Bear Lake, Oneida County, 2006

Aquatic Plant Survey for Bear Lake, Oneida County, 2006

[Survey conducted on August 10, 2006]

February 2007

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Bear Lake, Oneida County, Aquatic Plant Survey

Size: 312 acres (WDNR)
Mean depth: 8 ft (WDNR)
Maximum depth: 20 ft (WDNR)

Introduction and Methods

Bear Lake is located within a forested area in the Oneida County, Wisconsin. The aquatic plants are of interest because currently there are no non-native species present in Bear Lake. The objective of the 2006 plant evaluation was to conduct one plant survey to characterize the aquatic plant community and then compare this survey to previous surveys conducted on Bear Lake.

The aquatic plant survey of Bear Lake was conducted by Blue Water Science on August 10, 2006 with assistance from the Bear Lake District. The survey used a point-intercept method and consisted of 96 points that were distributed throughout the lake (Figure 1). The grid pattern was modeled on the grid used in a 1977 plant survey, sponsored by the WDNR..

Based on these results, plant distribution maps were constructed and results from 2006 were compared to past surveys.

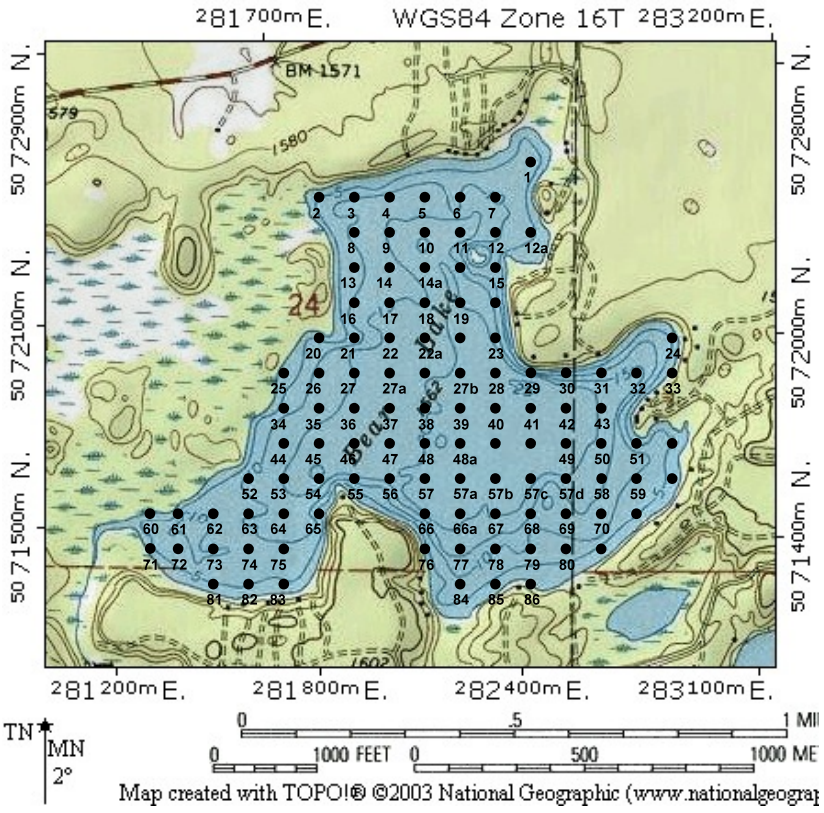

Figure 1. Point locations for the August 10, 2006 aquatic plant survey. The numbers on the grid pattern use the same points from the August 1, 1977 plant survey. For the 2006 survey, not all points have numbers, but they were sampled. Only numbered points were used in the statistics.

Results of the August 10, 2006 Plant Survey

Results from the point-intercept plant survey found 15 species of plants growing throughout most of the lake bed (Table 1 and Figure 2). Aquatic plants covered approximately 268 acres or 86% of the lake bottom. Fern pondweed, the dominant plant, and was found growing to a depth of 13 feet. Fern pondweed occurred at 60% of the sample sites. A variety of other species were present occurred up to 23% of the sites. Locations of individual species are shown in Table 2.

Table 1. Bear Lake aquatic plant occurrences and densities for the August 10, 2006 survey based on 96 sample sites. Density ratings are 1-5 with 1 being low and 5 being most dense.

	Sample Sites (n=96)		
	Occur	% Occur	Density
Watershield (*Brasenia Schreberi*)	14	15	2.4
Spatterdock (*Nuphar variegatum*)	2	2	2.0
White waterlily (*Nymphaea sp*)	5	5	2.0
Chara (*Chara sp*)	3	3	2.0
Elodea (*Elodea canadensis*)	17	18	1.3
Spike rush (Isoetes sp)	9	9	2.0
Naiads (*Najas flexilis*)	14	15	1.2
Cabbage (*Potamogeton amplifolius*)	16	17	1.6
Nuttall's pondweed (*P. epihydrus*)	1	1	1.0
Claspingleaf pondweed (*P. Richardsonii*)	10	10	1.2
Fern pondweed (*P. Robbinsii*)	58	60	2.2
Snailseed pondweed (*P. Spirillus*)	8	8	1.1
Flatstem pondweed (*P. zosteriformis*)	17	18	1.6
Bent grass (*Sagittaria sp*)	1	1	1.0
Water celery (*Vallisneria americana*)	22	23	1.3
Filamentous algae	1	1	1.0

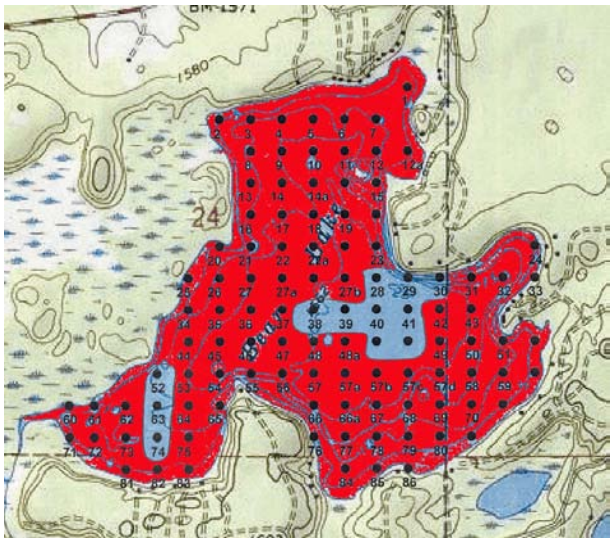

Figure 2. Aquatic plant coverage for August 10, 2006 is shown in red shading.

Table 2. Individual point data for Bear Lake on August 10, 2006.

Sample Site	1	2	3	4	5	6	7	7a	8	9	10	11	12	13	14	14a	15	16	17	18	19
Sample Depth (ft)	5	3	6	7	7	8	5.5	5	4	6		9	5	5	7		5	5	10	12	13
Watershield		4							4												
Spatterdock		2							2												
White waterlily																					
Chara									2												
Elodea						2															1
Turf grass								1						2							
Naiads			1										1	2				1			
Cabbage				2	2	1	3			3					2	1					
Nuttall's pondweed											1										
Claspingleaf pondweed			2	1		1	1	2						1				1			
Fern pondweed	2	2	2	2	2	2	2		4	2	3	3	3		3	2	3.5	1	2.5	3	1
Snailseed pondweed																					
Flatstem pondweed							1									2					
Bent grass																					
Water celery						1	1	2				2	1	1				2			
Filamentous algae																					

Sample Site	20	21	22	22a	23	24	25	26	27	27a	27b	28	29	30	31	32	33	34	35	36	37
Sample Depth (ft)	7	10	13	14	16	6	4	6	9	13	14	16	18	17	9	10	8	4	9	9	12
Watershield							1											3			
Spatterdock																					
White waterlily							2														
Chara								3													
Elodea				2		2					0.5				2		1		1		
Turf grass							1											1			
Naiads	0.5																				
Cabbage				1				0.5	1								1				
Nuttall's pondweed																					
Claspingleaf pondweed																					
Fern pondweed	0.5	3.5	2	3		3		1	3	2.5					3	2	3		2	3	2
Snailseed pondweed						1	1														
Flatstem pondweed			1	1							2										
Bent grass																					
Water celery	1						1	2	1						2			1			
Filamentous algae																					

Table 2. Individual point data for Bear Lake on August 10, 2006.

Sample Site	38	39	40	41	42	43	44	45	46	47	48	48a	49	50	51	52	53	54	55	56	57
Sample Depth (ft)	14	16	16	16	13	11	6	7	11	40	11	14	15	14	7	6	9	10	11	11	8
Watershield							1														
Spatterdock																					
White waterlily																					
Chara																					
Elodea									1	1			2	1						1	
Turf grass																					
Naiads							1	1													
Cabbage								2													
Nuttall's pondweed																					
Claspingleaf pondweed															1						
Fern pondweed						2		1	3	2	3			1	2			3	2	2	1
Snailseed pondweed													1								0.5
Flatstem pondweed					2							1	2	3			1		1		
Bent grass																					
Water celery							1	1													1
Filamentous algae																					

Sample Site	57a	57b	57c	58	59	60	61	62	63	64	65	66	66a	67	68	69	70	71	72	73	74
Sample Depth (ft)	13	13	13	8	4	6	5	5	6	6	7	13	13	11	6	7	5	3	5	5	5
Watershield						3	1	1										3	3	1	
Spatterdock																					
White waterlily						1												3			
Chara																					
Elodea	1										1	2									
Turf grass					1																
Naiads					1	1		1													
Cabbage										1						1	1				
Nuttall's pondweed																					
Claspingleaf pondweed																					
Fern pondweed				2	0.5					2	3	2	2	3		2	3	1			
Snailseed pondweed	1				1										2						
Flatstem pondweed		2	3									1			1	2					
Bent grass																					
Water celery					1										1						
Filamentous algae										1											

Table 2. Individual point data for Bear Lake on August 10, 2006.

Sample Site	75	76	77	78	79	80	81	82	83	84	85	86
Sample Depth (ft)	5	3	8	5	5	4	4	4	4	6	4	5
Watershield							2	3	4			
Spatterdock												
White waterlily							3	1				
Chara											1	
Elodea		1										
Turf grass				3	3						2	4
Naiads	1			1		2				2		
Cabbage						3						
Nuttall's pondweed												
Claspingleaf pondweed						1						1
Fern pondweed	1		2				2			1		
Snailseed pondweed					1							
Flatstem pondweed			1									
Bent grass									1			
Water celery				1	1	2						2
Filamentous algae												

Figure 3. Bear Lake resident, Dale Jalinski, helped conduct the aquatic plant survey on Bear Lake.

Figure 4. [top] Water lilies, watershield, and arrowhead were present on some shorelines. [bottom] Fern pondweed was the dominant plant in Bear Lake in August, 2006.

Summary of Plant Surveys

Aquatic plant surveys have been conducted previously in Bear Lake in 1977 and 1991. The percent occurrence of plants from the surveys is summarized in Table 3 and in Appendix B.

Table 3. Bear Lake aquatic plant occurrences for 1977, 1991, and 2006.

	August 1, 1977 (sponsored by WDNR)	July 29, 1991 (Blue Water Science)	August 10, 2006 (Blue Water Science)
Pickerel plant (*Pontederia cordata*)	0	4	0
Bulrush (*Scirpus sp*)	0	3	0
Common cattail (*Typha latifolia*)	0	4	0
Watershield (*Brasenia Schreberi*)	1	8	15
Spatterdock (*Nuphar variegatum*)	1	4	2
White waterlily (*Nymphaea sp*)	1	4	5
Coontail (*Ceratophyllum demersum*)	1	0	0
Chara (*Chara sp*)	1	4	3
Elodea (*Elodea canadensis*)	15	13	18
Turf grass/Quillwort (Isoetes sp)	1	3	9
Naiads (*Najas flexilis*)	20	21	15
Cabbage/Largeleaf pondweed (*Potamogeton amplifolius*)	23	35	17
Nuttall's (ribbonleaf) pondweed (*P. epihydrus*)	6	0	1
Variable pondweed (*P. gramineus*)	7	0	0
Claspingleaf (Richardson) pondweed (*P. Richardsonii*)	4	14	10
Fern pondweed (*P. Robbinsii*)	49	40	60
Snailseed pondweed (*P. Spirillus*)	0	0	8
Flatstem pondweed (*P. zosteriformis*)	23	36	18
Bent grass (*Sagittaria sp*)	0	0	1
Water celery (*Vallisneria americana*)	17	22	23
Percent Aquatic Plant Coverage	81%	89%	86%
July - August Average Secchi Disc Transparency (ft)	8.9	8.8	10.6

APPENDIX A - AQUATIC PLANTS FROM 2006

Results from the point-intercept plant survey found 15 species of plants growing throughout most of the lake bed (Table 1 and Figure 2). Aquatic plants covered approximately 268 acres or 86% of the lake bottom. Fern pondweed, the dominant plant, and was found growing to a depth of 13 feet. Fern pondweed occurred at 60% of the sample sites. A variety of other species were present occurred up to 23% of the sites.

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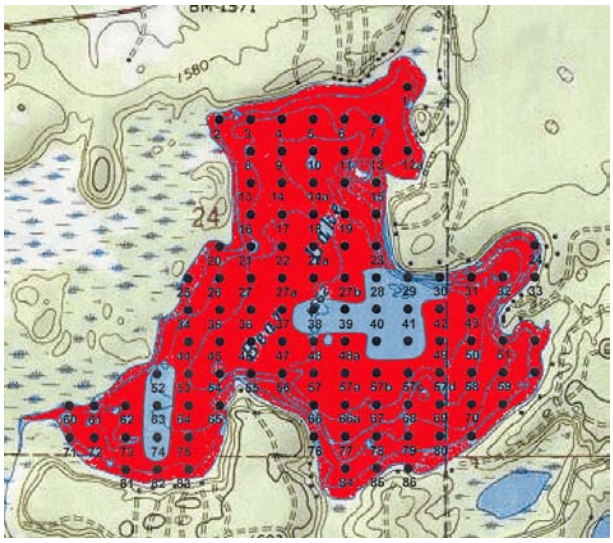


Figure 2. Aquatic plant coverage for August 10, 2006 is shown in red shading.

APPENDIX B - AQUATIC PLANTS FROM 1999 AND 1977

4.5. Lake Plants

Introduction: Aquatic plants are important to maintaining a healthy lake. Bear Lake appears to be healthy and its plant community is healthy. In fact, some residents might think its too healthy. This section reviews aquatic plant data in Bear Lake.

Methods: An aquatic plant survey was conducted on Bear Lake on July 29, 1991. Twenty transects were run with sample points at 0-1.5 feet, 1.5-5 feet, 5-10 feet, and greater than 10 feet (Figure 14).

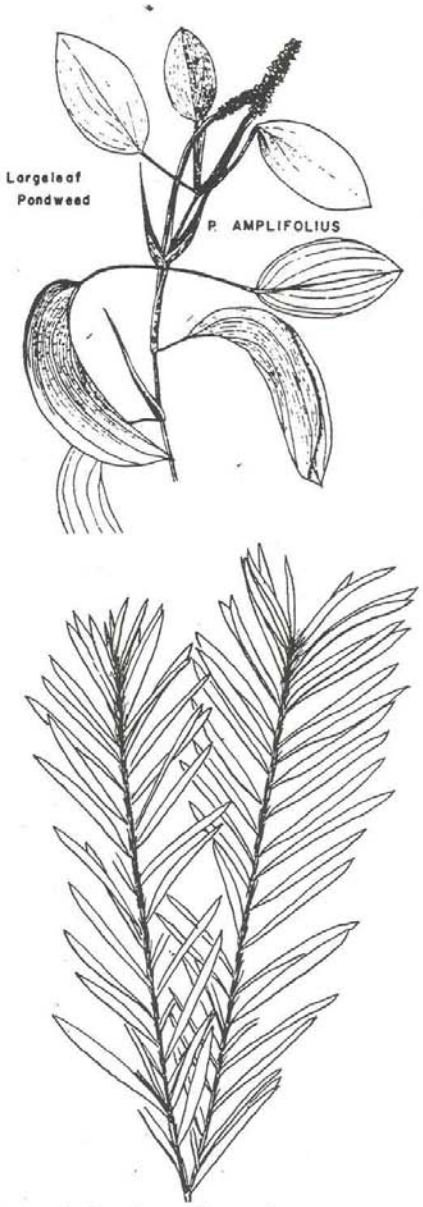
Results: In 1991, rooted plants were found in water to a depth of 17 feet. Plant coverage is shown in Figure 15. Six plant groups are represented, with the group dominated by the fern pondweed (*Potamogeton robbinsii*) being the most abundant. A macrophyte survey was conducted about 14 years prior, on August 1, 1977 (Figure 16). Plant coverage appears to be slightly different compared to 1991. In 1991 *P. amplifolius* and *P. zosterformis* appear to be more abundant than in 1977. Also, plants may have been rooted in slightly deeper water than 1977.

A species list of plants for 1991 and 1977 is shown in Table 15. Percent occurrence is based on number of times plants are present at a sample station. Taking into account that different consultants did the survey, it appears there may have been some changes in the plant community. Comparing 1991 to 1977 the fern pondweed may have decreased and *P. amplifolius* and *P. zosteriformis* may have increased.

The percent of lake that is colonized may have increased slightly from 1977 to 1991 (Table 16). Coverage was about 81% in 1977 and about 89% in 1991. These coverages are pretty close considering that two different firms did the surveys.

Biomass estimates were proposed to be done for Bear Lake using X-16 Lowrance sonar printouts. Estimates have not been made. The sonar printout did not delineate the lake bottom clearly enough to determine where the plants stopped and the sediments began. Scuba diving observations indicated that the extensive fern pondweed beds have several feet of peaty substrate that is partially decomposed fern pondweed. This is why sonar printouts were not able to clearly identify the lake bottom.

The underwater video allowed us to make in-situ observations and to make notes while viewing the aquatic plant community.



Largeleaf pondweed (Potamogeton amplifolius)(top) and fern pondweed (Potamogeton robbinsii) (bottom) are both native aquatic plants and are beneficial to a healthy plants community in Bear Lake.

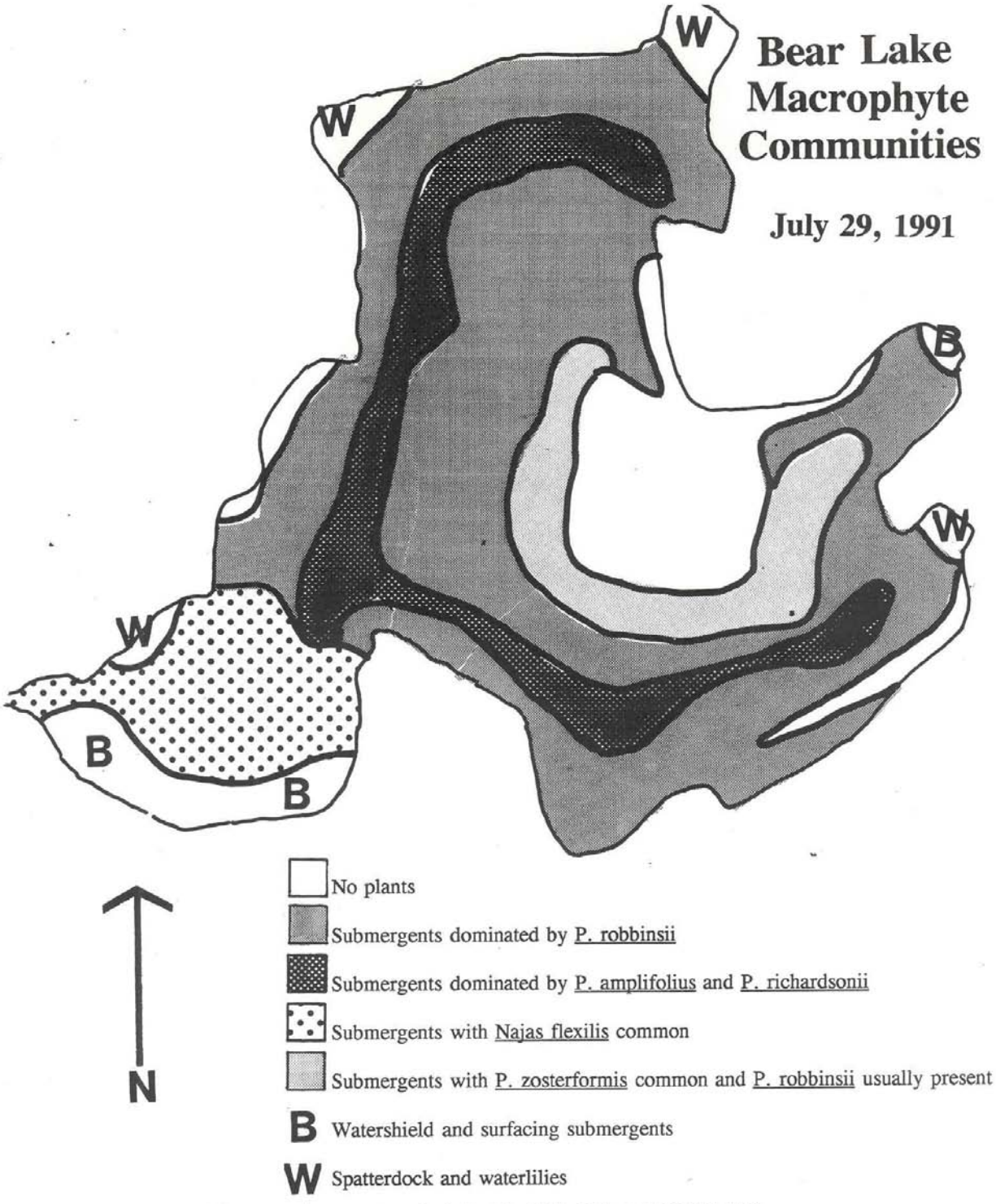


Figure 15. Bear Lake macrophyte survey conducted by Blue Water Science on July 29, 1991.

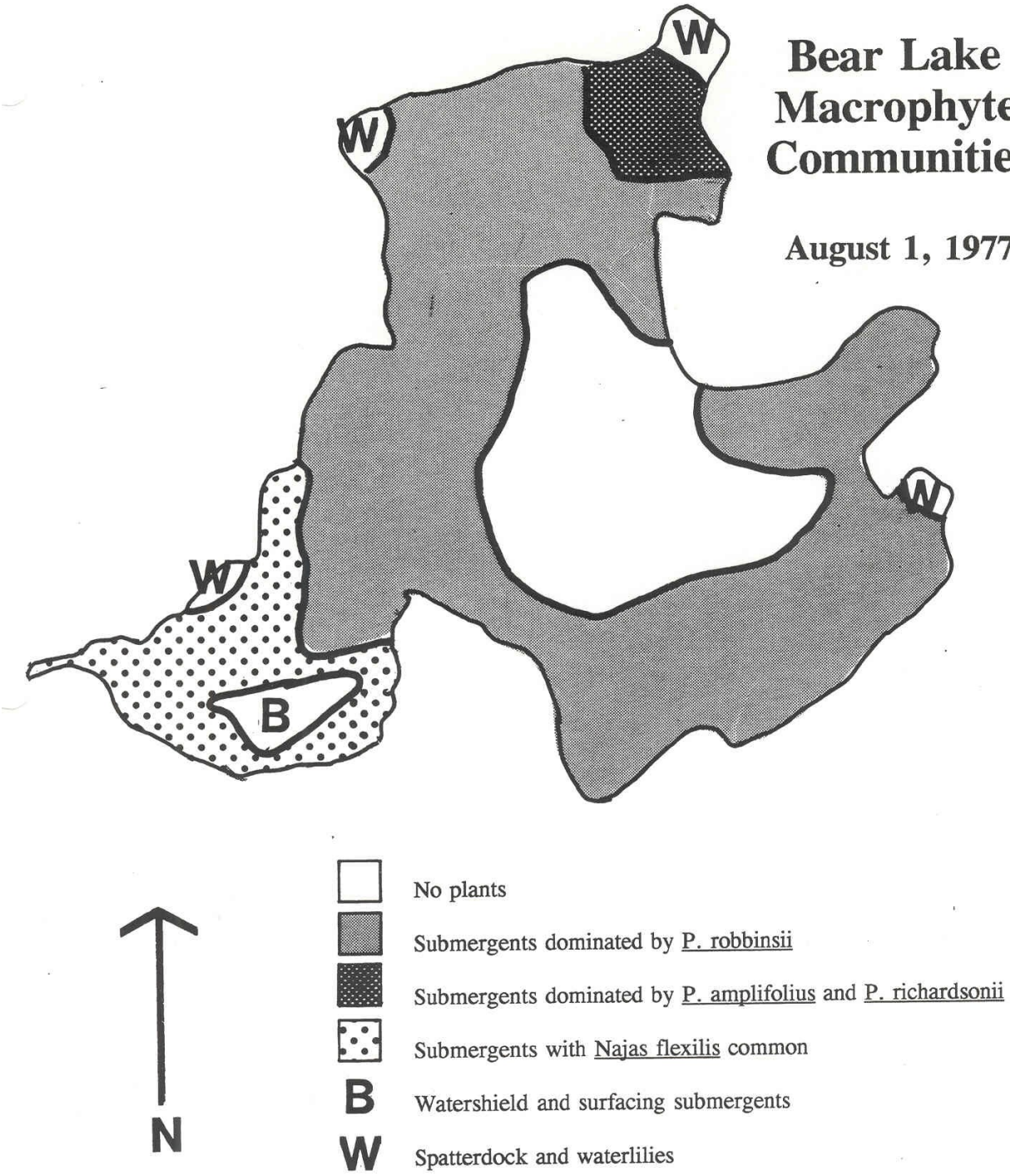


Figure 15. Bear Lake macrophyte survey conducted by Northern Environmental Services on August 1, 1977.

Table 15. Bear Lake macrophyte species list and percent occurrence from August 1, 1977 and July 29, 1991.

Species	Frequency (% occurrence) 1977	1991
Brazenia schreberi (watershield)	1	8
Ceratophyllum demersum (coontail)	1	0
Chara sp. (chara)	1	4
Elodea canadensis (elodea)	15	13
Isoetes sp. (quillwort)	1	3
Lobelia dormtmanna (water lobelia)	0	0
Najas flexilis (slender naiad)	20	21
Nuphar advena (spatterdock)	1	4
Nymphaea odorata (water lily)	1	4
Pontederia cordata (pickerel weed)	0	4
Potamogeton amplifolius (largeleaf pondweed)	23	35
P. epihydrus (ribbonleaf pondweed)	6	0
P. gramineus (variable pondweed)	7	0
P. richardsonii (richardsons pondweed)	4	14
P. robbinsii (fern pondweed)	49	40
P. zosteriformis (flatstem pondweed)	23	36
Sagittaria sp.	0	0
Scirpus (bulrush)	0	3
Typha latifolia (common cattail)	0	4
Valisneria americana (water celery)	17	22

Table 16. Percent of bottom coverage in Bear Lake, August 1, 1977 and July 29, 1991.

Bottom type	1977 Percent of coverage	1991 Percent of coverage
No plants	19	11
Submergents dominated by *P. robbinsii*	61	52
Submergents dominated by *P. amplifolius*	4	14
Submergents *Najas flexilis*	11	6
Submergents dominated by *P. zosterformis* but with *P. robbinsii* usually present	0	9
Watershield and surfacing submergents	2	4
Spatterdock and waterlily	3	3
	100	100

Some of our observations are listed below:

□ We found light penetration to the deepest parts of Bear lake (around 25 feet) although there was no plant growth.

□ *P. robbinsii* is not always upright, large expanses of *P. robbinsii* are fallen over. This makes fairly good invertebrate habitat but is not the best fish habitat (in regard to hiding places)

□ The sediment/water interface is poorly defined over extensive of *P. robbinsii* colonized communities. Poorly decomposed plant material ("proto peat") is often several feet thick. Mucky sediments are below this. For sediment release to be a significant loading factor, it has to come through this organic blanket.

□ Winter diving observations indicated that much of the aquatic macrophyte community is still "green". It is not growing vigorously, but it is not dead either.

(***From: Bear Lake Comprehensive Lake Management Plan, prepared by Blue Water Science, 1997)***