ASPL-005-04

Aquatic Biologists, Inc. SINCE 1977

Specialists in Lake & Pond Management, Services & Supplies

426 N.W. Cumberland St.
Berlin, WI 54923
(920) 361-3223

September 30, 2004

Scott Provost
427 E. Tower Drive. Suite 100
Wautoma, WI 54982

Scott:

Enclosed you will find a copy of the *2004 Wilson Lake Post-Treatment Survey Results and Management Update* for your review and comment. Any comments you may have can be forwarded to me at the address above.

Please call me at 920-420-2077 if you have any questions.

Thank you,

Brad Roost

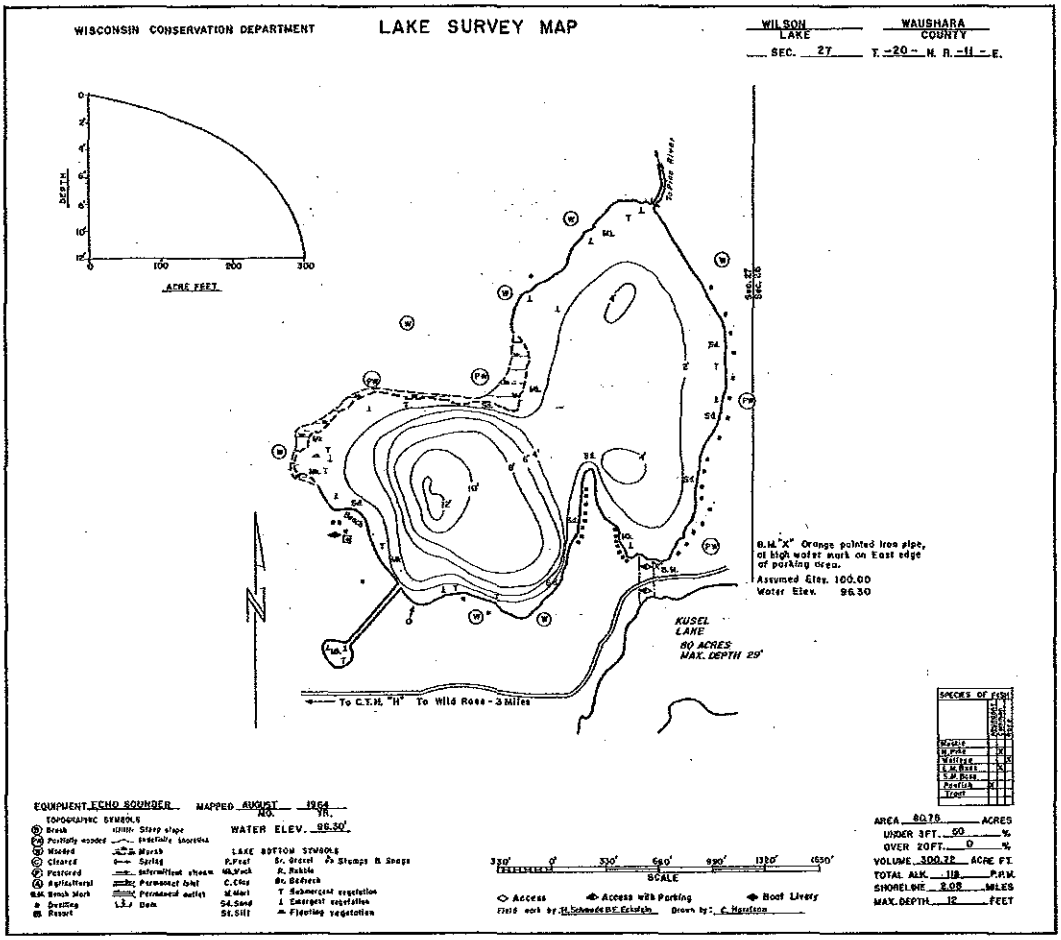
Brad Roost,
ABI Staff Technician

Mark Please review
Scott

ASPL-005-04

2004 Wilson Lake Post-Treatment Survey Results and Management Update

September 30, 2004



Prepared by:

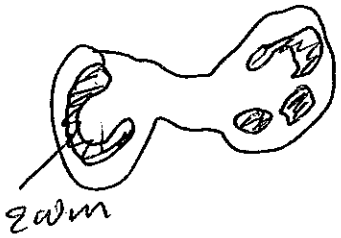
Brad Roost
Aquatic Biologists, Inc.
N4828 Hwy 45
Fond du Lac, WI 54935
920-361-4088

Sponsored by:

The Kusel, Wilson, Round Lakes Protection and Rehabilitation District and the Wisconsin Department of Natural Resources

general comments:
I would produce a cover type ~~or~~ species map to illustrate Δ's in AP community

2000



2004

Show change

Where's the discussion on harvesting and other options?

Little more emphasis on I&E and prevention methods.

Introduction

The report entitled *Management of aquatic plants in Wilson Lake 2001-2006* outlined a course of action for controlling Eurasian watermilfoil (*Myriophyllum spicatum*) in Wilson Lake. The management plan recommended aggressively treating Eurasian watermilfoil throughout the lake using Navigate® (2,4-D). This follow-up report is intended to present the results of an August 2004 plant survey, compare plant survey data collected since 2000, discuss recent management of Wilson Lake, and make future management recommendations.

History

An aeration system has been operating in Wilson Lake since 1988. It was installed to prevent winter fish kills, and has also accelerated decomposition of organic sediments – increasing the average depth of the lake by two feet. If this is stated, please cite source and authenticate!

During May 2000 a whole-lake aquatic plant survey was conducted on Wilson Lake to provide baseline data on the lake's plant community and the distribution of Eurasian watermilfoil. This survey and all subsequent plant surveys consisted of collecting aquatic plants along 12 evenly spaced transects in the lake using a tethered rake (Figure 1). A total of 192 rake tows were made during each plant survey. All plants collected were identified to *genus* and *species* whenever possible.

The 2000 survey found a diverse aquatic plant community dominated by Eurasian watermilfoil. Milfoil was found in both basins of Wilson Lake totaling 18 acres. Shortly after the survey, in June 2000, 7.75 acres of milfoil were treated along the shore.

In 2001 lake residents and ABI staff mapped the remaining Eurasian watermilfoil. Dense milfoil beds were found in three areas of the lake totaling 10.2 acres. These areas were treated in July 2001. In September 2001, three months following treatment, a plant survey was again performed. This survey found a 95% decline in Eurasian watermilfoil. This survey also showed a positive response from the native plant community. It however, showed the low-level presence of curly-leaf pondweed (*Potamogeton pectinatus*), another exotic plant species capable of reaching nuisance levels.

In June 2002 another follow-up plant survey was conducted. This survey showed an increase in the frequency of both Eurasian watermilfoil (10.4% frequency) and curly leaf pondweed (9.9% frequency). After mapping the milfoil beds, 9.3 acres were found and treated in July 2002. It should be noted that this apparent regrowth of Eurasian watermilfoil was located in a different part of the lake than what had previously been treated.

who is this?

In July 2003, 16.8 acres of curly-leaf pondweed were treated in Wilson Lake with Aquathol K (endothall). One month later, Patti Bielecki led a plant survey modeled after previous surveys. The results of this survey showed a decrease in Eurasian watermilfoil to levels comparable to those found in the September 2001 survey (3.6% frequency in 2001, 3.1%frequency in 2003). Curly-leaf pondweed was also not found in the lake.

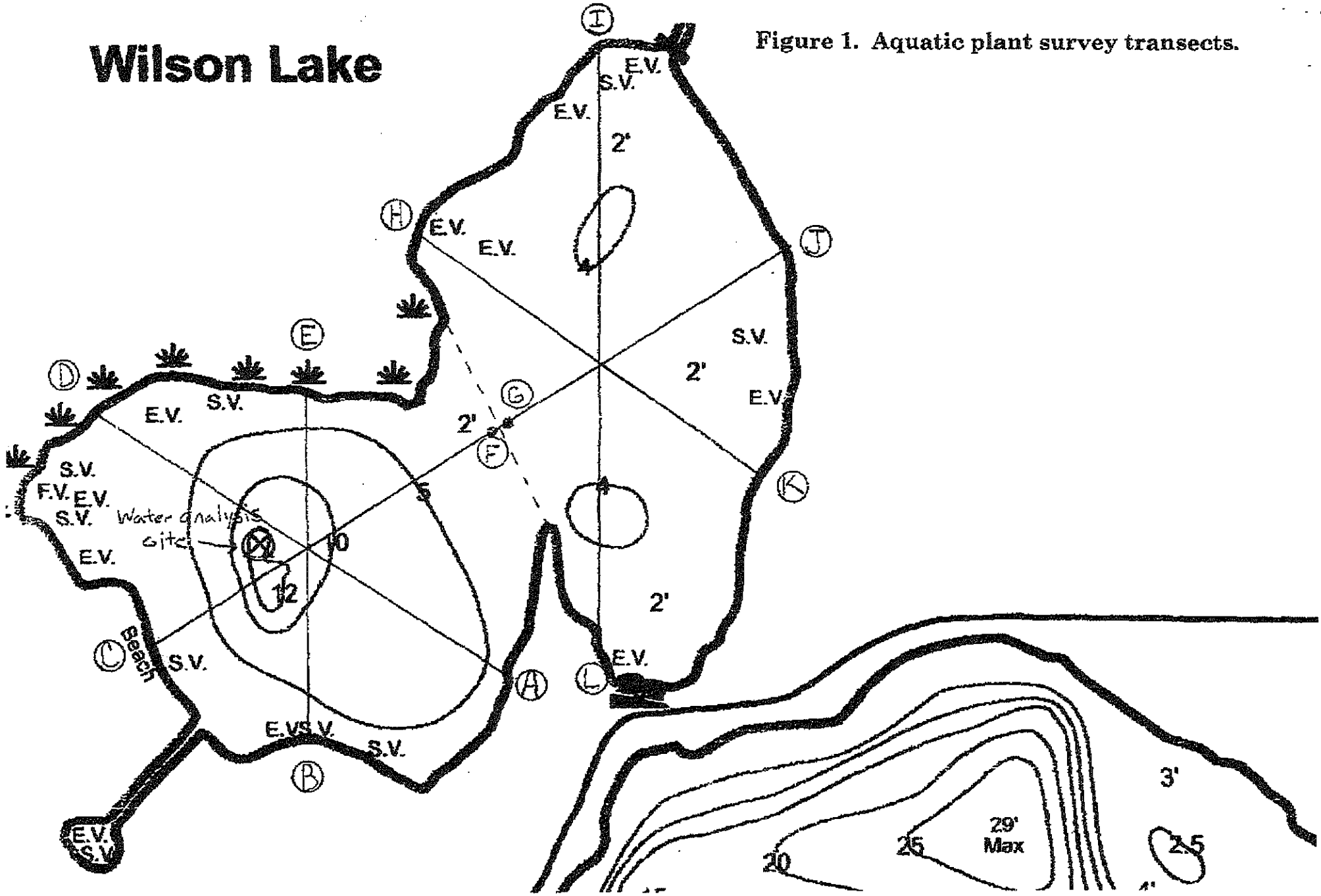


Figure 1. Aquatic plant survey transects.

By spring 2004, increased levels of curly leaf pondweed were again found in Wilson Lake. As per the recommendations of the Army Corps of Engineers, again 16.8 acres were treated May 11th 2004. The return of curly leaf pondweed to this extent after having not been found during the previous fall's plant survey is likely due to curly leaf pondweed's life cycle. Unlike most other aquatic plants, as lake water heats up during mid to late summer, curly leaf pondweed plants begin to die back, and become dormant forming specialized over wintering structures called turions. When water temperatures drop again later in the fall plant growth resumes. In August, 2004 ABI staff conducted a follow-up plant survey. The following portion of this report presents the results of this survey.

2004 Plant Survey Results

On August 4, 2004 a plant survey was conducted on Wilson Lake. This was approximately 12 weeks after *Aquathol K* treatment. Methods described above were again used. Data collected in this survey was used to calculate the occurrence and abundance (percent frequency and percent composition) of each plant species found (Appendix A and Table 1). Results show that no Eurasian watermilfoil and only one plant of curly leaf pondweed were found in Wilson Lake.

Percent frequency data from each year between 2000 and 2004 were compiled to show five-year trends (Table 2). Data from 2000 and 2004 were analyzed to determine whether differences between the surveys were statistically significant. Paired t-tests were run on the data using 95% confidence intervals. This comparison of each plant species is given in Table 3. Of the 22 species found in 2000 and 2004, Eurasian watermilfoil decreased the mostly significantly, having been found at 66.7% frequency in 2000 and 0% frequency in 2004. Other significant decreases include Bushy pondweed (*Najas flexilis*), Illinois pondweed (*Potamogeton illinoensis*) and Flatstem pondweed (*Potamogeton zosteriformis*). Musk Grass (*Chara* spp.) and Common waterweed (*Elodea canadensis*) showed the greatest increases.

The decline in frequency and distribution of natives was seen after the *Aquathol* treatment in spring 2004. At this same time decreases in water quality/clarity were also noticed. It is unclear if the apparent loss of aquatic plants is due to herbicide treatment or decreased water clarity. However, it should be noted that the *Aquathol* was applied at labeled rates, which should not have an impact on the native plant community. Might be helpful to show rates. I think that it would show how light the treatment was.

A visual survey of the emergent plants growing along the shore of Wilson Lake found purple loosestrife (*Lythrum salicaria)* growing in the undeveloped portions of the north shore. Although not extensive at this point, if left alone, it too will reach nuisance levels. Suggest Bio control? Good opportunity.

Water Quality Monitoring

Basic water quality data were collected in April and June 2002 and August 2004 (Tables 4.1 – 4.3). ~~Parameters~~ Constituents analyzed in the field include water transparency (Secchi depth), pH, dissolved oxygen and temperature. Water samples were sent to the State Lab of

Table 1. Results of the aquatic plant survey conducted on Wilson lake, August 4, 2004

Species common name	scientific name	Frequency	Percent Frequency	Percent Composition
Musk Grass	*Chara spp.*	*125*	65.1	44.3
Elodea	*Elodea canadensis*	*72*	37.5	25.5
White Water Lily	*Nymphaea odorata*	*14*	7.3	5.0
Watershield	*Brasenia schreberi*	*6*	3.1	2.1
Variable Pondweed	*Potamogeton gramineus*	*5*	2.6	1.8
Bladderwort	*Utricularia vulgaris*	*4*	2.1	1.4
Spadderdock	*Nuphar variegata*	*4*	2.1	1.4
Bushy Pondweed	*Najas flexilis*	*2*	1.0	0.7
Water Celery	*Valisneria americana*	*2*	1.0	0.7
Curly Leaf Pondweed	*Potamogeton crispus*	*1*	0.5	0.4
Green Algae	*Cladophora, Pithiophora, etc.*	*1*	0.5	0.4
No Plants Found		*46*	24.0	16.3
	Total	*282*		

Table 2. Comparison of 2000 - 2004 Wilson Lake aquatic plant surveys data.

Species		2000 Percent Frequency	2001 Percent Frequency	2002 Percent Frequency	2003 Percent Frequency	2004 Percent Frequency	Average
Musk Grass	*Chara* spp.	39.1	46.4	48.4	13.5	65.1	42.5
Bushy Pondweed	*Najas flexilis*	39.6	58.9	58.9	36.5	1.0	39.0
Eurasian Watermilfoil	*Myriophyllum spicatum*	66.7	3.6	10.4	3.1	0.0	16.8
Common Waterweed	*Elodea canadensis*	10.9	9.9	20.3	0.0	37.5	15.7
Illinois Pondweed	*Potamogeton illinoensis*	20.3	17.7	25.5	0.0	0.0	12.7
White Water Lily	*Nymphaea odorata*	5.2	6.8	7.3	10.4	7.3	7.4
Flatstem Pondweed	*Potamogeton zosteriformis*	10.4	9.4	11.5	2.1	0.0	6.7
Coontail	*Ceratophyllum demersum*	7.3	10.9	7.3	6.3	0.0	6.4
Water Celery	*Valisneria americana*	1.0	20.8	2.6	0.0	1.0	5.1
Variable Pondweed	*Potamogeton gramineus*	0.0	20.3	0.0	0.0	2.6	4.6
Watershield	*Brasenia schreberi*	3.6	1.0	4.2	9.4	3.1	4.3
Green Algae	*Cladophora, Pithophora, etc.*	3.5	0.0	11.5	0.5	0.5	3.2
Northern Watermilfoil	*Myriophyllum sibericum*	6.3	2.6	0.0	3.1	0.0	2.4
Spadderdock	*Nuphar variegata*	0.5	0.5	1.0	7.8	2.1	2.4
Curly Leaf Pondweed	*Potamogeton crispus*	0.0	1.0	9.9	0.0	0.5	2.3
Floating Leaf Pondweed	*Potamogeton natans*	0.5	4.2	3.1	0.0	0.0	1.6
Water Stargrass	*Zosterella dubia*	2.6	1.6	2.1	0.0	0.0	1.3
White-stem Pondweed	*Potamogeton praelongus*	0.5	0.5	4.7	0.0	0.0	1.1
Sago Pondweed	*Potamogeton pectinatus*	0.0	3.1	0.0	2.6	0.0	1.1
Small Pondweed	*Potamogeton pusillus*	3.1	2.1	0.0	0.0	0.0	1.0
Bladderwort	*Utricularia vulgaris*	0.5	1.6	1.0	0.0	2.1	1.0
Clasping Leaf Pondweed	*Potamogeton richardsonii*	0.0	5.2	0.0	0.0	0.0	1.0
Hardstem Bullrush	*Scirpus acutus*	2.1	0.5	0.0	2.1	0.0	0.9
Water Thread Pondweed	*Potamogeton diversifolius*	0.0	0.0	3.1	0.0	0.0	0.6
Stonewort	*Nitella* spp.	2.6	0.0	0.0	0.0	0.0	0.5
Common Duckweed	*Lemna minor*	0.0	0.0	0.0	2.1	0.0	0.4
Cattails	*Typha* spp.	0.0	0.0	0.0	1.0	0.0	0.2
Needle Rush	*Eleocharis acicularis*	0.0	0.0	0.5	0.0	0.0	0.1
Water Moss	*Drepanocladus* spp.	0.0	0.0	0.5	0.0	0.0	0.1
No Plants Found		7.8	13.5	2.6	n.a.	24.0	12.0

Interesting. Do you believe this is due to succession?

looks like ↓ in diversity

Table 3. Analysis of variance between 2000 (top row) and 2004 (*bottom row*) Wilson Lake submergent plant survey data.

Species	Transect / Occurences														stat. sig.
	A	B	C	D	E	F	G	H	I	J	K	L	total	t-value*	difference
Watershield (*Brasenia schreberi*)	0	0	0	2	0	0	0	4	1	0	0	0	7	0.21	N
	0	*0*	*0*	*4*	*0*	*0*	*0*	*0*	*2*	*0*	*0*	*0*	*6*		
Coontail (*Ceratophyllum demersum*)	2	0	6	3	0	0	0	0	1	2	0	0	14	2.18	N
	0	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*		
Musk Grass (*Chara spp.*)	6	7	10	4	4	4	8	4	5	6	9	8	75	-6.66	Y
	9	*14*	*12*	*5*	*6*	*11*	*15*	*10*	*8*	*11*	*12*	*12*	*125*		
Green Algae (*Cladophora, Pithophora, etc.*)	0	0	5	0	1	0	1	0	0	0	0	0	7	1.15	N
	0	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*0*	*0*	*0*	*0*	*1*		
Elodea (*Elodea canadensis*)	1	1	0	2	2	5	0	1	1	1	0	3	17	-5.58	Y
	8	*7*	*9*	*6*	*0*	*11*	*6*	*6*	*5*	*5*	*1*	*9*	*73*		
Northern Watermilfoil (*Myriophyllum sibericum*)	2	1	8	0	0	0	1	0	0	0	0	0	12	1.51	N
	0	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*		
Eurasian Watermilfoil (*Myriophyllum spicatum*)	9	7	10	12	13	12	8	12	12	11	7	15	128	14.79	Y
	0	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*		
Bushy Pondweed (*Najas flexilis*)	3	5	1	2	5	10	0	5	11	13	8	13	76	4.92	Y
	0	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*2*	*2*		
Stonewort (*Nitella spp.*)	3	0	2	0	0	0	0	0	0	0	0	0	5	1.45	N
	0	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*		
Spadderdock (*Nuphar variegata*)	0	0	0	0	0	0	0	0	1	0	0	0	1	-1.00	N
	0	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*4*	*0*	*0*	*0*	*4*		
White Water Lily (*Nymphaea odorata*)	0	0	0	2	0	0	0	2	2	2	0	2	10	-0.77	N
	0	*0*	*3*	*4*	*0*	*0*	*0*	*0*	*4*	*0*	*0*	*3*	*14*		
Curly Leaf Pondweed (*Potamogeton crispus*)	0	0	0	0	0	0	0	0	0	0	0	0	0	-1.00	N
	0	*0*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*		
Variable Pondweed (*Potamogeton gramineus*)	0	0	0	0	0	0	0	0	0	0	0	0	0	-1.82	N
	0	*0*	*0*	*0*	*0*	*0*	*2*	*0*	*2*	*0*	*0*	*1*	*5*		
Illinois Pondweed (*Potamogeton illinoensis*)	0	3	1	0	3	8	0	6	3	3	4	5	36	4.12	Y
	0	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*		
Floating Leaf Pondweed (*Potamogeton natans*)	0	0	0	0	0	0	0	0	1	0	0	0	1	1.00	N
	0	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*		
White-stem Pondweed (*Potamogeton praelongus*)	0	1	0	0	0	0	0	0	0	0	0	0	1	1.00	N
	0	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*		

Chara + Najas responding to ↓ in Ewm?

Table 3. Analysis of variance between 2000 (top row) and 2004 (*bottom row*) Wilson Lake submergent plant survey data.

Species	Transect / Occurences														stat. sig.
	A	B	C	D	E	F	G	H	I	J	K	L	total	t-value*	difference
Small Pondweed (*Potamogeton pusillus*)	0	0	0	0	0	0	0	0	0	0	4	2	6	1.39	N
	0	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*		
Flatstem Pondweed (*Potamogeton zosteriformis*)	1	0	6	3	5	2	0	2	2	1	1	0	23	3.44	Y
	0	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*		
Hardstem Bullrush (*Scirpus acutus*)	0	0	0	0	0	0	0	4	0	0	0	0	4	1.00	N
	0	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*		
Bladderwort (*Utricularia vulgaris*)	1	0	0	0	0	0	0	0	0	0	0	0	1	-0.71	N
	0	*0*	*0*	*4*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*4*		
Water Celery (*Valisneria americana*)	2	0	0	0	0	0	0	0	0	0	0	0	2	0.00	N
	0	*0*	*2*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*2*		
Water Stargrass (*Zosterella dubia*)	0	0	4	0	0	0	0	0	1	0	0	0	5	1.24	N
	0	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*		
No Plants Found	3	3	0	3	0	0	0	2	0	1	2	1	15	-2.53	Y
	5	*0*	*2*	*10*	*10*	*4*	*1*	*2*	*4*	*3*	*3*	*1*	*45*		

*** Paired t-test for two sample for means; 95% Confidence limit, df = 11, t = 2.201**

Table 4.1 April 15, 2002 water quality data for Wilson Lake

Parameter	Result /Unit
Secchi Depth	14 feet
pH	8.4
Chlorophyll a	<1 µg/l
Nitrate + Nitrite (as N) - Surface	60 µg/l
Total Phosphorus - Surface	10 µg/l
N/P Ratio - Surface	6:1
Nitrate + Nitrite (as N) - Bottom	75 µg/l
Total Phosphorus - Bottom	21 µg/l
N/P Ratio - Bottom	3.6:1

How can you calculate this

Dissolved Oxygen and Temperature Profiles

Depth (ft)	Temp (C.)	D.O. (mg/l)
0	11.9	11.6
1	11.8	11.8
2	11.7	11.6
3	11.6	11.6
4	11.6	11.6
5	11.6	11.7
6	11.6	11.7
7	11.5	11.6
8	10.6	11.6
9	10.3	11.7
10	10.2	11.7
11	10.1	12.0
12	9.5	12.9
13	9.4	13.1
14	9.0	3.3

Table 4.2 June 7, 2002 water quality data for Wilson Lake

Parameter	Result /Unit
Secchi Depth	8 feet
pH	8.4

Dissolved Oxygen and Temperature Profiles

Depth (ft)	Temp (C.)	D.O. (mg/l)
0	21.0	9.6
1	21.0	9.4
2	20.9	9.3
3	20.9	9.6
4	20.8	9.3
5	20.8	9.5
6	20.3	9.7
7	20.0	9.5
8	19.6	9.4
9	18.8	13.6
10	18.0	10.8
11	17.8	9.1
12	17.4	8.1
13	17.2	7.6
14	17.0	6.5

If this is NO_2+NO_3/TP ratio it shouldn't be used in this way

Table 4.3 August 4, 2004 water quality data for Wilson Lake

Parameter	Result /Unit
Secchi Depth	3.3 feet
pH	8.5
Chlorophyll a	14.7 µg/l
Total Phosphorus - Surface	27 µg/l

Dissolved Oxygen and Temperature Profiles

Depth (ft)	Temp (C.)	D.O. (mg/l)
0	23.3	6.98
1	25.3	6.82
2	25.3	6.69
3	25.3	6.59
4	25.3	6.70
5	25.2	6.47
6	25.1	6.47
7	24.9	6.42
8	24.8	5.90
9	24.7	5.94
10	24.5	5.51
11	24.3	1.84
12		
13		
14		

Hygiene for analysis of nitrogen (nitrate and nitrite as nitrogen) total phosphorus and chlorophyll a.

Dissolved oxygen and Secchi depth data suggest a decline in water quality in the past two years. However, a number of normal factors can affect these data. For example, water quality can vary throughout a lake over a single growing season. Secchi depths are generally expected to be greater in the spring and gradually decrease through the summer - as lake water heats up and planktonic algae and suspended particles become more prevalent. Also, the dissolved oxygen concentrations in water are greatly affected by the temperature of the water (Figures 2 and 3). As a rule, colder water can hold more oxygen than warmer water. In the spring, oxygen levels would be expected to be higher than levels found in late summer. Although these trends are often seen, it should be noted that these data might also suggest a general trend of decreasing water quality in Wilson Lake. Total phosphorus, chlorophyll a and Secchi depth are often used as trophic state indicators for lakes. Values measured for these parameters can be used to calculate Trophic State Index (TSI) values (Figure 4). Lakes can be categorized into three trophic levels: oligotrophic (low productivity, high water quality), mesotrophic (medium productivity and water quality), and eutrophic (high productivity, low water quality). Although lakes can naturally evolve from oligotrophic conditions to eutrophic, this process is often highly influenced by human activity. Generally, the higher the TSI calculated for a lake, the more eutrophic it is. Water quality measurements taken in August 2004 (Table 5) place Wilson Lake at the lower boundaries of classic eutrophy. Wilson Lake has many other characteristics of a eutrophic lake: shallowness, dense aquatic plant growth and heavy accumulation of organic sediments.

% saturation graph works good to show this

should expand this if you present it. Explain.

Conclusions and Recommendations

Since 1999, the primary management concern for residents of Wilson Lake has been the control of Eurasian watermilfoil. It had quickly reached nuisance levels in the lake – spreading from a single location near the south boat landing to nearly lake-wide distribution in two year's time. Aesthetic values, recreational uses, and ecological health had become significantly reduced by the predominance of milfoil. Following a number of herbicide treatments, milfoil levels have been drastically reduced to sub-nuisance levels. In fact, the 2004 plant survey found no Eurasian watermilfoil in Wilson Lake. *May be, but it's still there.*

Prior to treatment for Eurasian watermilfoil, Wilson Lake experienced heavy planktonic algae blooms. This has previously been indirectly attributed to high concentrations of milfoil continuously cycling large amounts of nutrient from the bottom sediments. However, now that Eurasian watermilfoil and subsequently curly leaf pondweed have been all but eliminated from Wilson Lake, this possible decrease in water quality would require further investigation. *I think there's too little data and way too premature to make this claim. What other causes. It would be interesting to see monitoring spatially.*

The Army Corps of Engineers recommends monitoring regrowth in lakes treated for curly leaf pondweed for two to three years. It is unlikely that Wilson Lake will need to be retreated in the near future. However, everyone involved should be prepared in the event new plants or turions are found in the lake. If this is the case, and significant regrowth from turions is found, a large-scale treatment would again be warranted. It is

Not sure you want to say this. turions are viable 2-3 years, I'd be careful.

Figure 2. Wilson Lake Dissolved Oxygen Profiles, 2002, 2004

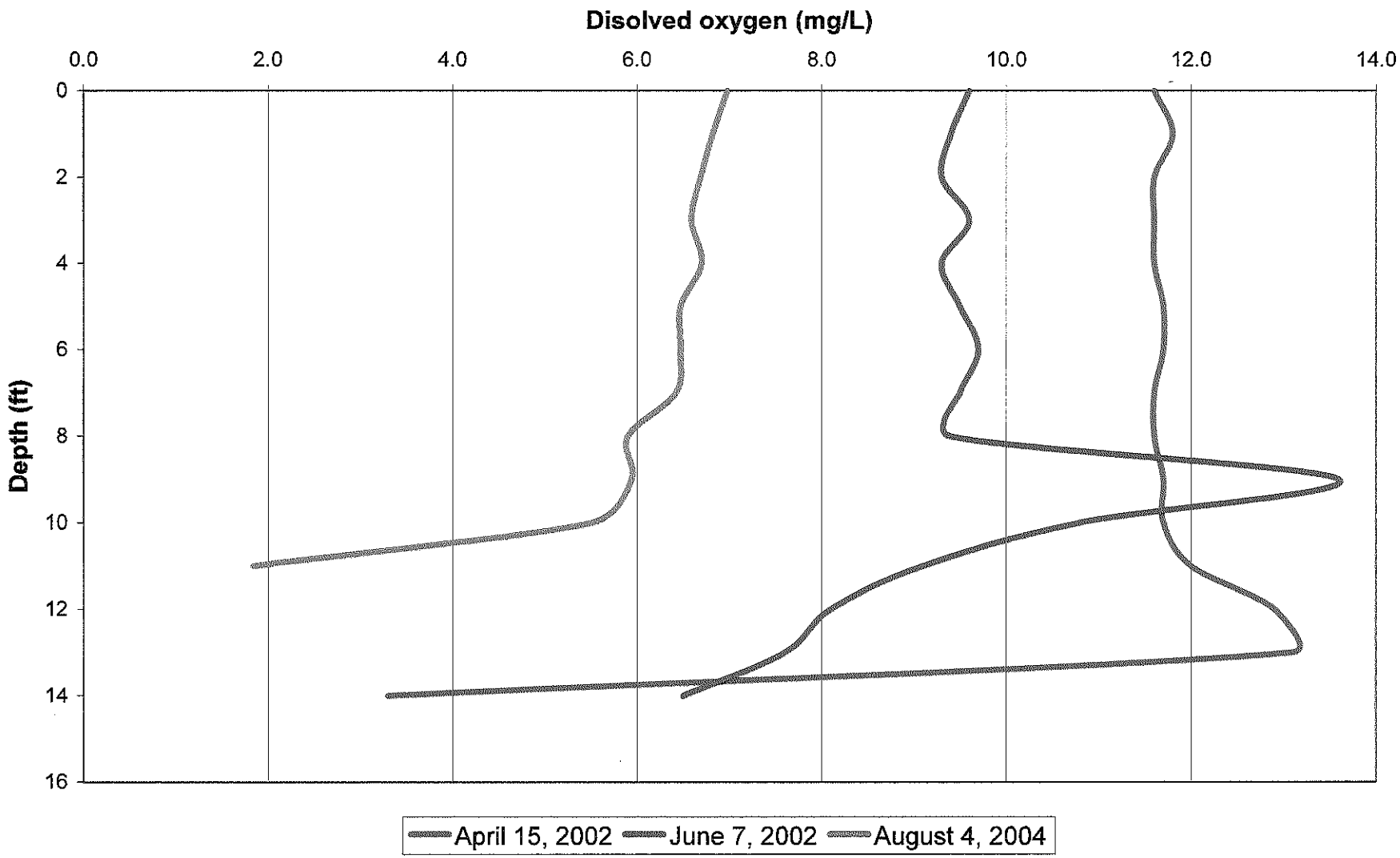
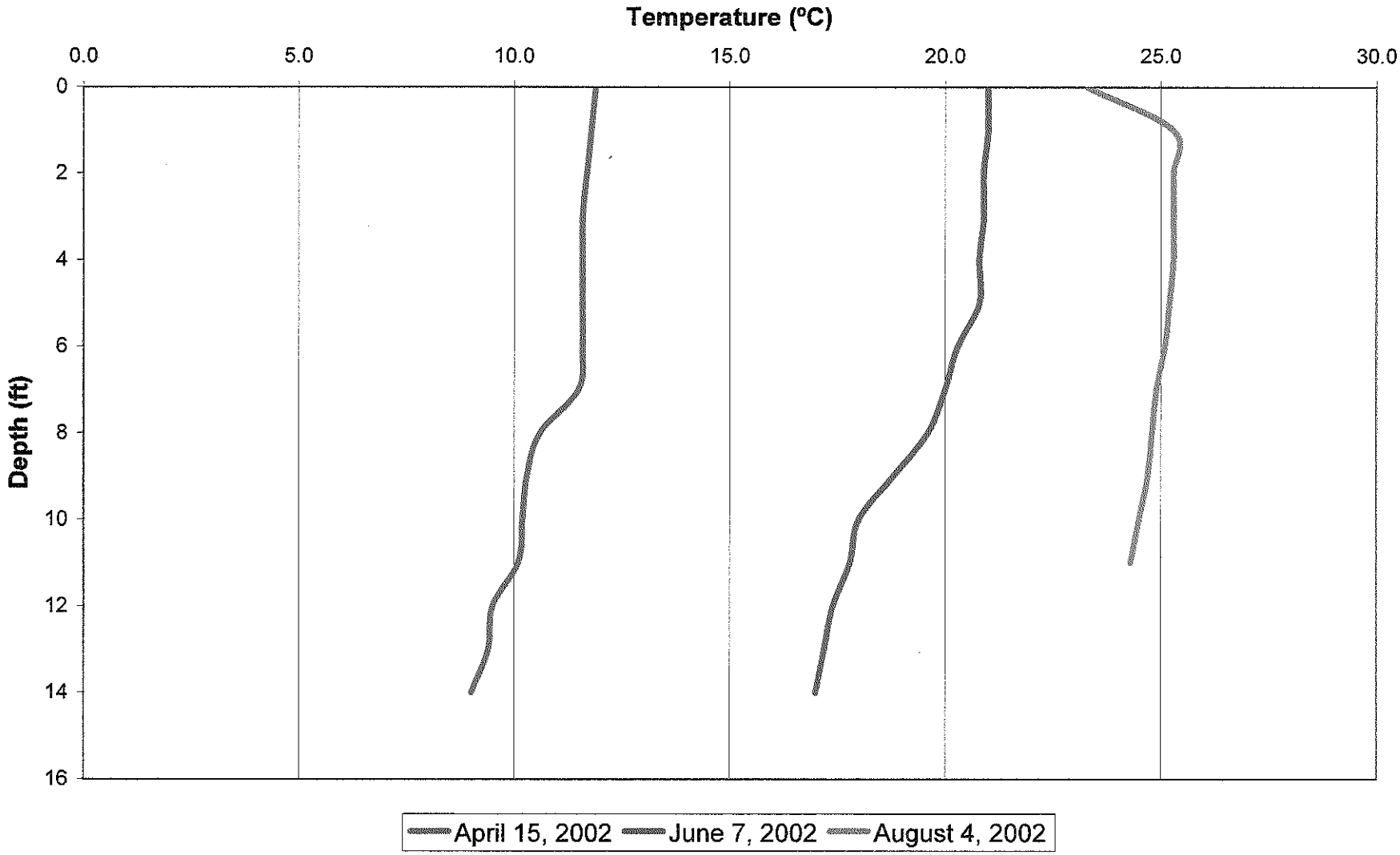


Figure 3. Wilson Lake Temperature Profiles, 2002, 2004



likely only a small numbers of plants would be found and spot treatment would be needed. Continued monitoring of exotic plant species is highly recommended for any lake susceptible to infestation. To this end, lake property owners and in particular district board members should be well informed on the threat posed by these nuisance plants and how to readily identify them.

In regards to the purple loosestrife found along the north shore, there are number of options for control. Since the number of plants is low, cutting, hand pulling or spot treating with a broad leaf herbicide are option the lake district could handle themselves. Also, two species of leaf-eating beetles (*Galerucella calmariensis* and *G. pusilla*) are being raised and released in the state. Initial attempts in Wisconsin have been quite successful, showing good control in only 2-3 years on smaller sites. These beetles are available by the Wisconsin DNR. However, only a small number are sent assuming they will be propagated by someone (in this case, a property owner) and allowed to reproduce and multiply before being released on site. Contact Brock Woods (608-221-6349) at the DNR for further details. If the lake district prefers, Aquatic Biologists inc. staff will raise and release these beetles at a nominal cost.

Future management of Wilson Lake should focus primarily on continued water quality monitoring and watershed issues. Specific elements for future monitoring should include continued water chemistry sampling in both basins of the lake, sediment mapping (including percent organics), and analysis of groundwater and stream flow rates and associated nutrient inputs. With the approval of the Protection and Rehabilitation District, Aquatic Biologists, Inc. will submit a Lake Management Planning Grant application which would include these elements. The hope of this study is to better understand the possible causes and sources of impairment to the water quality in Wilson Lake.

In addition to focusing on water quality in the near future, it is also recommended that Aquatic Plant Management Plan for Wilson Lake be updated in 2006.

Figure 4. Comparison of Trophic State Index values and water quality parameters

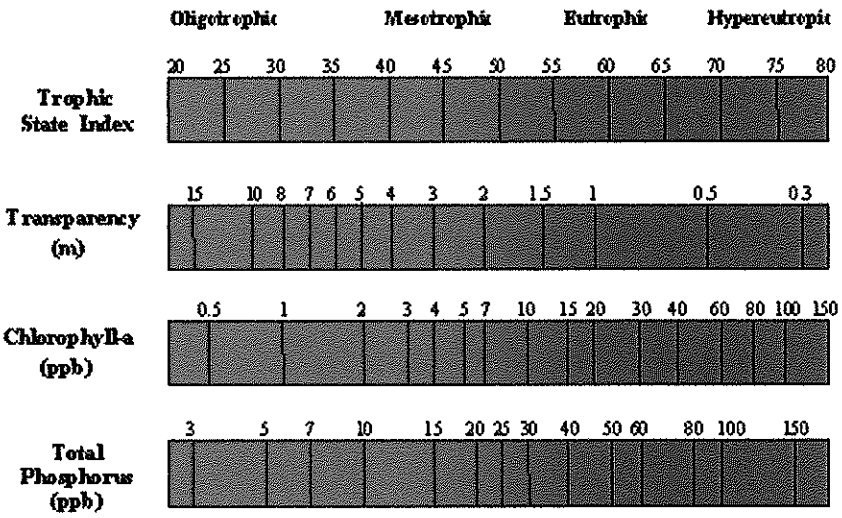


Table 5. Trophic State Index values for Wilson Lake 2002 and 2004

	Parameter						
Location	Phosphorus (mg/l)	*Phosphorus TSI*	Chlorophyll (µg/l)	*Chlorophyll TSI*	Secchi (m)	*Secchi TSI*	Nitrogen (mg/l)
April 15, 2002	0.01	*37.35*	*<1*	*<30.60*	4.3	*39.09*	11.70
June 7, 2002	--	--	--	--	2.4	*47.16*	2.30
August 4, 2004	0.027	*51.68*	14.7	*56.97*	1.0	*59.92*	1.42

Appendix A

Aquatic plant survey data collected at Wilson Lake, August 4, 2004

Waterbody:	Wilson Lake	**Collectors:**	A. Chikowski
County:	Waushara		B. Roost
Date:	8/4/2004		

TRANSECT:	A1	A2	A3	A4	Total
Depth feet	2.5	9	14	13	
Substrate	sand/muck	muck	muck	muck	
GPS Coordinates	N44° 10.395'	N44° 10.406'	N44° 10.421'	N44° 10.434'	
	W89° 10.407'	W89° 10.450'	W89° 10.502'	W89° 10.531'	
Species / Occurrence					
Elodea	3	4		1	8
Musk Grass (Chara)	4	3	1	1	9
No Plants Found			3	2	5
				Total	22

TRANSECT:	B1	B2	B3	B4	Total
Depth feet	2.5	10	10	12	
Substrate	sand/muck	muck	muck	muck	
GPS Coordinates	N44° 10.345'	N44° 10.372'	N44° 10.407'	N44° 10.433'	
	W89° 10.565'	W89° 10.564'	W89° 10.553'	W89° 10.542'	
Species / Occurrence					
Elodea	1	3	1	2	7
Musk Grass (Chara)	4	4	4	2	14
				Total	21

TRANSECT:	C1	C2	C3	C4	Total
Depth feet	2	5.5	8	11	
Substrate	sand/muck	muck	muck	muck	
GPS Coordinates	N44° 10.414'	N44° 10.416'	N44° 10.416'	N44° 10.431'	
	W89° 10.669'	W89° 10.629'	W89° 10.596'	W89° 10.555'	
Species / Occurrence					
Curly Leaf Pondweed				1	1
Elodea	2	2	3	2	9
Musk Grass (Chara)	4	4	3	1	12
Water Celery	2				2
White Water Lily	3				3
No Plants Found				2	2
				Total	29

TRANSECT:	D1	D2	D3	D4	Total
Depth feet	3	11	13	12	
Substrate	muck	muck	muck	muck	
GPS Coordinates	N44° 10.499'	N44° 10.477'	N44° 10.461'	N44° 10.439'	
	W89° 10.747'	W89° 10.667'	W89° 10.614'	W89° 10.545'	
Species / Occurrence					
Bladderwort	4				4
Elodea	4	1	1		6
Musk Grass (Chara)	4		1		5
Watershield	4				4
White Water Lily	4				4
No Plants Found		3	3	4	10
				Total	33

Waterbody:	Wilson Lake	**Collectors:**	A. Chikowski
County:	Waushara		B. Roost
Date:	8/4/2004		

TRANSECT:	E1	E2	E3	E4	Total
Depth feet	2.5	11	14	12	
Substrate	sand	muck	muck	muck	
GPS Coordinates	N44° 10.521' W89° 10.504'	N44° 10.479' W89° 10.514'	N44° 10.452' W89° 10.526'	N44° 10.445' W89° 10.533'	
Species / Occurrence					
Musk Grass (Chara)	4			2	6
No Plants Found		4	4	2	10
				Total	16

TRANSECT:	F1	F2	F3	F4	Total
Depth feet	3	4	12	13	
Substrate	sand	muck	muck	muck	
GPS Coordinates	N44° 10.486' W89° 10.407'	N44° 10.469' W89° 10.446'	N44° 10.450' W89° 10.482'	N44° 10.446' W89° 10.522'	
Species / Occurrence					
Elodea	3	3	3	2	11
Musk Grass (Chara)	3	4	3	1	11
No Plants Found	1		1	2	4
				Total	26

TRANSECT:	G1	G2	G3	G4	Total
Depth feet	4	6	4	5	
Substrate	muck	muck	muck	muck	
GPS Coordinates	N44° 10.497' W89° 10.405'	N44° 10.517' W89° 10.371'	N44° 10.532' W89° 10.352'	N44° 10.550' W89° 10.334'	
Species / Occurrence					
Elodea	2	3		1	6
Musk Grass (Chara)	4	3	4	4	15
Variable Pondweed			1	1	2
No Plants Found		1			1
				Total	24

TRANSECT:	H1	H2	H3	H4	Total
Depth feet	2	4	4	4	
Substrate	muck	muck	muck	muck	
GPS Coordinates	N44° 10.610' W89° 10.444'	N44° 10.591' W89° 10.393'	N44° 10.569' W89° 10.345'	N44° 10.558' W89° 10.329'	
Species / Occurrence					
Elodea	3	2		1	6
Filamentous Green Algae	1				1
Musk Grass (Chara)		3	3	4	10
No Plants Found		1	1		2
				Total	19

Waterbody:	Wilson Lake		**Collectors:**	A. Chikowski	
County:	Waushara			B. Roost	
Date:	8/4/2004				
TRANSECT:	I1	I2	I3	I4	Total
Depth feet	2	5	4	5	
Substrate	muck	muck	muck	muck	
GPS Coordinates	N44° 10.697'	N44° 10.653'	N44° 10.592'	N44° 10.564'	
	W89° 10.297'	W89° 10.297'	W89° 10.297'	W89° 10.317'	
Species / Occurrence					
Elodea	2		1	1	4
Musk Grass (Chara)			4	4	8
Spatterdock	4				4
Variable Pondweed			1	1	2
Watershield	2				2
White Water Lily	4				4
No Plants Found		4			4
				Total	28

TRANSECT:	J1	J2	J3	J4	Total
Depth feet	3.5	5	4.5		
Substrate	muck	muck	muck	muck	
GPS Coordinates	N44° 10.637'	N44° 10.611'	N44° 10.581'	N44° 10.558'	
	W89° 10.216'	W89° 10.242'	W89° 10.283'	W89° 10.316'	
Species / Occurrence					
Elodea	4	1			5
Musk Grass (Chara)	3		4	4	11
No Plants Found		3			3
				Total	19

TRANSECT:	K1	K2	K3	K4	Total
Depth feet	3.5	6	5	4	
Substrate	muck	muck	muck	muck	
GPS Coordinates	N44° 10.493'	N44° 10.521'	N44° 10.546'	N44° 10.552'	
	W89° 10.214'	W89° 10.268'	W89° 10.306'	W89° 10.322'	
Species / Occurrence					
Elodea	1				1
Musk Grass (Chara)	4		4	4	12
No Plants Found		4			4
				Total	17

TRANSECT:	L1	L2	L3	L4	Total
Depth feet	4	5	4		
Substrate	muck	muck	muck	muck	
GPS Coordinates	N44° 10.376'	N44° 10.438'	N44° 10.499'	N44° 10.543'	
	W89° 10.311'	W89° 10.310'	W89° 10.324'	W89° 10.329'	
Species / Occurrence					
Bushy Pondweed	2				2
Elodea	2	3	4		9
Musk Grass (Chara)	3	1	4	4	12
Variable Pondweed				1	1
White Water Lily	3				3
No Plants Found		1			1
				Total	28