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LAKE MANAGEMENT PLAN

FOR

WHITE LAKE, MARQUETTE COUNTY, WISCONSIN

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March, 1999

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SUMMARY

White Lake, Marquette County, Wisconsin is a 92 acre seepage lake which is deep, clear, and with relatively low nutrients. Excellent overall water quality is attributable to a very small watershed with sandy soils and low overland runoff to the lake. Wide fluctuations in lake level and recent Eurasian Water Milfoil infestation detract from the excellent overall condition of the lake. The White Lake District has undertaken many resource enhancement projects in the past and serves as the main steward of the lake.

Water quality monitoring indicated phosphorus and nitrogen well below expected levels. Historic water clarity readings were also excellent. Lake level measurements over the last fourteen years indicated wide fluctuations.

Aquatic plant surveys indicated many beneficial species, but at limited numbers because of Eurasian Water Milfoil (EWM) overabundance. Growth of EWM was largely contained in 4 to 12 feet in lake depth.

Public access for White Lake is below recommended levels as outlined by the WDNR. Adequate access is necessary to receive WDNR financial assistance for resource enhancement activities.

Future management of White Lake should include: continued monitoring of the resource, selective treatment of EWM populations, establishment of a water level control device, determination of public access policy, and riparian landowner management.

1. Water quality monitoring should be continued. Spring and fall surface water quality analyses should be continued as in the past. Self-Help water clarity readings should also be continued. Lake level readings should also continue even after installation of a water level control device.

2. Selective management of EWM populations should be initiated. Current harvest activities are spreading EWM throughout the lake; species selective herbicide treatments will reduce EWM populations while allowing native plants to become reestablished. Subsequent to selective treatment, follow-up surveys should be completed to assess effectiveness

3. Historic and present wide fluctuations in water level on White Lake indicate the need for a water level control device. An outlot currently owned by the District would serve as a good point to place a culvert to minimize high water levels. A pumping restriction should be established to further minimize resource impacts during low water levels.

4. If future WDNR funding is desired, public access must be provided. The most cost-effective means of providing minimum access to White Lake is to enter into a Private Provider Agreement between the WDNR and either of the owners of White Lake Estates or Scharenberg's Resort.

5. Because the watershed is intensely developed, landowner impacts can have a significant impact on White Lake water quality. Landowners should limit impermeable surfaces (paving, roofs, decks, etc.) on their property. Channelized flow should be slowed, redirected and/or detained. Dry wells should be constructed in areas of channelized flow. Septic systems should be properly maintained. Where possible and practical, holding tanks should be installed.

INTRODUCTION

White Lake is a 92 acre, natural seepage lake located in Marquette County, Wisconsin northeast of the city of Montello (Figure 1). The lake is characterized by a small, highly developed watershed, excellent water clarity, and wide fluctuations in water level. Recently, concern has been expressed about increased nuisance aquatic plant growth and declines in general water quality.

The White Lake District (WLD) was formed in 1997, and was formerly known as the White Lake Sanitation District. The WLD has about 90 members, and serves as the main steward for the resource. It was under their direction that this Phase I Lake Management Plan was developed and undertaken. The WLD contracted with Aquatic Biologists, Incorporated (ABI) of Fond du Lac, Wisconsin to carry out management planning efforts. Additional funding was provided by the Wisconsin Department of Natural Resources (WDNR) Lake Management Planning Grant Program.

Activities undertaken under this program included historic data review, water quality monitoring (summer, fall, and winter), an aquatic plant survey, public involvement activities, public access review, and a final report.

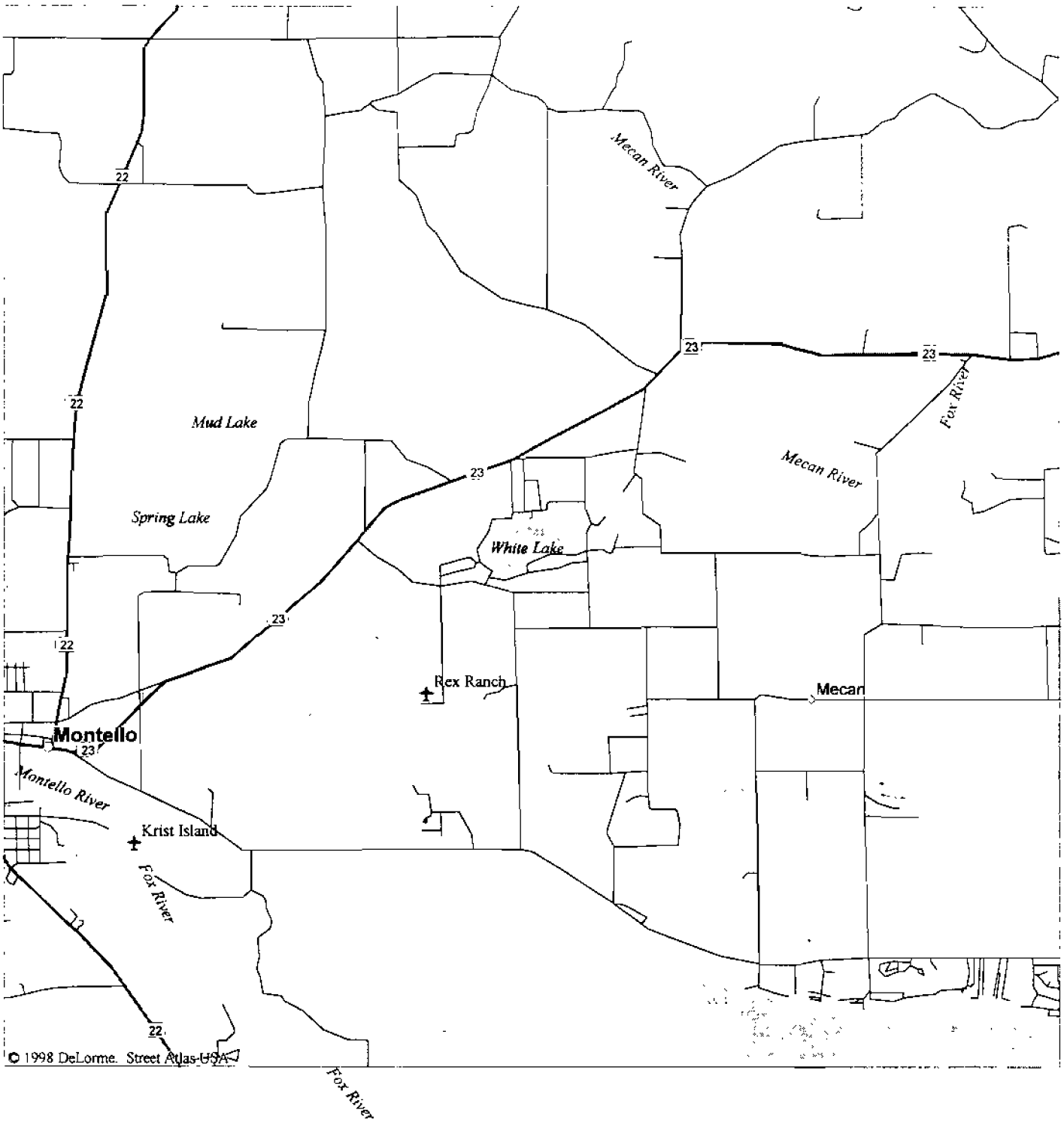

Figure 1. Project Location, White Lake, Marquette County, Wisconsin.

DESCRIPTION OF AREA

Physical Properties of the Resource

White Lake has a maximum depth of 42 feet and is classified as a seepage lake. A seepage lake classification indicates that there are no major inlets or outlets and the major water source for the lake is groundwater inflow (1). White Lake is approximately 3,500 feet long by 1,400 feet wide and its length is oriented in a northeast/southwest direction. The lake has 1.95 miles of shoreline of which nearly all is steeply sloped. About 5.4 percent of the surface area is less than 3 feet deep and 44.5 percent is greater than 20 feet deep. There currently are 93 homes around the lake, of which about 20 are permanent residents (2). There are very few undeveloped lots around the perimeter of White Lake.

Public access to White Lake is available only at a boat ramp located at Scharenberg's Resort (on the east shore). The resort historically has allowed public access at minimal or no cost and there is a large parking area near the boat ramp. A private boat ramp exists on the west shore and is jointly owned by property owners in White Lake Estates, a subdivision off the lake. Two other off-lake subdivisions own walk-in access lots to the lake.

Watershed Characteristics

The White Lake watershed is very small, highly developed and includes only about 160 acres (including the lake). The watershed to lake ratio (the ratio of land drained to lake size) for White Lake is 1.7 to 1. Nearly all the watershed is forested with small areas of lawn and roads. Soil types in the watershed include Plainfield sand (45% of the watershed), Gotham loamy fine sand (40%), and Boyer loamy fine sand (5%). Plainfield soils occurs on the north and east of the lake and have a 12 - 20 percent slope. Gotham soils occur on the south and west of the lake and have a slope of 2 - 6 percent. Boyer soils occur in a small area on the west end of the lake and have a 12 - 30 percent slope. All soils are droughty and susceptible to soil blowing and water erosion (4).

Historic Management

The White Lake fishery was sampled (using an electroshocker) on October 19, 1994. Shocking time was five hours and nineteen minutes and yielded the following species (in order of abundance): Yellow Perch (*Perca flavescens*), Largemouth Bass (*Micropterus salmoides*), Bluegill (*Lepomis macrochirus*), Bluntnose Minnow (*Pimephales notatus*), White Sucker (*Catostomas commersoni*), Green Sunfish (*Lepomis cyanellis*), Yellow Bullhead (*Ameirus natalis*), Johnny Darter (*Etheostoma nigra*), Iowa Darter (*Etheostoma exile*), Pumpkinseed (*Lepomis gibbosus*), and Brown Trout (*Salmo truta*) (2).

In February 1997, 18 fish cribs were built on the ice and subsequently dropped into the lake. The cribs were placed in areas where they would sink into 16 to 18 feet of water. The cribs were constructed out of green oak logs and brush bundles (2). Scuba observations indicated cribs were being used.

The WLD installed and currently maintains about seven dry wells around the perimeter of the lake. The dry wells were placed at key points of overland flow as determined by a stormwater study commissioned by the WLD (4). During periods of overland flow, runoff enters the wells and is filtered into the ground. Dry wells are cleaned annually (2).

The WLD has also contracted for aquatic plant harvest in each year since 1985. In 1997 White Lake was harvested for 30 hours and about 45 tons of plant material was removed. In 1998, the lake was harvested June 29 through July 1 (30 hours) and again later in the summer (45 hours). Over 131 tons of plant material was removed during 1998 and was nearly all Eurasian Water Milfoil (EWM, (5)).

METHODS

Water Quality Monitoring

Lake management planning program (LMPP) water samples were taken on June 30, July 28, August 31, and November 9, 1998 and January 26, 1999. Samples were collected sub-surface (three feet below the water surface) and bottom (three feet above the lake bottom) at the deepest point of the lake (Table 1, Figure 2).

Field measurements included air temperature, water temperature, pH and dissolved oxygen (DO). Water temperature and DO were measured with a YSI Model 59 DO meter which was calibrated for use prior to and subsequent to daily use. A Hach Model FF-1A test kit was used for pH measurements.

Samples for laboratory analyses were collected with a Kemmerer water bottle. Samples were immediately labeled, packaged, iced and preserved as necessary. Laboratory analysis was completed by the Wisconsin State Laboratory of Hygiene (SLOH), per WDNR protocol.

In addition to monitoring under this program, the WLD also conducted monitoring through the WDNR Self-Help Monitoring Program (SHMP). SHMP monitoring included Secchi, lake level and rainfall readings (1986 – 1998). The WLD also collected spring and fall water samples (1985 – 1998). These surface samples were analyzed by the UW-Stevens Point Environmental Task Force lab (ETF).

Aquatic Plant Surveys

Aquatic plant surveys were conducted on July 16, and August 31, 1998 using a method developed by Sorge *et. al.* and modified by the WDNR-Lake Michigan District (WDNR-LMD) for use in the Long Term Trend Lake Monitoring Program (6). Transect (line of collection) endpoints were established around the perimeter of White Lake for use as reference from one sampling period to the next (Table 1). Points were determined from landmarks around the lake perimeter and latitude/longitude was plotted from the USGS 7½ minute quadrangle for the area. Transect bearing was also recorded for future surveys. Eleven

Table 1. Sample Station Descriptions, White Lake, 1998 - 1999.

WATER QUALITY MONITORING

Site	Description	Latitude/Longitude	Depth
WL1	Deepest Point	N43° 48.793'/W89° 14.976'	42.0 feet

AQUATIC PLANT SURVEY TRANSECTS

Transect	Transect Origin (Latitude/Longitude)	Bearing (Degrees)	Depth Range[1]
A	N43° 48.881' W89° 14.885'	169	1/2/3/4
B	N43° 48.860' W89° 15.003'	158	1/2/3/4
C	N43° 48.855' W89° 15.076'	160	1/2/3/4
D	N43° 48.782' W89° 15.188'	186	1/2/3/4
E	N43° 48.807' W89° 15.306'	180	1/2/3/4
F	N43° 48.703' W89° 15.570'	110	1/2/3/4
G	N43° 48.581' W89° 15.562'	88	1/2/3/4
H	N43° 48.542' W89° 15.493'	30	1/2/3/4
I	N43° 48.635' W89° 15.309'	345	1/2/3/4
J	N43° 48.714' W89° 15.039'	30	1/2/3/4
K	N43° 48.808' W89° 14.819'	270	1/2/3/4

[1] 1 = 0.0 - 0.5 m (0.0 - 1.7 feet)
2 = 0.5 - 1.5 m (1.7 - 5.0 feet)
3 = 1.5 - 3.0 m (5.0 - 10.0 feet)
4 = 3.0 m + (over 10 feet)

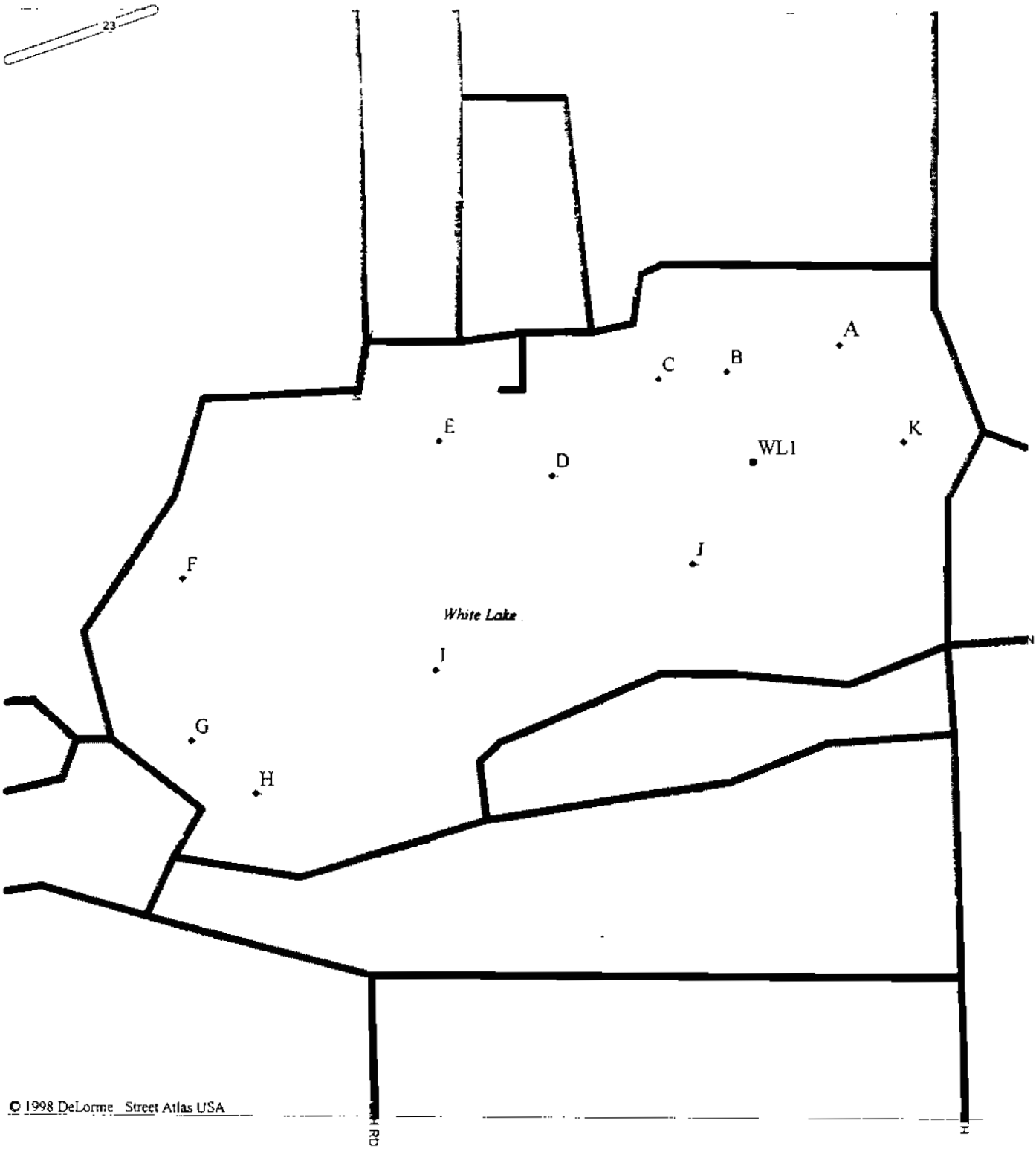

Figure 2. Sample Station Locations, White Lake, 1998 - 1999.

transects were sampled in 1998 to provide information from various habitats and areas of interest.

Data were recorded from four depth ranges: 0 to 0.5 meters (1.7 feet), 0.5 to 1.5 meters (5.0 feet), 1.5 to 3.0 meters (10.0 feet) and 3.0 (10.0 feet) meters and deeper. Plants were identified, density ratings assigned (see below), and substrate type recorded along a six foot wide path on the transect using a aquatic plant rake, snorkel gear or SCUBA as appropriate. Species in each depth range were given a density rating: 1 = Rare, 2 = Occasional, 3 = Common, 4 = Very Common, and 5 = Abundant. These ratings were treated as numeric data points for the purpose of simple descriptive statistics in the Discussion section of this report.

Public Access Review

As a mandatory part of this management planning program, a review of public access availability, current WDNR requirements and future options for increased public access was determined. Information was collected from WLD files, area realtors, WDNR, and an on-site review of the White Lake area.

DISCUSSION

Water Quality Monitoring

Lake Management Planning Program Data

The average phosphorus level for LMPP data was 0.009 mg/l (Table 2). This level is well below observed levels for natural lakes (ave. = 0.025 mg/l), seepage lakes (ave. = 0.021 mg/l), and lakes in the central region of Wisconsin (ave. = 0.020 mg/l; Figure 3) (7).

Average nitrogen level for LMPP data was 0.638 mg/l (Table 2). This level was also below observed levels for natural lakes (ave. = 0.82 mg/l), seepage lakes (ave. = 0.76 mg/l), and lakes in the central region (ave. = 0.72 mg/l) (7).

Environmental Task Force Data

ETF data included 27 sample dates from 1985 to 1998 and is displayed in Appendix I. Average total phosphorus for that period was 0.011 mg/l (Figure 4). Average total nitrogen was 0.537 mg/l. Over that period the average pH was 8.04; turbidity was 4.06; and color was 5.6 (8).

Self-Help Monitoring Data

Secchi disk (water clarity) readings for the SHMP data included 182 measurements from 1986 to 1998 (Figure 5). The average secchi depth was 19.39 feet (range = 7.0 – 34.5 feet; st. dev. = 5.4 feet). White Lake's average secchi transparency was very high compared to other lakes: natural lakes, 7.9 feet; seepage lakes, 8.9 feet; and central region lakes, 7.9 feet (2).

Lake Level Data

Lake level readings were conducted ice-out through ice over 1986 to 1998 and included 665 measurements (Figure 6). The average lake level was 95.10 feet. The data showed a range from the

Table 2. Water Quality Sampling Data, Station WL1 (Deepest Point), White Lake, 1998 – 1999.

PARAMETER	SAMPLE[1]	DATE				
		06/29/98	07/28/98	08/31/98	11/09/98	01/26/99
Air Temperature (degrees Fahrenheit)		80	80	60	36	39
Water Temperature (degrees Fahrenheit)	S	80.06	77.72	76.64	49.82	35.42
	B	54.50	54.32	57.02	49.46	39.56
pH (surface units)	S	8.0	8.0	8.5	7.5	7.75
	B	6.5	7.5	7.75	7.5	7.75
Dissolved Oxygen (mg/l)	S	7.69	8.26	6.75	8.47	11.70
	B	0.07	0.05	0.28	8.00	4.96
Total Kjeld. Nitrogen (mg/l)	S	0.58	0.83	0.63	0.52	0.44
	B	0.54	0.92	0.60	0.58	0.5557
Ammonia Nitrogen (mg/l)	S	0.014	ND	0.013	0.101	0.68
	B	ND[2]	ND	ND	0.100	0.75
NO_2 + NO_3 Nitrogen (mg/l)	S	ND	ND	0.012	0.011	0.066
	B	ND	ND	0.114	0.015	0.082
Total Nitrogen (mg/l)	S	0.58	0.83	0.642	0.631	0.506
	B	0.54	0.92	0.714	0.595	0.6377
Total Phosphorus (mg/l)	S	0.006	0.012	0.013	0.009	0.006
	B	0.011	0.020	0.025	0.008	0.008
Dissolved Phosphorus (mg/l)	S	0.003	ND	0.003	0.002	0.004
	B	0.003	ND	0.002	0.002	0.007
Nit./Phos Ratio (mg/l)	S	96.7	69.2	49.4	70.1	84.3
	B	49.1	46.0	28.6	74.4	79.7
Chlorophyll a (ug/l)	S	NR[3]	NR	2.6	1.79	NR

[1] S = surface, B = bottom; [2] ND = not detectable, result approximately zero; [3] NR = lab error or not collected;

current record low of 92.7 feet (recorded October 19, 1998) to 97.73 feet, recorded on May 12, 1987 and had a standard deviation of 3.82 feet (2).

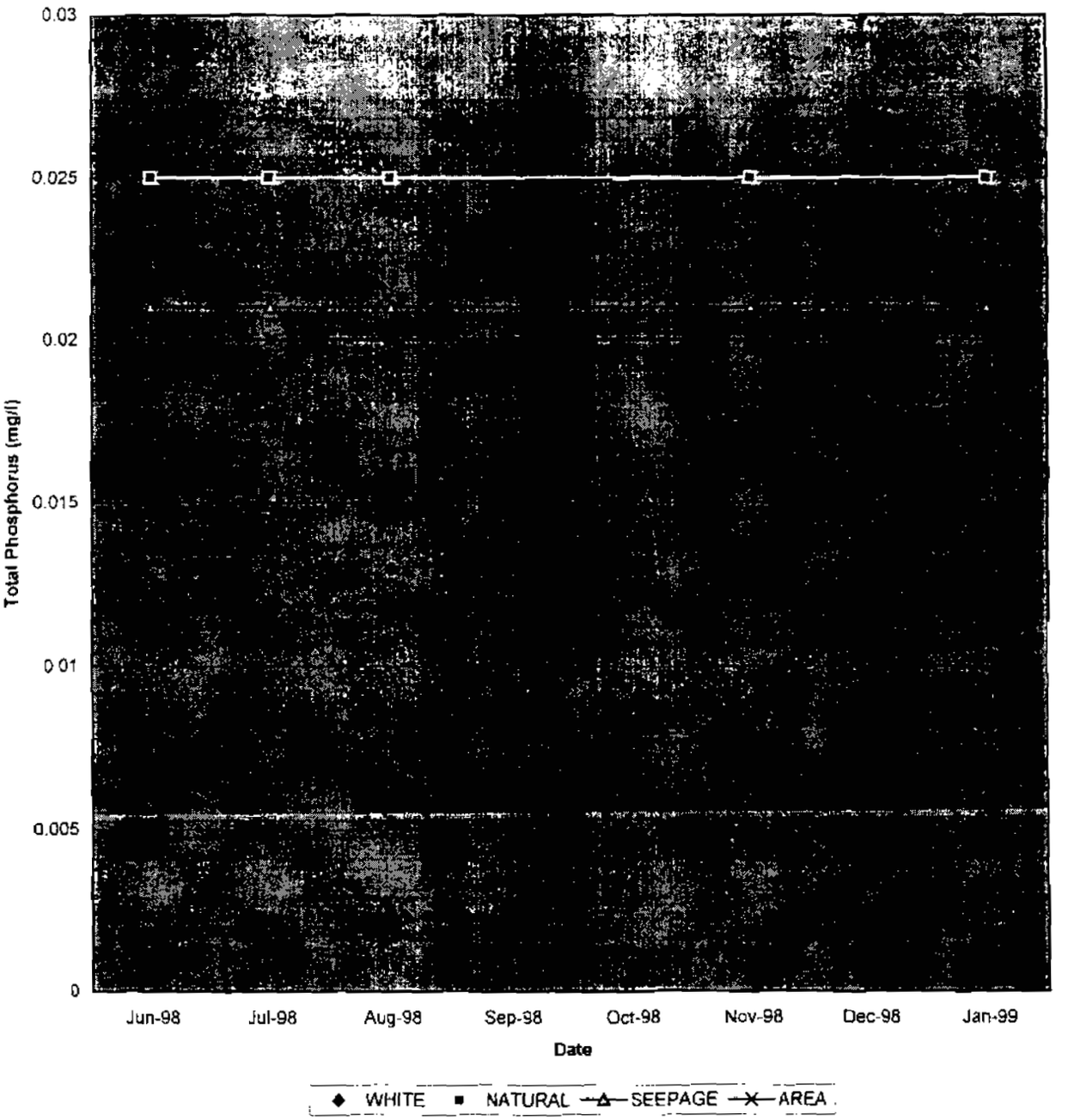

Figure 3. Total Phosphorus Comparison, White Lake, 1998.

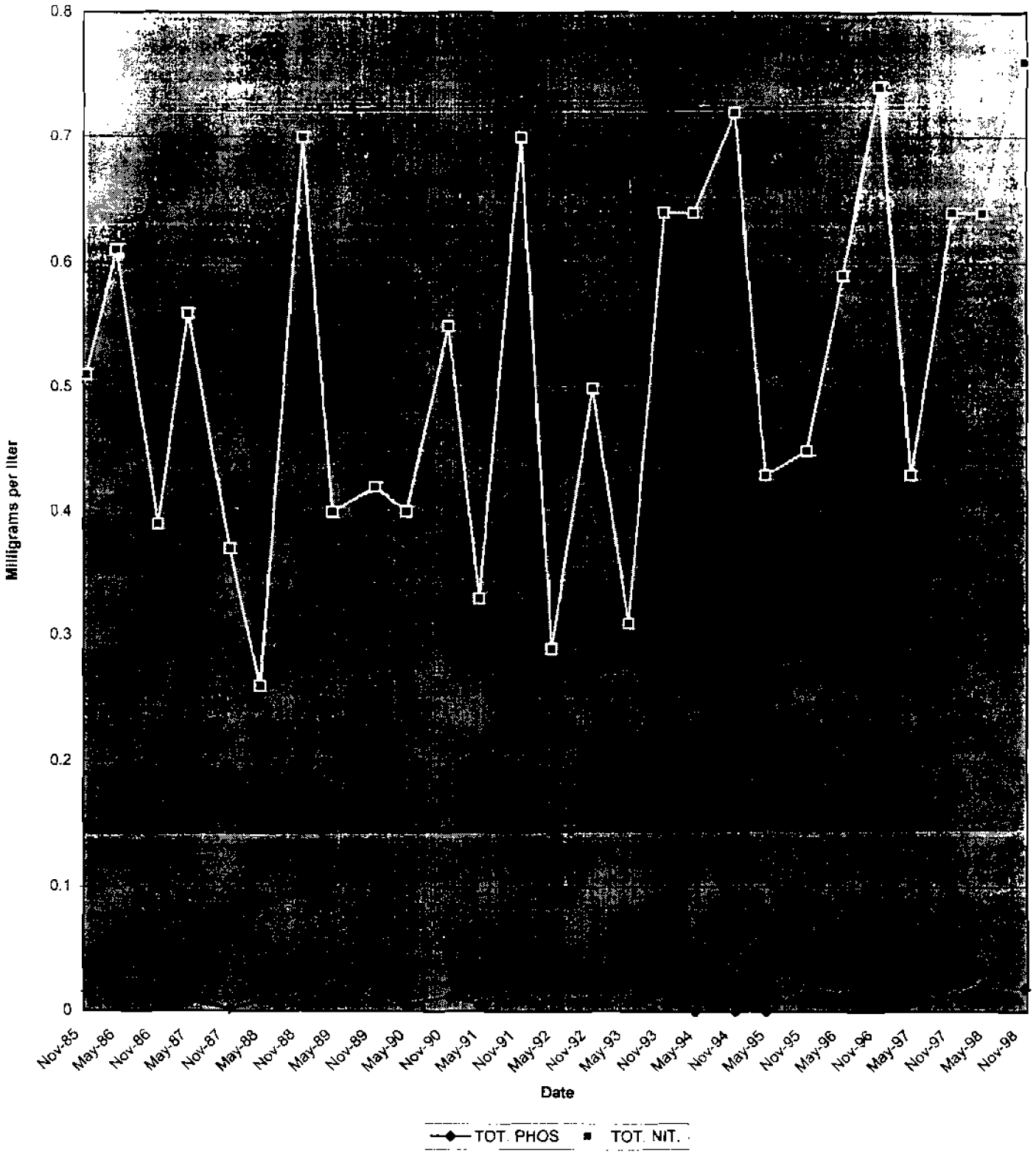

Figure 4. Environmental Task Force Data, White Lake, 1985 – 1998.

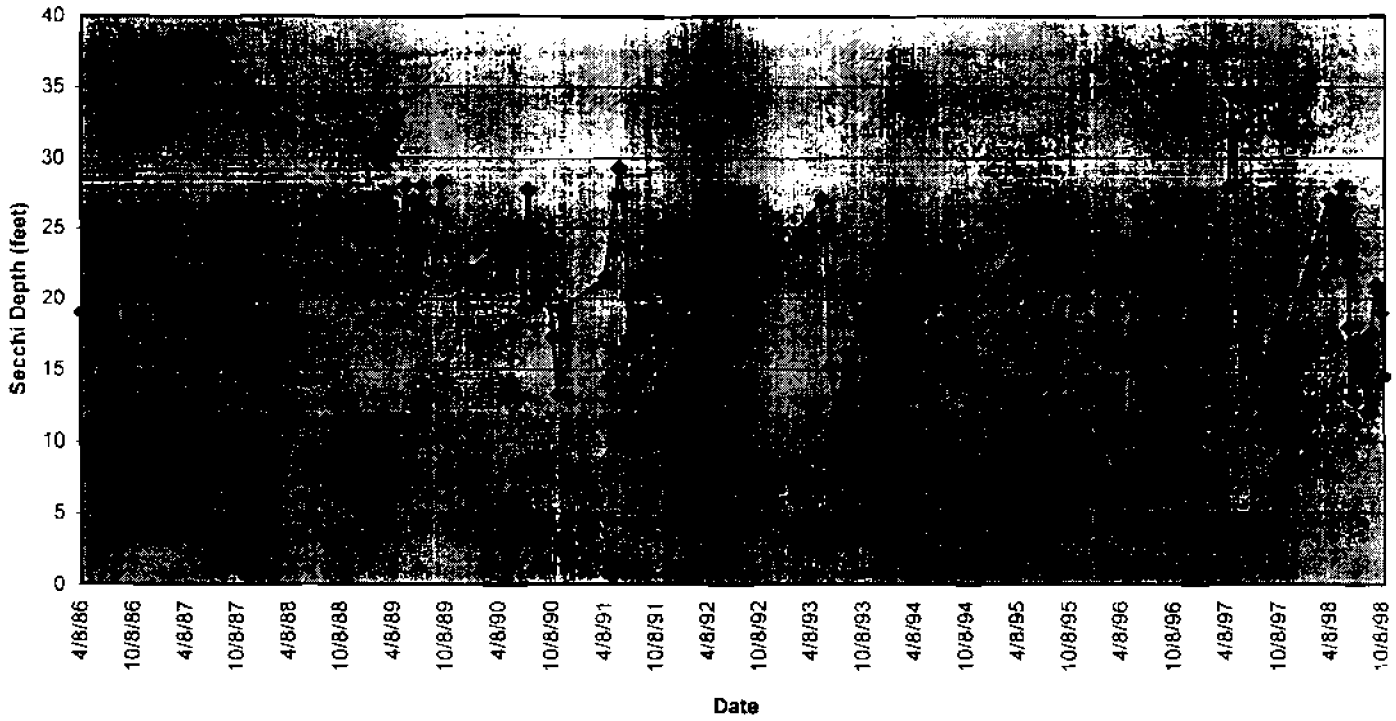

Figure 5. Self-Help Monitoring Data, White Lake, 1986 - 1998.

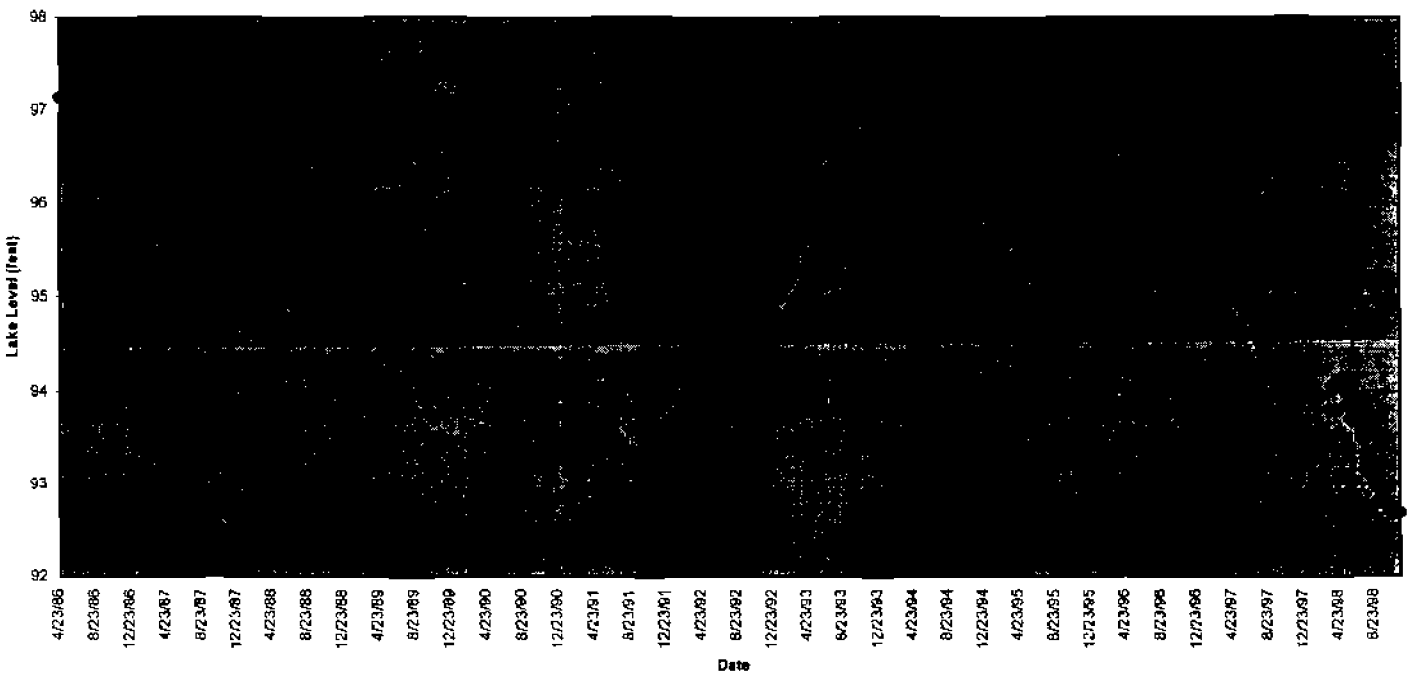

Figure 6. Lake Level Data, White Lake, 1986 – 1998.

Aquatic Plant Surveys

Surveys of aquatic plants in White Lake were performed on July 16 and August 31, 1998. Eleven species were found in eleven transects around the perimeter of the lake (Tables 3 - 7). The most common species observed was Eurasian Water Milfoil (*Myriophyllum spicatum*), found in 78 of 88 sample sites. Eurasian Water Milfoil (EWM) has a long, spaghetti-like stem with leaves arranged in whorls of four or five. It is an exotic species (not native to Wisconsin) and differs from native milfoil in that it quickly grows to nuisance levels and produces a dense canopy at the surface. This dense canopy severely impairs recreational use of the resource and shades out sunlight to more beneficial aquatic plants. EWM usually occurs in water 3 to 12 feet deep and on a variety of sediments (9). White Lake surveys found EWM primarily in the 4 to 12 foot depth range.

The next most common species observed in White Lake was Water Celery (*Vallisneria americana*). It was found in 56 of 88 sample sites and has long (up to 6 feet) ribbon-like leaves that emerge in a cluster near the sediment (Tables 3 - 7). Water Celery grows submerged and is typically found on hard substrates; abundance can increase with turbidity. It is rated as excellent waterfowl food and provides fish with forage, cover and spawning habitat (9). Water celery produces seeds, but spreads mainly from rhizome growth and reproduces mainly by tubers from one year to the next. In White Lake, Water Celery was mainly found in 0 to 10 feet depth range.

Muskgrass (*Chara* sp.), found in 43 of 88 sample sites (Tables 3 - 7). Muskgrass is actually classified as an algae though it form resembles that of a higher plant. It is a low growing plant which is bright green when actively growing and a gray-green later in the growing season when it develops a calcium carbonate crust. Muskgrass is excellent waterfowl food and provides good fish habitat, but most importantly, helps provide good water quality through sediment stabilization (9). Muskgrass was found mainly in the 0 to 5 foot range and on sand to silt substrates. With the exception of EWM, there were many beneficial aquatic plants observed.

Table 3. Aquatic Plant Species Observed, White Lake, 1998.

Species	Code
Coontail (*Ceratophyllum demersum*)	CERDE
Muskgrass (*Chara* sp.)	CHASP
Common waterweed (*Elodea canadensis*)	ELOCA
Filamentous algae	FILAL
Northern water milfoil (*Myriophyllum sibiricum*)	MYRNO
Eurasian water milfoil (*Myriophyllum spicatum*)	MYRSP
Bushy pondweed (*Najas* sp.)	NAJSP
Large-leaf pondweed (*Potamogeton amplifolius*)	POTAM
Leafy pondweed (*Potamogeton foliosus*)	POTFO
Sago pondweed (*Potamogeton pectinatus*)	POTPE
Eel grass (water celery) (*Vallisneria americana*)	VALAM

Table 4. Occurrence and Abundance of Aquatic Plants by Depth, White Lake, July 1998.

CODE	Depth Ranges							
	1 (N=11)		2 (N=11)		3 (N=11)		4 (N=11)	
	% of Sites	Σ Abundance (range)	% of Sites	Σ Abundance (range)	% of Sites	Σ Abundance (range)	% of Sites	Σ Abundance (range)
CERDE	0	0	0	0	9	2(2)	45	5(1)
CHASP	82	27(1-5)	82	30(1-5)	18	3(1-2)	9	1(1)
ELOCA	0	0	9	1(1)	27	4(1-2)	64	8(1-2)
FILAL	9	1(1)	27	3(1)	36	5(1-2)	9	1(1)
MYRNO	9	1(1)	27	3(1)	9	1(1)	0	0
MYRSP	73	15(1-3)	91	32(1-5)	100	55(5)	100	53(4-5)
NAJSP	64	8(1-2)	55	12(1-3)	45	6(1-2)	18	3(1-2)
POTAM	18	3(1-2)	18	2(1)	9	3(3)	0	0
POTFO	55	6(1-2)	36	6(1-2)	18	2(1)	27	4(1-2)
POTPE	36	11(1-5)	27	6(1-3)	0	0	0	0
VALAM	64	16(1-3)	91	29(2-4)	82	17(1-3)	45	8(1-2)

Table 5. Occurrence and Abundance of Aquatic Plants by Depth, White Lake, August 1998.

CODE	Depth Ranges							
	1 (N=11)		2 (N=11)		3 (N=11)		4 (N=11)	
	% of Sites	Σ Abundance (range)	% of Sites	Σ Abundance (range)	% of Sites	Σ Abundance (range)	% of Sites	Σ Abundance (range)
CERDE	0	0	0	0	9	3(3)	36	4(1)
CHASP	91	31(1-5)	82	28(1-5)	27	3(1)	0	0
ELOCA	9	1(1)	9	1(1)	9	1(1)	36	6(1-3)
FILAL	0	0	9	2(2)	9	1(1)	0	0
MYRNO	9	1(1)	18	2(1)	9	1(1)	0	0
MYRSP	45	6(1-2)	100	38(1-5)	100	55(5)	100	55(5)
NAJSP	64	11(1-3)	64	15(1-3)	36	6(1-2)	0	0
POTAM	0	0	27	3(1)	18	3(1-2)	0	0
POTFO	55	8(1-2)	36	6(1-2)	9	1(1)	9	1(1)
POTPE	36	9(2-3)	36	8(2)	0	0	0	0
VALAM	55	15(1-3)	91	26(1-4)	82	13(1-2)	27	3(1)

Table 6. Comparison of Occurrence as Percent of Total Abundance, White Lake, 1998.

Species Code	Depth Range							
	1		2		3		4	
	JUL	AUG	JUL	AUG	JUL	AUG	JUL	AUG
MYRSP	17	7	26	29	56	63	84	80
VALAM	18	18	23	20	17	15	10	4
CHASP	31	37	24	22	3	3	1	0
NAJSP	9	13	10	12	6	7	4	0

Table 7. Abundance, Distribution, and Substrate Relations for Aquatic Plants, White Lake, 1998.

Transect	Substrate	Species Code									
		CERDE		CHASP		ELOCA		FILAL		MYRNO	
		J[1]	A	J	A	J	A	J	A	J	A
A1	SAND	0	0	0	1	0	0	2	0	0	0
A2	SAND	0	0	0	3	3	0	0	0	0	0
A3	SILT	0	0	0	1	0	0	0	0	0	0
A4	SILT	0	0	0	0	0	0	0	0	0	0
B1	SAND	0	0	2	2	0	0	0	0	0	0
B2	SAND	0	0	4	4	0	0	0	2	0	0
B3	SAND	0	0	2	0	0	0	0	1	0	0
B4	SAND/ROCK/LOGS	0	0	0	0	0	0	0	0	0	0
C1	SAND/SILT	0	0	0	3	0	0	0	0	0	1
C2	SILT	0	0	2	3	0	0	0	0	0	1
C3	SAND/ROCK	2	3	2	0	0	0	0	0	0	0
C4	SAND/SILT	0	0	0	0	0	3	0	0	0	0
D1	SAND/GRAVEL	0	0	0	4	0	0	4	0	0	0
D2	SAND/GRAVEL	0	0	3	2	0	0	0	0	0	0
D3	SAND	0	0	2	1	0	0	0	0	0	0
D4	SAND/SILT	0	0	0	0	0	0	0	0	0	0
E1	SILT/SAND	0	0	1	5	0	0	0	0	0	0
E2	SAND	0	0	0	5	0	0	0	0	0	0
E3	SAND/SILT	0	0	0	0	0	0	0	0	0	0
E4	SAND/SILT	1	1	0	0	0	0	0	0	0	0
F1	SAND/ROCK	0	0	0	2	0	1	2	0	0	0
F2	SILT/SAND/ROCK	0	0	1	1	0	1	0	0	1	0
F3	SILT/SAND/ROCK	0	0	0	0	0	0	0	0	0	0
F4	SAND/ROCK	0	0	0	0	0	0	0	0	0	0
G1	SAND/GRAVEL	0	0	0	2	0	0	2	0	0	0
G2	SAND/GRAVEL	0	0	0	0	3	0	0	0	0	0
G3	SAND	0	0	0	0	0	0	0	0	0	0
G4	SAND	1	1	0	0	0	1	0	0	0	0
H1	SAND	0	0	2	4	0	0	0	0	0	0
H2	SAND	0	0	4	2	0	0	0	0	0	1
H3	SAND	0	0	2	0	0	0	0	0	0	0
H4	SILT	1	1	0	0	0	1	0	0	0	0
I1	SAND	0	0	0	2	0	0	0	0	0	0
I2	SAND	0	0	2	2	0	0	0	0	0	0
I3	SAND	0	1	2	1	0	1	0	0	0	1
I4	SAND	0	0	0	0	0	0	0	0	0	0
J1	SAND	0	0	0	5	0	0	4	0	0	0
J2	SAND	0	0	3	5	0	0	0	0	0	0
J3	SAND	0	0	2	0	0	0	0	0	0	0
J4	SAND/SILT	1	1	0	0	0	1	0	0	0	0
K1	SAND/ROCK	0	0	1	0	0	0	0	0	0	0
K2	SAND/ROCK	0	0	0	0	0	0	0	0	0	0
K3	SAND/SILT	0	0	0	0	0	0	0	0	0	0
K4	SAND/SILT	0	0	0	0	0	0	0	0	0	0

[1] J = July survey; A = August survey

Table 7 (cont.) Abundance, Distribution, and Substrate Relations for Aquatic Plants, White Lake, 1998

Transect	Substrate	Species Code											
		MYRSP		NAJSP		POTAM		POTFO		POTPE		VALAM	
		J[1]	A	J	A	J	A	J	A	J	A	J	A
A1	SAND	1	0	1	0	0	0	0	0	0	0	0	0
A2	SAND	4	3	1	1	0	0	0	0	0	2	3	2
A3	SILT	5	5	1	1	0	0	0	0	0	0	2	1
A4	SILT	5	5	0	0	0	0	2	1	0	0	0	0
B1	SAND	1	1	1	1	0	0	1	2	1	2	0	0
B2	SAND	2	3	0	3	0	0	0	0	1	2	2	3
B3	SAND	5	5	1	0	3	2	0	0	0	0	2	2
B4	SAND/ROCK/LOGS	5	5	1	0	0	0	0	0	0	0	0	0
C1	SAND/SILT	2	1	1	3	0	0	1	2	0	0	2	3
C2	SILT	1	1	3	3	0	0	2	2	0	0	3	3
C3	SAND/ROCK	5	5	0	2	0	0	0	0	0	0	2	2
C4	SAND/SILT	5	5	2	0	0	0	0	0	0	0	1	0
D1	SAND/GRAVEL	1	0	0	2	0	0	1	1	5	2	2	0
D2	SAND/GRAVEL	2	3	2	2	0	1	0	1	0	0	2	3
D3	SAND	5	5	0	0	0	0	1	0	0	0	1	1
D4	SAND/SILT	5	5	0	0	0	0	0	0	0	0	0	0
E1	SILT/SAND	0	1	2	2	2	0	2	1	0	0	0	0
E2	SAND	0	1	3	3	1	1	2	2	0	0	0	0
E3	SAND/SILT	5	5	0	0	0	0	0	0	0	0	0	0
E4	SAND/SILT	5	5	0	0	0	0	0	0	0	0	0	0
F1	SAND/ROCK	3	0	1	1	1	0	0	1	0	0	3	3
F2	SILT/SAND/ROCK	4	5	1	2	1	1	1	0	0	0	3	4
F3	SILT/SAND/ROCK	5	5	0	0	0	1	0	0	0	0	1	1
F4	SAND/ROCK	5	5	0	0	0	0	1	0	0	0	0	0
G1	SAND/GRAVEL	3	2	0	0	0	0	0	0	2	2	3	3
G2	SAND/GRAVEL	5	5	0	0	0	0	0	0	0	0	3	2
G3	SAND	5	5	0	0	0	0	0	0	0	0	2	2
G4	SAND	5	5	0	0	0	0	0	0	0	0	0	0
H1	SAND	1	0	0	0	0	0	0	0	3	3	3	3
H2	SAND	3	4	0	0	0	0	0	0	3	2	4	3
H3	SAND	5	5	1	1	0	0	1	1	0	0	2	1
H4	SILT	4	5	0	0	0	0	1	0	0	0	2	1
I1	SAND	0	0	1	1	0	0	0	0	0	0	1	1
I2	SAND	2	3	0	0	0	0	0	0	3	2	4	3
I3	SAND	5	5	0	0	0	0	0	0	0	0	3	2
I4	SAND	5	5	0	0	0	0	0	0	0	0	2	1
J1	SAND	0	0	1	1	0	0	1	1	0	0	0	0
J2	SAND	4	5	2	1	0	0	1	1	0	0	3	2
J3	SAND	5	5	1	0	0	0	0	0	0	0	0	0
J4	SAND/SILT	5	5	0	0	0	0	0	0	0	0	1	0
K1	SAND/ROCK	3	1	0	0	0	0	0	0	0	0	2	2
K2	SAND/ROCK	5	5	0	0	0	0	0	0	0	0	2	1
K3	SAND/SILT	5	5	2	2	0	0	0	0	0	0	2	1
K4	SAND/SILT	5	5	0	0	0	0	0	0	0	0	2	1

[1] J = July survey; A = August survey

Public Access Review

By Wisconsin Administrative Code (NR 1.90) the minimum public access for White Lake is at least one public boat ramp with parking for five car-trailer units. Lakes without this minimum access do not receive priority ranking when applying for WDNR administrated funds. Currently, there are two boat ramps: at the east end (Scharenberg's Resort); and at the west end (White Lake Estates access lot). In order to satisfy NR 1.90, it appears there are three possibilities for providing adequate access to the lake: 1) purchasing a lot and constructing a boat ramp and parking area; 2) obtaining a Private Provider Agreement (PPA) between the owner of Sharenberg's Resort and the WDNR; or 3) obtaining a PPA between the owners White Lake Estates access lot and the WDNR.

Only a few lots around White Lake are capable of being developed into a boat ramp because of steep terrain; currently there are no vacant lots in areas where ramp construction is physically feasible.

CONCLUSIONS AND RECOMMENDATIONS

Water Quality Monitoring

Nutrient levels and overall water quality measurements were excellent for White Lake. Excellent readings are indicative of the small watershed, lack of sustained overland flow to the lake, and predominantly sandy soils. Recent data may indicate a slight decline in water quality, but more data is needed to make that distinction. Water quality monitoring should be continued and include the spring and fall Environmental Task Force collection, rainfall and lake level readings, and Self-Help water clarity measurements.

Lake Level

Lake level for White Lake is highly variable and this variability is detrimental to the White Lake resource. Variable water levels cause increased shoreline erosion, unstable submerged and floating aquatic plant habitat, and a lack of shoreline aquatic plants. The need for the installation of some type of water level control device is apparent. The most likely area for an overflow device is at the southwest corner of the lake at a lot owned by the District. A culvert established at the proper level would eliminate high water. An enforceable standard should also be adopted below which there should be no water drawn from the lake.

Aquatic Plants

There are many beneficial aquatic plants in White Lake but at limited numbers because of the overabundance of Eurasian Water Milfoil (EWM). The main mode of spread of EWM is by fragmentation and current harvesting activity and boat traffic is spreading EWM.

Currently, EWM populations are limited enough that the use of a selective herbicide (2,4-D) can selectively control EWM and allow native species to become more dominant. Recommended aquatic plant control is to use a selective herbicide on as much of the EWM population as possible (and practical)

and limit harvest and boat traffic in areas not treated. An effectiveness survey should be preformed subsequent to treatment to determine impact on target and non-target species.

Riparian landowners should employ raking, cutting (and removal), and/or herbicide use on small, localized areas to make future aquatic plant harvest further cost effective.

Public Access Review

By providing minimum public access to the lake the District can take advantage of WDNR funds under the Lake Management Planning Program, Lake Protection Grant Program, Wisconsin Waterways Commission (weed harvester grants), and other programs.

Signing a Private Provider Agreement appears to be the most feasible and cost-effective means for providing minimum public access to White Lake. Agreements must be signed for a minimum of five years and some work may be needed to get either access up to standards. WDNR funds are also available for updating public access to White Lake.

Other Recommendations

The White Lake watershed is small, but intensively used. The are a number of considerations for riparian landowners to control runoff and nutrient loading to the lake.

Any overland flow to the lake should be eliminated. Where runoff is channelized (from paved areas, downspouts, etc.) dry wells should be constructed to detain or slow this runoff. The soil is sandy and permeable and dry wells are an inexpensive option for runoff control.

In order to limit overland and channelized flow, reduce paved or impermeable areas. Driveways and walks can be constructed of porous gravel and paving bricks to allow water to seep into the soil instead of

running over land. When designing a new building, limit the roof area and direct downspouts away from the lake or to dry wells.

A major source of nutrients to lakes is residential septic systems. All landowners should properly maintain their system. Also, installation of holding tanks will minimize detrimental effects to the lake.

The White Lake District may consider adopting tighter shoreline zoning ordinances to limit impacts of riparian landowners to the lake. Waupaca County has adopted a very "lake and river friendly" code which is being considered by several other counties statewide.

The District should continue to maintain dry wells around White Lake. When need arises, new wells should be constructed and maintained.

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