2014.

The relatively aggressive use of aquatic herbicides in Beecher and Upper Lakes during the last 7 years has impacted the native plant community. Watershield (*B. Schreberi*) experienced a significant decline as early as 2010. Many of the small pondweeds, most notably Fries' pondweed (*Potamogeton fresii*), stiff pondweed (*P. strictifolius*), and small pondweed (*P. pusillus*) experienced significant declines (figure 10) in response to both the early -season 2,4-D spot treatments (2008-2010) and the whole-lake treatments (2013, 2014). No herbicides were used in 2011 or 2012 and all three species rebounded.

The Future of EWM management in Beecher & Upper Lakes

Experience has shown that EWM is a very aggressive invader in Beecher and Upper Lakes. Left unmanaged, EWM will likely expand to cover most of the littoral zone, overwhelming an otherwise rich and diverse native plant community and severely impacting recreation on Beech and Upper Lakes.

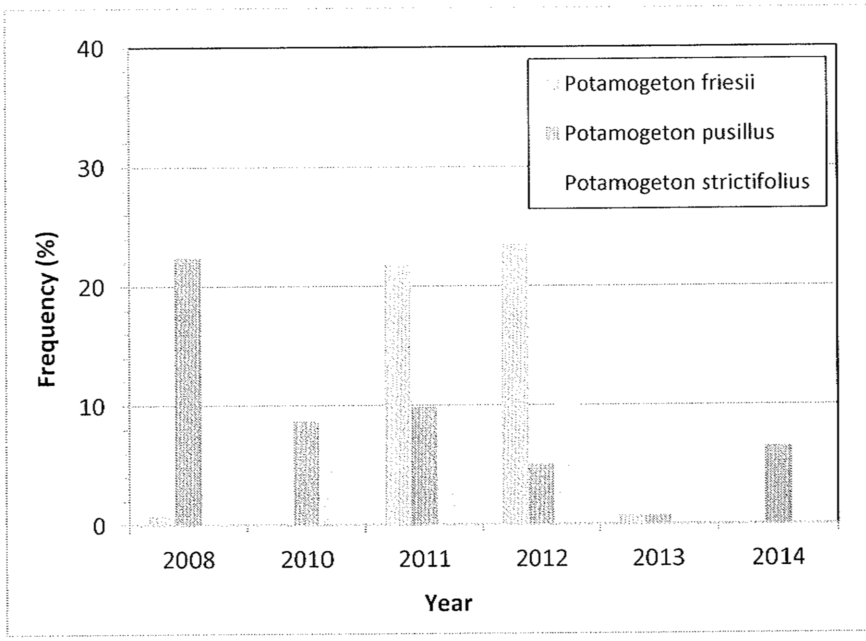

Figure 10. Selected small pondweed response to herbicide treatments in Beecher and Upper Lakes.

In response to the EWM invasion, over the last seven years, the Beecher Lake District has conducted five herbicide applications costing in excess of $24,000.00. Each treatment has been met with a rapid resurgence and continued expansion of EWM. As a result, the District does not feel that routine herbicide use is an effective use of their limited financial resources.

Although the 2011/12 winter drawdown was not effective at controlling EWM throughout most of the lake, the failure was due to factors beyond the control of the Lake District. Winter drawdown has proven effective on local waters (High Falls, Cauldron Falls, and Peshtigo Flowages) and elsewhere in Wisconsin. With the necessary dredging and modifications to the Beecher Lake Dam, winter drawdown still represents the best alternative for the long-term and sustainable control of EWM in Beecher and Upper Lakes.

The Beecher Lake District should apply for AIS Control Grant funding to modify the Beecher Lake Dam and dredge a channel from the dam to the main body of Beecher Lake. This project would allow the District to employ periodic winter drawdown as the primary EWM management tool and reduce or eliminate the need for aquatic herbicide use in the future.

STATS

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1		STATS	Total vegetation	Myriophyllum spicatum	Potamogeton crispus	Potamegeton epihydrus	Unknown Moss	Chara spp.	Schoenoplectus subterminalis	Elodea nuttallii	Utricularia vulgaris	Utricularia gibba	Ceratophyllum demersum	Potamogeton illinoensis	Potamogeton gramineus	Nuphar variegata	Nymphea odorata	Utricularia intermedia	Brasenia schreberi	Potamogeton praelongus	Freshwater
2	Lake Name	Beecher & Upper Lakes																			
3	County	Mrinette																			
4	WBIC																				
5	Survey Date	08/04/08																			
6		**INDIVIDUAL SPECIES STATS:**																			
7		Frequency of occurrence within vegetated areas (%)		38.93		1.53	28.24	61.07	4.58	0.76	11.45	16.03	34.35	4.58	29.01	8.40	16.03	6.87	26.72	7.63	7.63
8		Frequency of occurrence at sites shallower than maximum depth of plants		38.06		1.49	27.61	59.70	4.48	0.75	11.19	15.67	33.58	4.48	28.36	8.21	15.67	6.72	26.12	7.46	7.46
9		Relative Frequency (%)		9.0		0.4	6.5	14.1	1.1	0.2	2.6	3.7	7.9	1.1	6.7	1.9	3.7	1.6	6.2	1.8	1.8
10		Relative Frequency (squared)	0.06	0.01		0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11		Number of sites where species found		51		2	37	80	6	1	15	21	45	6	38	11	21	9	35	10	10
12		Average Rake Fullness	2.25	1.35		1.00	1.27	1.91	1.00	1.00	1.07	1.00	1.38	1.00	1.11	1.27	1.95	1.11	1.60	1.10	1.00
13		#visual sightings		7		1	2		1			3	1		5	11	10		17		
14		present (visual or collected)		present		present	present	present	present	present	present	present	present	present	present	present	present	present	present	present	present
15																					
16		**EXOTICS SPECIES STATS:**																			
17		# at surface		42																	
18		# within 1 ft of surface		3																	
19		# > 1 ft from surface		8																	
20		# sparse		30																	
21		# dense		18																	
22		# unknown		5																	
23																					
24		**SUMMARY STATS:**																			
25		Total number of points sampled	177																		
26		Total number of sites with vegetation	131																		
27		Total number of sites shallower than maximum depth of plants	134																		
28		Frequency of occurrence at sites shallower than maximum depth of plants	97.76																		
29		Simpson Diversity Index	0.94																		
30		Maximum depth of plants (ft)	11.00																		
31		Number of sites sampled using rake on Rope (R)	0																		
32		Number of sites sampled using rake on Pole (P)	153																		
33		Average number of all species per site (shallower than max depth)	4.25																		
34		Average number of all species per site (veg. sites only)	4.18																		
35		Average number of native species per site (shallower than max depth)	3.87																		
36		Average number of native species per site (veg. sites only)	4.18																		
37		Species Richness	32																		
38		Species Richness (including visuals)	37																		
39																					

STATS

-ponge

	B	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP
1	**STATS**	Nitella spp.	Najas flexilis	Filamentous algae	Potamogeton amplifolius	Megalodonta beckii	Elodea canadensis	Potamogeton zosteriformis	Potamogeton pusilis	Potamogeton friessi	Myriophyllum sibericum	Utricularia minor	Eleocharis palustris	Typha sp.	Potamogeton strictifolius	Eleocharis acicularis	Utricularia gemmiscapa	Potamogeton natans	Dulichium arundinaceum	Sparganium fluctuans	Stuckenia pectinata	x
2	Beecher & Upper Lakes																					
3	Mrinette																					
4																						
5	08/04/08																					
6	**INDIVIDUAL SPECIES STATS:**																					
7	Frequency of occurrence within vegetated areas (%)	29.01	22.14	6.11	15.27	9.92	6.87	4.58	22.90	0.76	1.53				3.05	2.29	1.53	2.29		2.29		
8	Frequency of occurrence at sites shallower than maximum depth of plants	28.36	21.64	5.97	14.93	9.70	6.72	4.48	22.39	0.75	1.49				2.99	2.24	1.49	2.24		2.24		
9	Relative Frequency (%)	6.7	5.1	1.4	3.5	2.3	1.6	1.1	5.3	0.2	0.4				0.7	0.5	0.4	0.5		0.5		
10	Relative Frequency (squared)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				0.00	0.00	0.00	0.00		0.00		
11	Number of sites where species found	38	29	8	20	13	9	6	30	1	2				4	3	2	3		3		
12	Average Rake Fullness	1.37	1.07	1.00	1.15	1.00	1.00	1.00	1.20	1.00	1.00				1.00	1.00	1.00	1.00		1.00		
13	#visual sightings		1	1	2		2			1		1	1	1				1	1	1	2	
14	present (visual or collected)	present	present	present	present	present	present	present	present	present	present	present	present	present	present	present	present	present	present	present	present	
15																						
16	**EXOTICS SPECIES STATS:**																					
17	# at surface																					
18	# within 1 ft of surface																					
19	# > 1 ft from surface																					
20	# sparse																					
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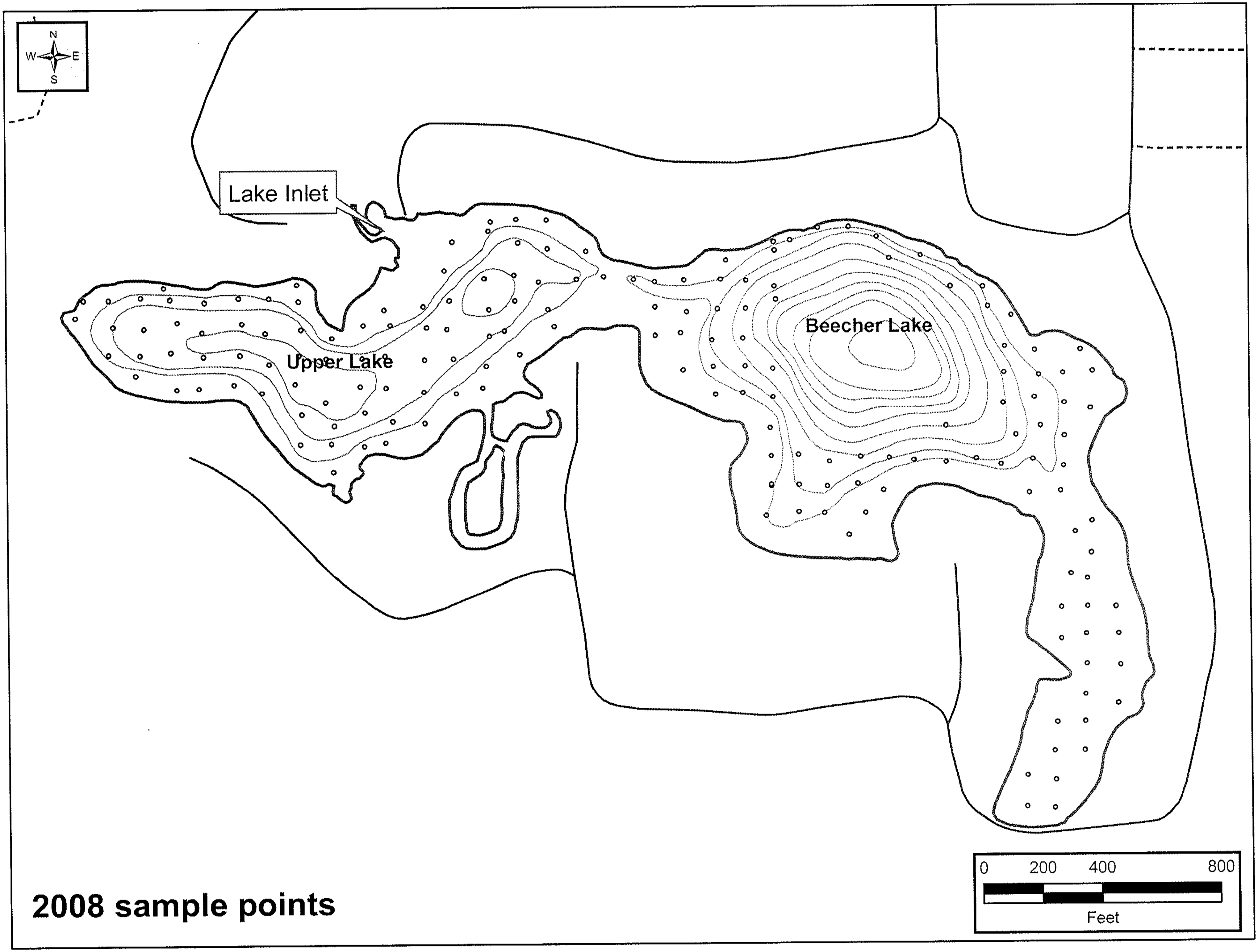
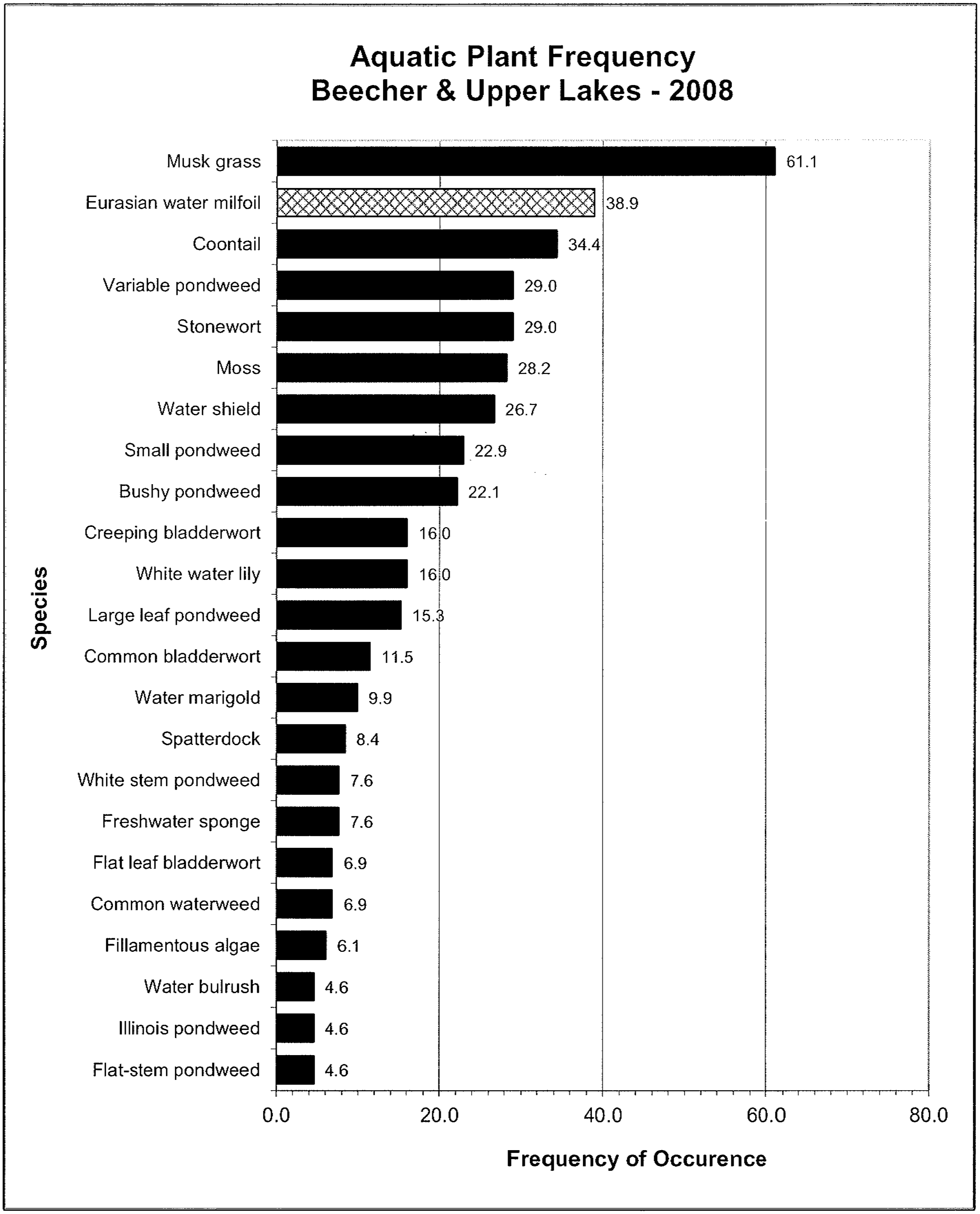
25	Total number of points sampled																					
26	Total number of sites with vegetation																					
27	Total number of sites shallower than maximum depth of plants																					
28	Frequency of occurrence at sites shallower than maximum depth of plants																					
29	Simpson Diversity Index																					
30	Maximum depth of plants (ft)																					
31	Number of sites sampled using rake on Rope (R)																					
32	Number of sites sampled using rake on Pole (P)																					
33	Average number of all species per site (shallower than max depth)																					
34	Average number of all species per site (veg. sites only)																					
35	Average number of native species per site (shallower than max depth)																					
36	Average number of native species per site (veg. sites only)																					
37	Species Richness																					
38	Species Richness (including visuals)																					
39																						

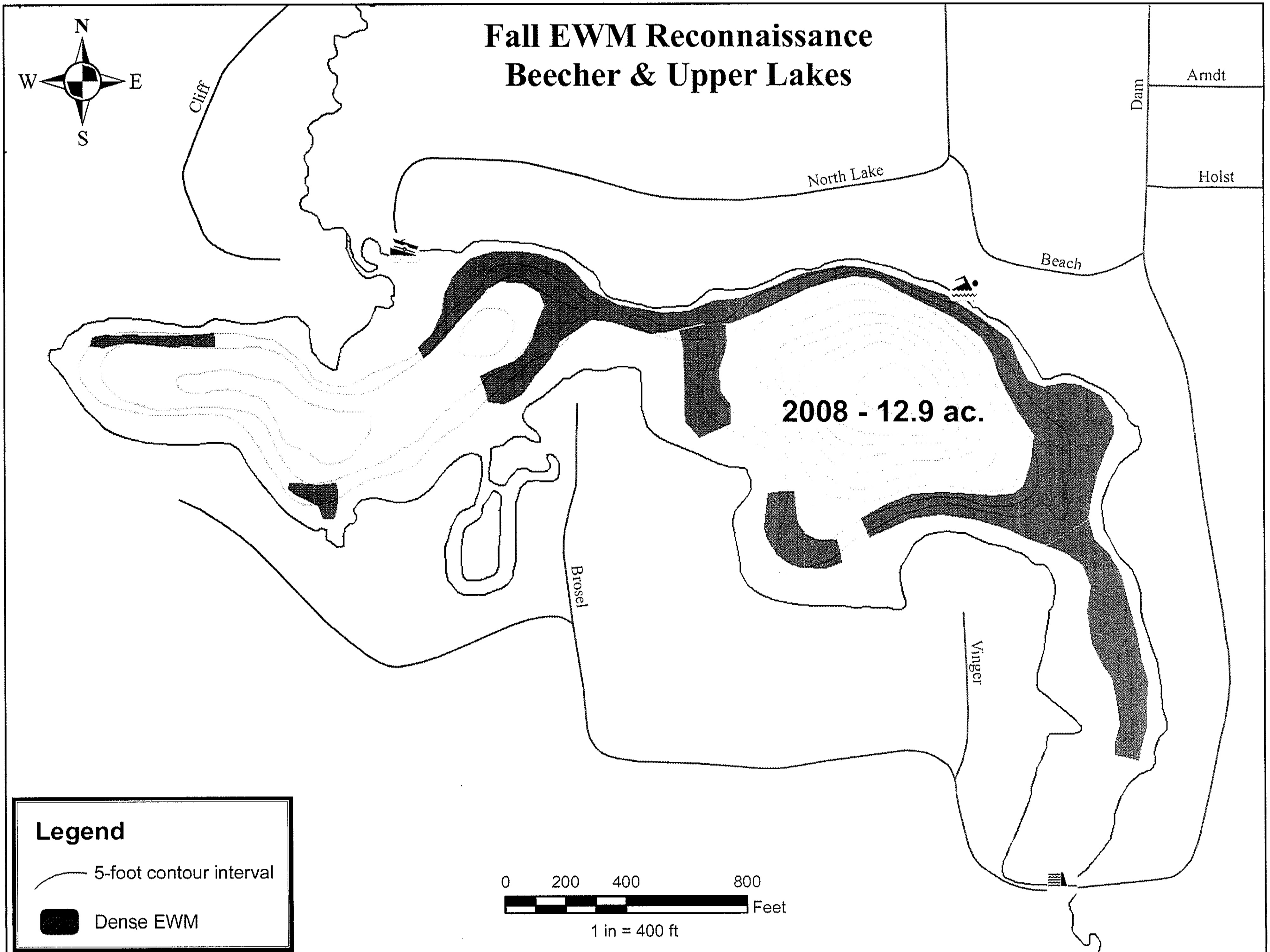


2008 sample points

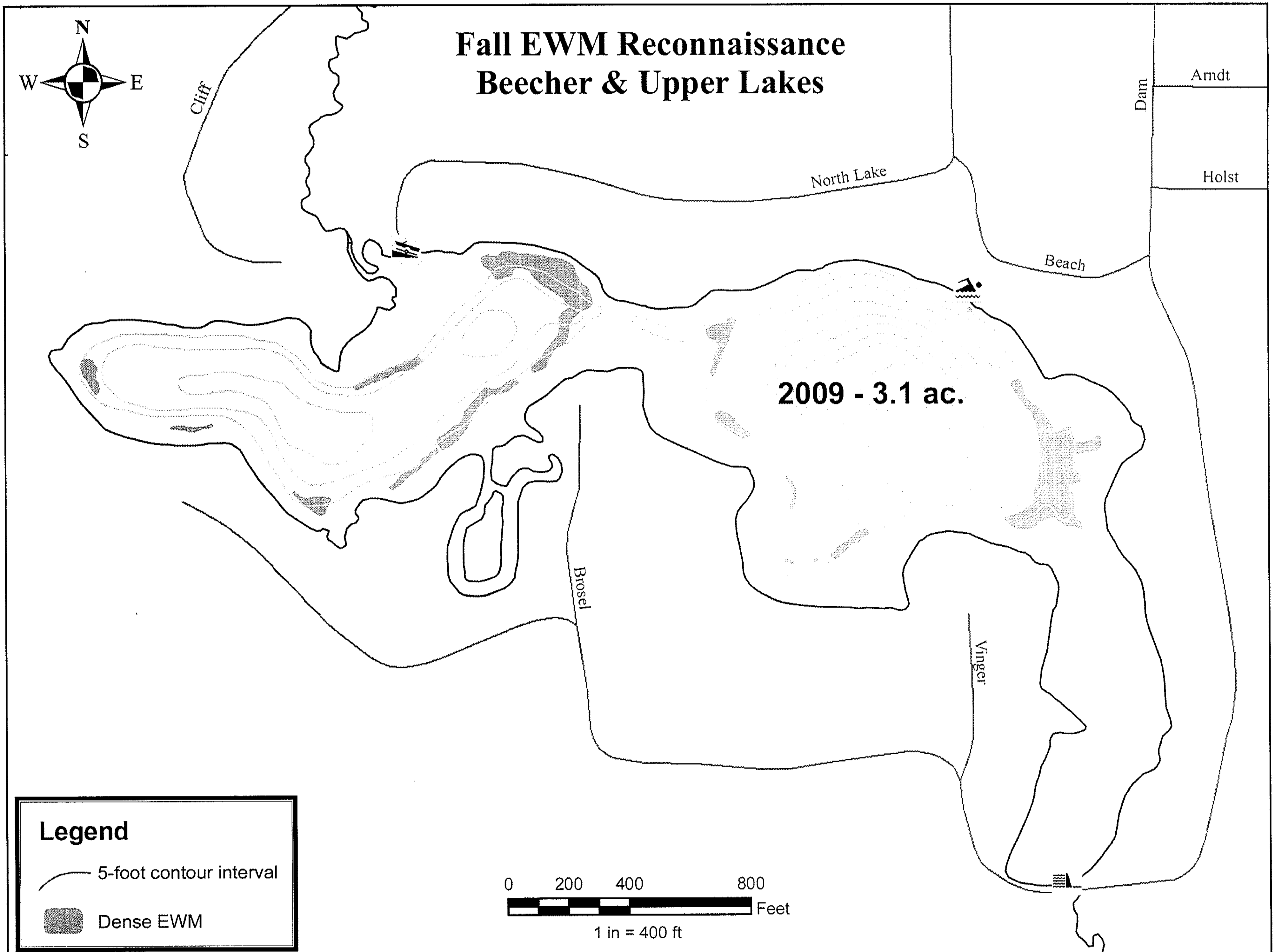


Aquatic Plant Frequency
Beecher & Upper Lakes - 2008
Species
Musk grass 61.1
Eurasian water milfoil 38.9
Coontail 34.4
Variable pondweed 29.0
Stonewort 29.0
Moss 28.2
Water shield 26.7
Small pondweed 22.9
Bushy pondweed 22.1
Creeping bladderwort 16.0
White water lily 16.0
Large leaf pondweed 15.3
Common bladderwort 11.5
Water marigold 9.9
Spatterdock 8.4
White stem pondweed 7.6
Freshwater sponge 7.6
Flat leaf bladderwort 6.9
Common waterweed 6.9
Fillamentous algae 6.1
Water bulrush 4.6
Illinois pondweed 4.6
Flat-stem pondweed 4.6
0.0
20.0
40.0
60.0
80.0
Frequency of Occurence

Fall EWM Reconnaissance
Beecher & Upper Lakes



Fall EWM Reconnaissance Beecher & Upper Lakes



STATS

Lake Name	Beecher & Upper Lakes
County	Marinette
WBIC	
Survey Date	08/10/10

INDIVIDUAL SPECIES STATS:

	Total vegetation	Myriophyllum spicatum	Potamogeton crispus	Nymphea odorata	Utricularia vulgaris	Chara spp.	Najas flexilis	Potamogeton zosteriformis	Potamogeton amplifolius	Utricularia gibba	Nitella sp.	Utricularia intermedia	Moss	Ceratophyllum demersum	Potamogeton gramineus	Stuckenia peclinata	Eleocharis acicularis	Nuphar variegata	Potamogeto
Frequency of occurrence within vegetated areas (%)		8.14		36.05	37.21	68.60	44.19	9.30	29.07	36.05	10.47	39.53	9.30	39.53	25.58	1.16	3.49	3.49	9.30
Frequency of occurrence at sites shallower than maximum depth of plants		7.61		33.70	34.78	64.13	41.30	8.70	27.17	33.70	9.78	36.96	8.70	36.96	23.91	1.09	3.26	3.26	8.70
Relative Frequency (%)		1.7		7.7	7.9	14.6	9.4	2.0	6.2	7.7	2.2	8.4	2.0	8.4	5.4	0.2	0.7	0.7	2.0
Relative Frequency (squared)	0.07	0.00		0.01	0.01	0.02	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00
Number of sites where species found		7		31	32	59	38	8	25	31	9	34	8	34	22	1	3	3	8
Average Rake Fullness	2.40	1.14		2.19	1.22	2.15	1.37	1.13	1.20	1.06	1.00	1.32	1.75	1.29	1.18	3.00	1.33	1.67	1.13
#visual sightings		9		3	4			3	4						1	2		3	
present (visual or collected)		present		present	present	present	present	present	present	present	present	present	present	present	present	present	present	present	present

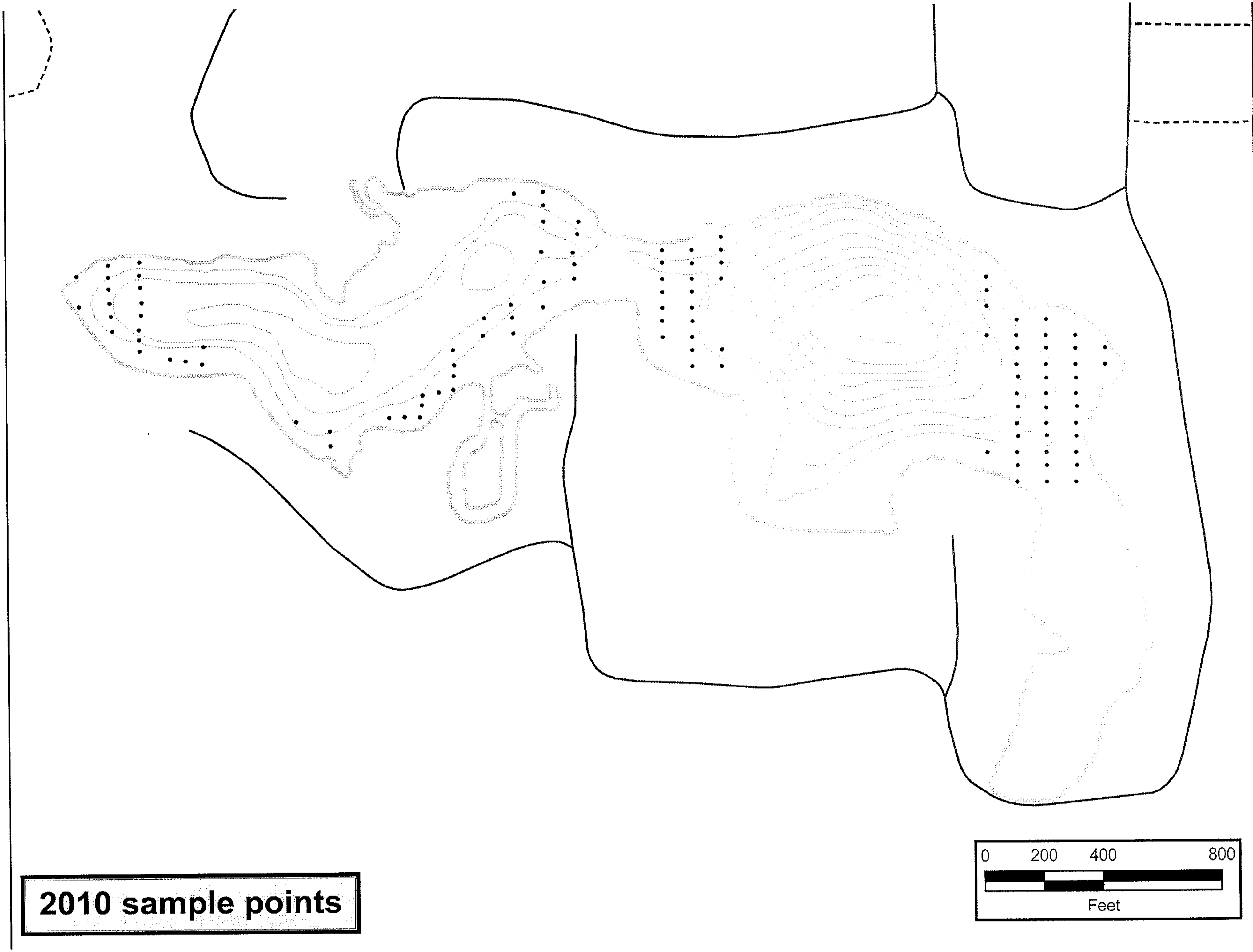
EXOTICS SPECIES STATS:

# at surface	0	
# within 1 ft of surface	0	
# > 1 ft from surface	0	
# sparse	0	
# dense	0	
# unknown	0	

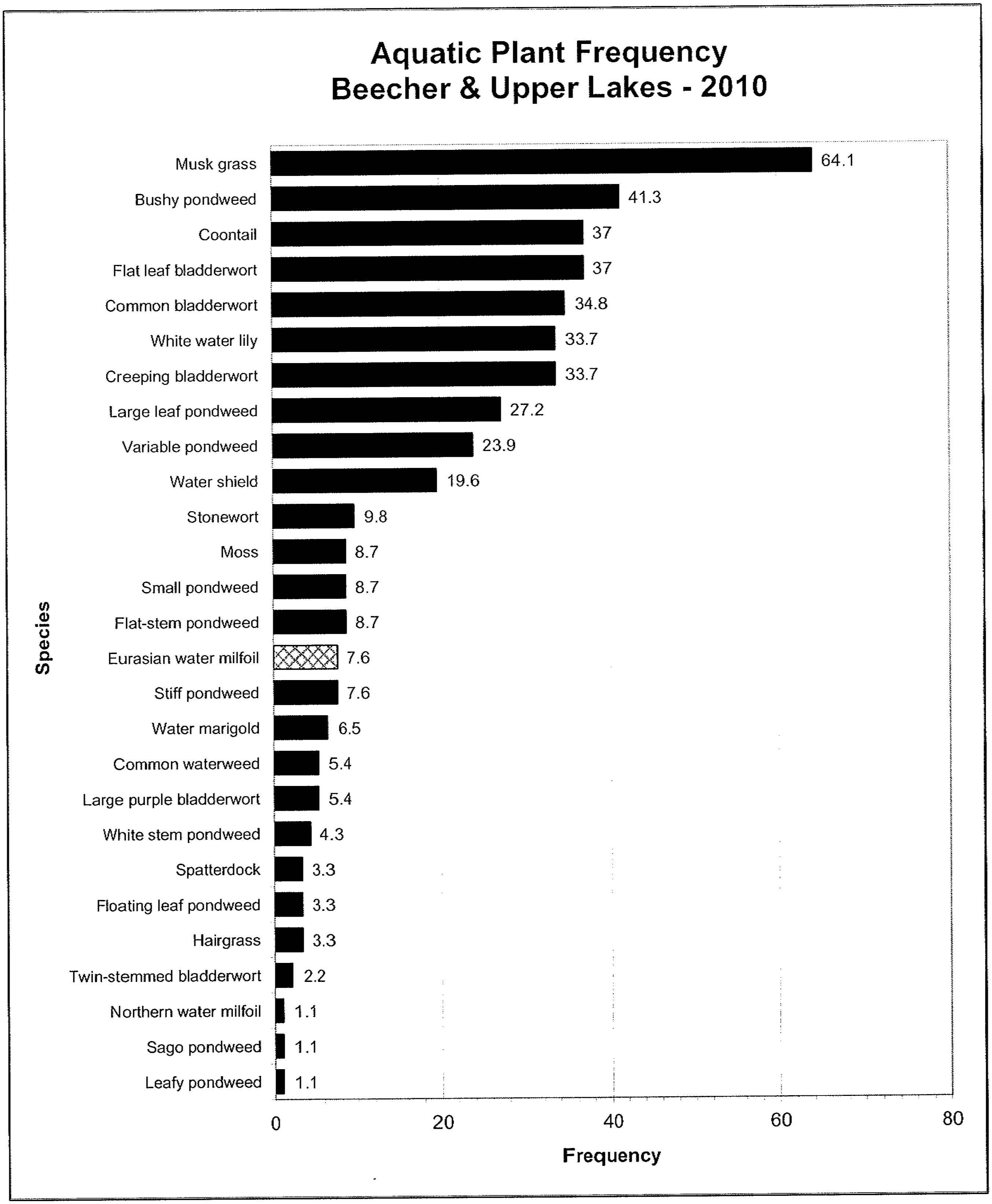
SUMMARY STATS:

Total number of points sampled	114
Total number of sites with vegetation	86
Total number of sites shallower than maximum depth of plants	92
Frequency of occurrence at sites shallower than maximum depth of plants	93.48
Simpson Diversity Index	0.93
Maximum depth of plants (ft)	7.00
Number of sites sampled using rake on Rope (R)	0
Number of sites sampled using rake on Pole (P)	114
Average number of all species per site (shallower than max depth)	4.40
Average number of all species per site (veg. sites only)	4.63
Average number of native species per site (shallower than max depth)	4.33
Average number of native species per site (veg. sites only)	4.63
Species Richness	27
Species Richness (including visuals)	27

	B	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF
1	**STATS**	... pusilis / Brassenia schreberii	Elodea canadensis	Megalodonta beckii	Potamogeton natans	Potamogeton strictifolius	Myriophyllum sibericum	Utricularia purpurea	Utriculria gemniscapa	Potamogeton praelongus	Potamogeton foliosus	x
2	Beecher & Upper Lakes											
3	Marinette											
4												
5	08/10/10											
6	**INDIVIDUAL SPECIES STATS:**											
7	Frequency of occurrence within vegetated areas (%)	20.93	5.81	6.98	3.49	8.14	1.16	5.81	2.33	4.65	1.16	
8	Frequency of occurrence at sites shallower than maximum depth of plants	19.57	5.43	6.52	3.26	7.61	1.09	5.43	2.17	4.35	1.09	
9	Relative Frequency (%)	4.4	1.2	1.5	0.7	1.7	0.2	1.2	0.5	1.0	0.2	
10	Relative Frequency (squared)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	Number of sites where species found	18	5	6	3	7	1	5	2	4	1	
12	Average Rake Fullness	1.17	1.20	1.17	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
13	#visual sightings	3			2					1		
14	present (visual or collected)	present	present	present	present	present	present	present	present	present	present	
15												
16	**EXOTICS SPECIES STATS:**											
17	# at surface											
18	# within 1 ft of surface											
19	# > 1 ft from surface											
20	# sparse											
21	# dense											
22	# unknown											
23												
24	**SUMMARY STATS:**											
25	Total number of points sampled											
26	Total number of sites with vegetation											
27	Total number of sites shallower than maximum depth of plants											
28	Frequency of occurrence at sites shallower than maximum depth of plants											
29	Simpson Diversity Index											
30	Maximum depth of plants (ft)											
31	Number of sites sampled using rake on Rope (R)											
32	Number of sites sampled using rake on Pole (P)											
33	Average number of all species per site (shallower than max depth)											
34	Average number of all species per site (veg. sites only)											
35	Average number of native species per site (shallower than max depth)											
36	Average number of native species per site (veg. sites only)											
37	Species Richness											
38	Species Richness (including visuals)											
39												



2010 sample points

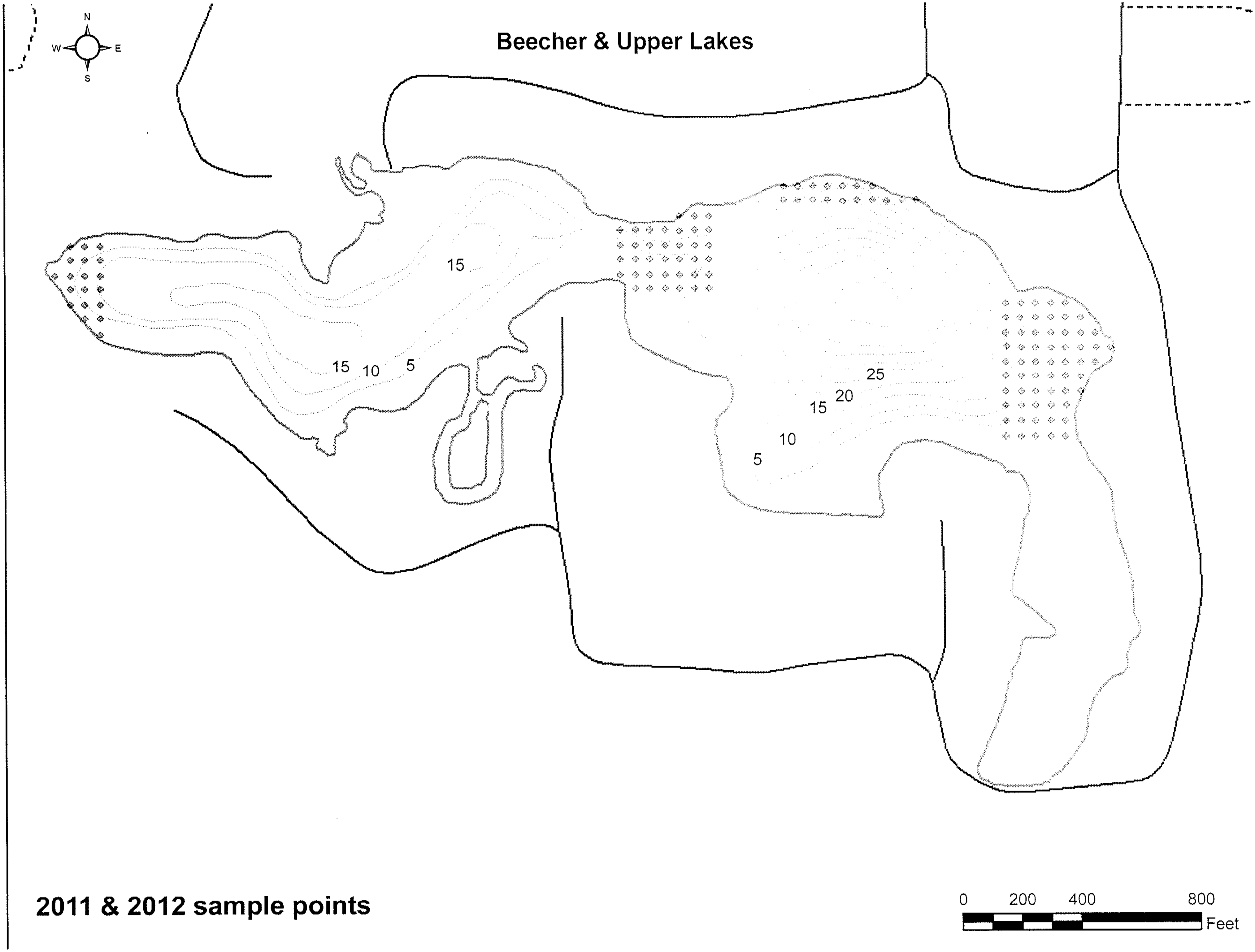


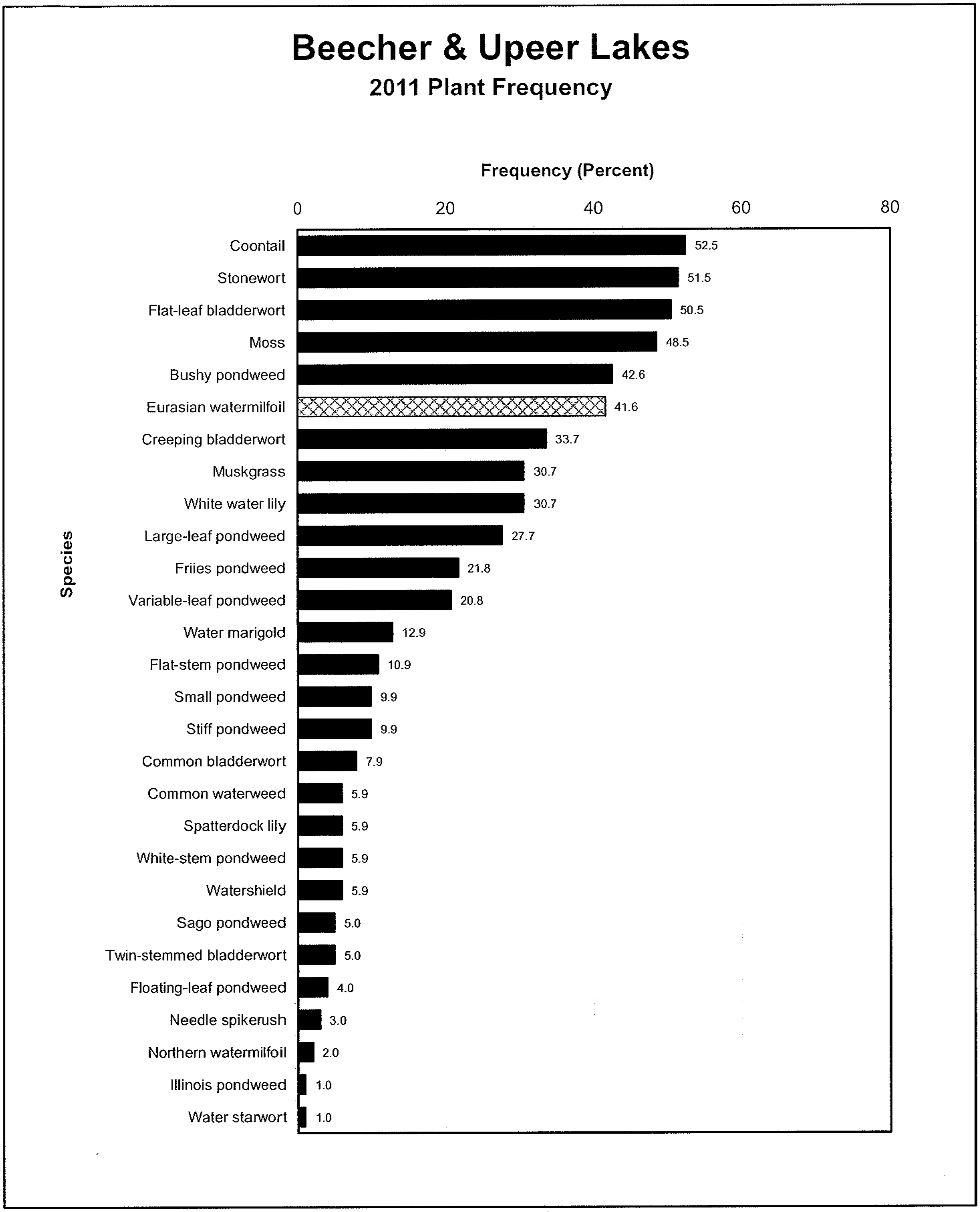
Aquatic Plant Frequency
Beecher & Upper Lakes - 2010
Species
Musk grass
Bushy pondweed
Coontail
Flat leaf bladderwort
Common bladderwort
White water lily
Creeping bladderwort
Large leaf pondweed
Variable pondweed
Water shield
Stonewort
Moss
Small pondweed
Flat-stem pondweed
Eurasian water milfoil
Stiff pondweed
Water marigold
Common waterweed
Large purple bladderwort
White stem pondweed
Spatterdock
Floating leaf pondweed
Hairgrass
Twin-stemmed bladderwort
Northern water milfoil
Sago pondweed
Leafy pondweed
64.1
41.3
37
37
34.8
33.7
33.7
27.2
23.9
19.6
9.8
8.7
8.7
8.7
7.6
7.6
6.5
5.4
5.4
4.3
3.3
3.3
3.3
2.2
1.1
1.1
1.1
0
20
40
60
80
Frequency

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1		**STATS**	Total vegetation	Myriophyllum spicatum	Potamogeton crispus	Chara sp.	Potamogeton amplifolius	Elodea canadensis	Nitella sp.	Najas flexilis	Unk. Potamogeton	Ceratophyllum demersum	Potamogeton gramineus	Stuckenia pectinata	Vallisneria americana	Potamogeton zosteriformis	Zosterella dubia	Utricularia vulgaris	Nymphaea odorata	Nuphar
2	Lake Name	Beecher & Upper Lakes																		
3	County	Marinette																		
4	WBIC																			
5	Survey Date	7/29/2011 & 8/3/11																		
6		**INDIVIDUAL SPECIES STATS:**																		
7		Frequency of occurrence within vegetated areas (%)		44.68		32.98	29.79	6.38	55.32	45.74		56.38	22.34	5.32		11.70		8.51	32.98	6.38
8		Frequency of occurrence at sites shallower than maximum depth of plants		41.58		30.69	27.72	5.94	51.49	42.57		52.48	20.79	4.95		10.89		7.92	30.69	5.94
9		Relative Frequency (%)		7.6		5.6	5.1	1.1	9.4	7.8		9.6	3.8	0.9		2.0		1.4	5.6	1.1
10		Relative Frequency (squared)	0.06	0.01		0.00	0.00	0.00	0.01	0.01		0.01	0.00	0.00		0.00		0.00	0.00	0.00
11		Number of sites where species found		42		31	28	6	52	43		53	21	5		11		8	31	6
12		Average Rake Fullness	2.65	1.36		1.65	1.18	1.00	1.83	1.19		1.30	1.10	1.20		1.09		1.25	2.26	1.00
13		#visual sightings		21			11			2		4	5	2		4		4	13	6
14		present (visual or collected)		present		present	present	present	present	present		present	present	present		present		present	present	present
15																				
16		**EXOTICS SPECIES STATS:**																		
17		# at surface		0																
18		# within 1 ft of surface		0																
19		# > 1 ft from surface		0																
20		# sparse		0																
21		# dense		0																
22		# unknown		0																
23																				
24		**SUMMARY STATS:**																		
25		Total number of points sampled	114																	
26		Total number of sites with vegetation	94																	
27		Total number of sites shallower than maximum depth of plants	101																	
28		Frequency of occurrence at sites shallower than maximum depth of plants	93.07																	
29		Simpson Diversity Index	0.94																	
30		Maximum depth of plants (ft)	8.00																	
31		Number of sites sampled using rake on Rope (R)	0																	
32		Number of sites sampled using rake on Pole (P)	115																	
33		Average number of all species per site (shallower than max depth)	5.49																	
34		Average number of all species per site (veg. sites only)	5.45																	
35		Average number of native species per site (shallower than max depth)	5.07																	
36		Average number of native species per site (veg. sites only)	5.45																	
37		Species Richness	28																	
38		Species Richness (including visuals)	29																	
39																				

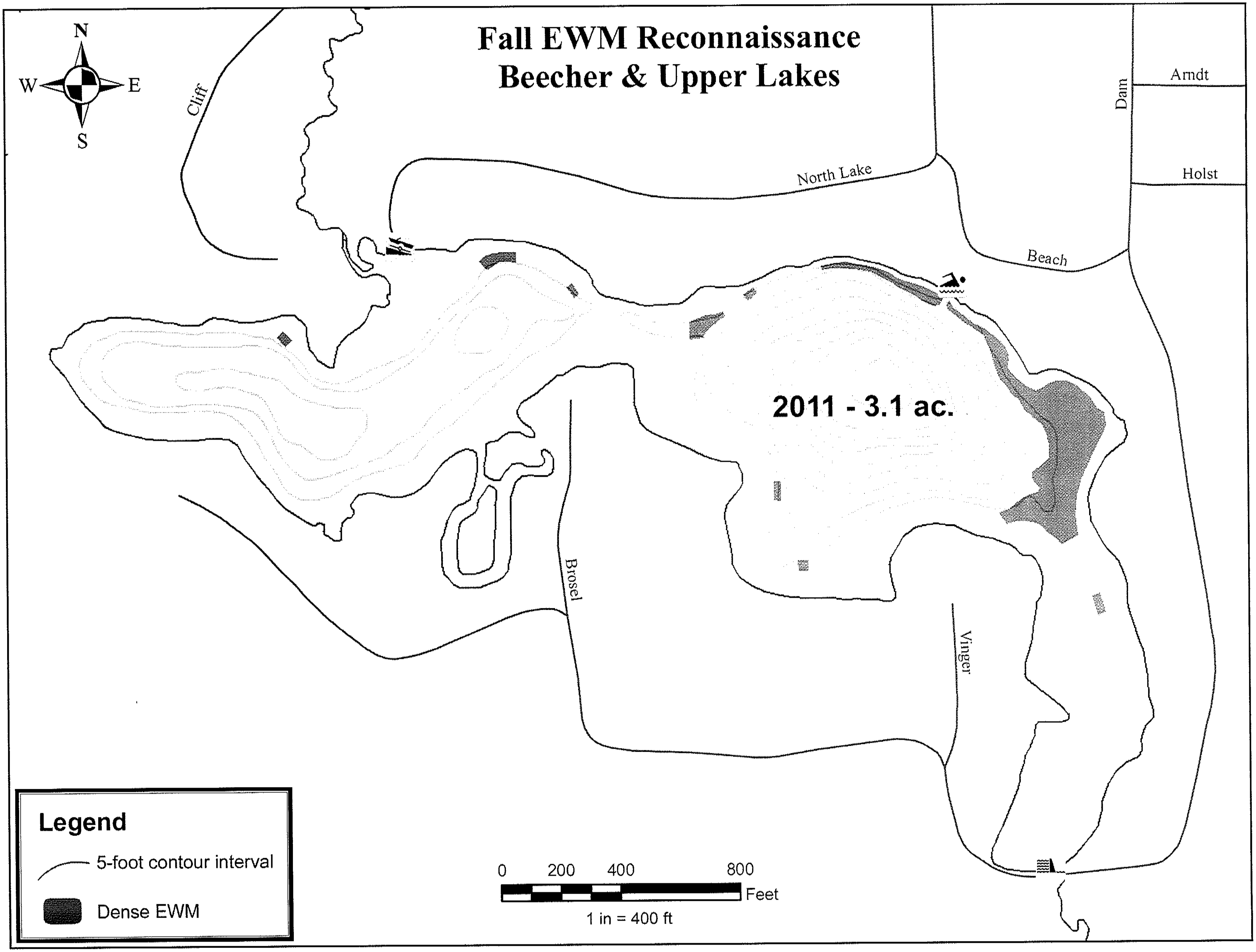
ariegata

	B	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM
1	**STATS**	Potamogeton praelongus	Megalodonta beckii	Potamogeton illinoensis	Potamogeton natans	Potamogeton pusillus	Brasenia schreberi	Utricularia intermedia	Utricularia gibba	Utricularia geminiscapa	Potamogeton friesii	Myriophyllum sibiricum	Eleocharis acicularis	Moss	Equisetum fluviatile	Potamogeton strictifolius	Callitriche sp.	X	X	X
2	Beecher & Upper Lakes																			
3	Marinette																			
4																				
5	7/29/2011 & 8/3/11																			
6	**INDIVIDUAL SPECIES STATS:**																			
7	Frequency of occurrence within vegetated areas (%)	6.38	13.83	1.06	4.26	10.64	6.38	54.26	36.17	5.32	23.40	2.13	3.19	52.13		10.64	1.06			
8	Frequency of occurrence at sites shallower than maximum depth of plants	5.94	12.87	0.99	3.96	9.90	5.94	50.50	33.66	4.95	21.78	1.98	2.97	48.51		9.90	0.99			
9	Relative Frequency (%)	1.1	2.3	0.2	0.7	1.8	1.1	9.2	6.1	0.9	4.0	0.4	0.5	8.8		1.8	0.2			
10	Relative Frequency (squared)	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01		0.00	0.00			
11	Number of sites where species found	6	13	1	4	10	6	51	34	5	22	2	3	49		10	1			
12	Average Rake Fullness	1.00	1.15	1.00	1.25	1.00	1.17	1.33	1.06	1.00	1.18	1.00	1.00	1.53		1.80	3.00			
13	#visual sightings	3	4		6	2	11	5	3	1		1			2		1			
14	present (visual or collected)	present	present	present	present	present	present	present	present	present	present	present	present	present	present	present	present			
15																				
16	**EXOTICS SPECIES STATS:**																			
17	# at surface																			
18	# within 1 ft of surface																			
19	# > 1 ft from surface																			
20	# sparse																			
21	# dense																			
22	# unknown																			
23																				
24	**SUMMARY STATS:**																			
25	Total number of points sampled																			
26	Total number of sites with vegetation																			
27	Total number of sites shallower than maximum depth of plants																			
28	Frequency of occurrence at sites shallower than maximum depth of plants																			
29	Simpson Diversity Index																			
30	Maximum depth of plants (ft)																			
31	Number of sites sampled using rake on Rope (R)																			
32	Number of sites sampled using rake on Pole (P)																			
33	Average number of all species per site (shallower than max depth)																			
34	Average number of all species per site (veg. sites only)																			
35	Average number of native species per site (shallower than max depth)																			
36	Average number of native species per site (veg. sites only)																			
37	Species Richness																			
38	Species Richness (including visuals)																			
39																				


Beecher & Upper Lakes
N
W
E
S
15
15
10
5
25
20
15
10
5
2011 & 2012 sample points
0
200
400
800
Feet


Beecher & Upeer Lakes
2011 Plant Frequency
Frequency (Percent)
0
20
40
60
80
Species
Coontail 52.5
Stonewort 51.5
Flat-leaf bladderwort 50.5
Moss 48.5
Bushy pondweed 42.6
Eurasian watermilfoil 41.6
Creeping bladderwort 33.7
Muskgrass 30.7
White water lily 30.7
Large-leaf pondweed 27.7
Friies pondweed 21.8
Variable-leaf pondweed 20.8
Water marigold 12.9
Flat-stem pondweed 10.9
Small pondweed 9.9
Stiff pondweed 9.9
Common bladderwort 7.9
Common waterweed 5.9
Spatterdock lily 5.9
White-stem pondweed 5.9
Watershield 5.9
Sago pondweed 5.0
Twin-stemmed bladderwort 5.0
Floating-leaf pondweed 4.0
Needle spikerush 3.0
Northern watermilfoil 2.0
Illinois pondweed 1.0
Water starwort 1.0

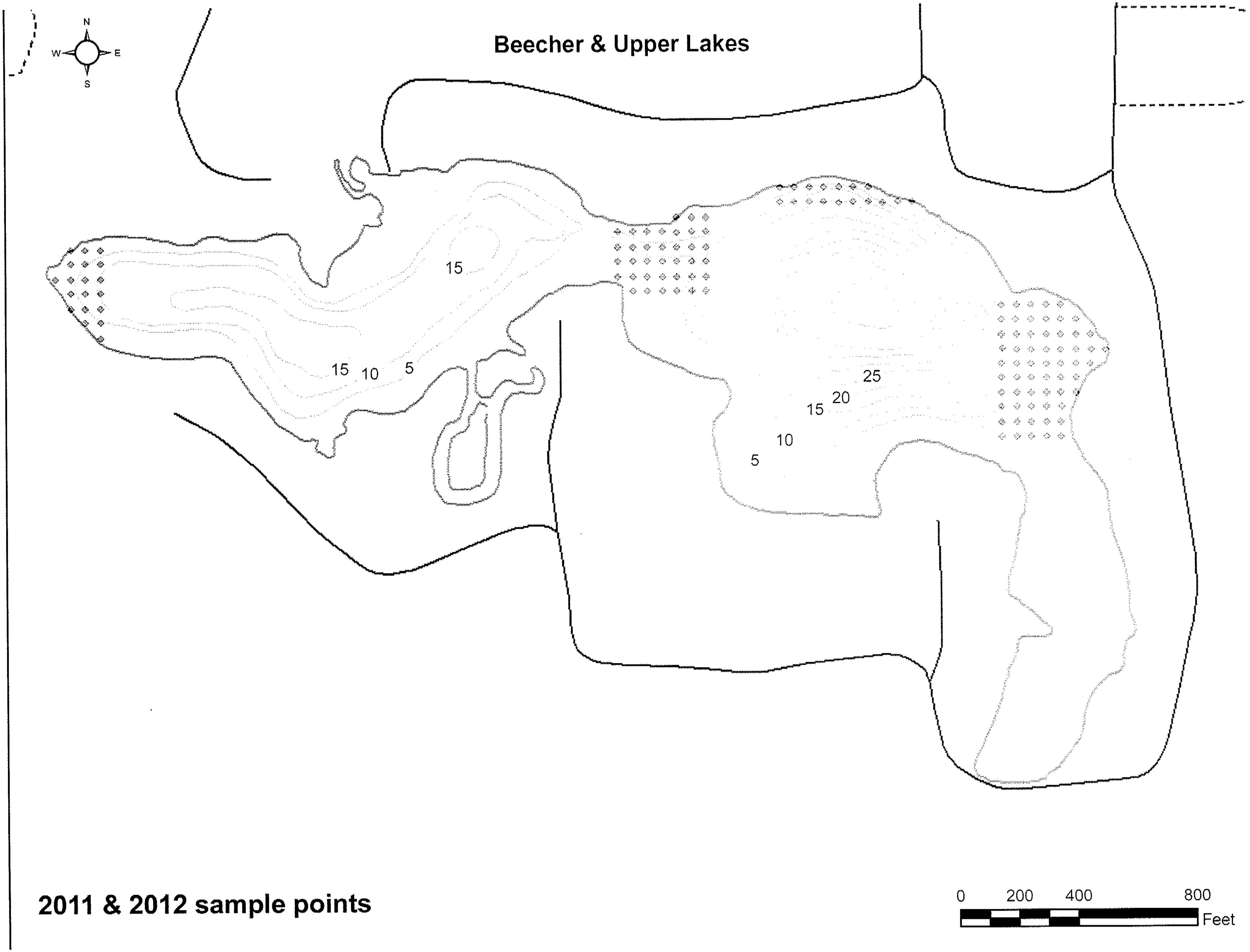
Fall EWM Reconnaissance
Beecher & Upper Lakes



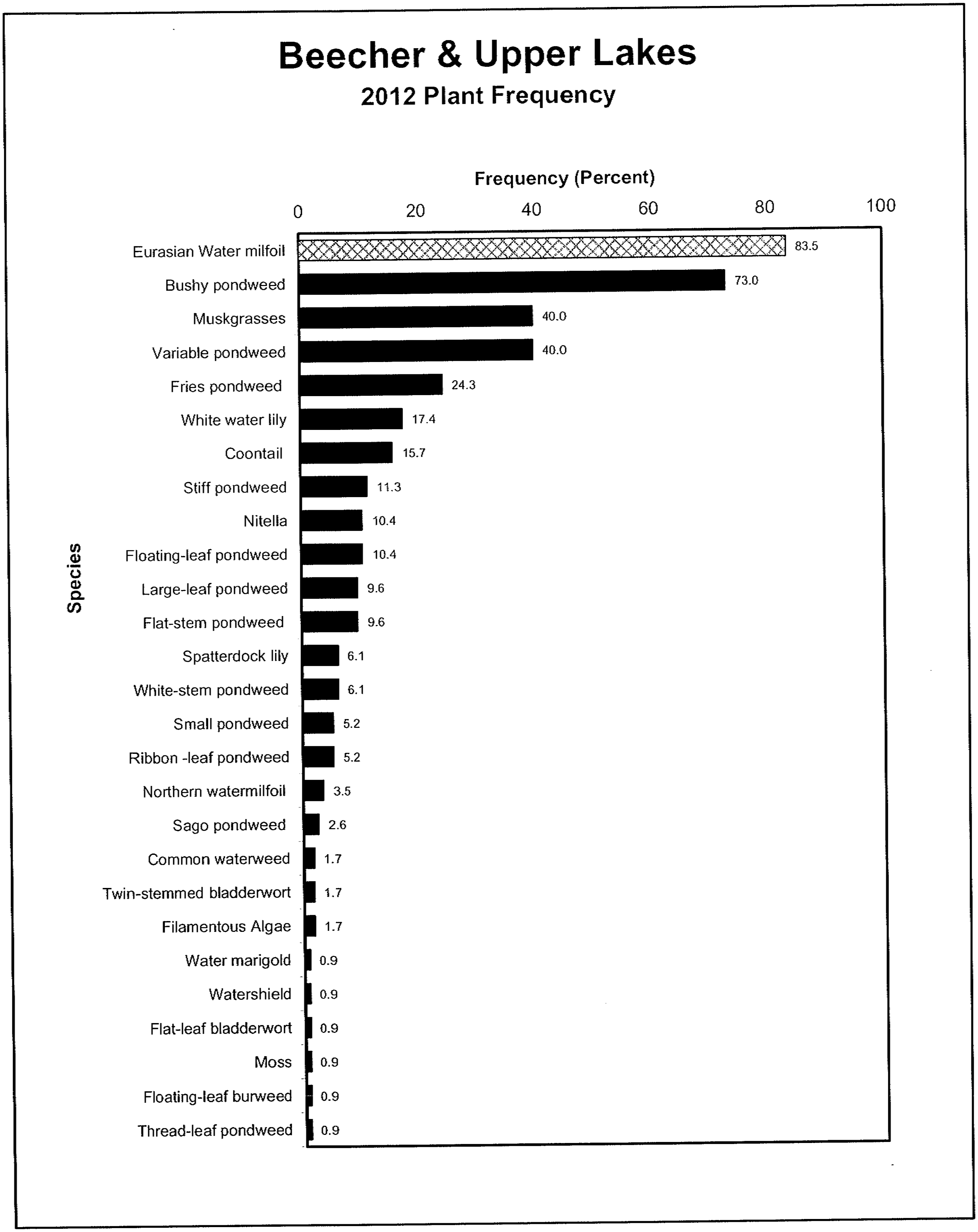
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA
1		**STATS**	Total vegetation	Myriophyllum spicatum	Potamogeton crispus	Chara sp.	Potamogeton amplifolius	Elodea canadensis	Nitella sp.	Najas flexilis	Potamogeton fresii	Ceratophyllum demersum	Potamogeton gramineus	Stuckenia pectinata	Vallisneria americana	Potamogeton zosteriformis	Zosterella dubia	Utricularia vulgaris	Nymphaea odorata	Nuphar variegata	Scirpus validus	Potamogeton richardsonii	Polygonum amphibium	Potamogeton praelongus	Heteranthera dubia	Megalodonta beckii	Potamo
2	Lake Name	Beecher & Upper Lakes																									
3	County	Marinette																									
4	WBIC	0																									
5	Survey Date	08/22/12																									
6		**INDIVIDUAL SPECIES STATS:**																									
7		Frequency of occurrence within vegetated areas (%)		83.48		40.00	10.43	1.74	10.43	73.04	24.35	15.65	40.00	2.61		9.57			17.39	6.09				6.09		0.87	
8		Frequency of occurrence at sites shallower than maximum depth of plants		80.67		38.66	10.08	1.68	10.08	70.59	23.53	15.13	38.66	2.52		9.24			16.81	5.88				5.88		0.84	
9		Relative Frequency (%)		21.7		10.4	2.7	0.5	2.7	19.0	6.3	4.1	10.4	0.7		2.5			4.5	1.6				1.6		0.2	
10		Relative Frequency (squared)	0.12	0.05		0.01	0.00	0.00	0.00	0.04	0.00	0.00	0.01	0.00		0.00			0.00	0.00				0.00		0.00	
11		Number of sites where species found		96		46	12	2	12	84	28	18	46	3		11			20	7				7		1	
12		Average Rake Fullness	2.41	1.73		1.35	1.25	1.00	1.17	1.96	1.18	1.00	1.24	2.00		1.18			1.45	1.14				1.00		1.00	
13		#visual sightings		15			2				1	1		3		2			10	10							
14		present (visual or collected)		present		present	present	present	present	present	present	present	present	present		present			present	present				present		present	
15																											
16		**EXOTICS SPECIES STATS:**																									
17		# at surface		0																							
18		# within 1 ft of surface		0																							
19		# > 1 ft from surface		0																							
20		# sparse		0																							
21		# dense		0																							
22		# unknown		0																							
23																											
24		**SUMMARY STATS:**																									
25		Total number of points sampled	121																								
26		Total number of sites with vegetation	115																								
27		Total number of sites shallower than maximum depth of plants	119																								
28		Frequency of occurrence at sites shallower than maximum depth of plants	96.64																								
29		Simpson Diversity Index	0.88																								
30		Maximum depth of plants (ft)	11.00																								
31		Number of sites sampled using rake on Rope (R)	121																								
32		Number of sites sampled using rake on Pole (P)	0																								
33		Average number of all species per site (shallower than max depth)	3.72																								
34		Average number of all species per site (veg. sites only)	3.18																								
35		Average number of native species per site (shallower than max depth)	2.92																								
36		Average number of native species per site (veg. sites only)	3.18																								
37		Species Richness	27																								
38		Species Richness (including visuals)	27																								
39																											

	B	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW
1	**STATS**	Potamogeton natans	Potamogeton pusillus	Ranunculus aqualilis	Schoenoplectus acutus	Utricularia resupinata	Brasenia schreberi	Utricularia intermedia	Utricularia gibba	Utricularia geminiscapa	Potamogeton obtusifolius	Myriophyllum sibiricum	Eleocharis acicularis	Moss	Equisetum fluviatile	Potamogeton strictifolius	Callitriche sp.	Sparganuim fluctuans	Potamogeton diversofolius	Potamogeton epihydrus	Filamentous Algae	X	X
2	Beecher & Upper Lakes																						
3	Marinette																						
4	0																						
5	08/22/12																						
6	**INDIVIDUAL SPECIES STATS:**																						
7	Frequency of occurrence within vegetated areas (%)	10.43	5.22				0.87	0.87		1.74		3.48		0.87		11.30		0.87	0.87	5.22	1.74		
8	Frequency of occurrence at sites shallower than maximum depth of plants	10.08	5.04				0.84	0.84		1.68		3.36		0.84		10.92		0.84	0.84	5.04	1.68		
9	Relative Frequency (%)	2.7	1.4				0.2	0.2		0.5		0.9		0.2		2.9		0.2	0.2	1.4	0.5		
10	Relative Frequency (squared)	0.00	0.00				0.00	0.00		0.00		0.00		0.00		0.00		0.00	0.00	0.00	0.00		
11	Number of sites where species found	12	6				1	1		2		4		1		13		1	1	6	2		
12	Average Rake Fullness	1.00	1.00				1.00	1.00		1.00		1.00		1.00		1.15		1.00	1.00	1.00	1.00		
13	#visual sightings	5					2	2				1				4		1					
14	present (visual or collected)	present	present				present	present		present		present		present		present		present	present	present	present		
15																							
16	**EXOTICS SPECIES STATS:**																						
17	# at surface																						
18	# within 1 ft of surface																						
19	# > 1 ft from surface																						
20	# sparse																						
21	# dense																						
22	# unknown																						
23																							
24	**SUMMARY STATS:**																						
25	Total number of points sampled																						
26	Total number of sites with vegetation																						
27	Total number of sites shallower than maximum depth of plants																						
28	Frequency of occurrence at sites shallower than maximum depth of plants																						
29	Simpson Diversity Index																						
30	Maximum depth of plants (ft)																						
31	Number of sites sampled using rake on Rope (R)																						
32	Number of sites sampled using rake on Pole (P)																						
33	Average number of all species per site (shallower than max depth)																						
34	Average number of all species per site (veg. sites only)																						
35	Average number of native species per site (shallower than max depth)																						
36	Average number of native species per site (veg. sites only)																						
37	Species Richness																						
38	Species Richness (including visuals)																						
39																							

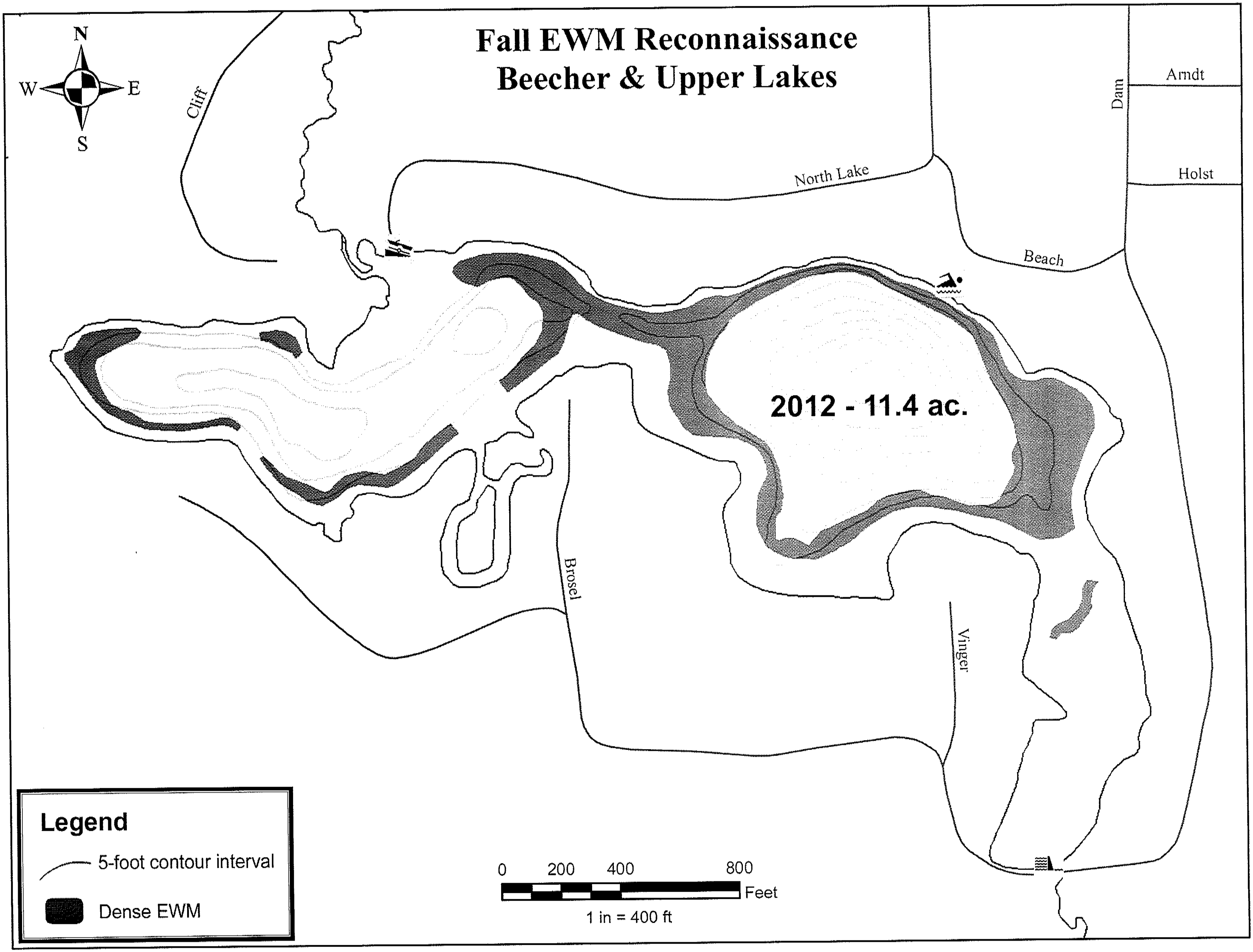
Beecher & Upper Lakes



2011 & 2012 sample points



Beecher & Upper Lakes
2012 Plant Frequency
Frequency (Percent)
0
20
40
60
80
100
Species
Eurasian Water milfoil 83.5
Bushy pondweed 73.0
Muskgrasses 40.0
Variable pondweed 40.0
Fries pondweed 24.3
White water lily 17.4
Coontail 15.7
Stiff pondweed 11.3
Nitella 10.4
Floating-leaf pondweed 10.4
Large-leaf pondweed 9.6
Flat-stem pondweed 9.6
Spatterdock lily 6.1
White-stem pondweed 6.1
Small pondweed 5.2
Ribbon -leaf pondweed 5.2
Northern watermilfoil 3.5
Sago pondweed 2.6
Common waterweed 1.7
Twin-stemmed bladderwort 1.7
Filamentous Algae 1.7
Water marigold 0.9
Watershield 0.9
Flat-leaf bladderwort 0.9
Moss 0.9
Floating-leaf burweed 0.9
Thread-leaf pondweed 0.9

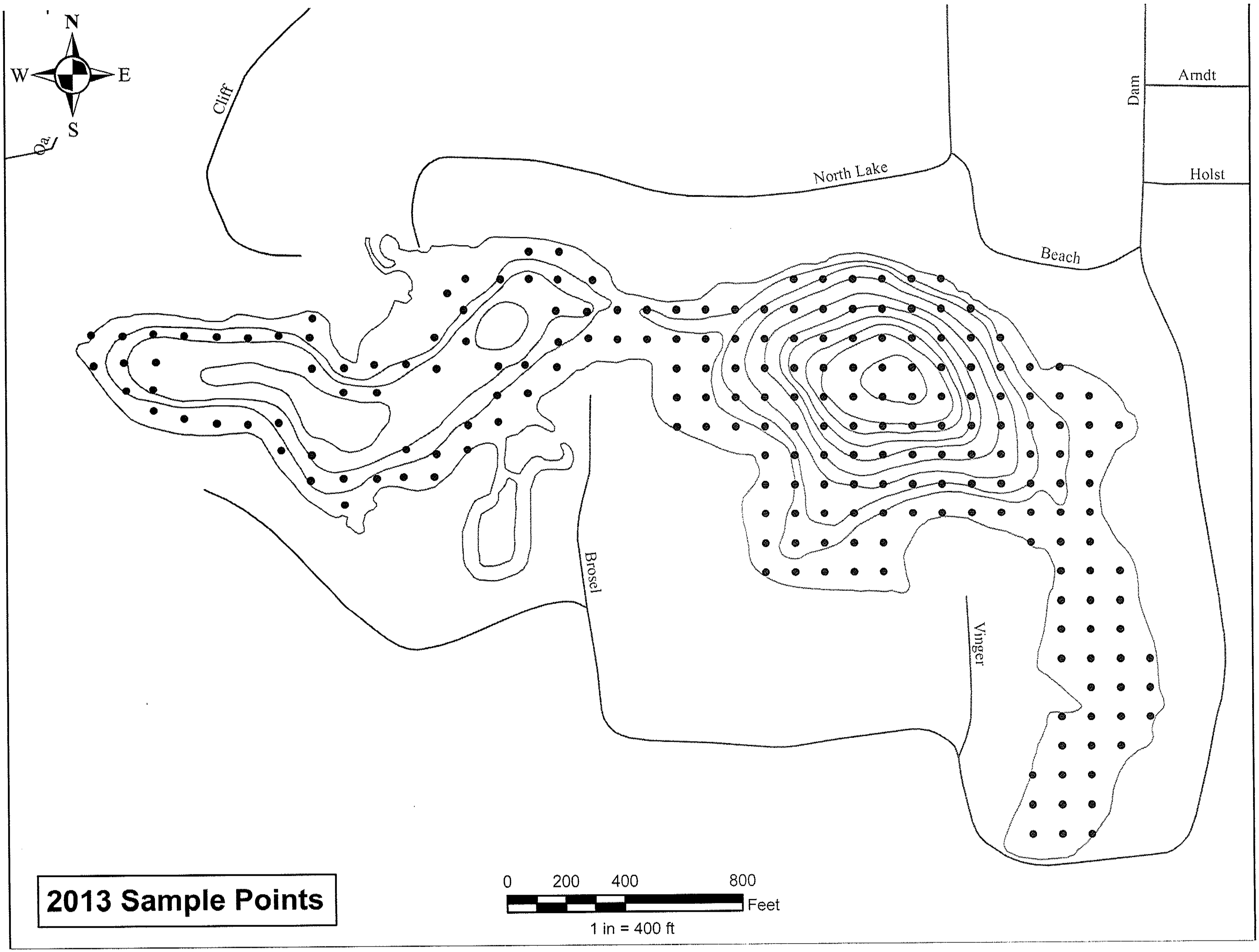

Fall EWM Reconnaissance
Beecher & Upper Lakes
N
W
E
S
Cliff
North Lake
Dam
Arndt
Holst
Beach
2012 - 11.4 ac.
Brosel
Vinger
Legend
5-foot contour interval
Dense EWM
0
200
400
800
Feet
1 in = 400 ft

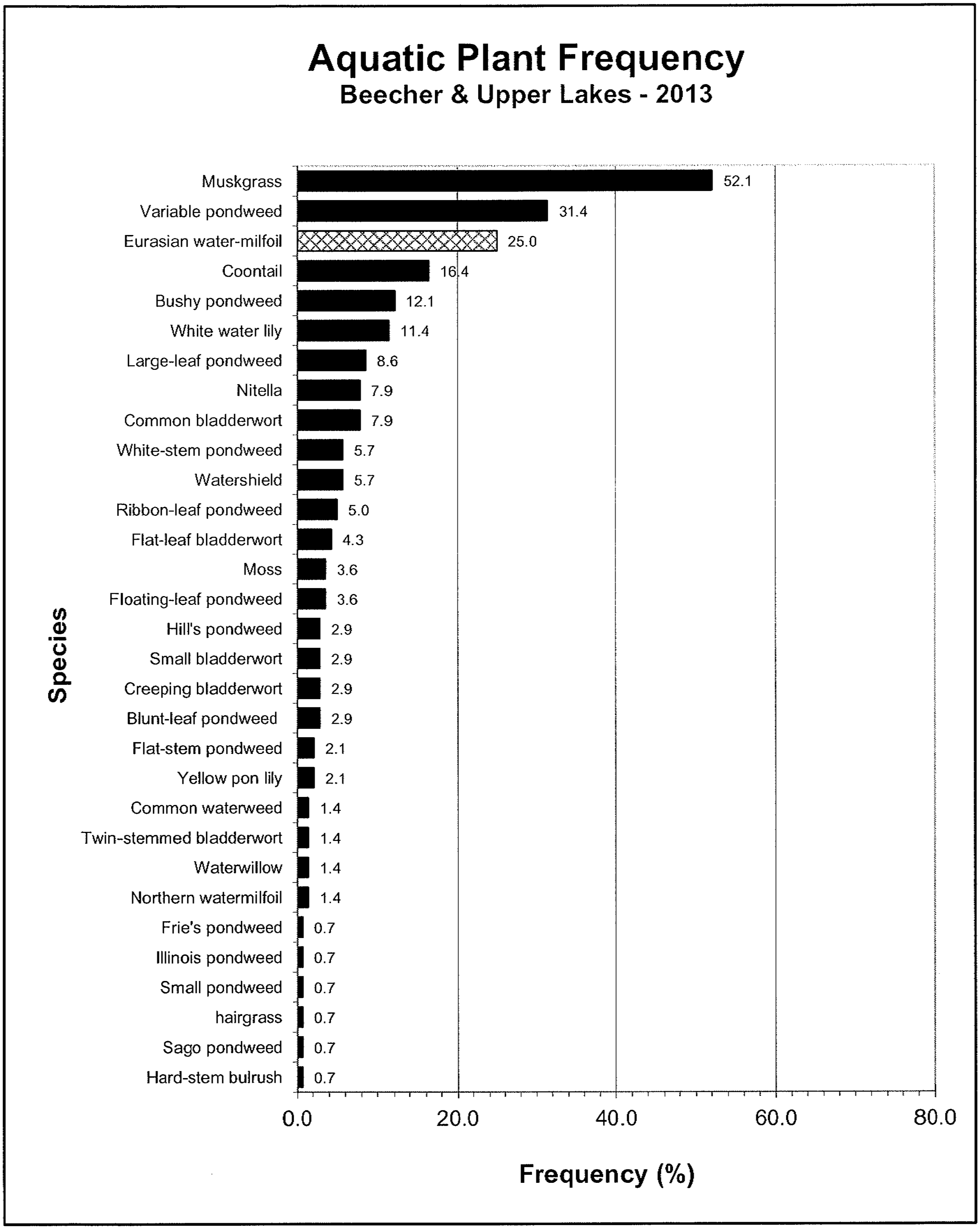
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1		**STATS**	Total vegetation	Myriophyllum spicatum	Moss	Ceratophyllum demersum	Chara	Elodea canadensis	Najas flexilis	Nitella sp.	Nymphaea odorata	Potamogeton friesii	Potamogeton gramineus	Potamogeton illinoensis	Potamogeton natans	Potamogeton pusillus	Potamogeton zosteriformus	Utricularia mior	Utricula vulgaris	Potamo
2	Lake Name	Beecher & Uper Lakes																		
3	County	Marinette																		
4	WBIC																			
5	Survey Date	07/08/13																		
6		**INDIVIDUAL SPECIES STATS:**																		
7		Frequency of occurrence within vegetated areas (%)		28.00	4.00	18.40	58.40	1.60	13.60	8.80	12.80	0.80	35.20	0.80	4.00	0.80	2.40	3.20	8.80	9.60
8		Frequency of occurrence at sites shallower than maximum depth of plants		25.00	3.57	16.43	52.14	1.43	12.14	7.86	11.43	0.71	31.43	0.71	3.57	0.71	2.14	2.86	7.86	8.57
9		Relative Frequency (%)		11.1	1.6	7.3	23.1	0.6	5.4	3.5	5.1	0.3	13.9	0.3	1.6	0.3	0.9	1.3	3.5	3.8
10		Relative Frequency (squared)	0.10	0.01	0.00	0.01	0.05	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11		Number of sites where species found		35	5	23	73	2	17	11	16	1	44	1	5	1	3	4	11	12
12		Average Rake Fullness	1.70	1.43	1.00	1.35	1.26	1.00	1.12	1.55	1.69	2.00	1.39	2.00	1.40	1.00	1.67	1.00	1.45	1.50
13		#visual sightings		16		3					22		14		14		1	2	5	12
14		present (visual or collected)		present	present	present	present	present	present	present	present	present	present	present	present	present	present	present	present	present

	A	B	C	D
15				
16		**EXOTICS SPECIES STATS:**		
17		# at surface		#REF!
18		# within 1 ft of surface		#REF!
19		# > 1 ft from surface		#REF!
20		# sparse		#REF!
21		# dense		#REF!
22		# unknown		#REF!
23				
24		**SUMMARY STATS:**		
25		Total number of points sampled	211	
26		Total number of sites with vegetation	125	
27		Total number of sites shallower than maximum depth of plants	140	
28		Frequency of occurrence at sites shallower than maximum depth of plants	89.29	
29		Simpson Diversity Index	0.90	
30		Maximum depth of plants (ft)	10.00	
31		Number of sites sampled using rake on Rope (R)	11	
32		Number of sites sampled using rake on Pole (P)	129	
33		Average number of all species per site (shallower than max depth)	2.23	
34		Average number of all species per site (veg. sites only)	2.32	
35		Average number of native species per site (shallower than max depth)	1.31	
36		Average number of native species per site (veg. sites only)	1.89	
37		Species Richness	31	
38		Species Richness (including visuals)	33	
39				

	B	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM
1	**STATS**	Sparganuim chlorocarpum	Potamogeton Praelongus	Nuphar variegata	Brasenia schreberi	Potamoageton epihydrus	X	Eleocharis accicularis	Stuckenia pectinata	Utricularia gibba	Utricularia intermedia	Utricularia gemniscapa	Schoenoplectus acutus	Potamogeton hillii	Potamogeton obtusifolius	Justica (waterwillow)	Myriophyllum sibericum	Polygonum amphibium	X	X
2	Beecher & Uper Lakes																			
3	Marinette																			
4																				
5	07/08/13																			
6	**INDIVIDUAL SPECIES STATS:**																			
7	Frequency of occurrence within vegetated areas (%)		6.40	2.40	6.40	5.60		0.80	0.80	3.20	4.80	1.60	0.80	3.20	3.20	1.60	0.80			
8	Frequency of occurrence at sites shallower than maximum depth of plants		5.71	2.14	5.71	5.00		0.71	0.71	2.86	4.29	1.43	0.71	2.86	2.86	1.43	0.71			
9	Relative Frequency (%)		2.5	0.9	2.5	2.2		0.3	0.3	1.3	1.9	0.6	0.3	1.3	1.3	0.6	0.3			
10	Relative Frequency (squared)		0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
11	Number of sites where species found		8	3	8	7		1	1	4	6	2	1	4	4	2	1			
12	Average Rake Fullness		1.25	1.33	1.25	1.00		2.00	2.00	1.00	1.00	1.00	1.00	1.25	1.00	1.00	1.00			
13	#visual sightings	1	8	28	16	4				1	2		4	10	2	3		1		
14	present (visual or collected)	present	present	present	present	present		present	present	present	present	present	present	present	present	present	present	present		
15																				
16	**EXOTICS SPECIES STATS:**																			
17	# at surface																			
18	# within 1 ft of surface																			
19	# > 1 ft from surface																			
20	# sparse																			
21	# dense																			
22	# unknown																			
23																				
24	**SUMMARY STATS:**																			
25	Total number of points sampled																			
26	Total number of sites with vegetation																			
27	Total number of sites shallower than maximum depth of plants																			
28	Frequency of occurrence at sites shallower than maximum depth of plants																			
29	Simpson Diversity Index																			
30	Maximum depth of plants (ft)																			
31	Number of sites sampled using rake on Rope (R)																			
32	Number of sites sampled using rake on Pole (P)																			
33	Average number of all species per site (shallower than max depth)																			
34	Average number of all species per site (veg. sites only)																			
35	Average number of native species per site (shallower than max depth)																			
36	Average number of native species per site (veg. sites only)																			
37	Species Richness																			
38	Species Richness (including visuals)																			
39																				

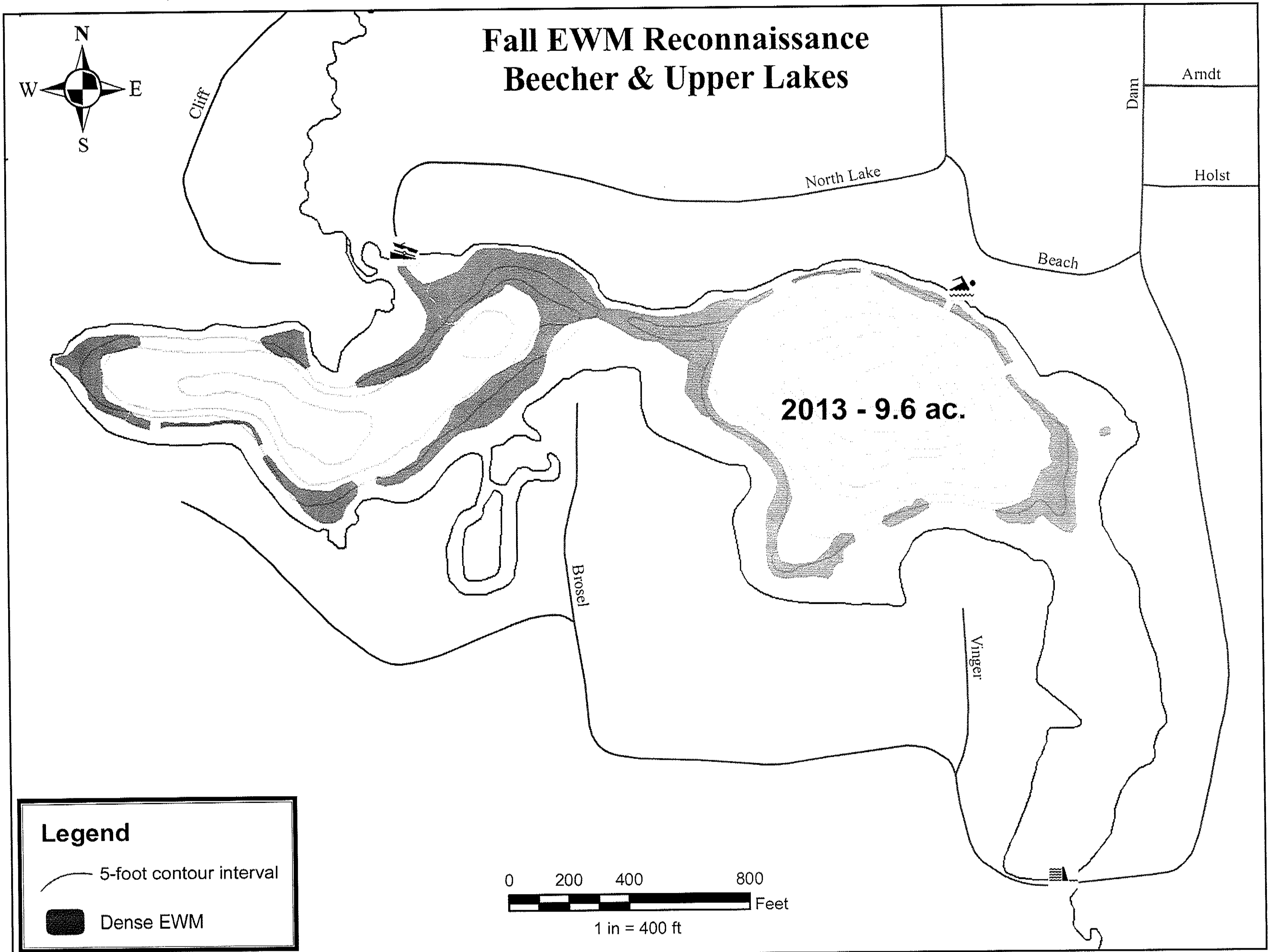
...eton amplipholius


N
E
S
W
Cliff
Qa.
North Lake
Dam
Arndt
Holst
Beach
Brosel
Vinger
0
200
400
800
Feet
1 in = 400 ft
2013 Sample Points



Aquatic Plant Frequency
Beecher & Upper Lakes - 2013
Species
Muskgrass 52.1
Variable pondweed 31.4
Eurasian water-milfoil 25.0
Coontail 16.4
Bushy pondweed 12.1
White water lily 11.4
Large-leaf pondweed 8.6
Nitella 7.9
Common bladderwort 7.9
White-stem pondweed 5.7
Watershield 5.7
Ribbon-leaf pondweed 5.0
Flat-leaf bladderwort 4.3
Moss 3.6
Floating-leaf pondweed 3.6
Hill's pondweed 2.9
Small bladderwort 2.9
Creeping bladderwort 2.9
Blunt-leaf pondweed 2.9
Flat-stem pondweed 2.1
Yellow pon lily 2.1
Common waterweed 1.4
Twin-stemmed bladderwort 1.4
Waterwillow 1.4
Northern watermilfoil 1.4
Frie's pondweed 0.7
Illinois pondweed 0.7
Small pondweed 0.7
hairgrass 0.7
Sago pondweed 0.7
Hard-stem bulrush 0.7
0.0
20.0
40.0
60.0
80.0
Frequency (%)

Fall EWM Reconnaissance
Beecher & Upper Lakes



STATS

	Total vegetation	Myriophyllum spicatum	Ceratophyllum demersum	Potamogeton amplifolius	Moss	Nitella	Potamogeton pusillus	Nyphaea odorata	Nuphar variegata	Chara	Brasenia schreberi	Potamogeton praelongus	Utricularia vulgaris	Potamogeton gramineus	Utricularia gibba	Utricularia geminiscapa	Potamogeton natans	Megalod
Lake Name: Beecher & Upper Lakes																		
County: Marinette																		
WBIC																		
Survey Date: 08/13/14																		
INDIVIDUAL SPECIES STATS:																		
Frequency of occurrence within vegetated areas (%)		44.70	30.30	15.91	31.06	8.33	6.82	17.42	9.85	62.88	8.33	6.82	9.09	24.24	5.30	6.82	8.33	2.27
Frequency of occurrence at sites shallower than maximum depth of plants		42.75	28.99	15.22	29.71	7.97	6.52	16.67	9.42	60.14	7.97	6.52	8.70	23.19	5.07	6.52	7.97	2.17
Relative Frequency (%)		13.1	8.9	4.7	9.1	2.4	2.0	5.1	2.9	18.4	2.4	2.0	2.7	7.1	1.6	2.0	2.4	0.7
Relative Frequency (squared)	0.09	0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Number of sites where species found		59	40	21	41	11	9	23	13	83	11	9	12	32	7	9	11	3
Average Rake Fullness	1.96	1.61	1.45	1.24	1.07	1.27	1.00	1.48	1.31	1.49	1.27	1.22	1.08	1.09	1.00	1.00	1.55	1.00
#visual sightings		11	2	17			2	19	9		15	1	4	4	1	1	6	
present (visual or collected)		present	present	present	present	present	present	present	present	present	present	present	present	present	present	present	present	present

EXOTICS SPECIES STATS:

# at surface	#REF!
# within 1 ft of surface	#REF!
# > 1 ft from surface	#REF!
# sparse	#REF!
# dense	#REF!
# unknown	#REF!

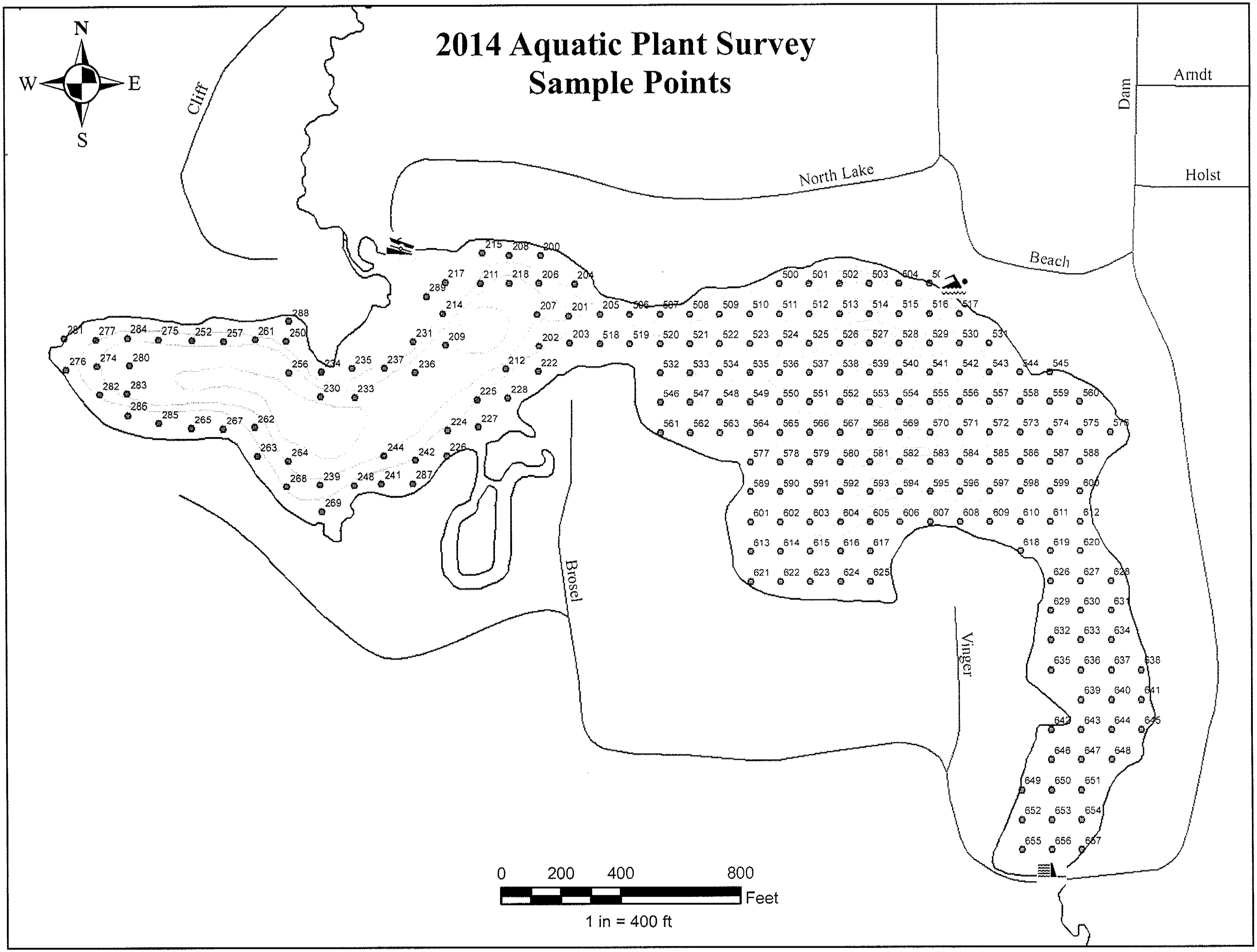
SUMMARY STATS:

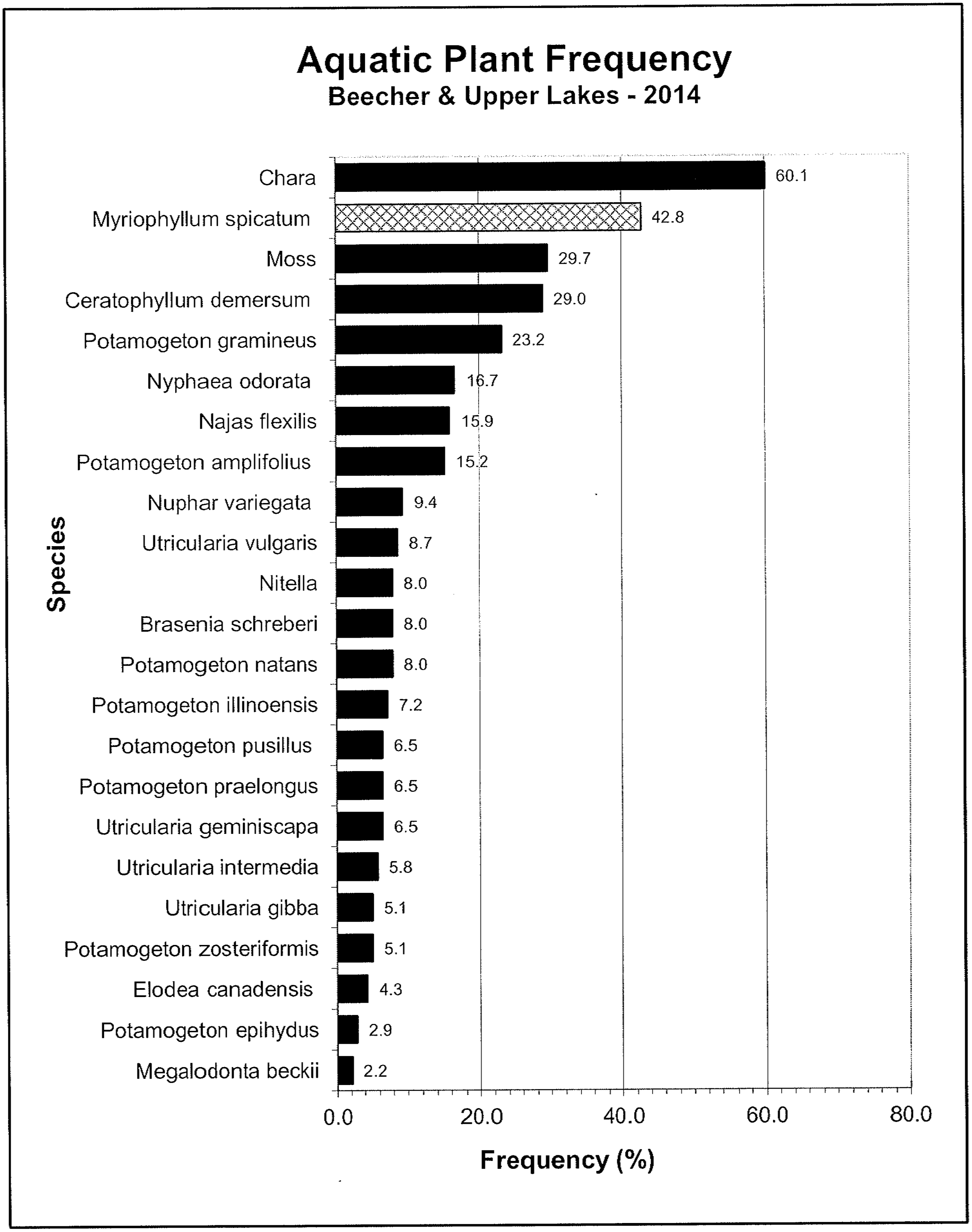
Total number of points sampled	167
Total number of sites with vegetation	132
Total number of sites shallower than maximum depth of plants	138
Frequency of occurrence at sites shallower than maximum depth of plants	95.65
Simpson Diversity Index	0.91
Maximum depth of plants (ft)	8.00
Number of sites sampled using rake on Rope (R)	0
Number of sites sampled using rake on Pole (P)	171
Average number of all species per site (shallower than max depth)	3.27
Average number of all species per site (veg. sites only)	3.05
Average number of native species per site (shallower than max depth)	2.10
Average number of native species per site (veg. sites only)	2.40
Species Richness	23
Species Richness (including visuals)	23

…onta beckii

	B	U	V	W	X	Y	Z	AA	AB
1	**STATS**	Najas flexilis	Potamogeton illinoensis	Utricularia intermedia	Elodea canadensis	Potamogeton zosteriformis	Potamogeton epihydus	X	X
2	Beecher & Upper Lakes								
3	Marinette								
4									
5	08/13/14								
6	**INDIVIDUAL SPECIES STATS:**								
7	Frequency of occurrence within vegetated areas (%)	16.67	7.58	6.06	4.55	5.30	3.03		
8	Frequency of occurrence at sites shallower than maximum depth of plants	15.94	7.25	5.80	4.35	5.07	2.90		
9	Relative Frequency (%)	4.9	2.2	1.8	1.3	1.6	0.9		
10	Relative Frequency (squared)	0.00	0.00	0.00	0.00	0.00	0.00		
11	Number of sites where species found	22	10	8	6	7	4		
12	Average Rake Fullness	1.14	1.00	1.00	1.00	1.14	1.00		
13	#visual sightings	1	2	1	1		1		
14	present (visual or collected)	present	present	present	present	present	present		
15									
16	**EXOTICS SPECIES STATS:**								
17	# at surface								
18	# within 1 ft of surface								
19	# > 1 ft from surface								
20	# sparse								
21	# dense								
22	# unknown								
23									
24	**SUMMARY STATS:**								
25	Total number of points sampled								
26	Total number of sites with vegetation								
27	Total number of sites shallower than maximum depth of plants								
28	Frequency of occurrence at sites shallower than maximum depth of plants								
29	Simpson Diversity Index								
30	Maximum depth of plants (ft)								
31	Number of sites sampled using rake on Rope (R)								
32	Number of sites sampled using rake on Pole (P)								
33	Average number of all species per site (shallower than max depth)								
34	Average number of all species per site (veg. sites only)								
35	Average number of native species per site (shallower than max depth)								
36	Average number of native species per site (veg. sites only)								
37	Species Richness								
38	Species Richness (including visuals)								
39									

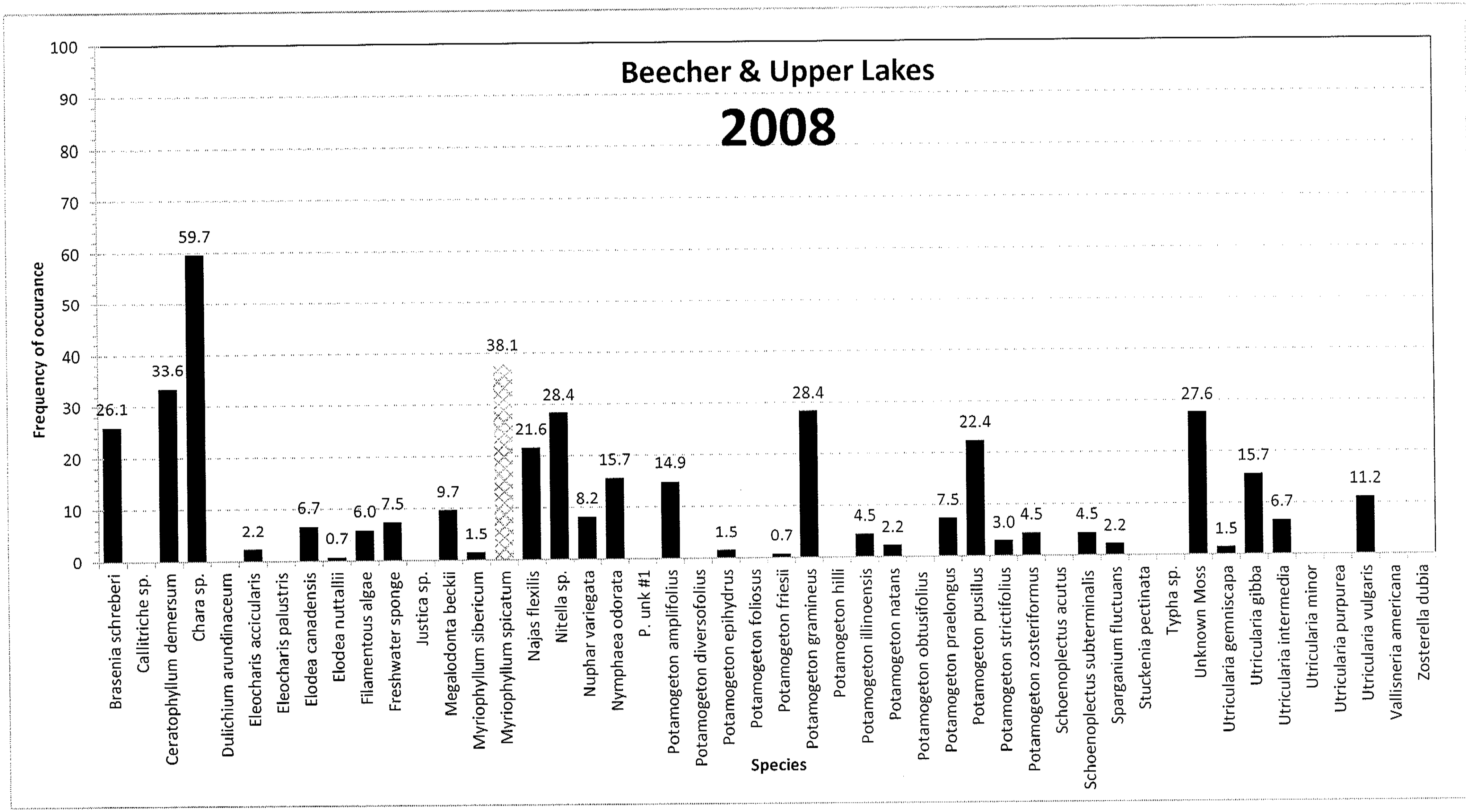
2014 Aquatic Plant Survey
Sample Points

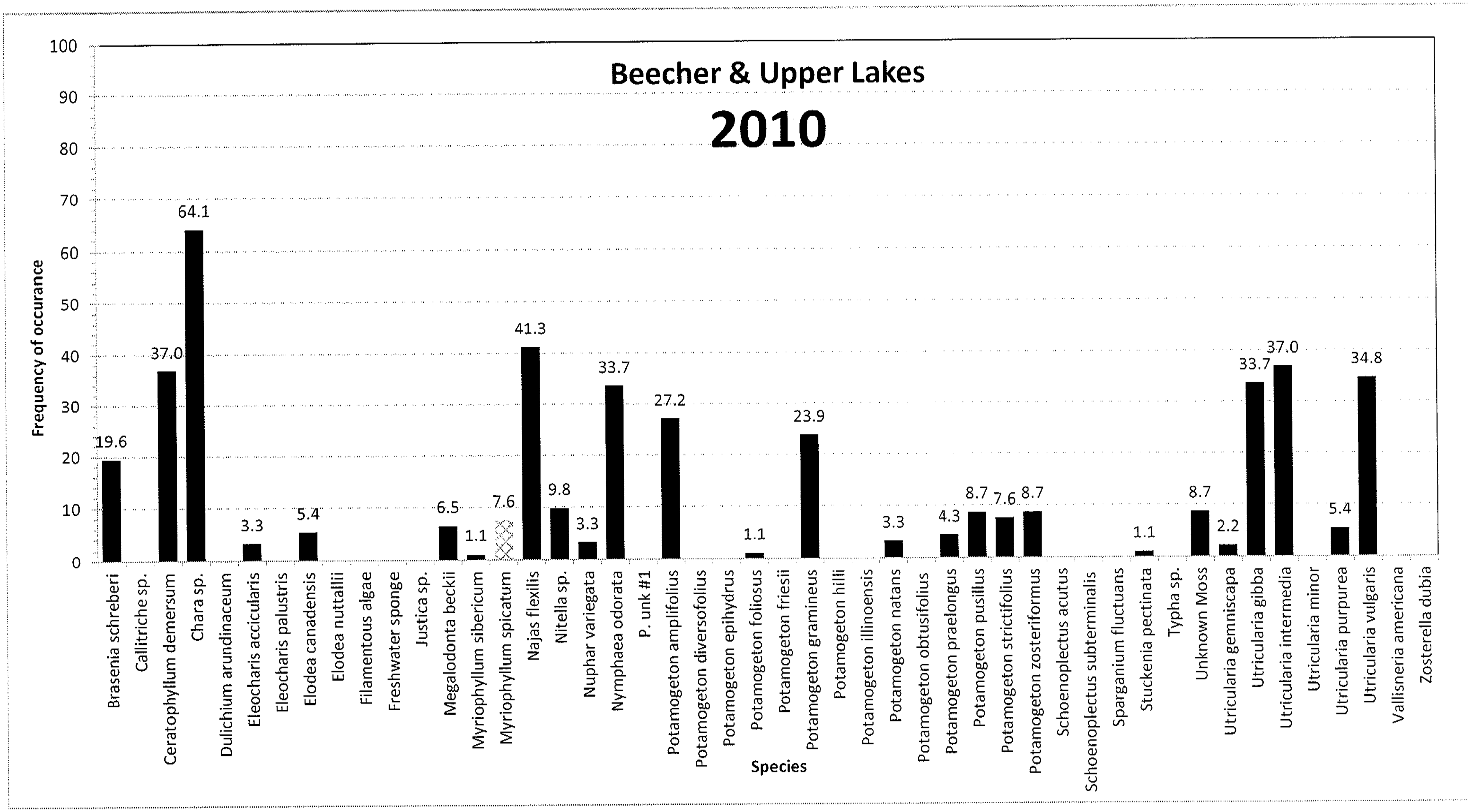



Aquatic Plant Frequency
Beecher & Upper Lakes - 2014
Species
Chara
60.1
Myriophyllum spicatum
42.8
Moss
29.7
Ceratophyllum demersum
29.0
Potamogeton gramineus
23.2
Nyphaea odorata
16.7
Najas flexilis
15.9
Potamogeton amplifolius
15.2
Nuphar variegata
9.4
Utricularia vulgaris
8.7
Nitella
8.0
Brasenia schreberi
8.0
Potamogeton natans
8.0
Potamogeton illinoensis
7.2
Potamogeton pusillus
6.5
Potamogeton praelongus
6.5
Utricularia geminiscapa
6.5
Utricularia intermedia
5.8
Utricularia gibba
5.1
Potamogeton zosteriformis
5.1
Elodea canadensis
4.3
Potamogeton epihydus
2.9
Megalodonta beckii
2.2
0.0
20.0
40.0
60.0
80.0
Frequency (%)

Beecher & Upper Lakes

Scientific Name	Common Name	2008 Frequency	2010 Frequency	2011 Frequency	2012 Frequency	2013 Frequency	2014 Frequency
Brasenia schreberi	Water shield	26.1	19.6	5.9	0.8	5.7	8.0
Callitriche sp.	water starwort			1.0			
Ceratophyllum demersum	Coontail	33.6	37.0	52.5	15.1	16.4	29.0
Chara sp.	Musk grass	59.7	64.1	30.7	38.7	52.1	60.1
Dulichium arundinaceum	Three way sedge						
Eleocharis accicularis	Hairgrass	2.2	3.3	3.0		0.7	
Eleocharis palustris	Creeping spikerush						
Elodea canadensis	Common waterweed	6.7	5.4	5.9	1.7	1.4	4.3
Elodea nuttallii	Slender waterweed	0.7					
Filamentous algae	Fillamentous algae	6.0			1.7		
Freshwater sponge	Freshwater sponge	7.5					
Justica sp.	Water willow					1.4	
Megalodonta beckii	Water marigold	9.7	6.5	12.9	0.8		2.2
Myriophyllum sibericum	Northern water milfoil	1.5	1.1	2.0	3.4	1.4	
Myriophyllum spicatum	Eurasian water milfoil	38.1	7.6	41.6	80.7	25.0	42.8
Najas flexilis	Bushy pondweed	21.6	41.3	42.6	70.6	12.1	15.9
Nitella sp.	Stonewort	28.4	9.8	51.5	10.1	7.9	8.0
Nuphar variegata	Spatterdock	8.2	3.3	5.9	5.9	2.1	9.4
Nymphaea odorata	White water lily	15.7	33.7	30.7	16.8	11.4	16.7
P. unk #1	Unk. pondweed						
Potamogeton amplifolius	Large leaf pondweed	14.9	27.2	27.7	10.1	8.6	15.2
Potamogeton diversofolius	Water-thread pondweed				0.8		
Potamogeton epihydrus	Ribbon leaf pondweed	1.5			5.0	5.0	2.9
Potamogeton foliosus	Leafy pondweed		1.1				
Potamogeton friesii	Frie's pondweed	0.7		21.8	23.5	0.7	
Potamogeton gramineus	Variable pondweed	28.4	23.9	20.8	38.7	31.4	23.2
Potamogeton hilli	Hill's pondweed					2.9	
Potamogeton illinoensis	Illinois pondweed	4.5		1.0		0.7	7.2
Potamogeton natans	Floating leaf pondweed	2.2	3.3	4.0	10.1	3.6	8.0
Potamogeton obtusifolius	Blunt-leaf pondweed					2.9	
Potamogeton praelongus	White stem pondweed	7.5	4.3	5.9	5.9	5.7	6.5
Potamogeton pusillus	Small pondweed	22.4	8.7	9.9	5.0	0.7	6.5
Potamogeton strictifolius	Stiff pondweed	3.0	7.6	9.9	10.9		
Potamogeton zosteriformus	Flat-stem pondweed	4.5	8.7	10.9	9.2	2.1	5.1
Schoenoplectus acutus	Hardstem bulrush					0.7	
Schoenoplectus subterminalis	water bulrush	4.5					
Sparganium fluctuans	Floating leaf burreed	2.2			0.8		
Stuckenia pectinata	Sago pondweed		1.1	5.0	2.5	0.7	
Typha sp.	Cattail						
Unknown Moss	Moss	27.6	8.7	48.5	0.8	3.6	29.7
Utricularia gemniscapa	Twin-stemmed bladderwort	1.5	2.2	5.0	1.7	1.4	6.5
Utricularia gibba	Creeping bladderwort	15.7	33.7	33.7		2.9	5.1
Utricularia intermedia	Flat leaf bladderwort	6.7	37.0	50.5	0.8	4.3	5.8
Utricularia minor	Small bladderwort					2.9	
Utricularia purpurea	Large purple bladderwort		5.4				
Utricularia vulgaris	Common bladderwort	11.2	34.8	7.9		7.9	8.7
Vallisneria americana	Water celery						
Zosterella dubia	Water stargrass						


Beecher & Upper Lakes
2008
Frequency of occurance
Species
100
90
80
70
60
50
40
30
20
10
0
26.1
33.6
59.7
2.2
6.7
0.7
6.0
7.5
9.7
1.5
38.1
21.6
28.4
8.2
15.7
14.9
1.5
0.7
28.4
4.5
2.2
7.5
22.4
3.0
4.5
4.5
2.2
27.6
1.5
15.7
6.7
11.2
Brasenia schreberi
Callitriche sp.
Ceratophyllum demersum
Chara sp.
Dulichium arundinaceum
Eleocharis accicularis
Eleocharis palustris
Elodea canadensis
Elodea nuttallii
Filamentous algae
Freshwater sponge
Justica sp.
Megalodonta beckii
Myriophyllum sibericum
Myriophyllum spicatum
Najas flexilis
Nitella sp.
Nuphar variegata
Nymphaea odorata
P. unk #1
Potamogeton amplifolius
Potamogeton diversofolius
Potamogeton epihydrus
Potamogeton foliosus
Potamogeton friesii
Potamogeton gramineus
Potamogeton hilli
Potamogeton illinoensis
Potamogeton natans
Potamogeton obtusifolius
Potamogeton praelongus
Potamogeton pusillus
Potamogeton strictifolius
Potamogeton zosteriformus
Schoenoplectus acutus
Schoenoplectus subterminalis
Sparganium fluctuans
Stuckenia pectinata
Typha sp.
Unknown Moss
Utricularia gemniscapa
Utricularia gibba
Utricularia intermedia
Utricularia minor
Utricularia purpurea
Utricularia vulgaris
Vallisneria americana
Zosterella dubia


Beecher & Upper Lakes
2010
Frequency of occurance
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Brasenia schreberi
Callitriche sp.
Ceratophyllum demersum
Chara sp.
Dulichium arundinaceum
Eleocharis accicularis
Eleocharis palustris
Elodea canadensis
Elodea nuttallii
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Utricularia minor
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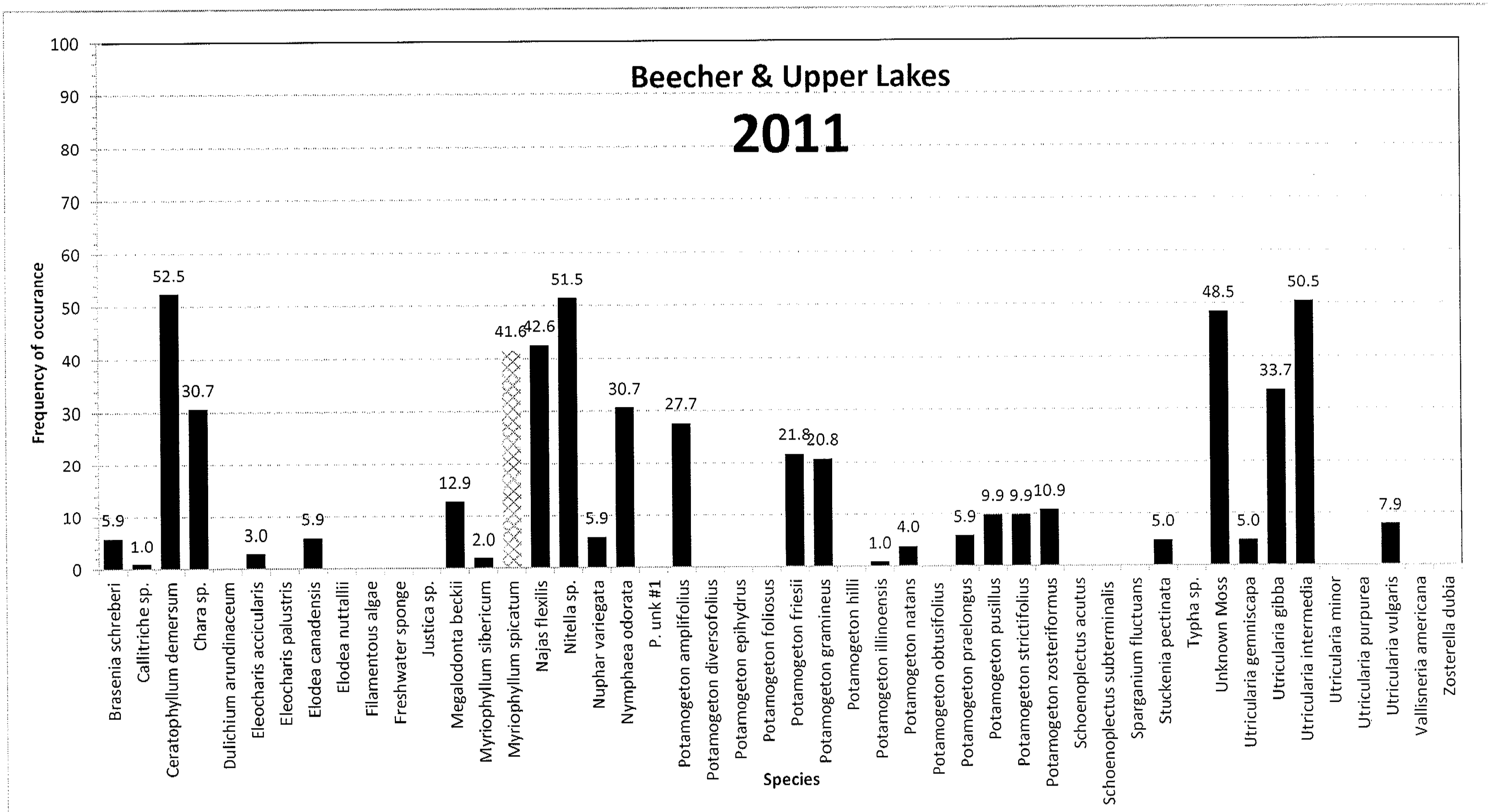
Vallisneria americana
Zosterella dubia
Species


Beecher & Upper Lakes
2011
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Callitriche sp.
Ceratophyllum demersum
Chara sp.
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P. unk #1
Potamogeton amplifolius
Potamogeton diversofolius
Potamogeton epihydrus
Potamogeton foliosus
Potamogeton friesii
Potamogeton gramineus
Potamogeton hillii
Potamogeton illinoensis
Potamogeton natans
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Typha sp.
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Utricularia gibba
Utricularia intermedia
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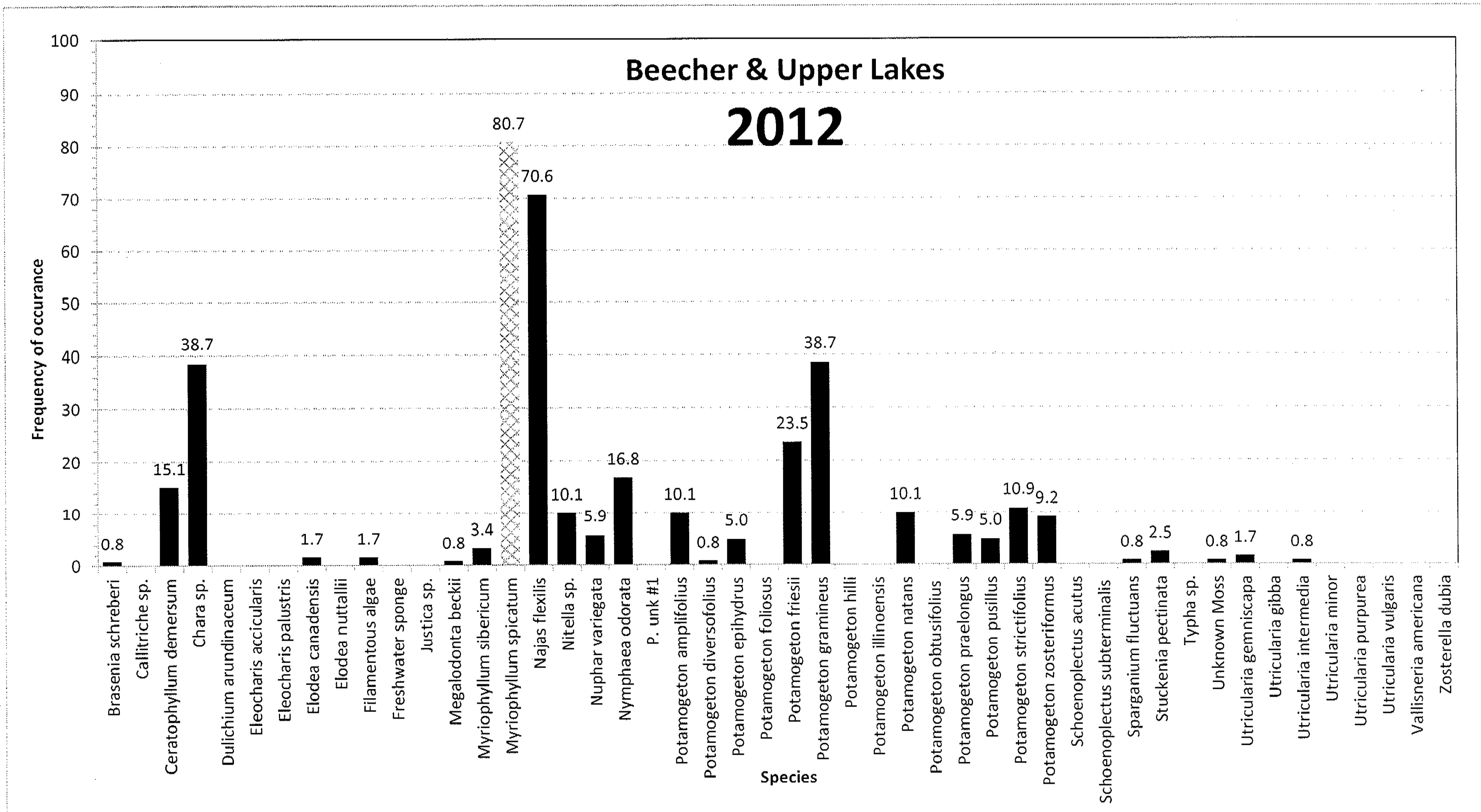
Utricularia vulgaris
Vallisneria americana
Zosterella dubia
Species



Beecher & Upper Lakes
2012
Frequency of occurance
Species
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50
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38.7
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Brasenia schreberi
Callitriche sp.
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Chara sp.
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Utricularia gemniscapa
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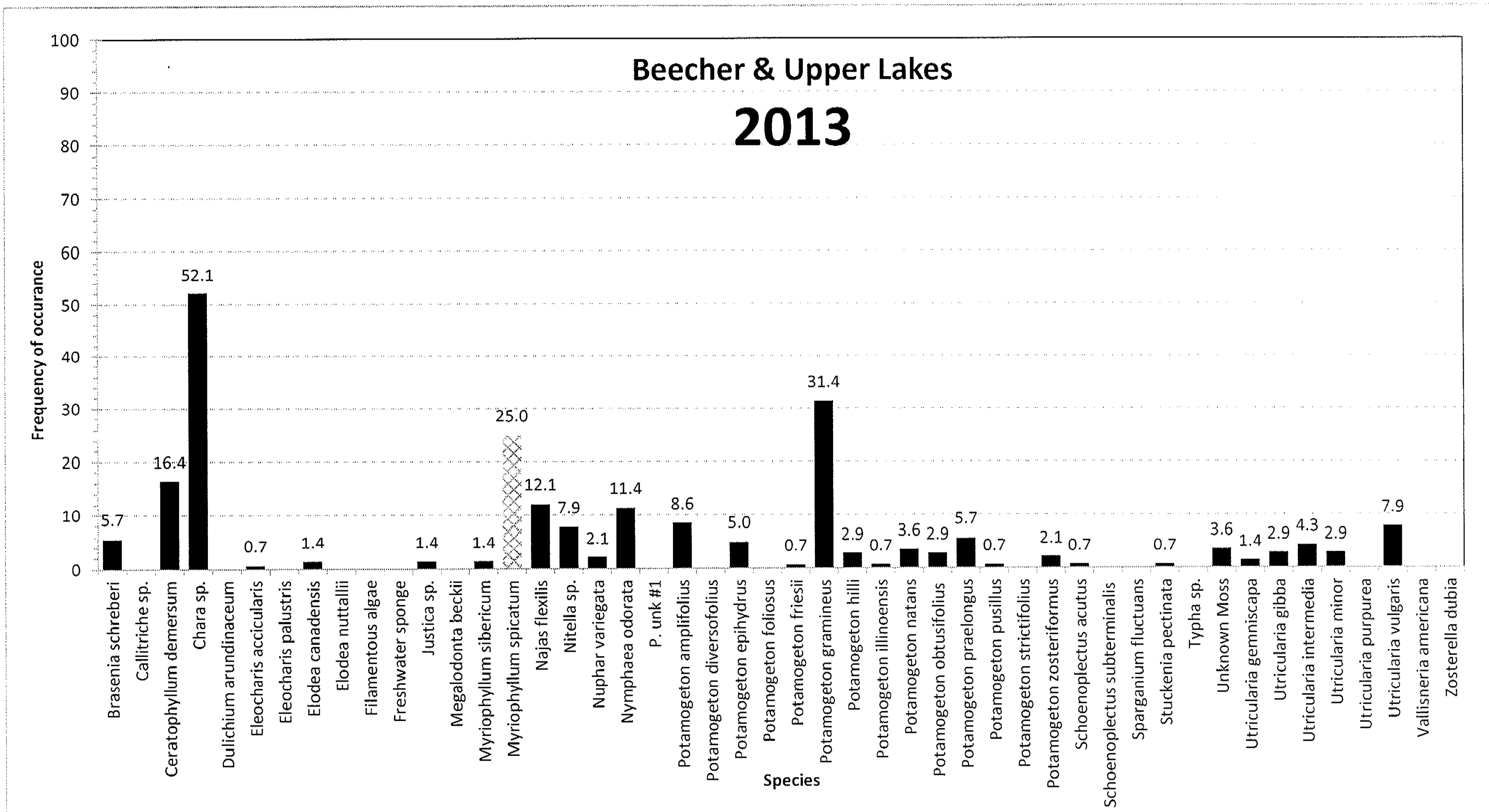
Vallisneria americana
Zosterella dubia


Beecher & Upper Lakes
2013
Frequency of occurance
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25.0
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2.1
11.4
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Utricularia gibba
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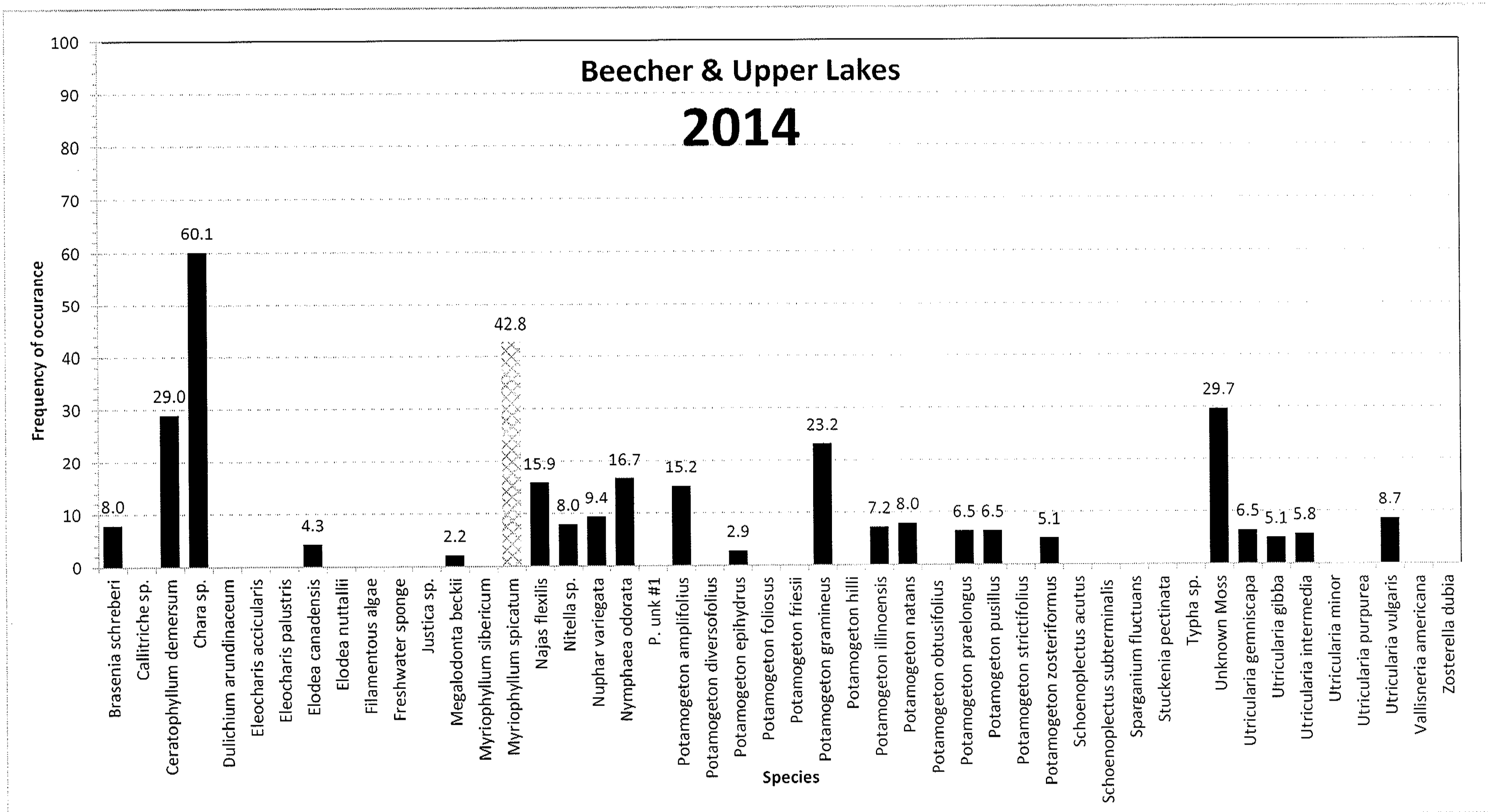
Utricularia purpurea
Utricularia vulgaris
Vallisneria americana
Zosterella dubia
Species



Beecher & Upper Lakes
2014
Frequency of occurance
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29.0
60.1
4.3
2.2
42.8
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23.2
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6.5
6.5
5.1
29.7
6.5
5.1
5.8
8.7
Brasenia schreberi
Callitriche sp.
Ceratophyllum demersum
Chara sp.
Dulichium arundinaceum
Eleocharis acicularis
Eleocharis palustris
Elodea canadensis
Elodea nuttallii
Filamentous algae
Freshwater sponge
Justica sp.
Megalodonta beckii
Myriophyllum sibericum
Myriophyllum spicatum
Najas flexilis
Nitella sp.
Nuphar variegata
Nymphaea odorata
P. unk #1
Potamogeton amplifolius
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Potamogeton hilli
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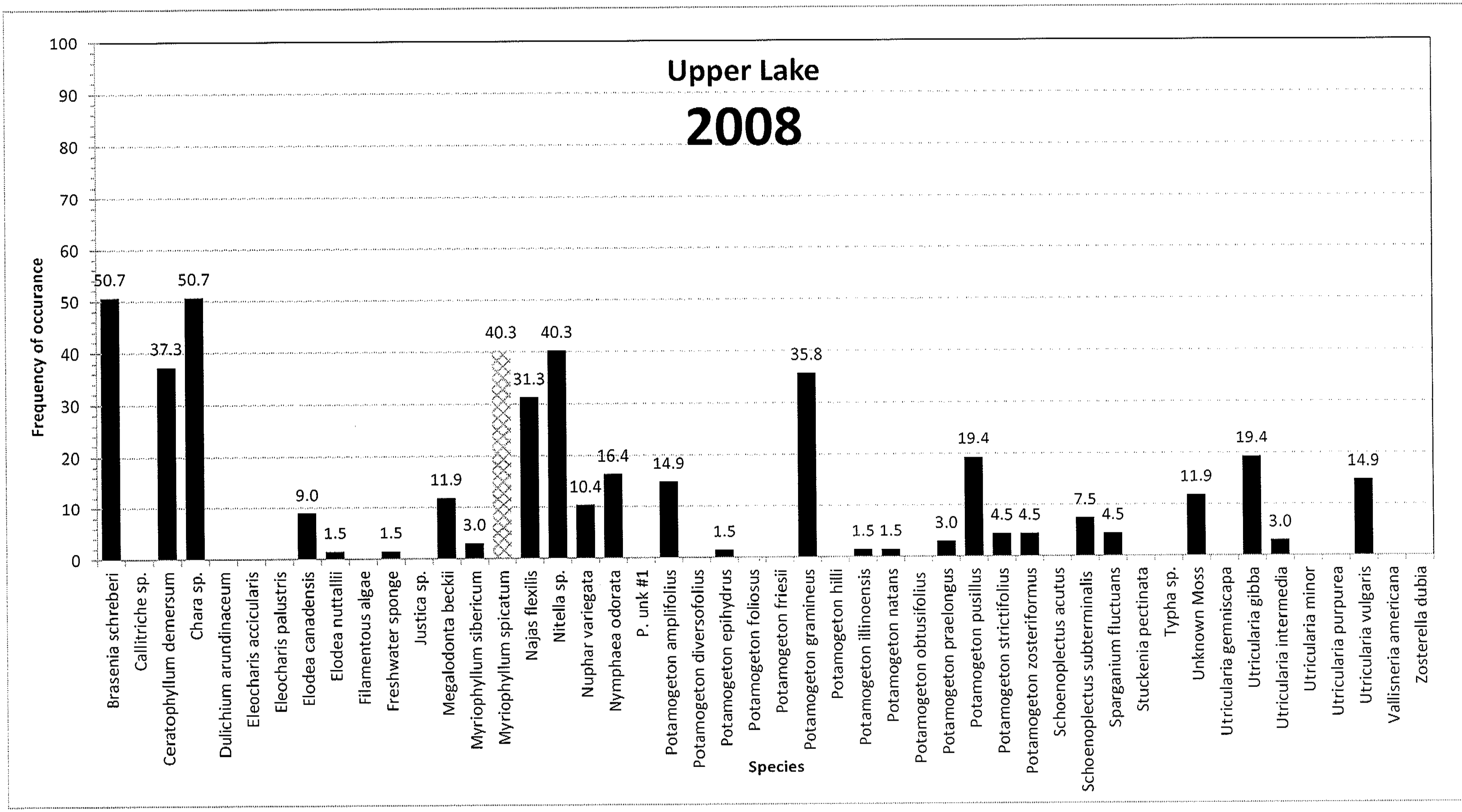
Potamogeton natans
Potamogeton obtusifolius
Potamogeton praelongus
Potamogeton pusillus
Potamogeton strictifolius
Potamogeton zosteriformus
Schoenoplectus acutus
Schoenoplectus subterminalis
Sparganium fluctuans
Stuckenia pectinata
Typha sp.
Unknown Moss
Utricularia gemniscapa
Utricularia gibba
Utricularia intermedia
Utricularia minor
Utricularia purpurea
Utricularia vulgaris
Vallisneria americana
Zosterella dubia
Species

Upper Lake Plant Frequency

Scientific Name	Common Name	2008 Frequency	2010 Frequency	2011 Frequency	2012 Frequency	2013 Frequency	2014 Frequency
Brasenia schreberi	Water shield	50.7	14.3	7.7		8.0	18.0
Callitriche sp.	water starwort						
Ceratophyllum demersum	Coontail	37.3	31.4	46.2	14.3	22.0	22.0
Chara sp.	Musk grass	50.7	60.0	38.5	57.1	36.0	50.0
Dulichium arundinaceum	Three way sedge						
Eleocharis accicularis	Hairgrass		2.9	15.4		2.0	
Eleocharis palustris	Creeping spikerush						
Elodea canadensis	Common waterweed	9.0	2.9		14.3	4.0	10.0
Elodea nuttallii	Slender waterweed	1.5					
Filamentous algae	Fillamentous algae						
Freshwater sponge	Freshwater sponge	1.5					
Justica sp.	Water willow						
Megalodonta beckii	Water marigold	11.9	2.9	7.7			2.0
Myriophyllum sibericum	Northern water milfoil	3.0	2.9	7.7	14.3		
Myriophyllum spicatum	Eurasian water milfoil	40.3	8.6		71.4	46.0	82.0
Najas flexilis	Bushy pondweed	31.3	34.3	38.5	78.6	8.0	16.0
Nitella sp.	Stonewort	40.3	14.3	23.1	28.6	16.0	8.0
Nuphar variegata	Spatterdock	10.4	2.9			4.0	4.0
Nymphaea odorata	White water lily	16.4	34.3	38.5	35.7	18.0	20.0
P. unk #1	Unk. pondweed					2.0	
Potamogeton amplifolius	Large leaf pondweed	14.9	22.9	30.8		16.0	12.0
Potamogeton diversofolius	Water-thread pondweed						
Potamogeton epihydrus	Ribbon leaf pondweed	1.5				2.0	2.0
Potamogeton foliosus	Leafy pondweed						
Potamogeton friesii	Frie's pondweed			15.4	7.1	2.0	
Potamogeton gramineus	Variable pondweed	35.8	31.4	23.1	28.6	22.0	32.0
Potamogeton hilli	Hill's pondweed						
Potamogeton illinoensis	Illinois pondweed	1.5		7.7		2.0	2.0
Potamogeton natans	Floating leaf pondweed	1.5	2.9			6.0	8.0
Potamogeton obtusifolius	Blunt-leaf pondweed						
Potamogeton praelongus	White stem pondweed	3.0	5.7			8.0	14.0
Potamogeton pusillus	Small pondweed	19.4	8.6	7.7	35.7	2.0	6.0
Potamogeton strictifolius	Stiff pondweed	4.5	8.6		14.3		
Potamogeton zosteriformus	Flat-stem pondweed	4.5	11.4	7.7	7.1	2.0	6.0
Schoenoplectus acutus	Hardstem bulrush						
Schoenoplectus subterminalis	water bulrush	7.5					
Sparganium fluctuans	Floating leaf burreed	4.5			7.1		
Stuckenia pectinata	Sago pondweed		2.9	7.7	14.3	2.0	
Typha sp.	Cattail						
Unknown Moss	Moss	11.9	17.1	30.8	7.1		22.0
Utricularia gemniscapa	Twin-stemmed bladderwort		5.7	7.7	7.1	4.0	10.0
Utricularia gibba	Creeping bladderwort	19.4	22.9	7.7		6.0	10.0
Utricularia intermedia	Flat leaf bladderwort	3.0	25.7	30.8		4.0	6.0
Utricularia minor	Small bladderwort						
Utricularia purpurea	Large purple bladderwort		2.9				
Utricularia vulgaris	Common bladderwort	14.9	34.3	7.7		14.0	12.0
Vallisneria americana	Water celery						
Zosterella dubia	Water stargrass						



Upper Lake
2008
Frequency of occurance
Species
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40
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1.5
1.5
11.9
3.0
40.3
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10.4
16.4
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7.5
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11.9
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3.0
14.9
Brasenia schreberi
Callitriche sp.
Ceratophyllum demersum
Chara sp.
Dulichium arundinaceum
Eleocharis accicularis
Eleocharis palustris
Elodea canadensis
Elodea nuttallii
Filamentous algae
Freshwater sponge
Justica sp.
Megalodonta beckii
Myriophyllum sibericum
Myriophyllum spicatum
Najas flexilis
Nitella sp.
Nuphar variegata
Nymphaea odorata
P. unk #1
Potamogeton amplifolius
Potamogeton diversofolius
Potamogeton epihydrus
Potamogeton foliosus
Potamogeton friesii
Potamogeton gramineus
Potamogeton hilli
Potamogeton illinoensis
Potamogeton natans
Potamogeton obtusifolius
Potamogeton praelongus
Potamogeton pusillus
Potamogeton strictifolius
Potamogeton zosteriformus
Schoenoplectus acutus
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Typha sp.
Unknown Moss
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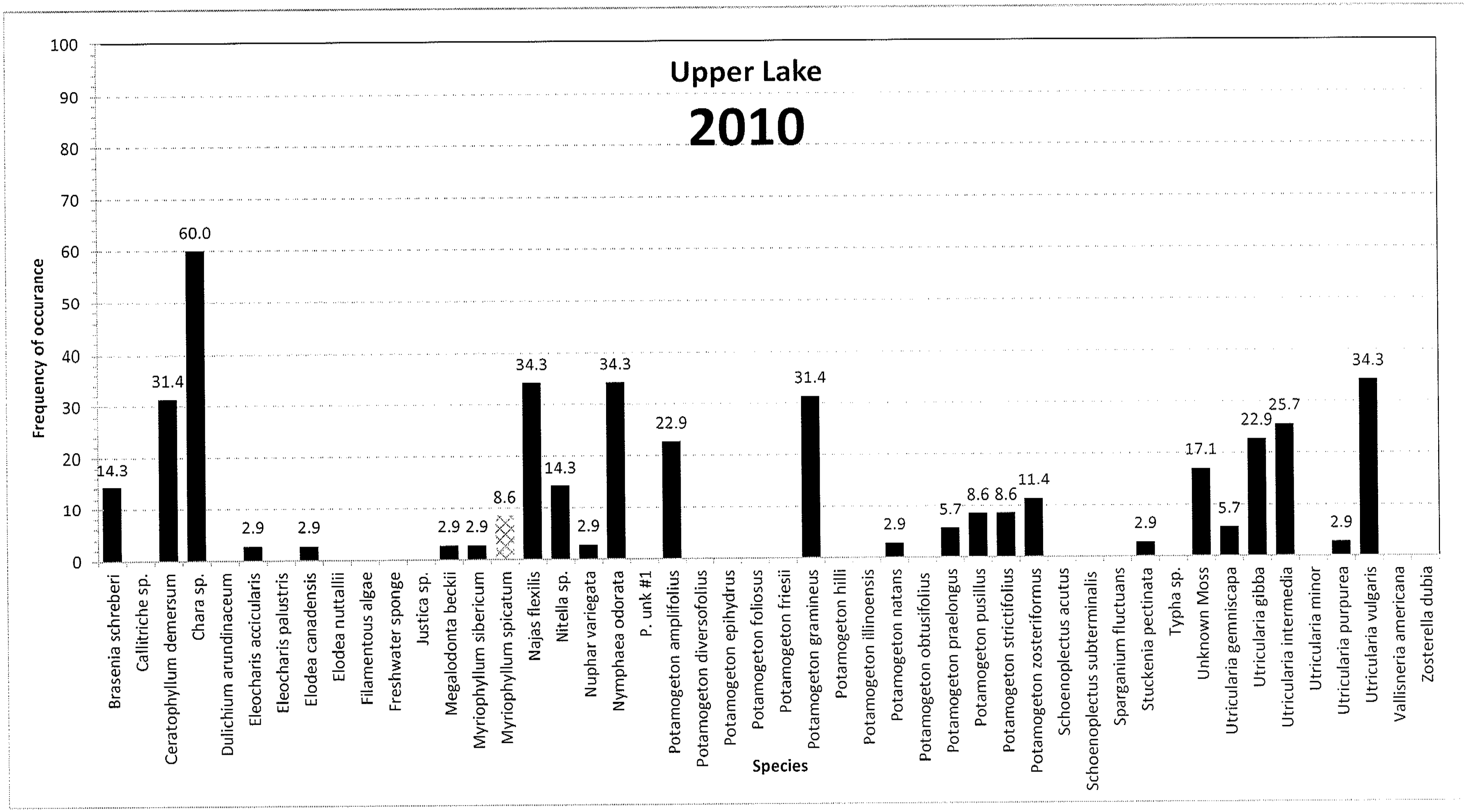
Utricularia gibba
Utricularia intermedia
Utricularia minor
Utricularia purpurea
Utricularia vulgaris
Vallisneria americana
Zosterella dubia



Upper Lake
2010
Frequency of occurance
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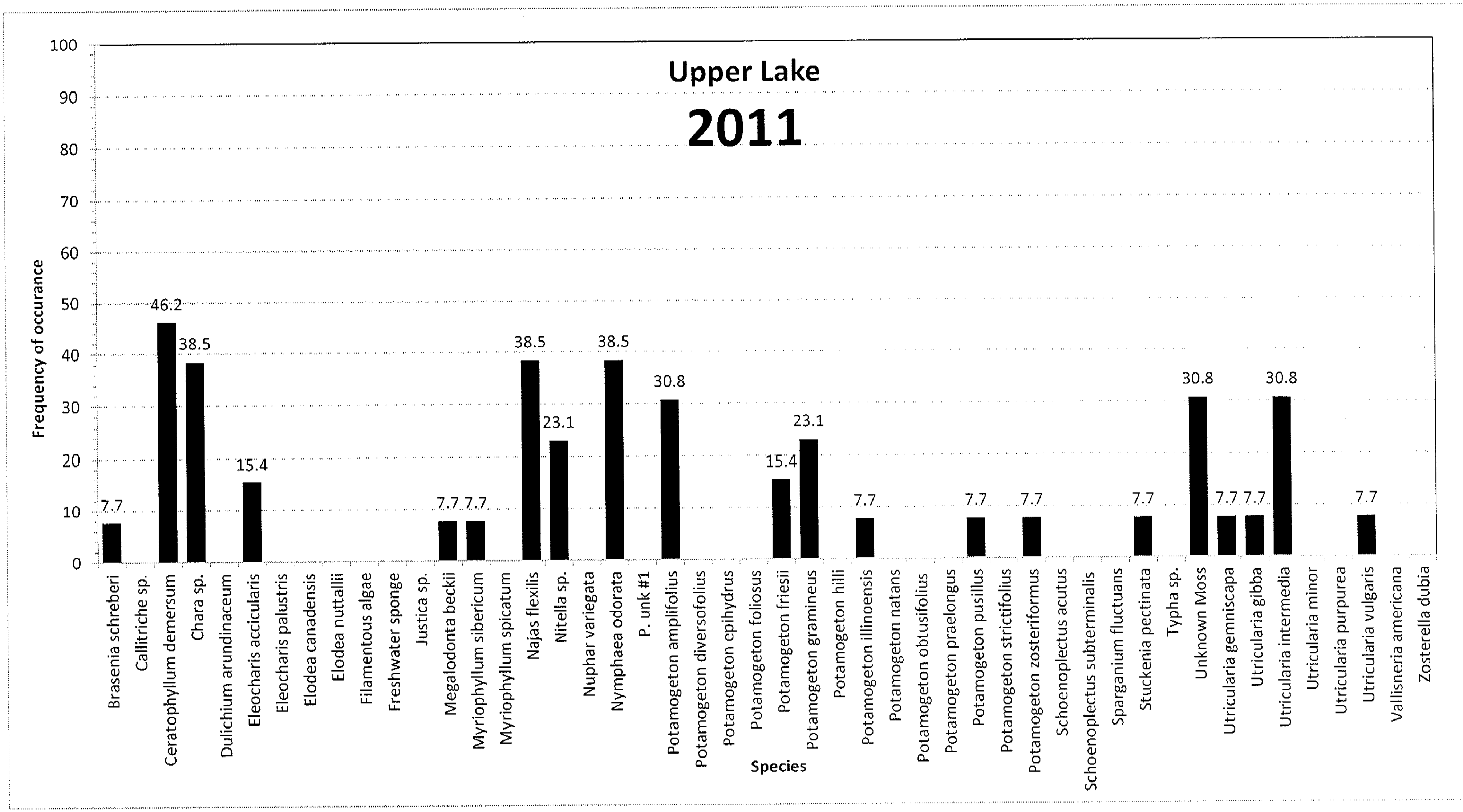
Species



Upper Lake
2011
Frequency of occurance
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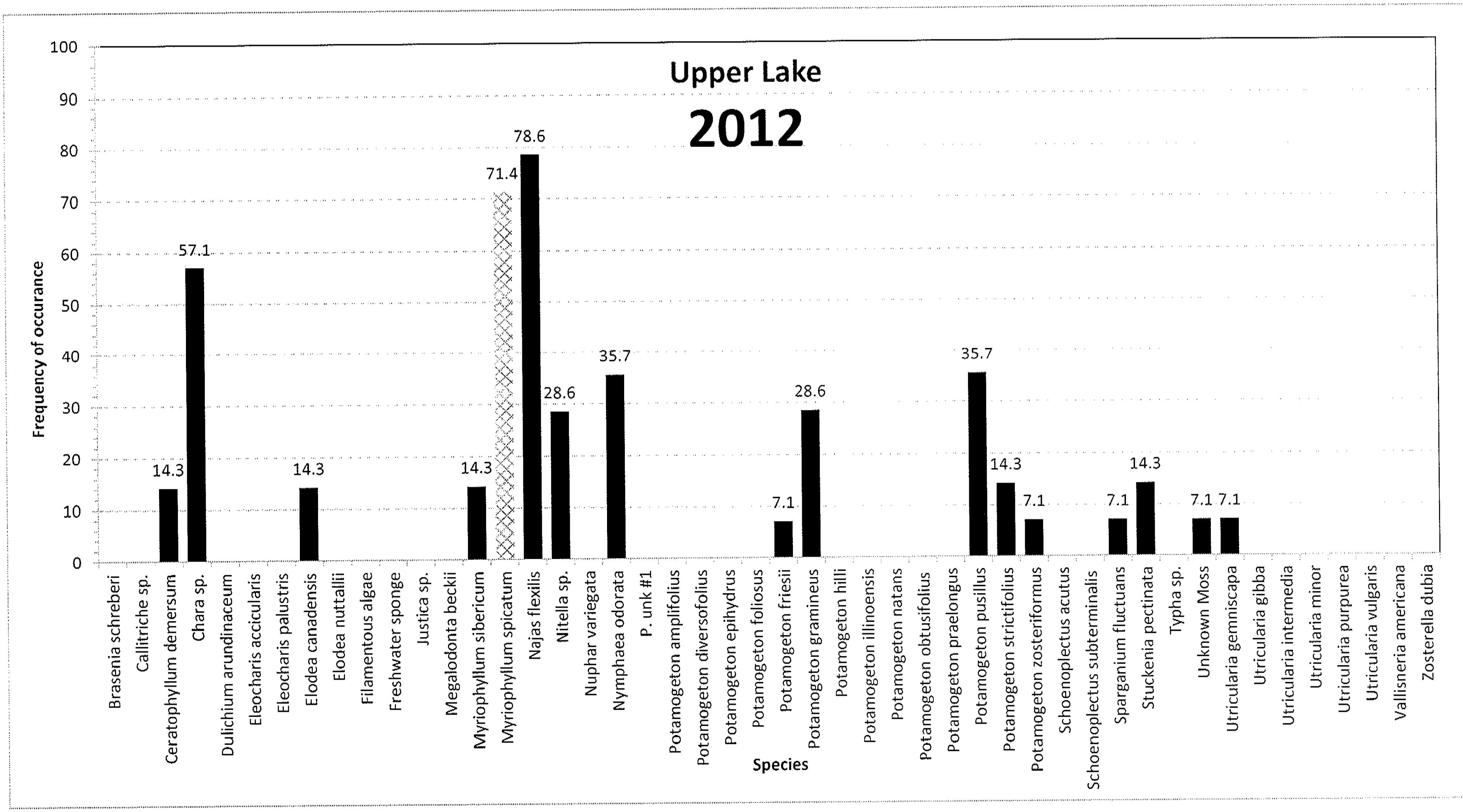
Species



Upper Lake
2012
Frequency of occurance
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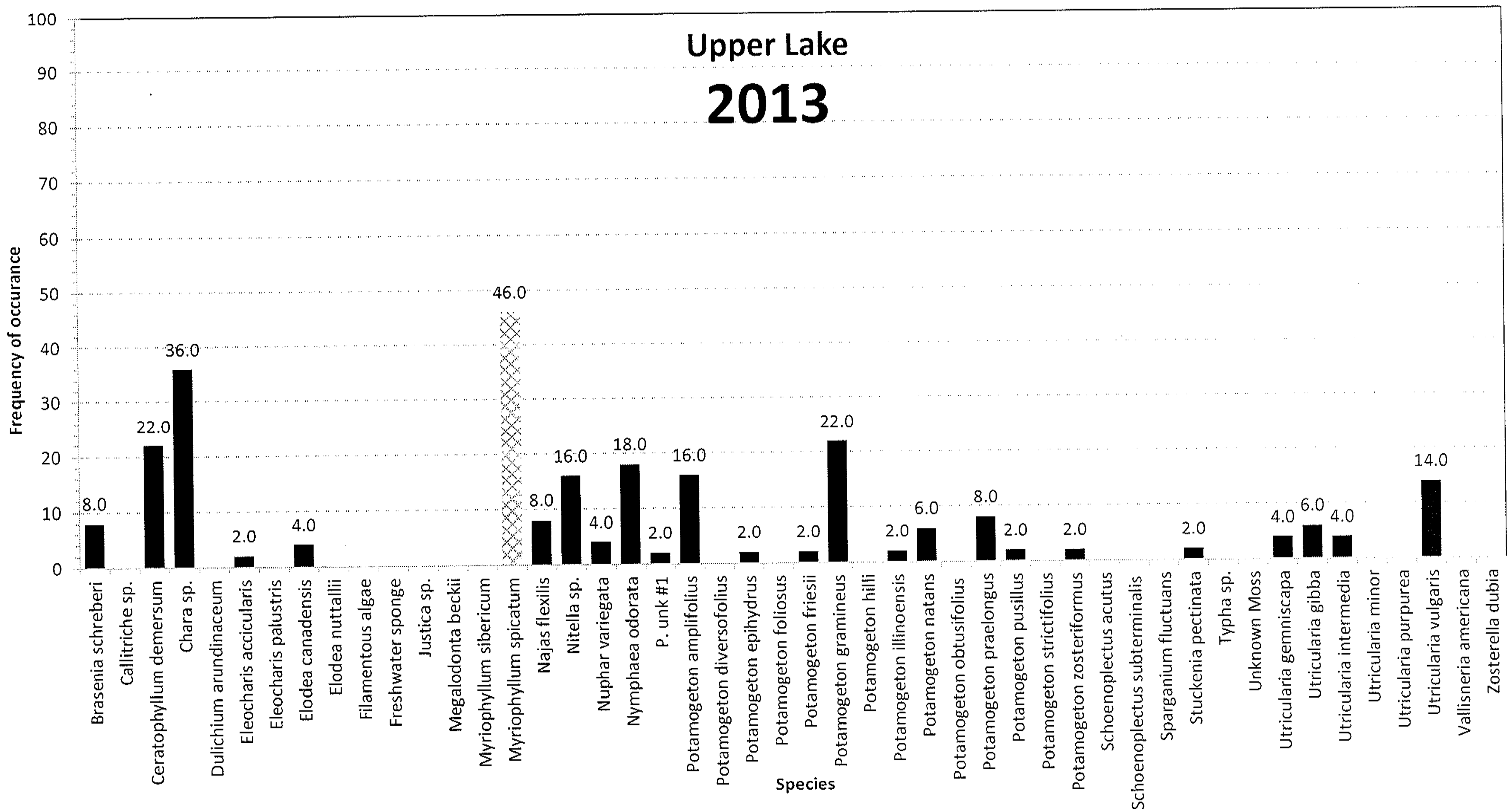
Upper Lake
2013
Frequency of occurance
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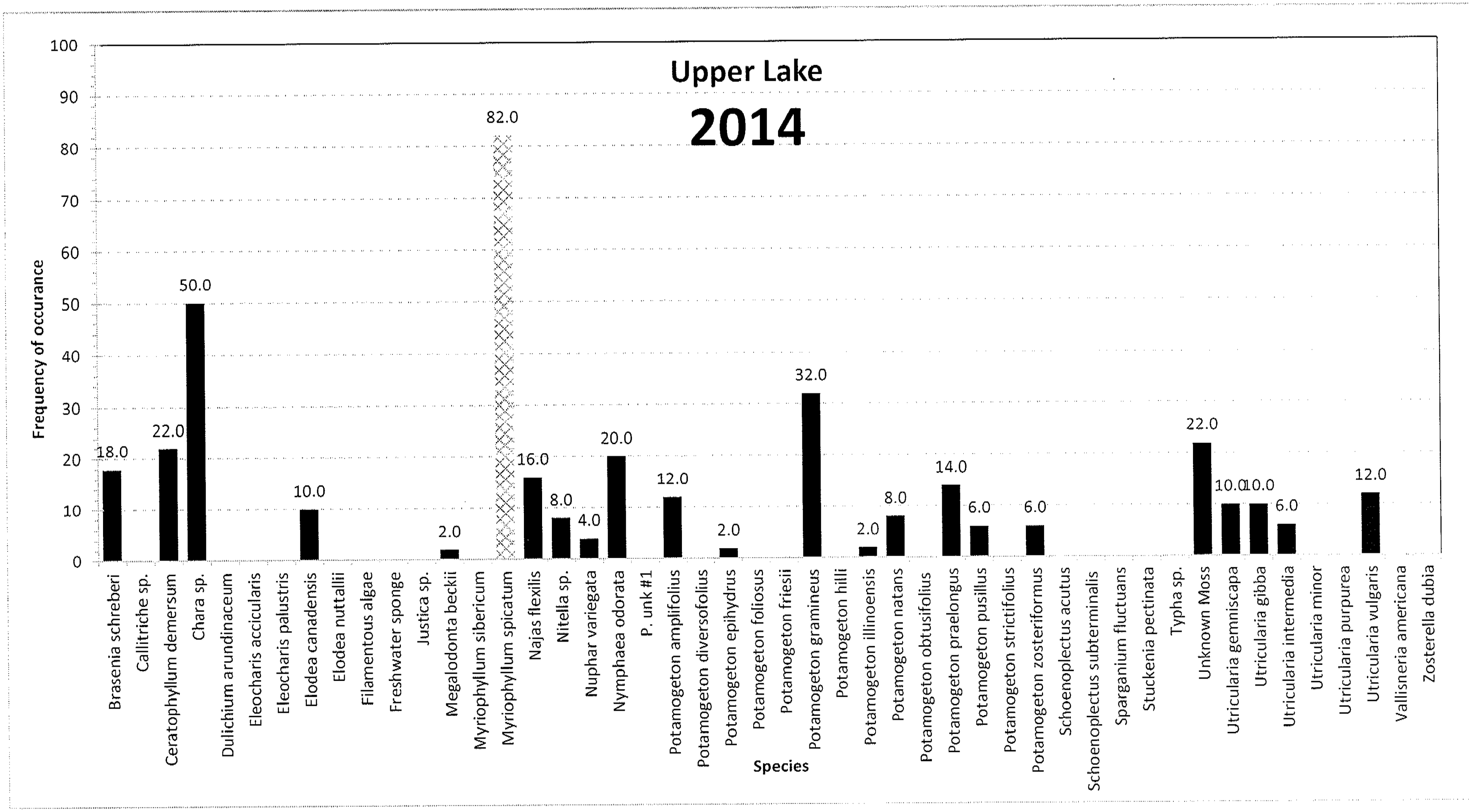
Megalodonta beckii
Myriophyllum sibericum
Myriophyllum spicatum
Najas flexilis
Nitella sp.
Nuphar variegata
Nymphaea odorata
P. unk #1
Potamogeton amplifolius
Potamogeton diversofolius
Potamogeton epihydrus
Potamogeton foliosus
Potamogeton friesii
Potamogeton gramineus
Potamogeton hilli
Potamogeton illinoensis
Potamogeton natans
Potamogeton obtusifolius
Potamogeton praelongus
Potamogeton pusillus
Potamogeton strictifolius
Potamogeton zosteriformus
Schoenoplectus acutus
Schoenoplectus subterminalis
Sparganium fluctuans
Stuckenia pectinata
Typha sp.
Unknown Moss
Utricularia gemniscapa
Utricularia gibba
Utricularia intermedia
Utricularia minor
Utricularia purpurea
Utricularia vulgaris
Vallisneria americana
Zosterella dubia



Upper Lake
2014
Frequency of occurance
100
90
80
70
60
50
40
30
20
10
0
18.0
22.0
50.0
10.0
2.0
82.0
16.0
8.0
4.0
20.0
12.0
2.0
32.0
2.0
8.0
14.0
6.0
6.0
22.0
10.0
10.0
6.0
12.0
Brasenia schreberi
Callitriche sp.
Ceratophyllum demersum
Chara sp.
Dulichium arundinaceum
Eleocharis accicularis
Eleocharis palustris
Elodea canadensis
Elodea nuttallii
Filamentous algae
Freshwater sponge
Justica sp.
Megalodonta beckii
Myriophyllum sibericum
Myriophyllum spicatum
Najas flexilis
Nitella sp.
Nuphar variegata
Nymphaea odorata
P. unk #1
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Potamogeton pusillus
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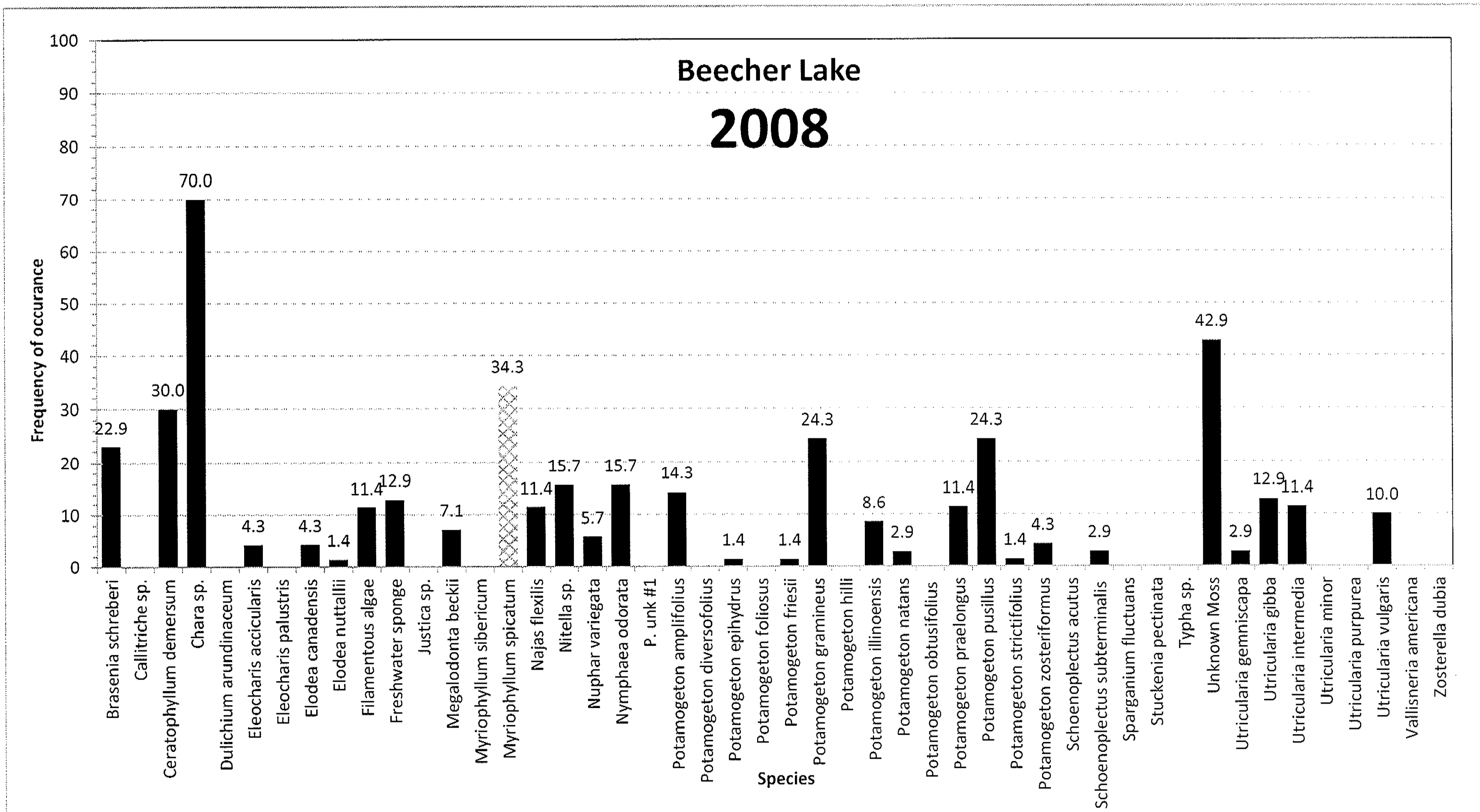
Schoenoplectus subterminalis
Sparganium fluctuans
Stuckenia pectinata
Typha sp.
Unknown Moss
Utricularia gemniscapa
Utricularia gibba
Utricularia intermedia
Utricularia minor
Utricularia purpurea
Utricularia vulgaris
Vallisneria americana
Zosterella dubia
Species

Beecher Lake Plant Frequency

Scientific Name	Common Name	2008 Frequency	2010 Frequency	2011 Frequency	2012 Frequency	2013 Frequency	2014 Frequency
Brasenia schreberi	Water shield	22.9	23.2	6.2	1.0	4.5	2.3
Callitriche sp.	water starwort			1.2			
Ceratophyllum demersum	Coontail	30.0	41.1	58.0	15.7	13.5	33.0
Chara sp.	Musk grass	70.0	67.9	32.1	37.3	61.8	65.9
Dulichium arundinaceum	Three way sedge						
Eleocharis accicularis	Hairgrass	4.3	3.6	1.2			
Eleocharis palustris	Creeping spikerush						
Elodea canadensis	Common waterweed	4.3	7.1	7.4			1.1
Elodea nuttallii	Slender waterweed	1.4					
Filamentous algae	Fillamentous algae	11.4			2.0		
Freshwater sponge	Freshwater sponge	12.9					
Justica sp.	Water willow					2.2	
Megalodonta beckii	Water marigold	7.1	8.9	14.8	1.0		2.3
Myriophyllum sibericum	Northern water milfoil			1.2	2.0	2.2	
Myriophyllum spicatum	Eurasian water milfoil	34.3	7.1	51.9	84.3	13.5	20.5
Najas flexilis	Bushy pondweed	11.4	46.4	46.9	71.6	14.6	15.9
Nitella sp.	Stonewort	15.7	7.1	60.5	7.8	3.4	8.0
Nuphar variegata	Spatterdock	5.7	3.6	7.4	6.9	1.1	12.5
Nymphaea odorata	White water lily	15.7	33.9	32.1	14.7	7.9	14.8
P. unk #1	Unk. pondweed						
Potamogeton amplifolius	Large leaf pondweed	14.3	30.4	29.6	11.8	4.5	17.0
Potamogeton diversofolius	Water-thread pondweed				1.0		
Potamogeton epihydrus	Ribbon leaf pondweed	1.4			5.9	6.7	3.4
Potamogeton foliosus	Leafy pondweed		1.8				
Potamogeton friesii	Frie's pondweed	1.4		24.7	26.5		
Potamogeton gramineus	Variable pondweed	24.3	19.6	22.2	41.2	37.1	18.2
Potamogeton hilli	Hill's pondweed					3.4	
Potamogeton illinoensis	Illinois pondweed	8.6					10.2
Potamogeton natans	Floating leaf pondweed	2.9	3.6	4.9	11.8	2.2	8.0
Potamogeton obtusifolius	Blunt-leaf pondweed					4.5	
Potamogeton praelongus	White stem pondweed	11.4	3.6	7.4	6.9	4.5	2.3
Potamogeton pusillus	Small pondweed	24.3	8.9	11.1	1.0		6.8
Potamogeton strictifolius	Stiff pondweed	1.4	7.1	12.3	10.8		
Potamogeton zosteriformus	Flat-stem pondweed	4.3	7.1	12.3	9.8	2.2	4.5
Schoenoplectus acutus	Hardstem bulrush					1.1	
Schoenoplectus subterminalis	water bulrush	2.9					
Sparganium fluctuans	Floating leaf burreed						
Stuckenia pectinata	Sago pondweed			4.9	1.0		
Typha sp.	Cattail						
Unknown Moss	Moss	42.9	3.6	55.6		5.6	33.0
Utricularia gemniscapa	Twin-stemmed bladderwort	2.9		4.9	1.0		4.5
Utricularia gibba	Creeping bladderwort	12.9	41.1	40.7		1.1	2.3
Utricularia intermedia	Flat leaf bladderwort	11.4	44.6	58.0	1.0	4.5	5.7
Utricularia minor	Small bladderwort					4.5	
Utricularia purpurea	Large purple bladderwort		7.1				
Utricularia vulgaris	Common bladderwort	10.0	35.7	8.6		4.5	6.8
Vallisneria americana	Water celery						
Zosterella dubia	Water stargrass						



Beecher Lake
2008
Frequency of occurance
Species
100
90
80
70
60
50
40
30
20
10
0
22.9
30.0
70.0
4.3
4.3
1.4
11.4
12.9
7.1
34.3
11.4
15.7
5.7
15.7
14.3
1.4
1.4
24.3
8.6
2.9
11.4
24.3
1.4
4.3
2.9
42.9
2.9
12.9
11.4
10.0
Brasenia schreberi
Callitriche sp.
Ceratophyllum demersum
Chara sp.
Dulichium arundinaceum
Eleocharis acicularis
Eleocharis palustris
Elodea canadensis
Elodea nuttallii
Filamentous algae
Freshwater sponge
Justica sp.
Megalodonta beckii
Myriophyllum sibericum
Myriophyllum spicatum
Najas flexilis
Nitella sp.
Nuphar variegata
Nymphaea odorata
P. unk #1
Potamogeton amplifolius
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Potamogeton foliosus
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Potamogeton illinoensis
Potamogeton natans
Potamogeton obtusifolius
Potamogeton praelongus
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Potamogeton strictifolius
Potamogeton zosteriformus
Schoenoplectus acutus
Schoenoplectus subterminalis
Sparganium fluctuans
Stuckenia pectinata
Typha sp.
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Utricularia gemniscapa
Utricularia gibba
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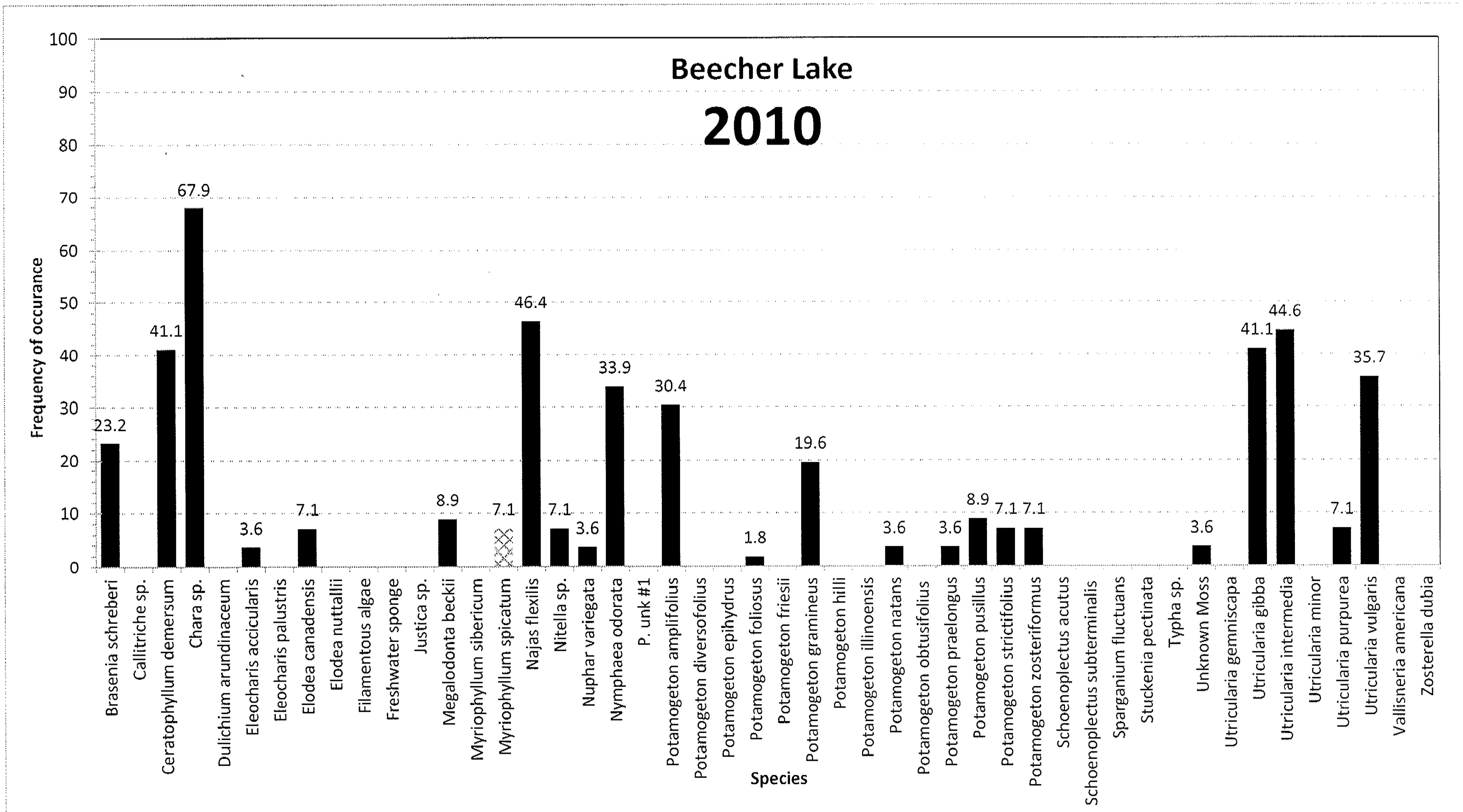
Utricularia minor
Utricularia purpurea
Utricularia vulgaris
Vallisneria americana
Zosterella dubia



Beecher Lake
2010
Frequency of occurance
Species
100
90
80
70
60
50
40
30
20
10
0
23.2
41.1
67.9
3.6
7.1
8.9
7.1
46.4
7.1
3.6
33.9
30.4
1.8
19.6
3.6
3.6
8.9
7.1
7.1
3.6
41.1
44.6
7.1
35.7
Brasenia schreberi
Callitriche sp.
Ceratophyllum demersum
Chara sp.
Dulichium arundinaceum
Eleocharis acicularis
Eleocharis palustris
Elodea canadensis
Elodea nuttallii
Filamentous algae
Freshwater sponge
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Myriophyllum spicatum
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Nitella sp.
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Nymphaea odorata
P. unk #1
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Potamogeton gramineus
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Potamogeton illinoensis
Potamogeton natans
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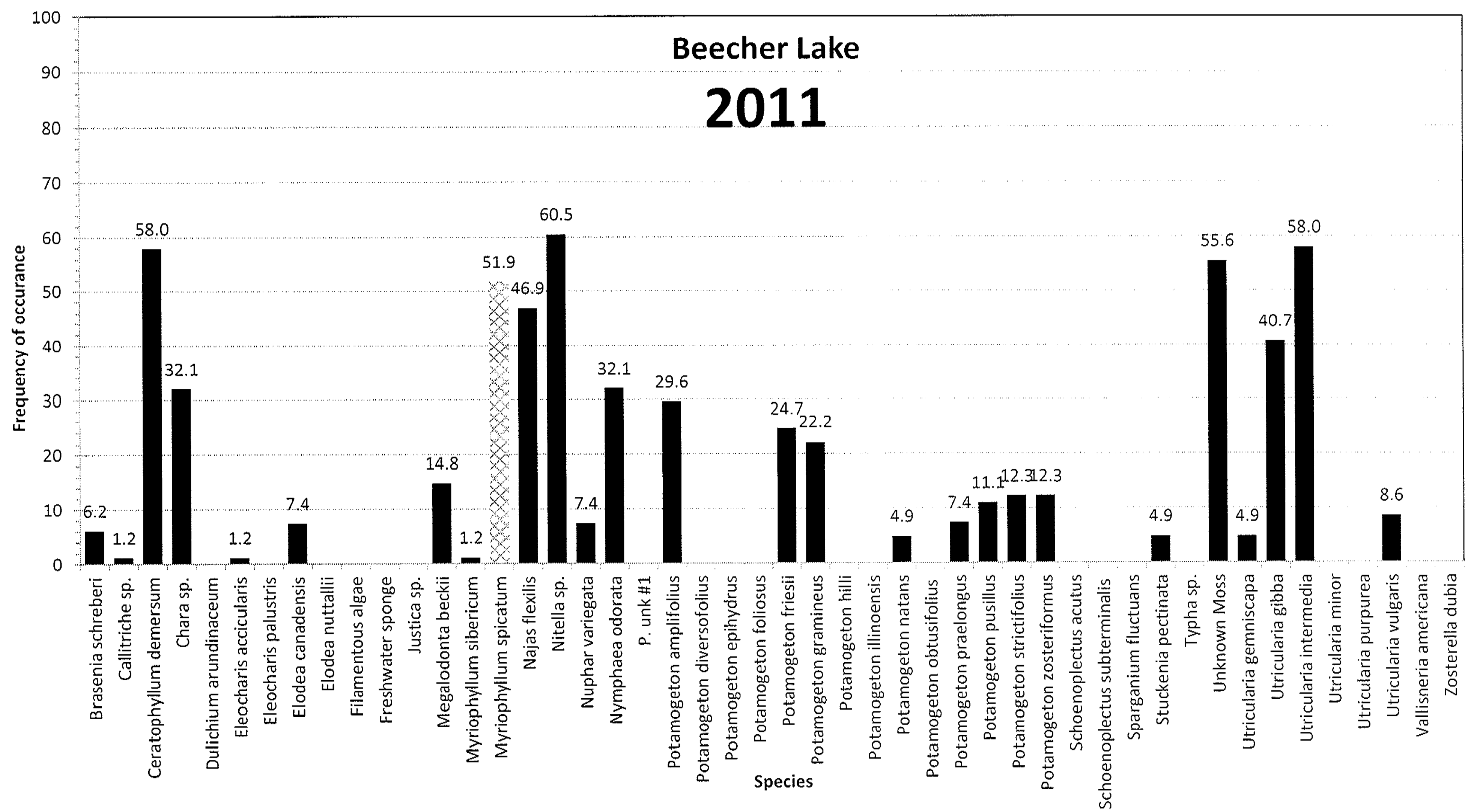
Schoenoplectus acutus
Schoenoplectus subterminalis
Sparganium fluctuans
Stuckenia pectinata
Typha sp.
Unknown Moss
Utricularia gemniscapa
Utricularia gibba
Utricularia intermedia
Utricularia minor
Utricularia purpurea
Utricularia vulgaris
Vallisneria americana
Zosterella dubia


Beecher Lake
2011
Frequency of occurance
Species
0
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20
30
40
50
60
70
80
90
100
6.2
1.2
58.0
32.1
1.2
7.4
14.8
1.2
51.9
46.9
60.5
7.4
32.1
29.6
24.7
22.2
4.9
7.4
11.1
12.3
12.3
4.9
55.6
4.9
40.7
58.0
8.6
Brasenia schreberi
Callitriche sp.
Ceratophyllum demersum
Chara sp.
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Eleocharis palustris
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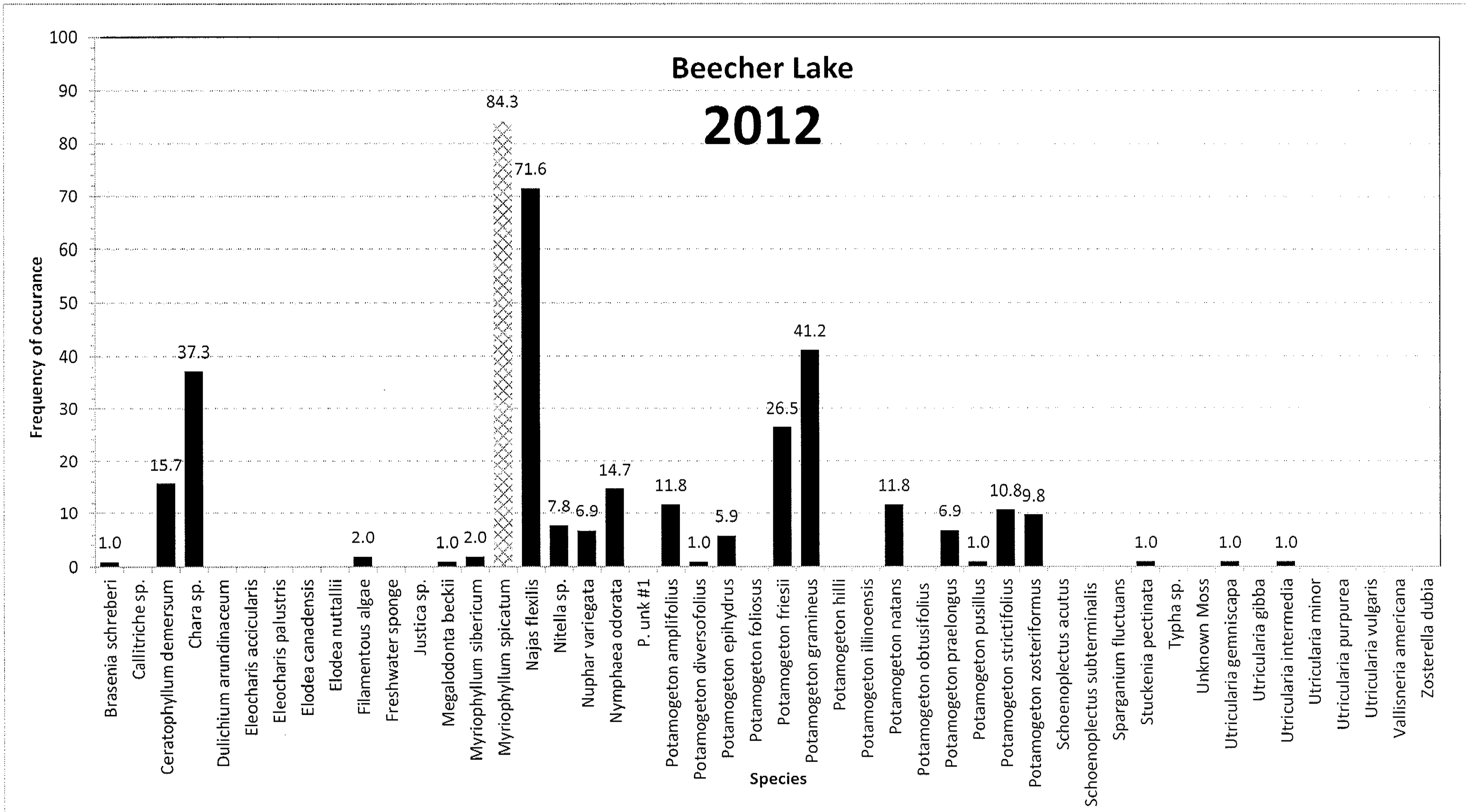
Utricularia vulgaris
Vallisneria americana
Zosterella dubia


Beecher Lake
2012
Frequency of occurance
Species
100
90
80
70
60
50
40
30
20
10
0
1.0
15.7
37.3
2.0
1.0
2.0
84.3
71.6
7.8
6.9
14.7
11.8
1.0
5.9
26.5
41.2
11.8
6.9
1.0
10.8
9.8
1.0
1.0
1.0
Brasenia schreberi
Callitriche sp.
Ceratophyllum demersum
Chara sp.
Dulichium arundinaceum
Eleocharis acicularis
Eleocharis palustris
Elodea canadensis
Elodea nuttallii
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Potamogeton diversofolius
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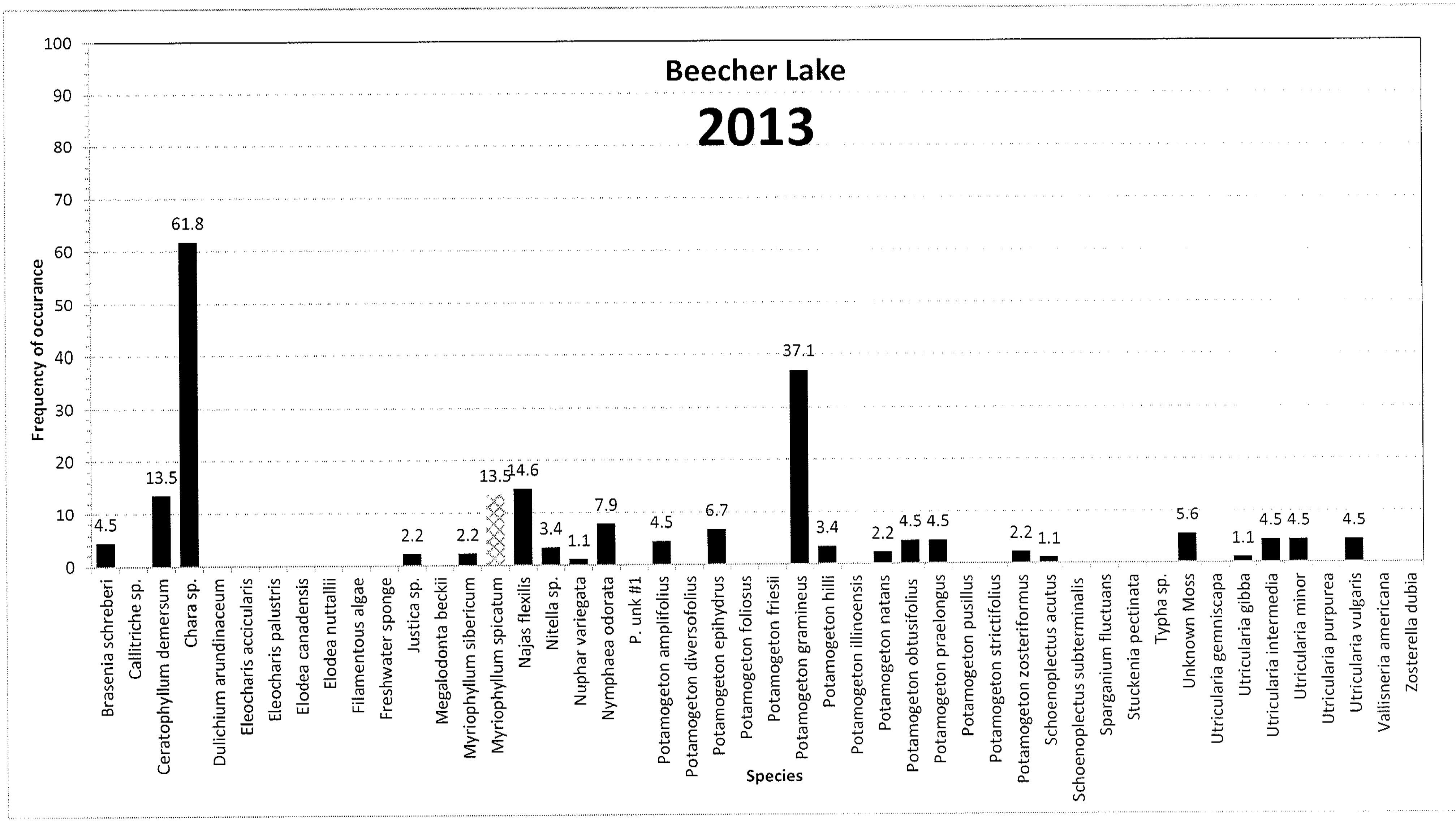
Potamogeton foliosus
Potamogeton friesii
Potamogeton gramineus
Potamogeton hilli
Potamogeton illinoensis
Potamogeton natans
Potamogeton obtusifolius
Potamogeton praelongus
Potamogeton pusillus
Potamogeton strictifolius
Potamogeton zosteriformus
Schoenoplectus acutus
Schoenoplectus subterminalis
Sparganium fluctuans
Stuckenia pectinata
Typha sp.
Unknown Moss
Utricularia gemniscapa
Utricularia gibba
Utricularia intermedia
Utricularia minor
Utricularia purpurea
Utricularia vulgaris
Vallisneria americana
Zosterella dubia


Beecher Lake
2013
Frequency of occurance
100
90
80
70
60
50
40
30
20
10
0
4.5
13.5
61.8
2.2
2.2
13.5
14.6
3.4
1.1
7.9
4.5
6.7
37.1
3.4
2.2
4.5
4.5
2.2
1.1
5.6
1.1
4.5
4.5
4.5
Brasenia schreberi
Callitriche sp.
Ceratophyllum demersum
Chara sp.
Dulichium arundinaceum
Eleocharis accicularis
Eleocharis palustris
Elodea canadensis
Elodea nuttallii
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Myriophyllum spicatum
Najas flexilis
Nitella sp.
Nuphar variegata
Nymphaea odorata
P. unk #1
Potamogeton amplifolius
Potamogeton diversofolius
Potamogeton epihydrus
Potamogeton foliosus
Potamogeton friesii
Potamogeton gramineus
Potamogeton hillii
Potamogeton illinoensis
Potamogeton natans
Potamogeton obtusifolius
Potamogeton praelongus
Potamogeton pusillus
Potamogeton strictifolius
Potamogeton zosteriformus
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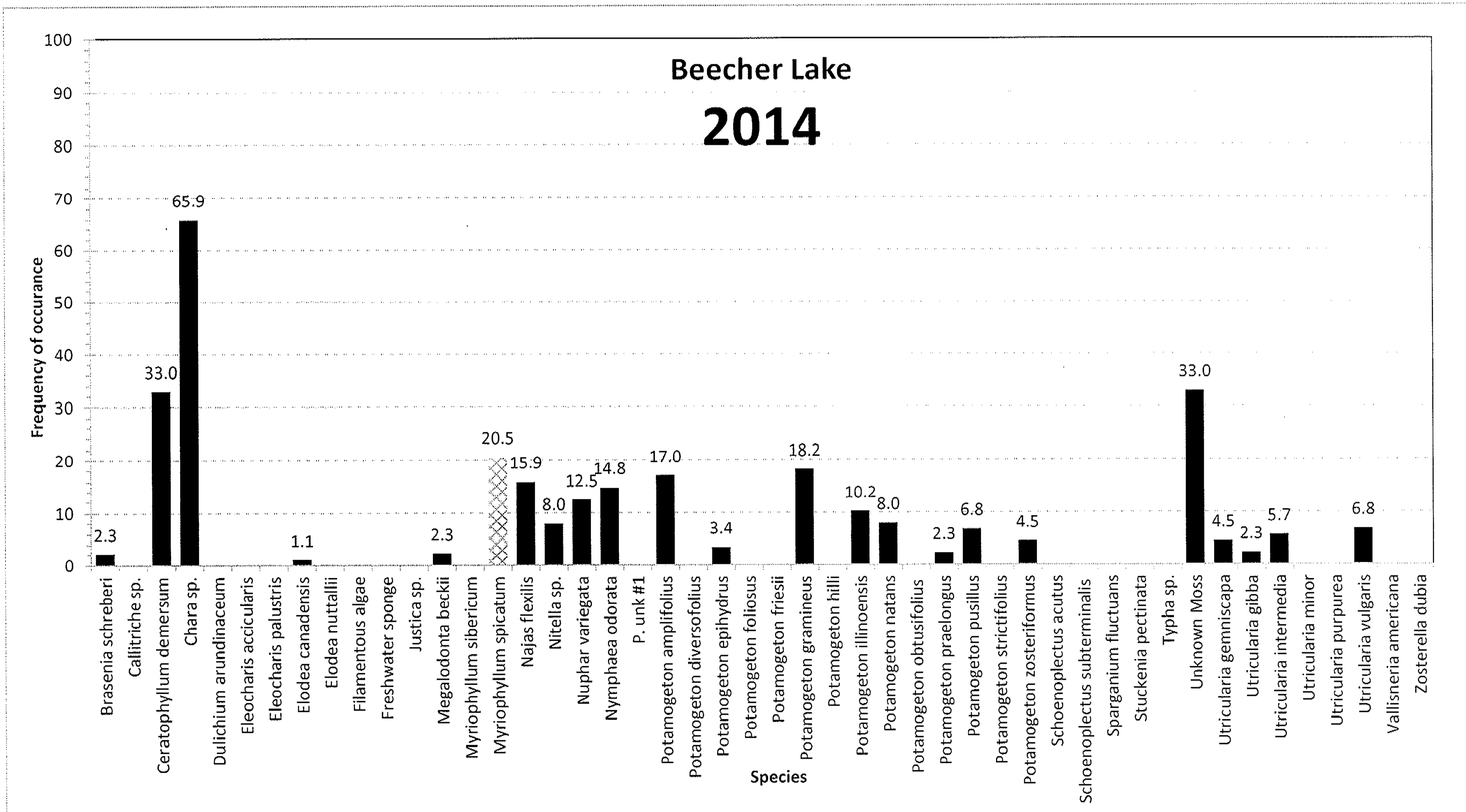
Utricularia purpurea
Utricularia vulgaris
Vallisneria americana
Zosterella dubia
Species



Beecher Lake
2014
Frequency of occurance
100
90
80
70
60
50
40
30
20
10
0
2.3
33.0
65.9
1.1
2.3
20.5
15.9
8.0
12.5
14.8
17.0
3.4
18.2
10.2
8.0
2.3
6.8
4.5
33.0
4.5
2.3
5.7
6.8
Brasenia schreberi
Callitriche sp.
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Potamogeton hilli
Potamogeton illinoensis
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Species