

MACROPHYTE SURVEY

PINE LAKE
FOREST COUNTY, WISCONSIN

PERFORMED BY: R.T. KRUEGER & G.A. KRUEGER

NORTHERN LAKE SERVICE, INC.
400 NORTH LAKE AVENUE
CRANDON, WISCONSIN 54520
JULY 30, 1992

PREPARED:
AUGUST 14, 1992

Introduction

On July 30, 1992, a general macrophyte survey was conducted on Pine Lake, Forest County. This was done to determine density, diversity, and distribution of aquatic plants. General observations were made throughout the lake with depth and density measurements made at specific numbered stations. The 55 stations on Pine Lake represent intersection points on a grid approximately 400 yds on the side. While this grid is larger than that used in 1977, I feel, due to the structure of the lake and nature of the plant communities, this study is as representative as the earlier work. This study also included sampling points in deeper areas of the lake which were not taken into consideration in 1977.

Methodology

At each numbered station a 10 foot circle is visualized and divided into 4 quadrants. Macrophytes are then collected, identified, and ranked as follows: 1 if present in 1 quadrant, 2 if present in 2 quadrants, etc... A ranking of 5 signifies complete or near complete dominance by one species, occupying a significant portion of the water column. If a species is observed growing outside the circle it is given a "p" for present. Species receiving only this designation are not considered when relative frequency, average density, and depth to growth are calculated, but are included on the species list. If a specimen cannot be identified to species it is referred to by the generic name followed by "sp". ("spp"

indicates the presence of more than one unidentified species of the given genus). Water depth, depth to vegetation, percent open water, and bottom type (if depth permits) are also recorded at each station.

Bottom type descriptions are as follows: D=detritus, G=gravel, H=hard, clay like, M=muck, r=rocks, S=sands.

Survey Finding

Pine Lake continues to support abundant and diverse plant growth. Vegetation was collected at all but 6 stations, and even these areas probably support some macrophyte growth albeit extremely sparse.

The most diversity was exhibited at station 2 with 15 species present. Three stations along the west shore shore (9, 19, & 32), and three on the south end (53, 54, & 55) support at least 10 species. Most other stations with depths of under 10 ft supported 3 to 7 species.

The most abundant species were *Ceratophyllum demersum* or coontail which was present in about 75% of the lakes and *Elodea canadensis* which was present at about 45% of the stations. In combination these plants were present at all but one vegetated station, from depths of 2.5 ft. to 13 ft. *Ceratophyllum* and *Elodea* generally produce low but dense growth - sometimes to nuisance proportions.

At the time of this study they were not surfacing and therefore not hampering recreation. (It has been pointed out that weed growth is down significantly from previous years.) In Pine Lake these two species account for approximately 45% of the plant biomass.

The genus *Potamogeten* contributes another 45%. This is an extremely diverse taxa. *Potamogeten praelongus*, white-stem pond weed and *P. zosteriformes*, flat-stem pondweed were the most prevalent, both present at 22 of the 55 stations. *P. robbinsii* and *P. richardsoni* were both present at over 25% of the stations with *P. robbinsii* receiving the highest average density of any species present at more than 3 stations, at 3.2. Five other *Potamogetens* were present. Most of the *Potamogetens* in Pine Lake have long erect stems (to 11 ft.) and are not as dense as *Ceratophyllum* and *Elodea*.

The remaining submergent species account for little biomass. *Myriophyllum exalbescens* (milfoil) was present in most of the beds of broadleaf pond weeds. *Vallisneria americana* and *Chara* (a large rigid algae) were the most prevalent on the sandy, wind-swept east shore.

Beds of emergent vegetation were present on approximately 5% of the surface area of the lake. These beds consisted mostly of the bulrush *scirpus heterochaetus* and were located near the south shore and at the mouth of Wildcat Creek. These areas generally had a

sandy bottom without much muck accumulation. Other emergents included *Typha latifolia* or cattail near the north and south shores and *Pontederia cordata* found at the mouth of Wildcat Creek. Emergents grew at depths of 3 to 5 ft.

Floating leaf vegetation was also present over about 5% of Pine Lake. The largest beds were near stations 2 and 32. The bed at station 2 consist of *Nuphar variegatum* and *Nymphaea odorata* while the one at 32 consisted of these two species along with *Brasenia shreberi*.

Summary

At the time of this survey, Pine Lake supported macrophyte growth nearly throughout. Plant growth extended to 13 ft deep and grew to an average of approximately 5.9 ft below the water's surface. (The average at the 13 stations 7 ft deep or less was 2.1 ft, while the remaining vegetated stations averaged 8 ft to growth.) Twenty-eight species were noted: 4 floating leaf, 3 emergents, and 21 submergents, two of which are actually large colonial algae. The vast majority of the plant biomass was accounted for by the submergent species, especially *Ceratophyllum demersum*, *Elodea canadensis*, and the *Potamogetens*.

As the macrophyte community maps indicate, distribution of community types and extent of growth have changed very little over the last 15 years. The species list and corresponding numbers are

also quite similar. Also like the original, this study found plant growth extended to depths beyond the predicted maximum. This is probably due clearer water conditions earlier in the year when growth began.

MACROPHYTE SURVEY OF: Pine

BY: RTK 'GAK'

ON: 7-30-92

TAXA	STATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Sagittaria Shreberi</i>										2						
<i>Ceratophyllum demersum</i>		2	4	1	1	3	2	4	3	2		1		3	3	
<i>Chara</i>																
<i>Eleocharis acicularis</i>																
<i>Elodea canadensis</i>		1	2													
<i>Heteranthera dubia</i>																
<i>Juncus belocarpus</i>																
<i>Lemna minor</i>																
<i>Lemna trisulca</i>		3	1													
<i>Megalodonta Beckii</i>			1													
<i>Myriophyllum exalbescens</i>			2													
M.																
M.																
Musci																
<i>Najas flexilis</i>																
N.																
<i>Nitella</i>																
<i>Nuphar variegatum</i>			4													
<i>Nymphaea</i>			2													
<i>Pontederia cordata</i>			P													
<i>Polygonum natans</i>																
<i>Potamogeton amplifolius</i>			P													
<i>P. gramineus</i>																
<i>P. praelongus</i>			1													
<i>P. zosteriformes</i>			2		1											
<i>P. robbinsii</i>		2	3	4	4											
<i>P. richardsoni</i>		1	1	2												
<i>P. illinoensis</i>			P													
<i>P. Sp. III</i>																
<i>Scirpus</i>																
<i>Sagittaria eurycarpum</i>																
<i>Spirodella polycarpum</i>																
<i>Typha latifolia</i>																
<i>Utricularia</i>			1													
<i>Vallisneria americana</i>		4														
<i>Wolffia columbiana</i>																
Depth to vegetation		2.5	-	3.5	3.5											
% Open water @ 0.5' depth			40													
Water depth (ft)		4	3	5	5											
Bottom type		M	M	M	M	M										

Numbers correspond to station map on the following page.

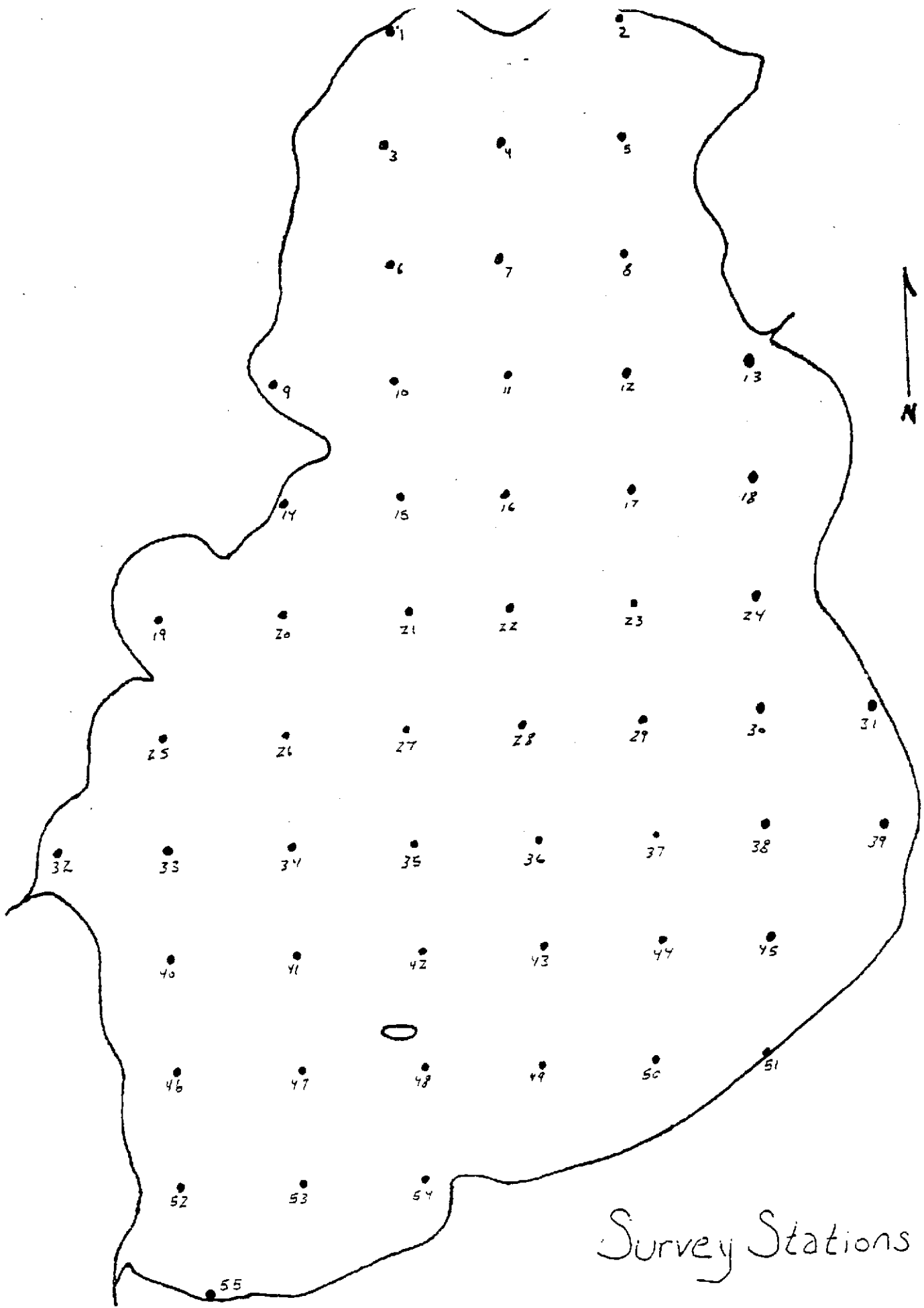
Numbers as explained on page 16

Each of these species belongs to the genus *Potamogeton*

This is the depth (in feet) from the surface to which vegetation extends - if this space is blank either vegetation was surfacing or it was absent

If this space is blank then no vegetation was surfacing - % open water is 100

Bottom types are explained on page 18 - blank spaces were undeterminable



Survey Stations

NORTHERN LAKE SERVICE, INC.

MACROPHYTE SURVEY OF: *Pine*

BY: *RTK GAK*

ON: *7-30-92*

TAXA	STATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Brasenia Shreberi</i>										2						
<i>Ceratophyllum demersum</i>		2	4	1	1	3	2	4	3	2		1		3	1	3
<i>Chara</i>																
<i>Eleocharis acicularis</i>																
<i>Elodea canadensis</i>		1	2			1	2	1		2	2				2	
<i>Heteranthera dubia</i>																
<i>Juncus belocarpus</i>																
<i>Lemna minor</i>										P						
<i>Lemna trisulca</i>		3	1							3						
<i>Megalodonta Beckii</i>			1													
<i>Mvriophyllum exalbescens</i>																
M.			2							1	3			1	1	
M.																
Musci											2					
<i>Najas flexilis</i>								1		P	1			2	1	
N.																
<i>Nitella</i>											4					
<i>Nuphar variegatum</i>			4							2						
<i>Nymphaea</i>			2													
<i>Pontederia cordata</i>			P													
<i>Polygonum natans</i>																
<i>Potamogeton amplifolius</i>			P			2									1	
<i>P. aramineus</i>														2		
<i>P. braealonous</i>			1			2	2	2								
<i>P. zosteriformes</i>			2		1	3	1			P	2					
<i>P. robbinsii</i>		2	3	4	4	4	4			3						
<i>P. richardsoni</i>		1	1	2		1	2			P	2			1		
<i>P. illinoensis</i>			P				2				1					
<i>P. Sp. III</i>								1	1							
<i>Scirpus</i>										P						
<i>Scarganium eurycarpum</i>																
<i>Spirodella polycarpum</i>																
<i>Typha latifolia</i>																
<i>Utricularia</i>			1													
<i>Vallisneria americana</i>		4								3	4			2	3	
<i>Wolffia columbiana</i>																
Depth to vegetation		2.5	—	3.5	3.5	2	1.5	6.5	12		6	10.5		3	5.5	
% Open water @ 0.5' depth			40							90						
Water depth (ft)		4	3	5	6	9	8.5	9	12.5	3.5	7	11	14	4.5	6	12
Bottom type		M	M	M	M	M	M	M	M	M	5	M	M	5	5	5

MACROPHYTE SURVEY OF: Pine

BY: RCK & GAK

ON: 7-30-92

TAXA	STATION	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
<i>Brasenia Shreberi</i>																
<i>Ceratophyllum demersum</i>		2	2	1		3	2	2			2	4	3	1	2	1
<i>Chara</i>																
<i>Eleocharis acicularis</i>																
<i>Flodea canadensis</i>		1						1			2					
<i>Heteranthera dubia</i>																
<i>Juncus pelocarpus</i>																
<i>Lemna minor</i>																
<i>Lemna trisulca</i>																
<i>Megalodonta Beckii</i>											3					
<i>Mvriophyllum exalbescens</i>																
M.																
M.																
Musci																
<i>Najas flexilis</i>			1										2			
N.																
<i>Nitella</i>																
<i>Nuphar variegatum</i>																
<i>Nymphaea</i>																
<i>Pontederia cordata</i>																
<i>Polygonum natans</i>																
<i>Potamogeton amplifolius</i>					2						2					
<i>P. gramineus</i>																
<i>P. praelongus</i>		2	1		3	2	3					P				
<i>P. rostriformis</i>					3						1					
<i>P. robbinsii</i>					4	2						3				
<i>P. richardsonii</i>				1	1											
<i>P. illinoensis</i>																
<i>P. Sp. vultus</i>						2						1	4			
<i>Scirpus vultus</i>											P					
<i>Scarganium eurycarpum</i>																
<i>Spirodella polycarpum</i>																
<i>Typha latifolia</i>																
<i>Utricularia</i>																
<i>Vallisneria americana</i>											3					
<i>Wolffia columbiana</i>																
<i>P. Sp. III</i>				1												
Depth to vegetation		10.5	11	11.5	6in.	2	2	10.5			1.5	7 1/2	11	11.5	11.5	12.5
1/2 Open water @ 0.5' depth																
Water depth (ft)		11	11.5	12	6	10	12	11	11.5	12	5	9	12	12	12	13
Bottom type		m	m		m	m	m	m	m		H	m	m	m	m	m

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MACROPHYTE SURVEY OF: PineBY: RTK GAKON: 7-30-92

TAXA	STATION	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
<i>Brasenia Shreberi</i>			P													
<i>Ceratophyllum demersum</i>		1	1		3	4	3	3	3	3		4		2	2	
<i>Chara</i>																
<i>Eleocharis acicularis</i>							2									
<i>Elodea canadensis</i>		2		2	2						3					
<i>Heteranthera dubia</i>																
<i>Juncus pelocarpus</i>																
<i>Lemna minor</i>																
<i>Lemna trisulca</i>																
<i>Megalodonta Beckii</i>										1	2					
<i>Myriophyllum exalbescens</i>																
M.				1							3					
Y.																
Musci																
<i>Najas flexilis</i>		2						1	2	1				1	3	
Y.																
<i>Nitella</i>																
<i>Nuphar variegatum</i>			2													
<i>Nymphaea</i>			2													
<i>Pontederia cordata</i>			P													
<i>Polygonum natans</i>																
<i>Potamogeton amplifolius</i>											2					
<i>P. gramineus</i>		2	P													
<i>P. praelongus</i>				2	3	1	3	1	1	1	2				1	
<i>P. zosteriformes</i>		1	2	1	1			1	1	3	2					
<i>P. robbinsii</i>		P	4	4				1								
<i>P. richardsoni</i>			2								3					
<i>P. illinoensis</i>			4													
<i>P. Sp.</i>					3										1	
<i>Scirpus validus</i>		3	P													
<i>Sagittarium eurycarpum</i>																
<i>Sagittaria polycarpum</i>																
<i>Typha latifolia</i>																
<i>Utricularia</i>																
<i>Vallisneria americana</i>		4	1								1					
<i>Zostera columbiana</i>																
<i>P. Sp. III</i>						1	1	3	1							
Depth to vegetation				6in.	4	6	11	6	4*	3*	1	5		11		
Open water @ 0.5' depth		4-5	50													
Water depth (ft)		5	3	7	9	9.5	11.5	11	12	10.5	5	8.5	11	11.5	12*	13
Bottom type		GrS	S	M	M	M	M	M	M	M	S	M	M	M	M	M

MACROPHYTE SURVEY OF: PineBY: RK GAKON: 7-30-92

TAXA	STATION	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
<i>Brasenia Shreberi</i>													1			
<i>Ceratophyllum demersum</i>			1	3	2	2	1			4	1					
<i>Chara</i>								2			2					
<i>Eleocharis acicularis</i>																
<i>Elodea canadensis</i>		3	1	3	2		3	2	3	3	2					
<i>Heteranthera dubia</i>																
<i>Juncus pelocarpus</i>										1						
<i>Lemna minor</i>																
<i>Lemna trisulca</i>																
<i>Megalodonta Beckii</i>																
<i>Myriophyllum exalbescens</i>																
M.		P	2				1	P	4	1						
M.																
Musci																
<i>Najas flexilis</i>				3	2	1		2		3	3					
N.																
<i>Nitella</i>																
<i>Nuphar variegatum</i>																
<i>Nymphaea</i>											P					
<i>Pontederia cordata</i>											P					
<i>Polygonum natans</i>																
<i>Potamogeton amplifolius</i>									2	1						
<i>P. gramineus</i>							2	1	2	3						
<i>P. praelongus</i>		2	3	1					1							
<i>P. zosteriformes</i>		2	3	2			1	1	2	1	1					
<i>P. robbinsii</i>		4	4	1												
<i>P. richardsoni</i>		P	P				2		2		1					
<i>P. illinoensis</i>																
<i>P. sp. 2 W/H</i>									1							
<i>Scirpus validus</i>									P	P	1					
<i>Sagittarium eurycarpum</i>																
<i>Spirodella polycarpum</i>																
<i>Typha latifolia</i>								P								
<i>Utricularia</i>																
<i>Vallisneria americana</i>							2	2	2	4	2					
<i>Wolffia columbiana</i>																
Insects								3								
Depth to vegetation		2	1	6	10	11	1.5	3	1	3	95					
Open water @ 0.5' depth											95					
Water depth (ft)		4.5	3	9	10.5	11.5	4	5	6.5	6	2.5					
Bottom type		m	m	m	m	m	S	S	S	SR	S					

PINE LAKE MACROPHYTE SPECIES LIST

<u>Species (common name)</u>	<u>Relative Frequency(%)</u>	<u>Average Density</u>	<u>Depth of Growth(ft.)</u>
Brasenia shreberi (water shield)	1.8	2	3.5
Ceratophyllum demersum (coontail)	76.4	2.2	3 - 13
Chara (muskwort)	3.6	2	2.5 - 5
Eleocharis acicularis (spike rush)	1.8	1	11.5
Elodea canadensis (American elodea)	44.0	2	2.5 - 11
Isoetes (quillwort)	1.8	3	5
Lemna minor (lesser duckweed)	P	P	---
Lemna trisulca (star duckweed)	5.5	2.3	3 - 4
Megalodonta beckii (water marigold)	1.8	3	3
Myriophyllum exalbescens (milfoil)	20.0	1.8	3 - 8
Najas flexilis (slender naiad)	32.7	1.8	2.5 - 12
Nitella (nitella)	1.8	4	7
Nuphar variegatum (yellow pond lily, spatterdock)	5.5	2.7	3 - 3.5
Nymphaea sp. (white water lily)	3.6	3	3
Pontedaria cordata (pickerel weed)	P	P	---
Potamogeton amplifolius (large leaf pondweed)	12.7	1.7	5 - 3.5
P. berchtoldi (Berchtold's pondweed)	9.1	2.2	8.5 - 12
P. gramineus (variable pondweed)	10.9	2	3 - 6.5
P. foliosus (leafy pondweed)	14.5	1.3	6.5 - 12.5

PINE LAKE MACROPHYTE SPECIES LIST

<u>Species (common name)</u>	<u>Relative Frequency(%)</u>	<u>Average Density</u>	<u>Depth of Growth(ft.)</u>
P. illinoensis (Illinois pondweed)	5.5	2.3	7 - 8.5
P. praelongus (white stem pondweed)	40.0	1.8	3 - 12
P. richardsoni (Richardson's pondweed)	25.5	1.6	2.5 - 12
P. robbinsii (Robbin's pondweed)	29.1	3.2	3 - 12
P. zosteriformes (flat-stem pondweed)	40.0	1.7	2.5 - 10.5
Scirpus heterochaetus (slender bulrush)	3.6	2	2.5 - 3
Typha latifolia	p	p	---
Utricularia vulgaris (bladderwort)	1.8	1	3
Vallisneria americana (eelgrass, wild celery)	p	p	---

Note: p=present, but not found at any numbered station.

Abundant Submergent

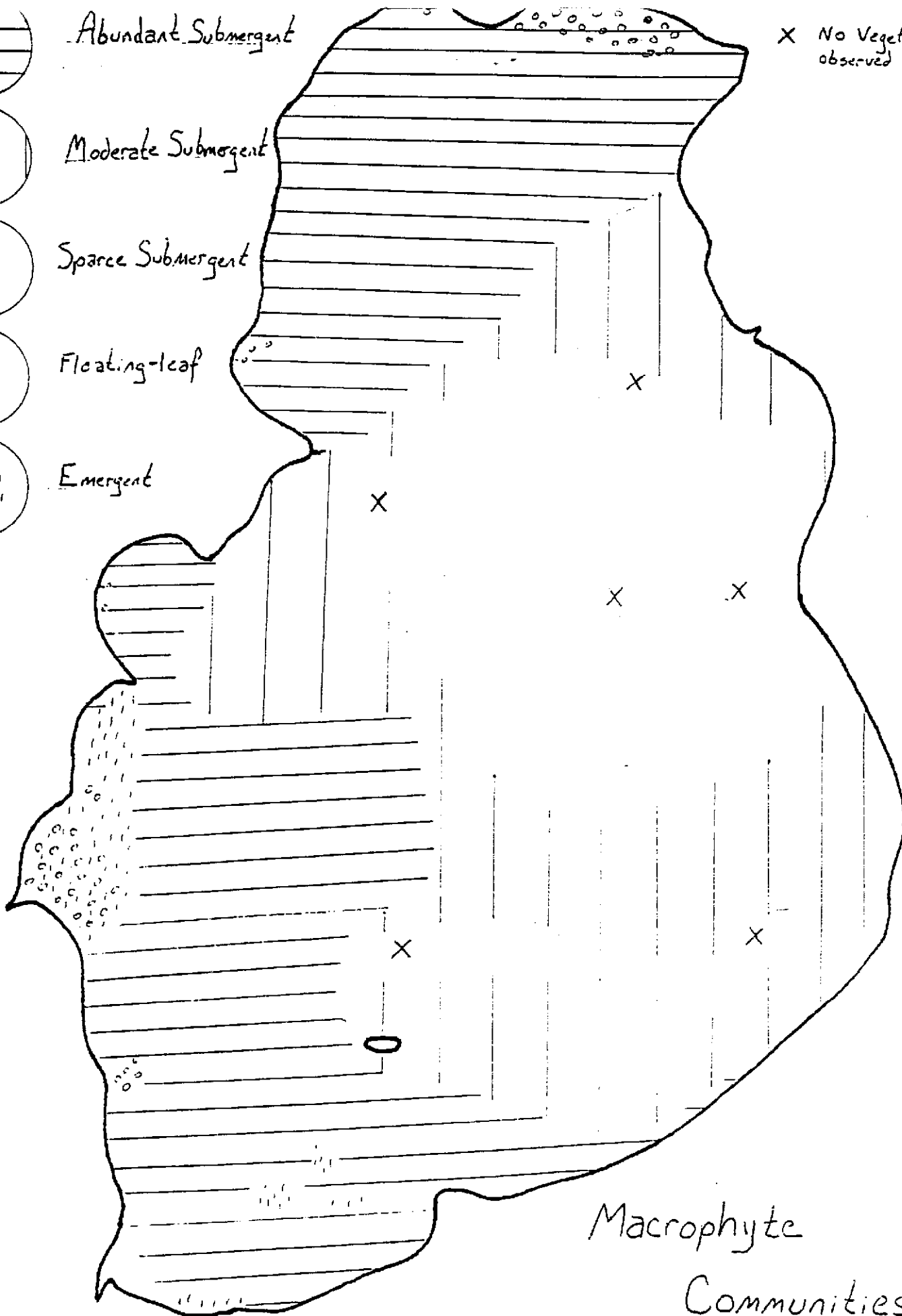
Moderate Submergent

Sparse Submergent

Floating-leaf

Emergent

X No Vegetation observed



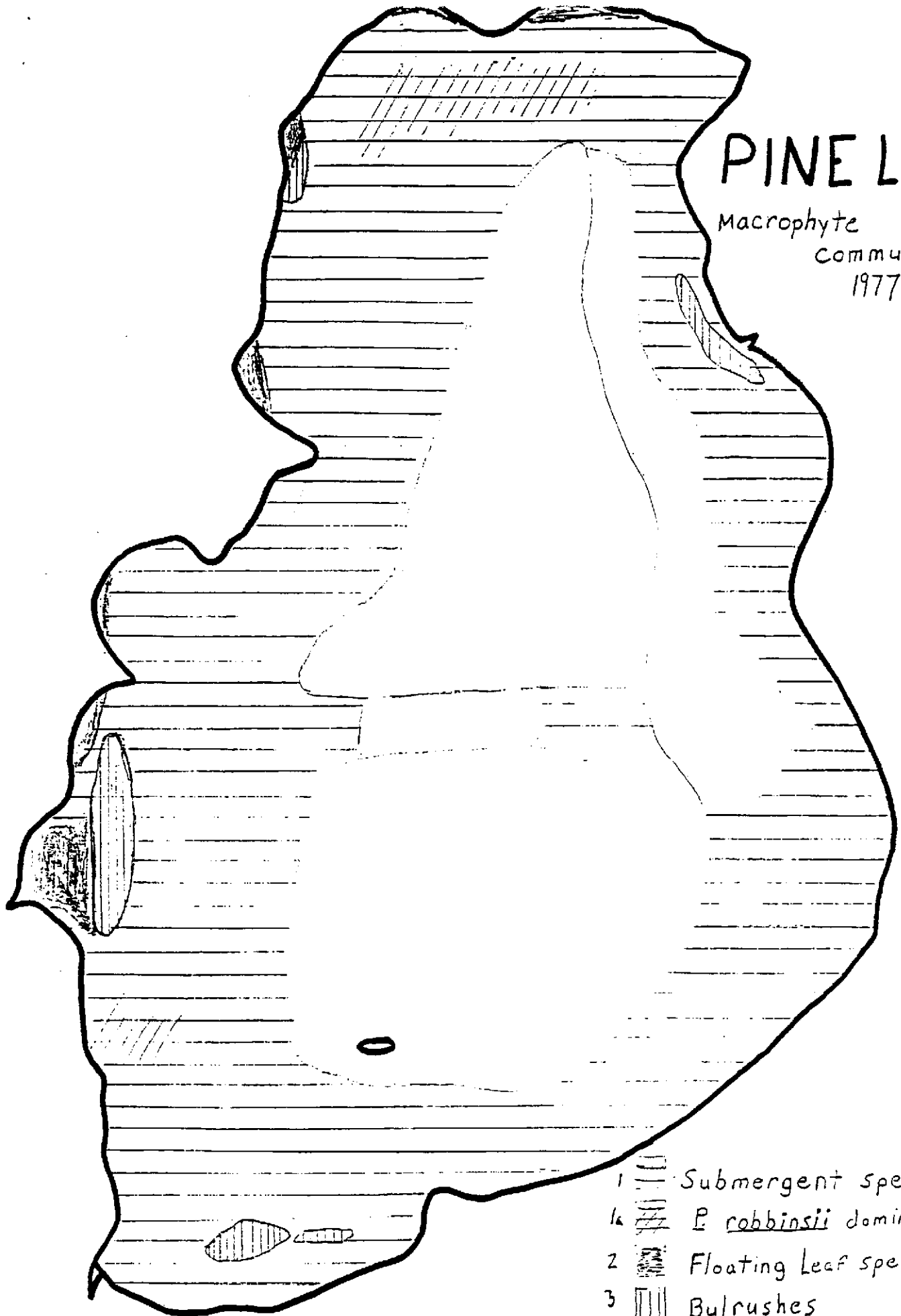
Macrophyte

Communities

1992

PINE LAKE

Macrophyte
Communities
1977



- 1 Submergent species
- 1a *P. robbinsii* dominant
- 2 Floating Leaf species
- 3 Bulrushes

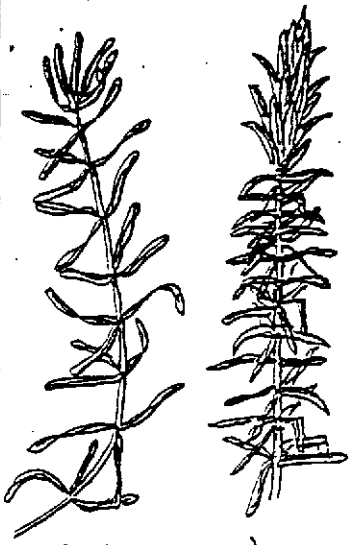
SPECIES GLOSSARY

- Brasenia shreberi* - Water shield; football-shaped floating leaves approximately 12 cm x 7 cm; thin, red stem attached to center of leaf; red waxy flower held about 1 cm above water surface; stem and underside of leaf extremely slimy.
- Ceratophyllum demersum* - Coontail; leaves 1 - 3.5 cm long, whorled on stems, palmately divided and serrated on one side; leaves crowded at tips of stems giving "coontail" effect.
- Chara* sp. - Muskwort; rigid, often brittle algae growing to 1 ft.; "leaves" simple, whorled around stems; plants reddish brown, yellow or green; strong musty smell when crushed.
- Eleocharis acicularis* - Needle rush; usually inconspicuous small grass-like plant; leaves linear \approx 1 mm diameter to 10 cm long.
- Elodea canadensis* - American elodea; leaves 1-2 cm long by 1.5-3 mm whorled on stems in groups of 3's or 4's; whorls about 0.5-1 cm apart; stem thin, light colored and brittle; flowers, with extremely thin white petiole, float on surface.
- Isoetes* sp. - Quillwort; leaves 10-30 cm, grass-like, hollow, recurved pointed; leaf bases swollen clasping.
- Lemna minor* - Lesser Duckweed; consists of only small floating leaf with tiny white root. Leaf \approx 3 mm diameter.
- Lemna trisulca* - Star Duckweed; small (\approx 7 mm) spatula-shaped segment connected to one another by "stalk" portion; each segment with one tiny root; plants often form large, tangled, sinking mats.
- Megalodonta beckii* - Water marigold; submerged leaves somewhat stiff finely dissected and crowded at the nodes; nodes 2-4 cm apart; stems \approx 4 mm diameter; flower daisy-like, held above the water and very rare.
- Myriophyllum exalbescens* - Northern water milfoil; submerged leaves to 3 cm long, in whorls of 3, 4, or 5, dissected into 6-10 pairs of thin segments form a central axis; flower small on a spike held above the water; floral bracts very small.

- Naja flexilis* - Slender naiad; leaves 1-3.5 cm long, opposite on stems, tapering to a slender pointed tip; leaf bases clasping; stems slender, flexible; plant ext. limp out of water.
- Nitella* sp. - large limp algae; dark green, almost transparent; "leaves" whorled on stems, with forked tips.
- Nuphar variegatum* - Yellow pond lily, spatterdock; leaves large (to 50 cm) oval, basal lobes rounded; stem stout, attached to leaf between basal lobes; flowers large (to 10 cm), yellow spherical.
- Nymphaea odorata* - white water lily; leaves large (to 40 cm) nearly circular; basal lobes pointed; stem stout attached to leaf between basal lobes; flower large (to 20 cm) with 25-50 waxy white petals surrounding yellow center.
- Pontedaria cordata* - Pickeral weed; leaves large (to 30 cm) heart-shaped, held upright above water; flowers numerous \approx 2 cm, usually purple, held above water in a spike-like arrangement (to 10 cm).
- Potamogeton amplifolius* - Large-leaf pondweed; leaves to 20 cm, folded along midrib and recurved (banana-shaped); plants often turning brown; flowers on dense spike (to 8 cm) held above the water; stipules rigid, persistent (to 4 cm); often with elliptical floating leaves.
- P. berchtoldi* - Berchtold's pondweed; inconspicuous small-leaved pondweed; leaves 1-5 cm x 1 mm, linear with 3 veins, paired glans at leaf bases; stems very slender with little or no branching.
- P. gramineus* - Variable pondweed; leaves variable usually to 7 cm x 8 mm somewhat bluntly tapered; veins 3-7, often several erect branching stems on runner-like horizontal stem; stipules persistent \approx 2 cm long; fruits dense on 1-3 cm spike.
- P. foliosus* - Leafy pondweed; leaves usually 2-5 cm x 2 mm, linear 3-5 veins; stem slender with much branching; fruit spike spherical.

- P. illinoensis* - Illinois pondweed; leaves lanceolate to 20 cm veins 9-19; stipules persistent, rigid to 8 cm; stem stout, branching; fruits dense on 6 cm spike.
- P. praelongus* - White-stem pondweed; stems stout often whitish and zig-zag; leaves to 20 cm often with conspicuous white midvein, clasping; leaf tips rounded into boat shape which splits when pressed; stipules paper-like persistent \approx 5 cm long; spike dense to 6 cm long.
- P. richardsoni* - Richardson pondweed; superficially very similar to *p. praelongus*; leaves to 10 cm, often with conspicuous white midvein, wavy leaf margins, clasping stems tapering to slender tip; stipules blunt, not persistent; stem usually white; floral spike to 3 cm.
- P. robbinsii* - Robbin's pondweed; leaves strongly two ranked (plant resembles a fern under water), stiff, \approx 10 cm x 5 mm; stipules not persistent; stem slightly flattened usually unbranched.
- P. zosteriformes* - Flat-stem pondweed; leaves linear to 20 cm x 5 mm; stem to 5 mm wide, strongly flattened slightly winged, limp; stipules to 3 cm; peduncle to 5 cm often curved.
- Scirpus* sp. - Bulrush; stems simple, rigid, linear, erect to 2 m, round, mostly hollow; flowers spraying out from side of stem near tip (actually end of stem with bract).
- Typha latifolia* - Cattail; leaves sword-like to 2 m, stiff; stem to 3 m stiff, erect; flowers tiny crowded into large (to 20 x 5 cm) cigar-like spike.
- Utricularia vulgaris* - Common bladderwort; leaves numerous, 1-3.5 cm, forked dissected into narrow segments-"net-like"; stems with many small egg-shaped bladders (\approx 2 mm) flowers conspicuous yellow, lipped, held above water; plant often not rooted but suspended in large masses.
- Vallisneria americana* - Eel grass, wild celery; leaves ribbon-like to 1 m x \approx 1.5 cm wide; flowers, white \approx 1 cm, floating on long, slender, spirally stem.

(These definitions have been written with regard to the species and variations of species found in Pine Lake, Forest County. It should not be relied upon as a key, especially on other lakes.)



Elodea canadensis



Najas flexilis



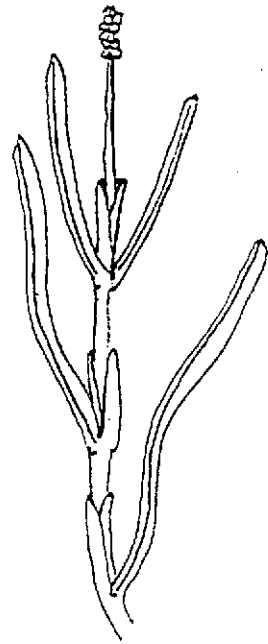
Potamogeton praelongus



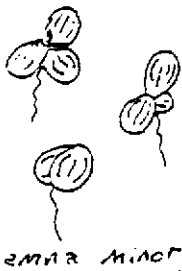
Potamogeton amplifolius



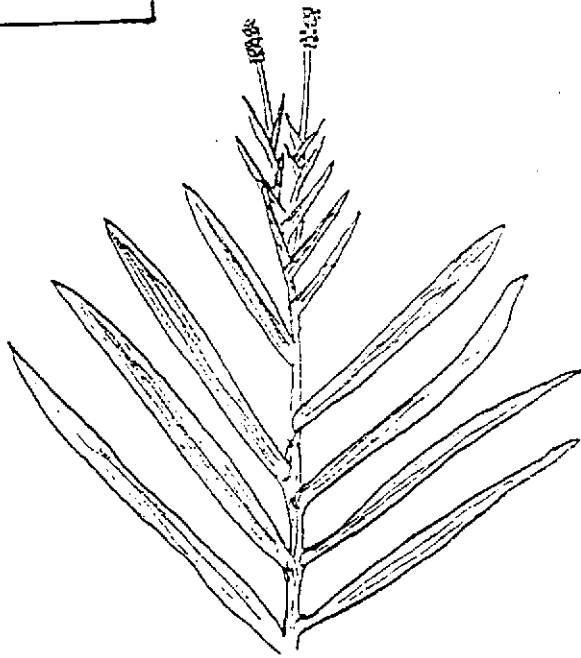
Potamogeton richardsonii



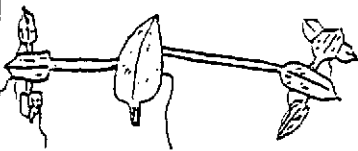
Potamogeton zosteriformes



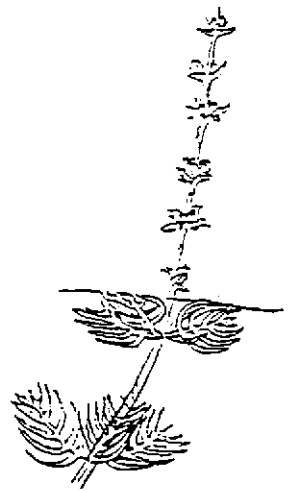
Lemna minor



Potamogeton robbinsii



Lemna trisulca

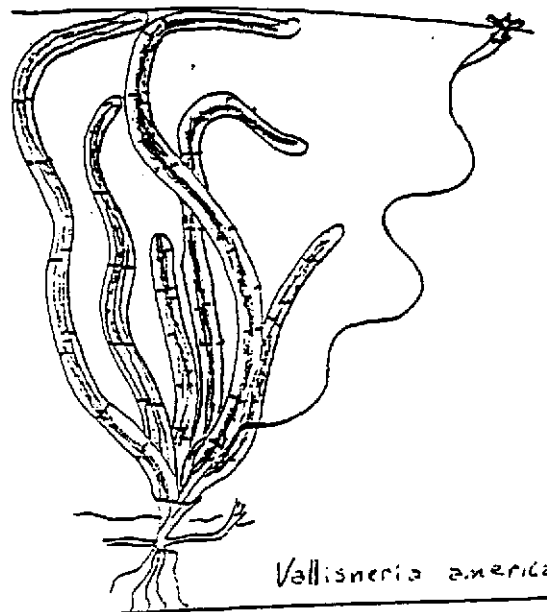


*Myriophyllum
exalbescens*

Potamogeton
gramineus



Chara sp



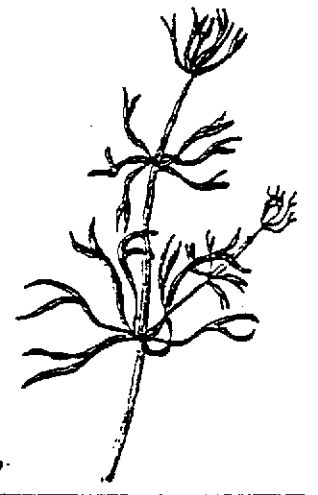
Vallisneria americana



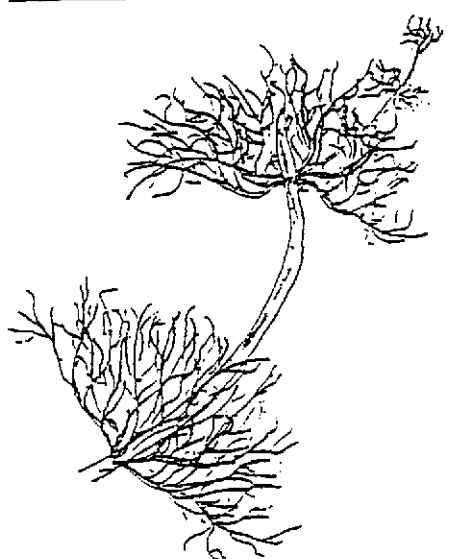
Ceratophyllum demersum



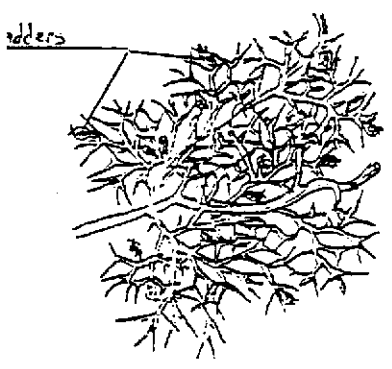
Potamogeton foliosus



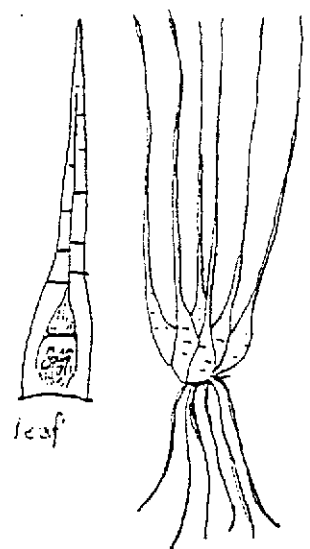
Najas sp.



Megalodonta beckii

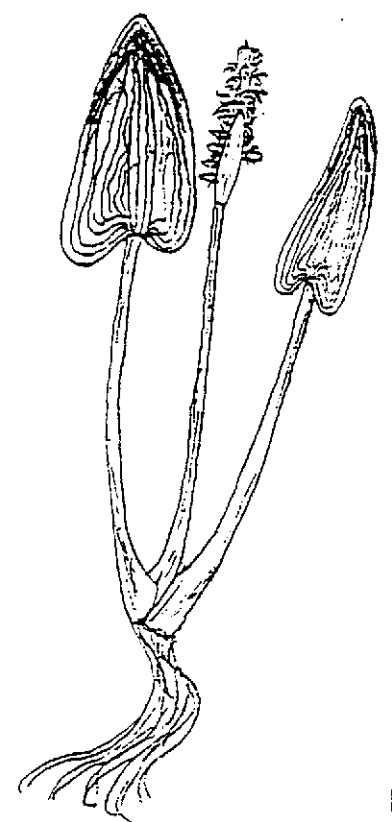


Utricularia vulgaris



leaf

Isoetes sp.



Pontederia cordata

Analytical Results

Appendix B

	<u>5/8</u>	<u>7/30</u>	<u>11/11</u>
Conductivity umbo (@25c)	85	90	87
pH (s.u.)	7.4	7.4	5.9
Alkalinity (mg/l)	34	38	36
Chloride (mg/l)	< 1	< 1	3
Nitrogen, ammonia (mg/l)	< 0.05	0.08	< 0.05
Nitrogen, NO ₂ & NO ₃ (mg/l)	(0.05	0.08	0.11
Nitrogen, Kjeldahl (mg/l)	0.62	0.46	0.45
Phosphorus, total (mg/l)	0.032	0.022	0.018
Secchi disc (ft.)	5.7	7.7	9.9

Chlorophyll	CCa α	Pheo α	TC α	TCb	TCc
05/08/92	10.12	3.82	12.76	0.666	1.72
07/30/92	5.70	0.73	6.34	0.15	0.72

CC α = Corrected Chlorophyll

Pheo α = Pheophytin α

TC α = Trichromatic Chlorophyll α

TCb = Trichromatic Chlorophyll b

TCc = Trichromatic Chlorophyll c

unit = ug/l

Dissolved Oxygen/Temperature

	5/8/92	7/30/92	11/11/92
0.1 m	10.7/10.4°	8.0/21.8°	11.8/1.9
1	10.6/10.4°	8.0/20.8°	11.9/1.9
2	10.5/10.1°	7.7/20.4°	11.9/1.9
3	10.1/9.8°	7.5/20.1°	11.7/1.9
4	3.5 bottom	3.5 bottom	11.2/1.9 4.5 bottom

Winter DO/Temp.

	02/25/93	03/28/93 site A	03/28/93 site B
0.1m	12.7/0.7	5.7/1.1	6.6/1.3
1	9.3/2.6	2.3/4.4	4.0/4.1
2	1.5/3.9	2.2/4.7	2.3/4.4
3	0.7/4.6		2.3/4.8
	3.5 bottom		3.5 bottom