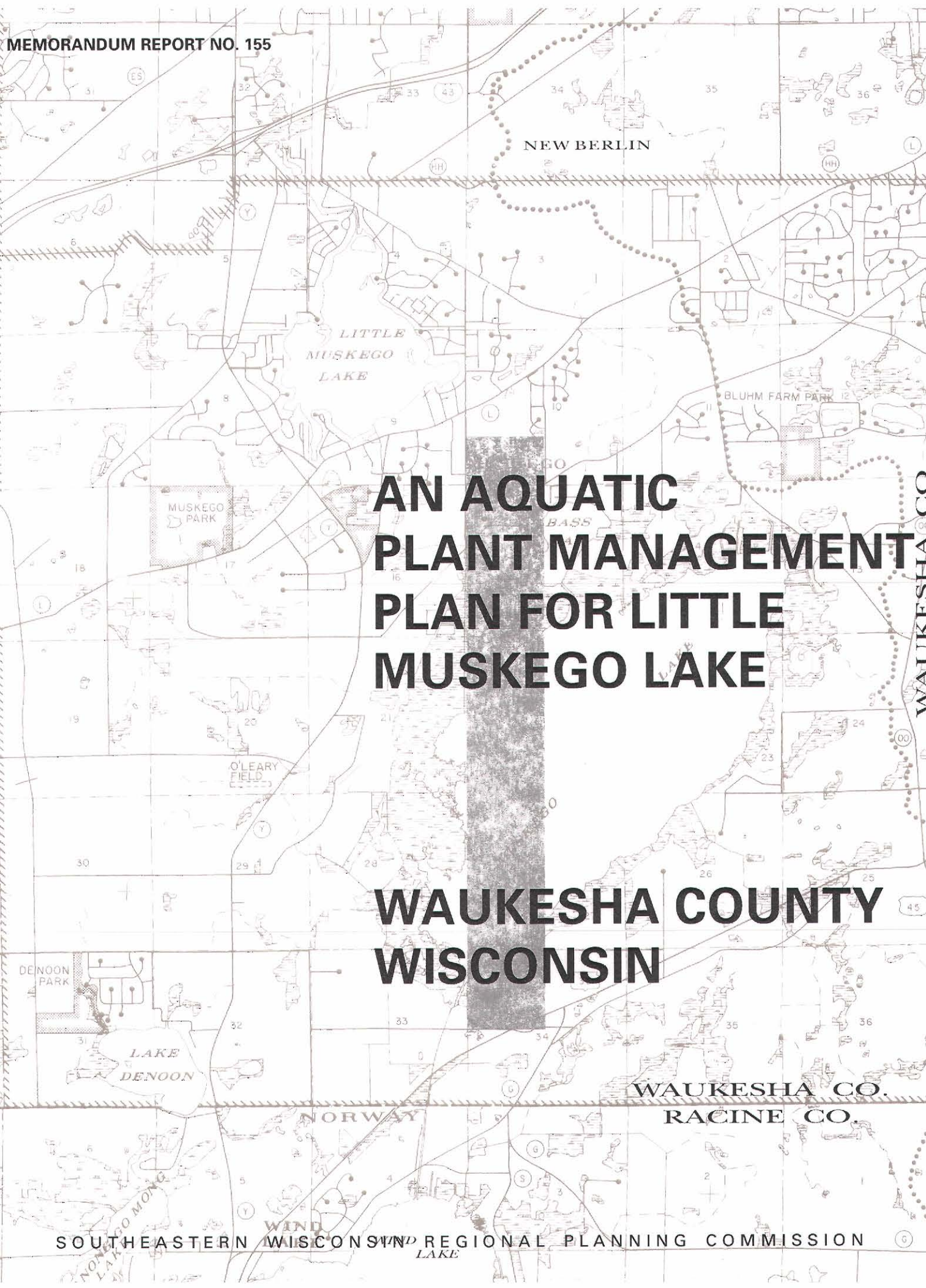
MEMORANDUM REPORT NO. 155



AN AQUATIC PLANT MANAGEMENT PLAN FOR LITTLE MUSKEGO LAKE

WAUKESHA COUNTY WISCONSIN

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MEMORANDUM REPORT
NUMBER 155

AN AQUATIC PLANT MANAGEMENT PLAN FOR LITTLE MUSKEGO LAKE

WAUKESHA COUNTY, WISCONSIN

Prepared by the

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Chapter I

INTRODUCTION

Little Muskego Lake, wholly located within the City of Muskego, Waukesha County, Wisconsin, is a valuable natural resource offering a variety of recreational and related opportunities to the resident community and its visitors. The Lake is an integral part of this lake-oriented community. However, the recreational and visual value of the Lake is perceived to be adversely affected by excessive aquatic plant growth within the Lake. Seeking to improve the usability and to prevent deterioration of the natural assets and recreational potential of Little Muskego Lake, the Little Muskego Lake Protection and Rehabilitation District continues to undertake an annual program of lake and aquatic plant management, in cooperation with the City of Muskego and the Little Muskego Lake Association, Inc.

Little Muskego Lake was included in the Wisconsin Department of Natural Resources (WDNR) Muskego-Wind Lakes Priority Watershed Project Area,[1] and has also been the subject of a comprehensive lake management plan prepared by the Regional Planning Commission.[2] This plan included an aquatic plant management plan element that has been adopted and implemented by the Little Muskego Lake Protection and Rehabilitation District.

This report sets forth an inventory of aquatic plant communities present within Little Muskego Lake, and represents part of the ongoing commitment of the Little Muskego Lake Protection and Rehabilitation District to sound planning with respect to the Lake. This inventory was prepared during 2002 by the Southeastern Wisconsin Regional Planning Commission in cooperation with the Little Muskego Lake Protection and Rehabilitation District, and includes the results of field surveys conducted by the Commission in August 2002. The aquatic plant survey was conducted by Commission staff using the modified Jesson and Lound[3] transect method employed by the Wisconsin Department of Natural Resources. The planning program was funded by the Little Muskego Lake Protection and Rehabilitation District.

This inventory is intended to be a refinement of the aquatic plant management plan element of the comprehensive lake management plan for Little Muskego Lake, and has been prepared pursuant to recommendations made in the aforereferenced comprehensive plan. The scope of this report is limited to a consideration of the aquatic plant

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[1] *Wisconsin Department of Natural Resources Publication No. PUBL-WR-375-94,* A Nonpoint Source Control Plan for the Muskego-Wind Lakes Priority Watershed Project, *October 1993.*

[2] *SEWRPC Community Assistance Planning Report No. 222,* A Management Plan for Little Muskego Lake, Waukesha County, Wisconsin, *June 1996.*

[3] *R. Jesson, and R. Lound, Minnesota Department of Conservation Game Investigational Report No. 6,* An Evaluation of a Survey Technique for Submerged Aquatic Plants, *1962.*

communities present within Little Muskego Lake, the documentation of historic changes in this plant community based upon currently existing data and information, and refinement of those management measures which can be effective in the control of aquatic plant growth. In addition, recommendations are made with respect to the Little Muskego Lake Protection and Rehabilitation District operations relating to aquatic plant and in-lake management activities.

The recreational lake use goals and objectives for Little Muskego Lake were developed in consultation with the Little Muskego Lake Protection and Rehabilitation District. The goals and objectives are to:

1. Protect and maintain public health, and promote public comfort, convenience, necessity and welfare, in concert with the natural resource, through the environmentally sound management of native vegetation, fishes and wildlife populations in and around Little Muskego Lake;

2. Effectively control the quantity and density of aquatic plant growths in portions of Little Muskego Lake basin to better facilitate the conduct of water-related recreation, improve the aesthetic value of the resource to the community, and enhance the resource value of the waterbody;

3. Effectively maintain the water quality of Little Muskego Lake to better facilitate the conduct of water-related recreation, improve the aesthetic value of the resource to the community, and enhance the resource value of the waterbody; and,

4. Promote a quality, water-based experience for residents and visitors to Little Muskego Lake consistent with the policies and objectives of the Wisconsin Department of Natural Resources as set forth in the regional water quality management plan, entitled SEWRPC Planning Report No. 30, *A Regional Water Quality Management Plan for Southeastern Wisconsin—2000*, adopted by the Regional Planning Commission on July 12, 1979, and as refined in the adopted lake management plan for Little Muskego Lake, entitled SEWRPC Community Assistance Planning Report No. 222, *A Management Plan for Little Muskego Lake, Waukesha County, Wisconsin*, June 1996.

This inventory and plan element, which conforms to the requirements and standards set forth in the relevant *Wisconsin Administrative Codes*,[4] should serve as an initial step in achieving these objectives over time.

[4]*This plan has been prepared pursuant to the standards and requirements set forth in the following chapters of the* Wisconsin Administrative Code*: Chapter NR 1, "Public Access Policy for Waterways;" Chapter NR 103, "Water Quality Standards for Wetlands;" Chapter NR 107, "Aquatic Plant Management;" and Chapter NR 109, "Aquatic Plants Introduction, Manual removal and Mechanical Control Regulations."*

Chapter II

INVENTORY FINDINGS

INTRODUCTION

Little Muskego Lake is located in the northern portion of the City of Muskego, Waukesha County, as shown on Map 1. As set forth in the adopted lake management plan,[1] Little Muskego Lake is the second in a chain of four lakes, comprised of Linnie Lac, Little Muskego Lake, Big Muskego Lake and Wind Lake, within the Southeastern Wisconsin Region. These lakes are situated along a tributary stream to the mainstem of the Fox River, and drain to the Fox River downstream of the Waterford Impoundment in Racine County. Little Muskego Lake is a throughflow lake situated upstream of Big Muskego Lake and downstream of Linnie Lac. Jewel Creek is the primary inflow entering the Lake from the north. The Lake outflow is controlled by a dam and a fixed-height overflow structure, both located on the southern side of Little Muskego Lake just upstream of CTH L. The dam discharges in a southerly direction through a concrete culvert into Muskego Creek and thence into Big Muskego Lake to the south and east of CTH L. Big Muskego Lake, in turn, discharges via the Muskego Canal to Wind Lake, and, ultimately, via the Wind Lake Drainage Canal to the Fox River at the Village of Rochester in Racine County, about 10.4 miles downstream of the Little Muskego Lake outlet.

WATERBODY CHARACTERISTICS

Little Muskego Lake is a 506-acre waterbody, the hydrographical characteristics of which are set forth in Table 1. The Lake is a throughflow lake with extensive shallow areas, especially in the northern portions of the Lake, and a single deep basin. The waterbody has a maximum depth of approximately 65 feet, a mean depth of 14 feet, and a volume of 7,170 acre-feet. The bathymetry of the Lake is shown on Map 2.

TRIBUTARY DRAINAGE AREA AND LAND USE CHARACTERISTICS

The total drainage area tributary to Little Muskego Lake, shown on Map 1, is approximately 12 square miles in areal extent. Portions of the total tributary drainage area extend into the City of New Berlin and the City of Muskego, both in Waukesha County.

The surrounding land uses within that portion of the drainage basin directly tributary to Little Muskego Lake are primarily urban, with low- to medium-density residential and commercial development being the dominant urban land uses. Existing land uses as of 2000 are shown on Map 3, for the total drainage area tributary to Little

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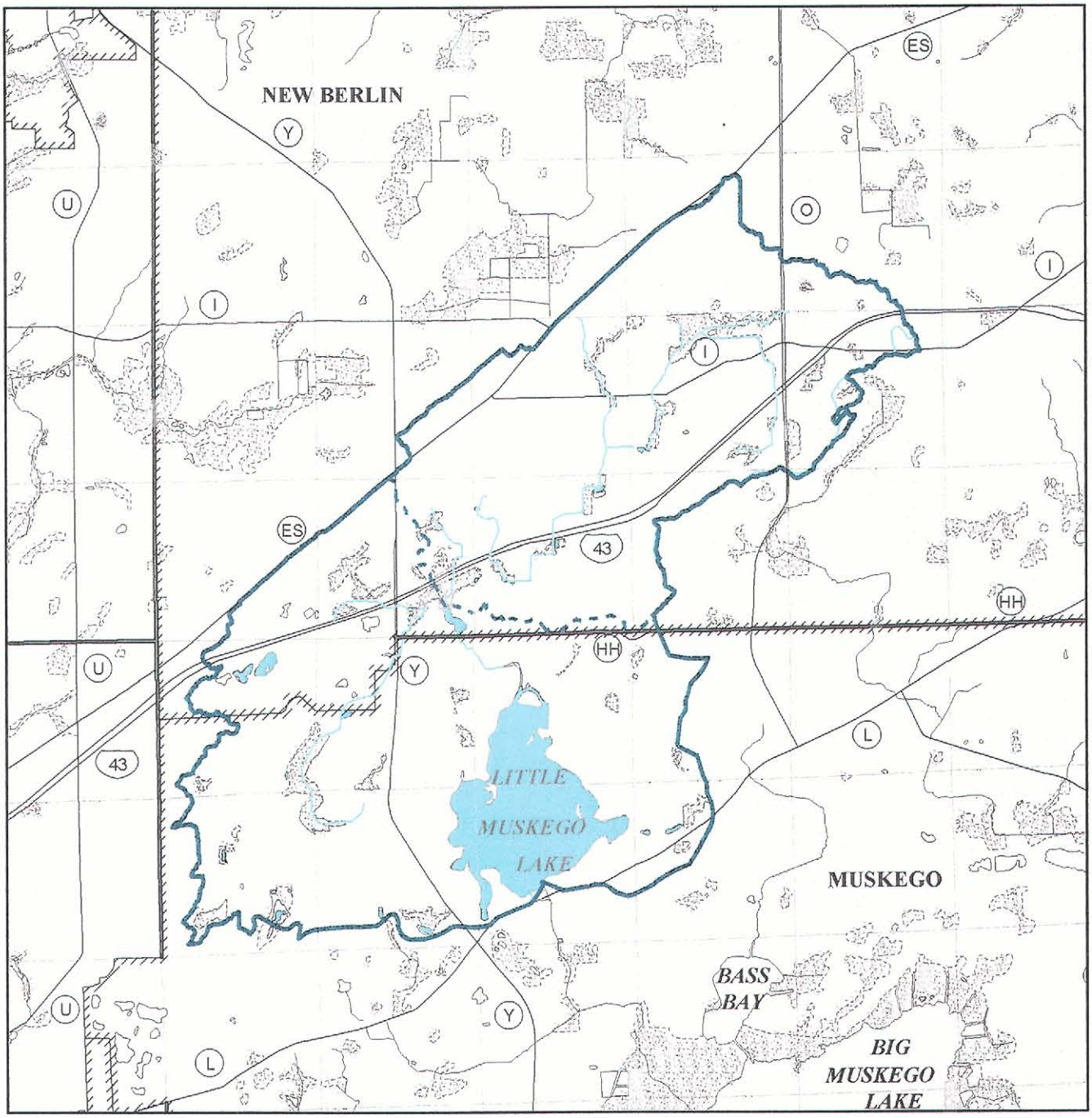
[1] *SEWRPC Community Assistance Planning Report No. 222,* A Management Plan for Little Muskego Lake, Waukesha County, Wisconsin, *June 1996.*

Map 1

TOTAL TRIBUTARY DRAINAGE AREA TO LITTLE MUSKEGO LAKE



Surface Water

Source: SEWRPC.

0 0.5 1 1.5 2 Miles

Table 1

HYDROLOGY AND MORPHOMETRY OF LITTLE MUSKEGO LAKE

Parameter	Measurement
Size (total)	
Total Area	506 acres
Total Drainage Area	7,324 acres
Direct Drainage Area	2,214 acres
Volume (total)	7,170 acre-feet
Residence Time[a] (1984 USGS study period)	0.9 years
Shape	
Maximum Length of Lake	1.3 miles
Length of Shoreline	7.1 miles
Maximum Width of Lake	1.0 mile
Shoreline Development Factor[b]	1.4
Depth	
Percentage of Surface Area of Lake	
Less than Three Feet	27 percent
Three to 20 Feet	47 percent
Greater than 20 Feet	26 percent
Mean Depth	14 feet
Maximum Depth	65 feet

[a]*Residence Time: Time required for a volume equivalent to the full volume of the Lake to flow into the Lake.*

[b]*Shoreline Development Factor: Ratio of shoreline length to that of a circular lake of the same area.*

Source: Wisconsin Department of Natural Resources and SEWRPC.

Muskego Lake, and are summarized in Table 2. Changes in land use within the drainage area tributary to the Lake include limited further urban development, infilling of already platted lots, and possible redevelopment of existing properties. Details of planned land use conditions are set forth in the adopted lake management plan for Little Muskego Lake.

SHORELINE PROTECTION STRUCTURES

Erosion of shorelines results in the loss of land, damage to shoreline infrastructure, and interference with lake access and use. Wind-wave erosion, ice movement, and motorized boat traffic usually cause such erosion. A survey of Little Muskego Lake shoreline, conducted by Commission staff during August 2002, identified an approximately equal distribution of areas with natural shorelines and areas protected by riprap, bulkheads, and similar structural shoreline protection measures, as shown on Map 4. No obvious erosion-related problems were observed beyond those previously identified in the adopted lake management plan.

WATER QUALITY

Water quality measurements on Little Muskego Lake have been conducted by the U.S. Geological Survey[2] since October 1986, as shown in Figure 1. Secchi-disc transparency readings were often between three feet and six feet, and are indicative of a waterbody with fair to poor water clarity.[3] With the development of a significant population of zebra mussel (*Dreissena polymorpha*) in the Lake in recent years, somewhat higher Secchi-disc transparencies (clearer water conditions) have been observed, as shown in Figure 1. The chlorophyll-*a* concentrations observed in the Lake, of between about 10 and 20 micrograms per liter (µg/l), are indicative of abundant growths of algae in the water column, and are consistent with total phosphorus concentrations in excess of 20 µg/l reported from the Lake.

Little Muskego Lake had a Carlson Trophic State Index (TSI) value that generally was in excess of 50,[4] indicative of enriched conditions. This TSI value, shown in Figure 2, is consistent with the historically poor to fair transparency conditions noted above, and indicates that the Lake remains a meso-eutrophic waterbody. Mesotrophic lakes, while relatively fertile and supporting abundant aquatic plant growths and productive fisheries, generally do not exhibit nuisance growths of algae and plants, while eutrophic lakes often support greater abundances of aquatic plant growths that can reach nuisance proportions and higher numbers of fishes

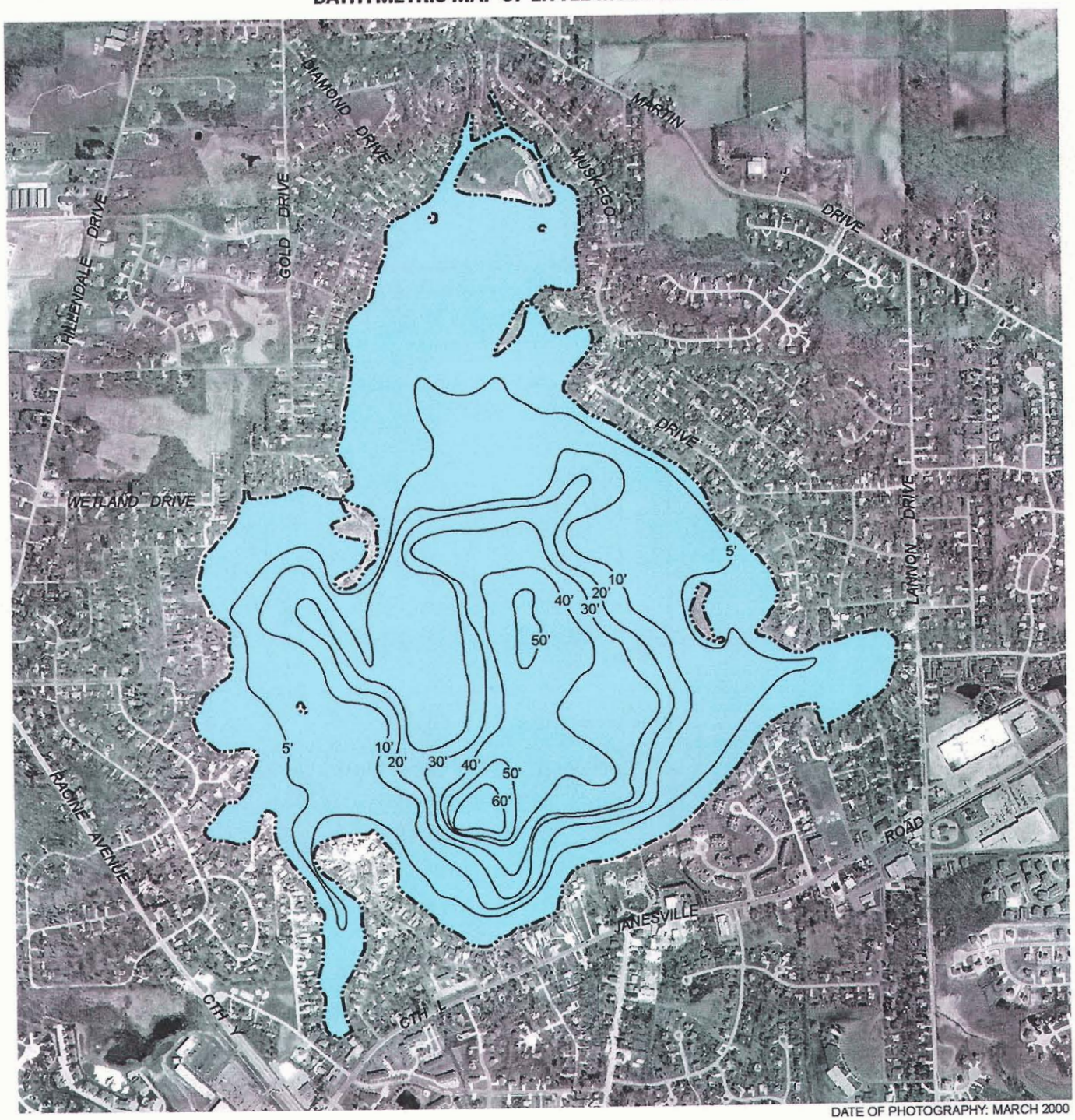
[2]*See U.S. Geological Survey Open-File Report 02-135,* Water-Quality and Lake-Stage Data for Wisconsin Lakes, Water Year 2001, *2002. These reports have been published annually since 1994; water quality monitoring of Little Muskego Lake by the U.S. Geological Survey is ongoing.*

[3]*R.A. Lillie and J.W. Mason,* Limnological Characteristics of Wisconsin Lakes, *Wisconsin Department of Natural Resources Technical Bulletin No. 138, 1983.*

[4]*R.E. Carlson, "A Trophic State Index for Lakes,"* Limnology and Oceanography, *Volume 22, No. 2, 1977.*

Map 2

BATHYMETRIC MAP OF LITTLE MUSKEGO LAKE



DATE OF PHOTOGRAPHY: MARCH 2000

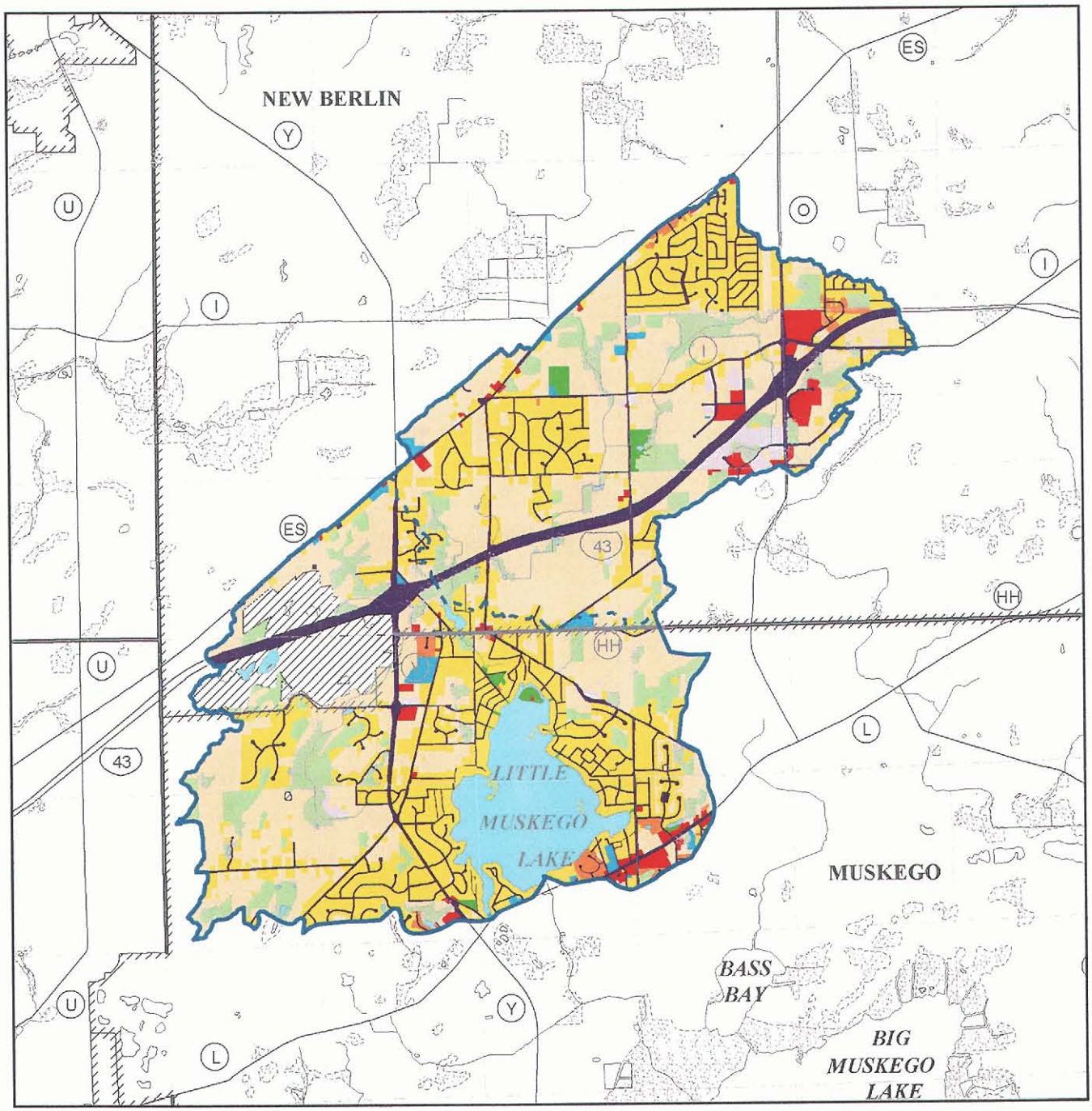
—20'— WATER DEPTH CONTOUR IN FEET

GRAPHIC SCALE
0 650 1300 FEET

Source: SEWRPC.

Map 3

EXISTING LAND USES WITHIN THE TOTAL TRIBUTARY DRAINAGE AREA OF LITTLE MUSKEGO LAKE: 2000



- Single-Family Residential
- Multi-Family Residential
- Commercial
- Industrial
- Transportation, Communications, and Utilities
- Governmental and Institutional
- Recreation
- Wetlands and Woodlands
- Surface Water
- Agricultural, Unused, and Other Open Lands
- Extractive and Landfill

0 0.5 1 1.5 2 Miles

Source: SEWRPC.

Table 2

EXISTING AND PLANNED LAND USE WITHIN THE DRAINAGE AREA TRIBUTARY TO LITTLE MUSKEGO LAKE: 2000 AND 2020

Land Use Categories	2000 Land Use Area (acres)	2020 Land Use Area (acres)
Urban		
Residential	2,084	2,819
Commercial	155	252
Industrial	86	205
Government and Institutional	61	133
Transportation, Commercial and Utilities	853	1,074
Recreation	47	119
Subtotal	3,286	4,602
Rural		
Agricultural	2,402	987
Woodlands	438	438
Wetlands	320	320
Water	509	509
Other	369	468
Subtotal	4,037	2,722
Total	7,324	7,324

Source: SEWRPC.

generally considered to be of lesser quality by sport anglers. Many of the cleaner lakes in Southeastern Wisconsin are classified as mesotrophic.[5]

AQUATIC PLANTS: DISTRIBUTION AND MANAGEMENT AREAS

Two previous surveys of the aquatic plant communities in Little Muskego Lake have been conducted. The first of these surveys was that of the Wisconsin Department of Natural Resources (WDNR), conducted during July 1992. The currency of this survey was confirmed by an aquatic plant community reconnaissance conducted by the Commission staff during July 1994 prior to the publication of the comprehensive lake management plan. The results of both surveys were set forth in the adopted lake management plan for Little Muskego Lake.[6] Subsequently, the Commission staff conducted a comprehensive survey of aquatic plant species in the Lake basin during August 2002. The results of these surveys are presented in Table 3, and the results of the 2002 survey are graphically depicted on Map 5.

Past and Present Aquatic Plant Management Practices

Aquatic plants have occurred within Little Muskego Lake in such abundance that they have frequently been perceived of as a problem, interfering with recreational uses and aesthetic enjoyment of the Lake. The aquatic plant surveys conducted on Little Muskego Lake within the last 10 years indicate a relatively stable aquatic plant community. Few changes are apparent during this period, despite the conduct of an extensive aquatic plant management program. The Lake generally supports a healthy and diverse aquatic macrophyte community, although extensive stands of Eurasian water milfoil (*Myriophyllum spicatum*) occur throughout the waterbody.

As set forth in the adopted lake management plan, an aquatic plant management program has been carried out on Little Muskego Lake in a documented manner since 1950, when records of aquatic plant management efforts were first maintained by the Wisconsin Department of Natural Resources. Prior to 1950, aquatic plant management interventions are likely, but were not recorded. The early aquatic plant control program conducted on Little Muskego Lake can be categorized as a chemical control program designed to minimize nuisance growths of aquatic macrophytes and algae. Between 1950 and 1969, 47,096 pounds of sodium arsenate and 200 pounds of copper sulfate were applied to Little Muskego Lake to control perceived nuisance growths of these plants.[7] These

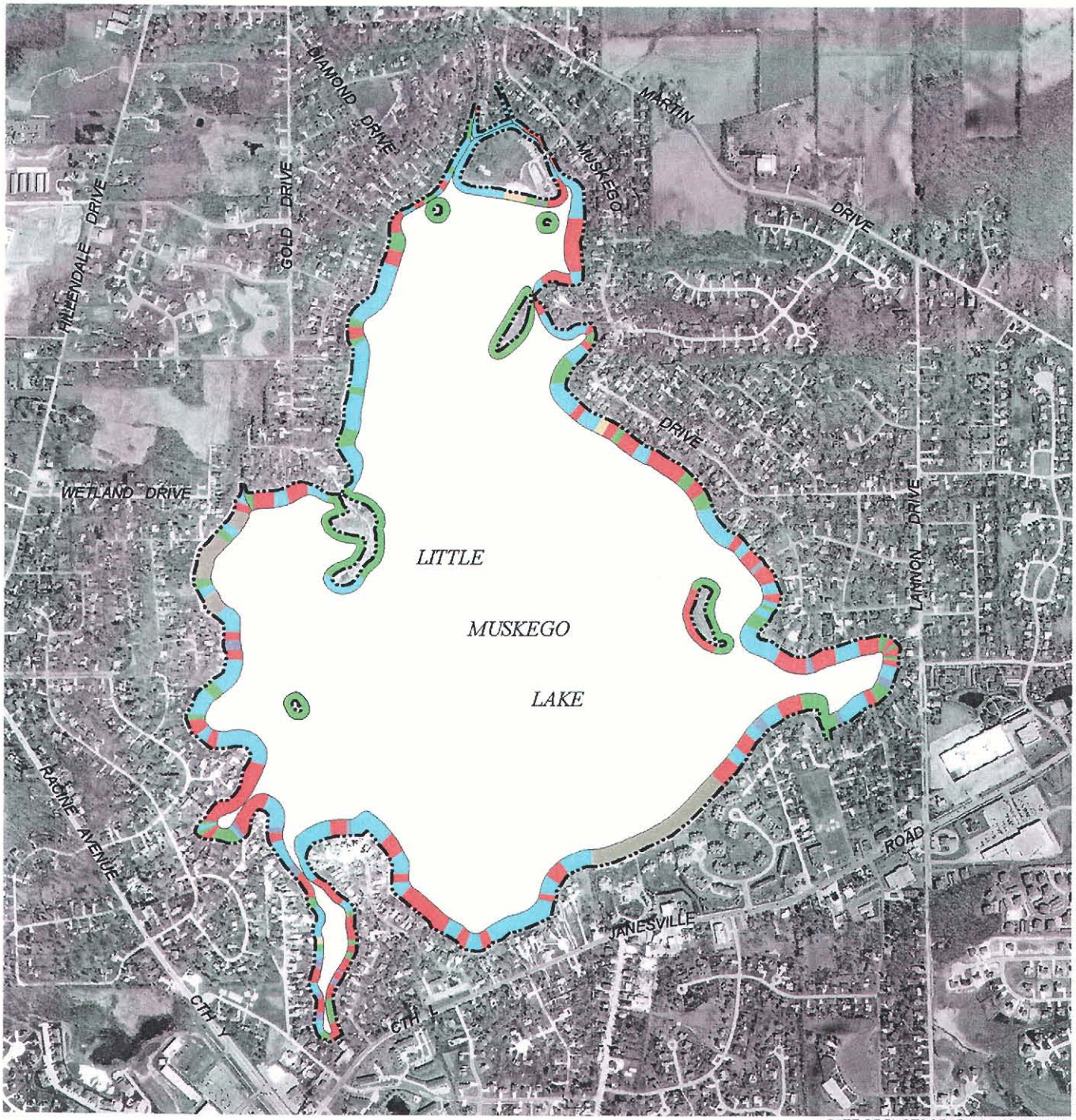
[5] *R.A. Lillie, and J.W. Mason,* Limnological Characteristics of Wisconsin Lakes, *Wisconsin Department of Natural Resources Technical Bulletin No. 138, 1983. Also see SEWRPC Memorandum Report No. 93,* A Regional Water Quality Management Plan for Southeastern Wisconsin: An Update and Status Report, *March 1995.*

[6] *Wisconsin Department of Natural Resources,* Aquatic Plant Management Sensitive Area Designation for Little Muskego Lake, Waukesha County, Wisconsin, *July 1992.*

[7] *Wisconsin Department of Natural Resources Technical Bulletin No. 57,* op. cit. *Also see Table 24, SEWRPC Community Assistance Planning Report No. 187,* A Management Plan for Little Muskego Lake, Waukesha County, Wisconsin, *March 1994.*

Map 4

SHORELINE PROTECTION STRUCTURES ON LITTLE MUSKEGO LAKE: 2002



DATE OF PHOTOGRAPHY: MARCH 2000

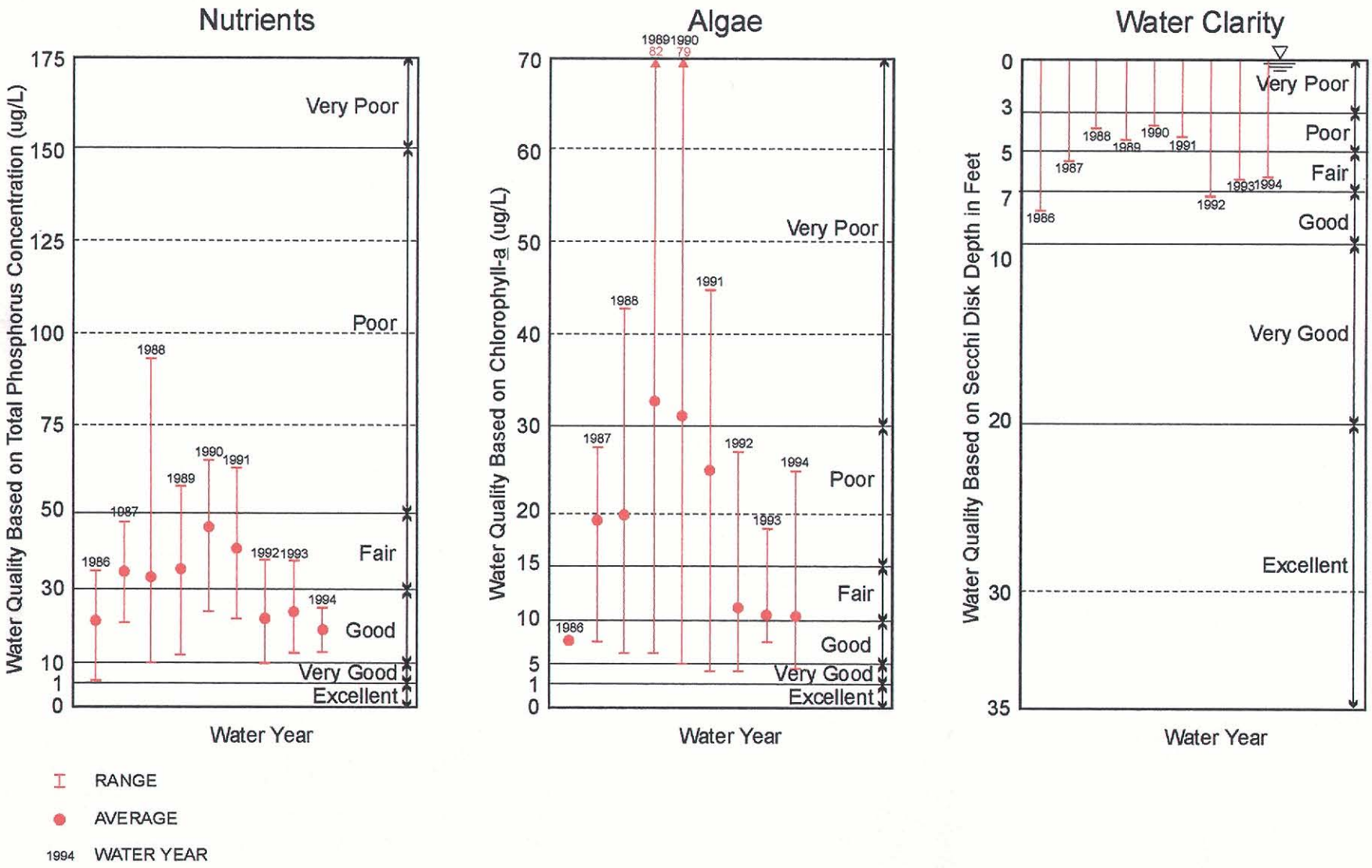
RIPRAP
BULKHEAD
BEACH
REVETMENT
NATURAL
PEA GRAVEL

GRAPHIC SCALE
0 650 1300 FEET

Source: SEWRPC.

Figure 1

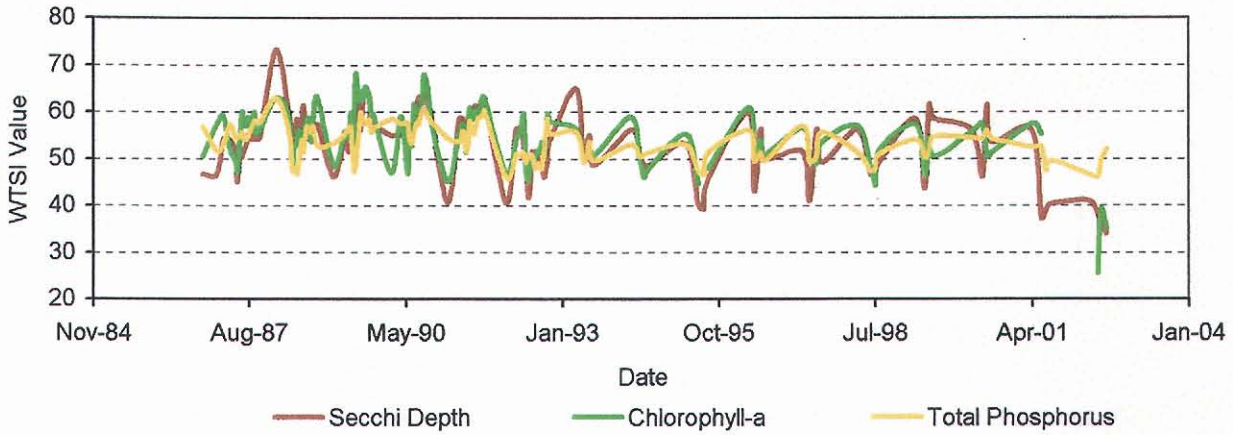
LITTLE MUSKEGO LAKE PRIMARY WATER QUALITY INDICATORS: 1986-1994



Source: Wisconsin Department of Natural Resources and SEWRPC.

Figure 2

TROPHIC STATE INDEX FOR LITTLE MUSKEGO LAKE: 1986-2000



Source: U.S. Geological Survey, Wisconsin Department of Natural Resources, and SEWRPC.

Table 3

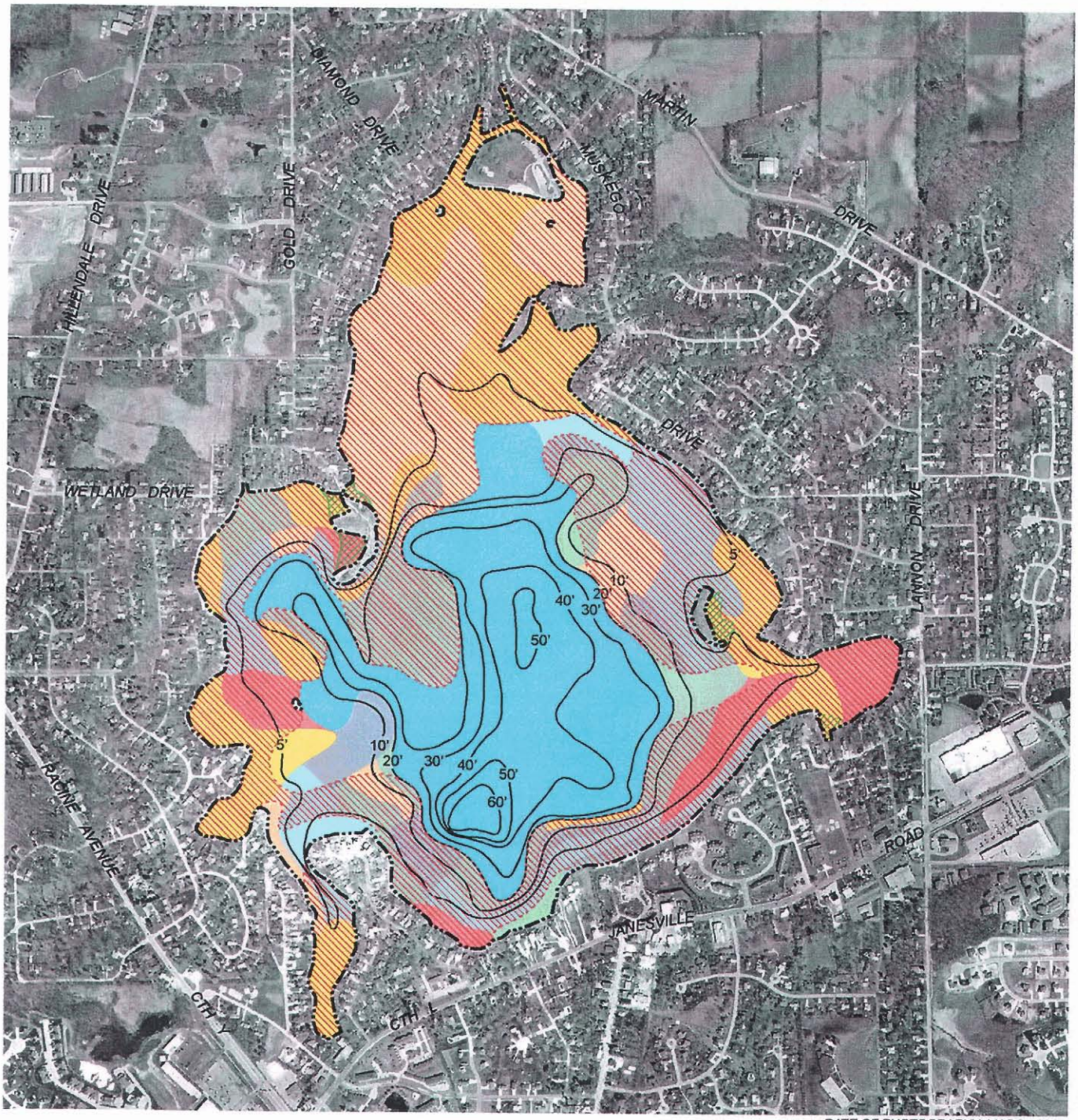
AQUATIC PLANT SPECIES IN LITTLE MUSKEGO LAKE: 1992 THROUGH 2002

Plant Species	1992	1994	2002
Ceratophyllum demersum (coontail)	X	X	X
Chara vulgaris (musk grass)	X	X	X
Elodea canadensis (Elodea)	--	--	X
Lemna minor (duckweed)	--	--	X
Myriophyllum spicatum (Eurasian water milfoil)	X	X	X
Najas sp. (bushy pondweed)	X	X	X
Nitella sp. (stonewort)	X	--	--
Nymphaea tuberosa (white water lily)	X	X	X
Potamogeton crispus (curly-leaf pondweed)	X	X	X
Potamogeton gramineus (variable pondweed)	--	--	X
Potamogeton illinoensis (Illinois pondweed)	--	--	X
Potamogeton pectinatus (Sago pondweed)	--	--	X
Potamogeton pusillus (small pondweed)	--	--	X
Potamogeton richardsonii (clasping-leaf pondweed)	X	X	X
Potamogeton zosterformis (flat-stemmed pondweed)	X	X	X
Ranunculus sp. (water crowfoot)	--	--	X
Vallisneria americana (water celery)	X	X	X
Zosterella dubia (water star grass)	--	--	X

Source: Wisconsin Department of Natural Resources and SEWRPC.

Map 5

AQUATIC PLANT COMMUNITY DISTRIBUTION IN LITTLE MUSKEGO LAKE: 2002



DATE OF PHOTOGRAPHY: MARCH 2000

—20'— WATER DEPTH CONTOUR IN FEET

OPEN WATER

WATER LILIES

EURASIAN WATER MILFOIL

COONTAIL; WATERWEED; WATER STAR GRASS; AND CLASPING, BUSHY, FLAT-STEM, SAGO, AND CURLY-LEAF PONDWEEDS

COONTAIL; MUSKGRASS; WILD CELERY; AND CLASPING-LEAF, BUSHY, FLAT-STEM, SAGO, AND CURLY-LEAF PONDWEEDS

COONTAIL; WATERWEED; MUSKGRASS; WATER STAR GRASS; WILD CELERY, AND BUSHY, FLAT-STEM, AND VARIABLE PONDWEEDS

COONTAIL; WATERWEED; MUSKGRASS; WATER STAR GRASS; WILD CELERY; STIFF WATER CROWFOOT; AND CLASPING-LEAF, BUSHY, FLAT-STEM, SAGO, AND VARIABLE PONDWEEDS

COONTAIL; WATERWEED; MUSKGRASS; WILD CELERY; STIFF WATER CROWFOOT; AND BUSHY, CLASPING-LEAF, FLAT-STEM, SAGO, CURLY-LEAF, VARIABLE, SMALL, AND ILLINOIS PONDWEEDS

COONTAIL; WATERWEED; MUSKGRASS; WATER STAR GRASS; WILD CELERY; AND CLASPING-LEAF, BUSHY, FLAT-STEM, SAGO, CURLY-LEAF, VARIABLE, SMALL, AND ILLINOIS PONDWEEDS

GRAPHIC SCALE

0 650 1300 FEET

Source: SEWRPC.

applications and subsequent applications of a range of other aquatic herbicides through 1994 are summarized in Table 4. In recent years, the aquatic plant control program conducted on Little Muskego Lake has shifted toward aquatic plant harvesting as a major element of the aquatic plant management strategy in the Lake.

Aquatic Plant Communities in Little Muskego Lake

The results of the 1992 and 1994 macrophyte surveys are set forth in Table 3. The 1992 survey identified 10 species of aquatic plants, many of which were reported to be common to abundant. One fewer plant species was observed during the 1994 survey, but, overall, little change in the aquatic plant community composition was noted during this period. Plant growth occurred in water up to 20 feet deep, but was concentrated in those areas where the water depth was less than 15 feet. Aquatic plants occurred throughout the Lake, but diversity was greatest in the vicinity of the eastern and western shorelines. The most diverse growths of aquatic plants occurred adjacent to the main basin of the Lake. Common aquatic plants found in Little Muskego Lake are illustrated in Appendix A.

In 1994, muskgrass (*Chara vulgaris*) was the most abundant aquatic plant, and occurred in three of the four WDNR-delineated environmentally sensitive areas in the Lake. Pursuant to the authorities set forth in Chapter NR 109 of the *Wisconsin Administrative Code*, the WDNR has identified four such environmentally sensitive areas within the Little Muskego Lake basin, one in the northern portion of the Lake, one in the eastern portion of the main lake basin, and two in the western portion of the main lake basin, as shown on Map 6. Muskgrass was the dominant macrophyte within two of these areas, including the largest area along the eastern shoreline. The plant is generally considered to be a low-growing plant that poses few problems for recreational lake users.

Water celery or eel grass (*Vallisneria americana*) and several species of pondweeds (*Potamogeton* spp.) also occurred within the Lake and were generally widely distributed throughout the Lake basin. The pondweeds were most abundant in the fourth, or northernmost, of the WDNR-delineated sensitive areas. In addition, white water lilies (*Nymphaea tuberosa*) were common in shallow water areas along each shoreline. Cattails (*Typha* sp.) and bulrush (*Scirpus* sp.) dominated the emergent flora along the shorelands of the Lake.

Eurasian water milfoil (*Myriophyllum spicatum*) was abundant in much of the Lake. In addition to being widespread throughout the main Lake basin, Eurasian water milfoil also occurred in all four of the WDNR-delineated sensitive areas. It was the dominant aquatic plant in the sensitive area on the western shore, and abundant within each of the others. Eurasian water milfoil is one of eight milfoil species found in Wisconsin and the only one known to be exotic or nonnative. Because of its nonnative nature, Eurasian water milfoil has few natural enemies that can inhibit its explosive growth under suitable conditions. The plant exhibits this characteristic growth pattern in lakes with organic-rich sediments, or where the lake bottom has been disturbed. In such cases, the Eurasian water milfoil populations displace native plant species and interfere with the aesthetic and recreational use of the waterbodies. This plant has been known to cause severe recreational use problems in lakes within the Southeastern Wisconsin Region.

Eurasian water milfoil reproduces by the rooting of plant fragments. Consequently, some recreational uses of lakes can result in the expansion of Eurasian water milfoil communities, especially when boat propellers fragment Eurasian water milfoil plants. These fragments, as well as fragments that occur for other reasons such as wind-induced turbulence or fragmentation of the plant by fishes, are able to generate new root systems, allowing the plant to colonize new sites. The fragments also can cling to boats, trailers, motors, and/or bait buckets, and can stay alive for weeks contributing to the transfer of milfoil to other lakes. For this reason, it is very important to remove all vegetation from boats, trailers, and other equipment after removing them from the water and prior to launching in other waterbodies.

During the 2002 aquatic plant survey of Little Muskego Lake, 17 species of aquatic plants were identified, 15 of which were submergent species and two, duckweed (*Lemna minor*) and white water lily (*Nymphaea tuberosa*), were floating-leaved species. The results of this survey are set forth in tabular form in Table 5. The number of aquatic plants suggests a more diverse and abundant aquatic plant community than previously recorded from the Lake. As noted above, both previous surveys reported no more than 10 species of aquatic plants, including the

Table 4

CHEMICAL CONTROLS ON LITTLE MUSKEGO LAKE: 1950-2002

Year	Macrophyte Control							Algal Control	
	Sodium Arsenite (pounds)	Diquat (gallons)	Silvex (pounds)	Endothall		2,4-D		Cutrine-Plus (gallons)	Copper Sulfate (pounds)
				Gallons	Pounds	Gallons	Pounds		
1950-1969	47,096	--	0.5	--	5	--	20	--	200
1970	--	5.0	--	7.0	--	--	--	--	50
1971[a]	--	--	--	--	--	--	--	--	--
1972[a]	--	--	--	--	--	--	--	--	--
1973[a]	--	--	--	--	--	--	--	--	--
1974[a]	--	--	--	--	--	--	--	--	--
1975	--	--	--	--	--	--	--	160.0	--
1976[b]	--	--	--	--	--	--	--	--	--
1977	--	--	--	--	--	--	--	--	--
1978	--	--	--	--	--	--	20	--	--
1979	--	--	--	7.0	--	165.5	--	83.5	--
1980	--	--	--	44.5	--	129.0	--	49.0	35
1981	--	--	--	49.0	--	167.0	--	52.5	--
1982	--	--	--	119.0	--	63.0	--	72.0	--
1983	--	--	--	--	--	--	--	--	--
1984	--	--	--	61.0	40	120.5	--	123.5	80
1985	--	--	--	27.0	--	86.0	--	88.5	--
1986	--	2.0	--	43.0	--	31.0	--	22.0	25
1987	--	50.5	--	10.0	--	--	--	101.0	--
1988	--	--	--	61.5	--	89.0	--	41.0	--
1989	--	11.0	--	90.4	--	17.5	--	68.5	--
1990	--	6.0	--	25.0	--	--	--	68.0	--
1991	--	--	--	--	18	--	--	--	--
1992	--	35.0	--	36.3	--	--	--	35.0	--
1993[a]	--	29.0	--	27.0	--	--	--	52.5	--
1994	--	19.0	--	21.5	--	--	--	13.5	--
1995	--	--	--	--	--	--	--	--	--
1996	--	--	--	--	--	--	--	--	--
1997	--	--	--	--	--	--	--	--	--
1998	--	--	--	--	--	--	3,530	2.5	--
1999	--	--	--	--	--	--	3,530	2.5	--
2000	--	--	--	--	--	--	1,600	--	--
2001	--	--	--	--	--	--	4,750	--	--
2002	--	1.5	--	--	--	--	6,225	--	--
Total	47,096	159.0	0.5	629.2	63	868.5	19,635	1,035.5	390

[a]*No chemical controls were used during these years.*

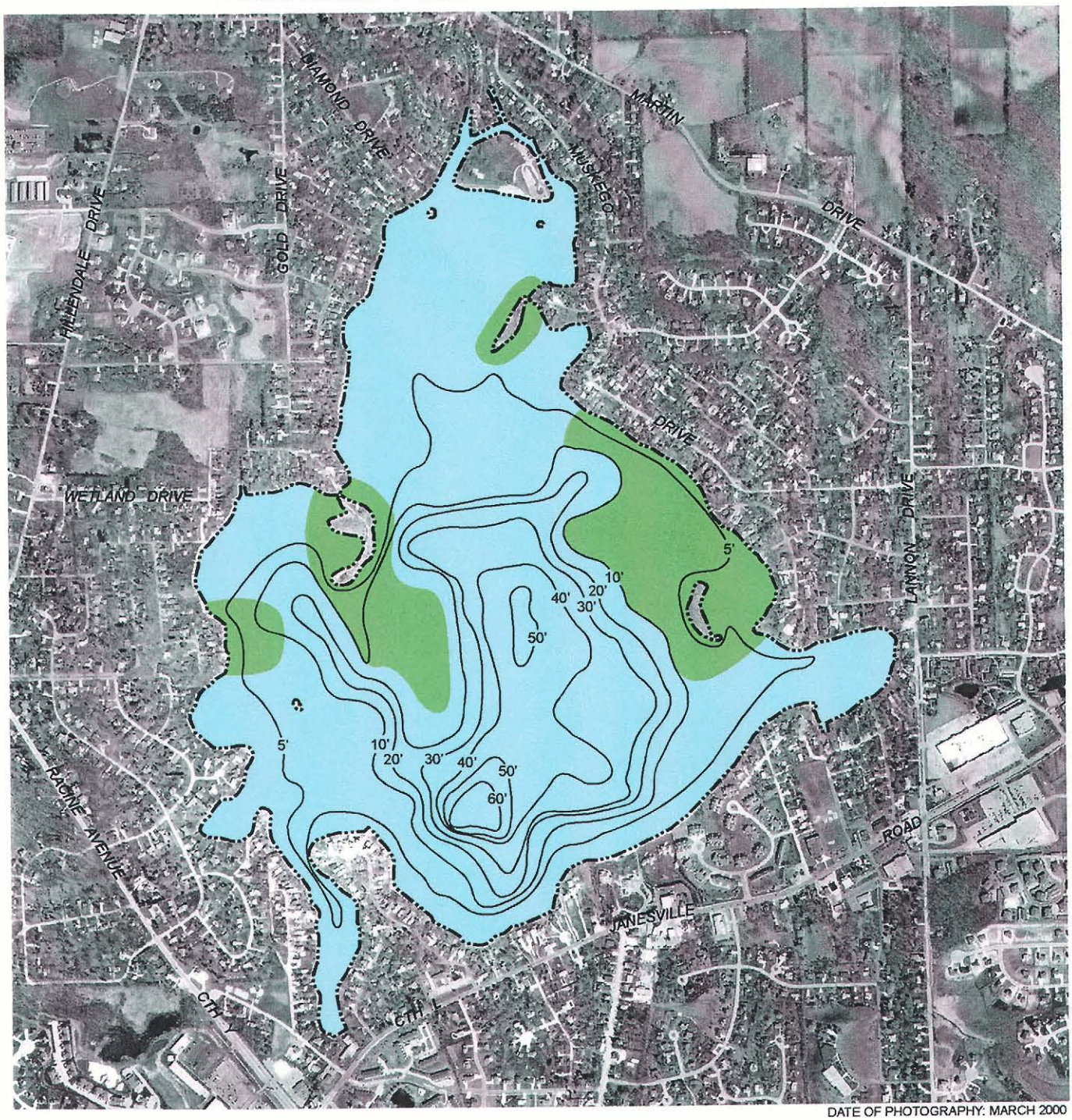
[b]*No records available for this year.*

Source: Wisconsin Department of Natural Resources and SEWRPC.

floating-leaved white water lily, as being present in the Lake. Nevertheless, there have been few changes in the composition of the aquatic plant community previously recorded in Little Muskego Lake, which might indicate that the greater number of species observed during the 2002 survey reflect the more rigorous aquatic plant sampling protocol employed. These differences may also reflect seasonal variations in plant community composition. It is noteworthy, however, that the absence of bushy pondweed (*Najas flexilis*), noted during the 1994, was confirmed during the 2002 survey. Most of the additional species observed during the 2002 survey and not previously reported from Little Muskego Lake were comprised of various species of pondweeds, including

Map 6

ENVIRONMENTALLY SENSITIVE AREAS OF LITTLE MUSKEGO LAKE



DATE OF PHOTOGRAPHY: MARCH 2000

ENVIRONMENTALLY SENSITIVE AREA

GRAPHIC SCALE

0 650 1300 FEET

Source: SEWRPC.

Table 5

FREQUENCY OF OCCURRENCE AND DENSITY RATINGS OF SUBMERGENT PLANT SPECIES LITTLE MUSKEGO: AUGUST 2002[a]

Aquatic Plant Species Present[b]	Sites Found	Frequency of Occurrence (percent)	Relative Density[c]	Importance Value
Bushy Pondweed	22	23.4	1.4	33.0
Coontail	90	95.7	3.3	317.0
Clasping Leaf Pondweed	22	23.4	1.7	39.4
Curly-Leaf Pondweed	14	14.9	1.6	24.5
Eel Grass	54	57.4	2.5	142.6
Elodea	66	70.2	2.9	201.1
Eurasian Water Milfoil	87	92.6	2.5	234.0
Flat-Stemmed Pondweed	46	48.9	1.7	85.1
Illinois Pondweed	5	5.3	1.2	6.4
Muskgrass	34	36.2	2.4	88.3
Sago Pondweed	41	43.6	1.5	64.9
Small Pondweed	2	2.1	1.0	2.1
Water Crowfoot	2	2.1	1.5	3.2
Variable Pondweed	9	9.6	1.6	14.9
Water Star Grass	20	21.3	1.5	31.9

NOTE: There were 94 total sample sites during the August 2002 survey.

[a]*Emergent plants, such as duckweed and white water lily, are not measurable using the Jesson and Lound Survey Technique for Submerged Aquatic Plants.*

[b]*Information obtained from* A Manual of Aquatic Plants *by Norman C. Fassett, University of Wisconsin Press;* Guide to Wisconsin Aquatic Plants, *Wisconsin Department of Natural Resources; and,* Through the Looking Glass...A Field Guide to Aquatic Plants, *Wisconsin Lakes Partnership, University of Wisconsin-Extension.*

[c]*Species relative density for all sample points including sample points where a particular species did not occur in Little Muskego Lake: Abundant (density rating = 4 to 5). Common (density rating = 2 to 3), Scarce (density rating = 1), and - = Absent (density rating = 0).*

Source: SEWRPC.

variable pondweed (*Potamogeton gamineus*), Illinois pondweed (*Potamogeton illinoensis*), Sago pondweed (*Potamogeton pectinatus*), and small pondweed (*Potamogeton pusillus*). The appearance of the pondweeds is generally considered to be a positive sign. The other species not previously reported from the Lake included Elodea (*Elodea canadensis*), water crowfoot (*Ranunculus* sp.), and water star grass (*Zosterella dubia*), and the floating-leaved macrophyte, duckweed (*Lemna minor*). Table 6 outlines the positive ecological significance of all aquatic plant species found in Little Muskego Lake.

During 2002, the aquatic plant survey of Little Muskego Lake was conducted using the modified Jesson and Lound transect method as adopted by the Wisconsin Department of Natural Resources. This methodology, when utilized in successive aquatic plant surveys, will allow the statistical evaluation of changes in the aquatic plant community within the Lake. [8] Where specific indices can be calculated based upon available data collected during the year 2002 aquatic plant survey, the values are given in Table 5. These indices include:

[8]*Memo from Stan Nichols, to J. Bode, J. Leverence, S. Borman, S. Engel, D., Helsel, entitled "Analysis of macrophtye data for ambient lakes-Dutch Hollow and Redstone Lakes example," Wisconsin Geological and Natural History Survey, University of Wisconsin-Extension, February 4, 1994.*

Table 6

LITTLE MUSKEGO AQUATIC PLANT ECOLOGICAL SIGNIFICANCE

Aquatic Plant Species Present	Ecological Significance
Ceratophyllum demersum (coontail)	Provides good shelter for young fish and supports insects valuable as food for fish and ducklings
Chara vulgaris (muskgrass)	Excellent producer of fish food, especially for young trout, bluegills, small and largemouth bass, stabilizes bottom sediments, and has softening effect on the water by removing lime and carbon dioxide
Elodea canadensis (waterweed)	Provides shelter and support for insects which are valuable as fish food
Myriophyllum spicatum (Eurasian water milfoil)	None known
Najas flexilis (bushy pondweed)	Stems, foliage, and seeds important wildfowl food and produces good food and shelter for fish
Potamogeton crispus (curly-leaf pondweed)	Provides food, shelter and shade for some fish and food for wildfowl
Potamogeton gramineus (variable pondweed)	Provides habitat for fish and food for waterfowl, in addition to muskrat, beaver, and deer
Potamogeton illnoensis (Illinois pondweed)	Provides shade and shelter for fish; harbor for insects; seeds are eaten by wildfowl
Potamogeton pectinatus (Sago pondweed)	This plant is the most important pondweed for ducks, in addition to providing food and shelter for young fish
Potamogeton pusillus (small pondweed)	Provides food for ducks, geese, muskrat, beaver, and deer, and provides food and shelter for fish
Potamogeton richardsonii (clasping-leaf pondweed)	Provides food, shelter and shade for some fish, food for some wildfowl, and food for muskrat. Provides shelter and support for insects, which are valuable as fish food
Potamogeton zosteriformis (flat-stem pondweed)	Provides some food for ducks
Ranunculus longirostris (stiff-water crow foot)	Provides food for trout, upland game birds, and wildfowl
Vallisneria americana (water celery)	Provides good shade and shelter, supports insects, and is valuable fish food
Zosterella dubia (water stargrass)	Provides food and shelter for fish, locally important food for waterfowl

[a]*Information obtained from* A Manual of Aquatic Plants *by Norman C. Fassett, University of Wisconsin Press;* Guide to Wisconsin Aquatic Plants, *Wisconsin Department of Natural Resources; and,* Through the Looking Glass...A Field Guide to Aquatic Plants, *Wisconsin Lakes Partnership, University of Wisconsin-Extension.*

Source: SEWRPC.

1. The frequency of occurrence (FREQ) is the number of occurrences of a species divided by the number of samples with vegetation, expressed as a percentage. It is the percentage of times a particular species occurred when there was aquatic vegetation present, and is analogous to the Jesson and Lound point system.

2. The relative frequency of occurrence (RFREQ) is the frequency of a species divided by the total frequency of all species. The sum of the relative frequencies should equal 100 percent. This statistic presents an indication of how the plants occur throughout a lake in relation to each other. It is used in the calculation of the Importance Value and Simpson Diversity Index set forth below.

3. The average or relative density (ADEN) is the sum of the density ratings for a species divided by the number of sampling points with vegetation. The maximum density rating of 4.0 is assigned to plants that occur at all points sampled at a given depth, the modified Jesson and Lound protocol adopted by the Wisconsin Department of Natural Resources uses four sampling points per depth sampled. The average density presents an indication of how abundant the growth of a particular plant is throughout the lake. This measure, along with the percent occurrence, gives a good indication of the distribution of aquatic plant communities in a lake.

4. The Simpson Diversity Index (SDI) is defined as one minus the sum of the relative frequencies squared, and is expressed in equation form as:

$$SDI = 1 - 3(RFREQ)^2$$

where SDI is the Simpson Diversity Index and RFREQ is the relative frequency value defined above. Based upon this index of community diversity, the closer the SDI value is to one, the greater the diversity between the communities being compared.

5. The importance value (IV) is defined as the product of the relative frequency and the average density, expressed as a percentage:

$$IV = (RFREQ)\ (ADEN)\ (100)$$

where IV is the importance value, RFREQ is the relative frequency, and ADEN is the average density. This number provides an indication of the dominance of a species within a community based upon both frequency and density. It also somewhat addresses the problem of difference in stature between different plant species.

6. The similarity index (SI) is a means of comparing two communities by estimating the degree to which the communities share common components. The index is calculated as:

$$SI = 2W / A + B$$

where SI is the similarity index value, W is the amount two communities have in common or the lowest relative frequency of a species pair, and A plus B is the sum of the relative frequency for both communities, which should always be about 200 since the relative frequency of each community should equal 100 percent. This index could be calculated based upon average density or the importance values. However, relative frequency is a better measure since it does not change much during the growing season so the results remain comparable, even if the timing of sampling is not exactly the same, and, given that there are several methods for assigning average density, use of average density may yield a result that is not directly comparable. Use of relative frequency avoids such interpretation problems. It should be noted that, although a 100 percent similarity is theoretically possible, repeated sampling studies from the same community has shown that a similarity index of 85 percent or higher should be considered indicative of no community change.

7. The p-value, or Pearson chi-squared test, is calculated using a statistical program for personal computers.[9] The p-values are calculated based upon a two by two frequency table. A p-value of less than or equal to 0.05 is the limit used to identify a significant difference between two populations. This means that, at $p = 0.05$, there is a 95 percent probability that two populations are different, or that, after comparing 100 mean values from each data set, 95 would be different and five would overlap.

[9] *Statistics for Windows, General Conventions and Statistics, 1995, Statsoft, Inc., Tulsa, Oklahoma.*

Emergent Wetland Plants

In addition to the submergent and floating-leaved aquatic plant species reported from within the Lake basin of Little Muskego Lake, SEWRPC staff also noted the emergent wetland vegetation that was present along the shoreline of the Lake. These plants are tabulated in Appendix B. No federal- or state-designated plants considered to be endangered, threatened or species of special concern were reported to be present within the shoreland areas of the Lake. Indeed, a number of nonnative wetland plant species were observed, which is consistent with the disturbed state of the shoreland.

FISHERIES

The Wisconsin Department of Natural Resources[10] reports that the fish population of Little Muskego Lake includes bluegill, pumpkinseed, largemouth bass, black crappie, green sunfish, warmouth, white sucker, yellow perch, walleyed pike, northern pike, carp, black and yellow bullhead, and golden shiner. As noted in the adopted lake management plan, the Lake is managed for bluegill, largemouth bass, and northern pike production. In addition, the Department has stocked walleyed pike, northern pike, and largemouth bass, as well as fathead minnow as forage for these other species, in order to enhance and maintain the sport fishing opportunities for anglers using Little Muskego Lake.

RECREATIONAL USES AND FACILITIES

As set forth in the adopted lake management plan, Little Muskego Lake is a multi-purpose waterbody serving a variety of recreational uses. Recreational uses include boating, waterskiing, swimming, and fishing during the summer months, and speed skating, snowmobiling, and ice-fishing during the winter. The Lake is well-served by public access sites, including both developed and fully operational public recreational boating access sites and relatively undeveloped public parks and walk-in trails. The Lake use zones identified in the adopted lake management plan for Little Muskego Lake and shown on Map 7 also recognize the variety of uses to which the Lake is subjected, especially during the open water seasons.

The Lake is used year around as a visual amenity, walking, bird watching and picnicking are popular passive recreational uses of the waterbody, and is heavily utilized during open water periods for a variety of recreational activities, as shown in Table 7. Recreational boating is a popular active recreational use of the Lake, as shown in Table 7. The types of watercraft found on the Lake include powered or ski boats, fishing boats, paddleboats, canoes, sailboats, and personal watercraft ("jetskis"), as shown in Table 8. The Lake is considered by the Wisconsin Department of Natural Resources to have adequate public recreational boating access, as defined in Section NR 1.91 of the *Wisconsin Administrative Code.*

LOCAL ORDINANCES

Little Muskego Lake is subject to a boating ordinance promulgated by the City of Muskego. This ordinance provides generally applicable rules for all waters within the jurisdiction of the City, as set forth in Appendix C. These rules limit the times during which boats may operate on Little Muskego Lake and allow for the enactment and enforcement of boating restrictions and limitations. The ordinance conforms to State of Wisconsin boating and water safety laws as set forth in Chapter 30, *Wisconsin Statutes.*

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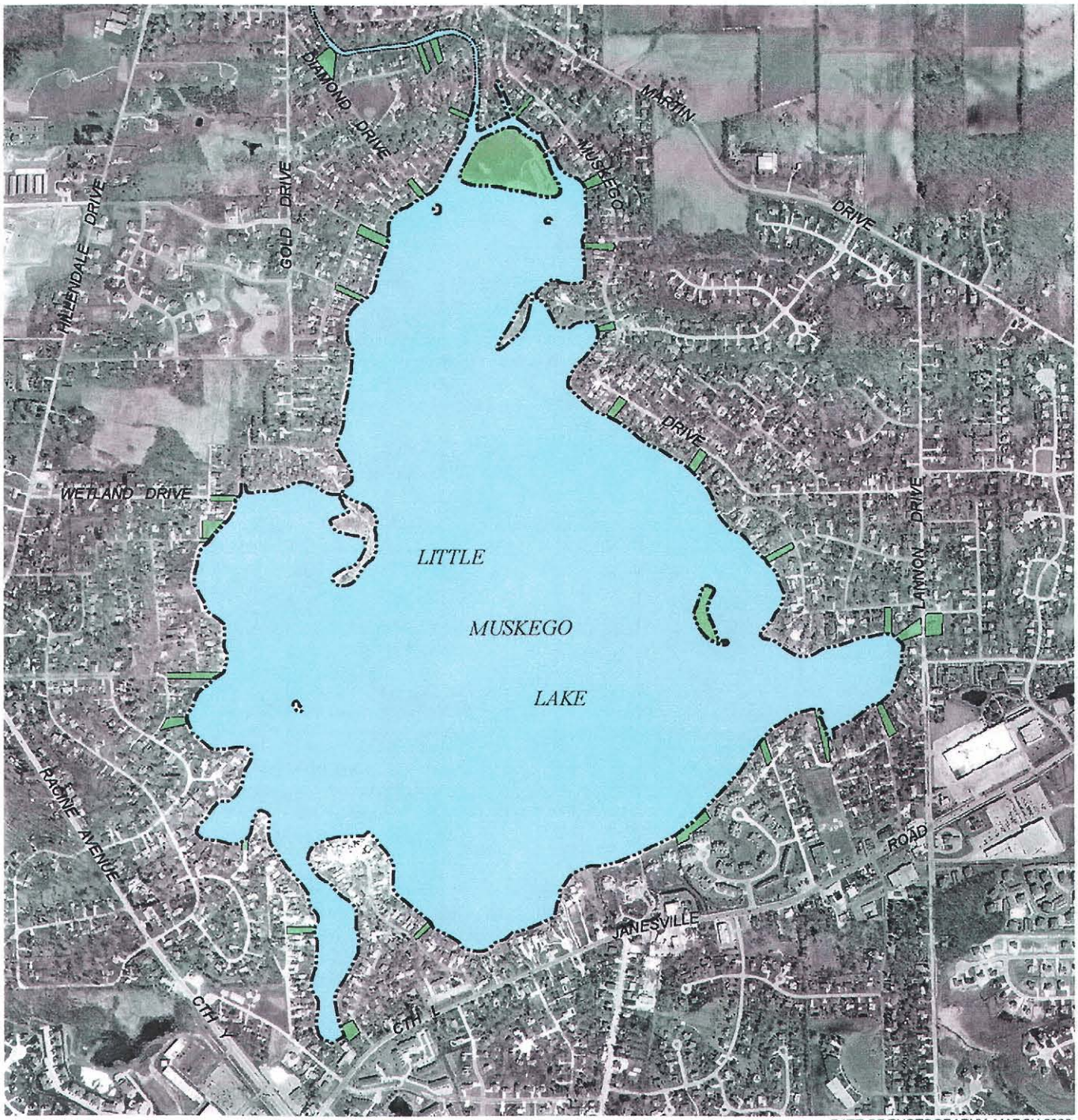
[10] *Wisconsin Department of Natural Resources Publication No. PUBL-FM-800-95REV,* Wisconsin Lakes, *1995. See also D. Fago, Wisconsin Department of Natural Resources Research Report No. 148,* Retrieval and Analysis Used in Wisconsin's Statewide Fish Distribution Survey, Second Edition, *December 1988.*

Map 7

PARK AND LAKE-ACCESS SITES IN THE VICINITY OF LITTLE MUSKEGO LAKE



DATE OF PHOTOGRAPHY: MARCH 2000

PARK OR LAKE ACCESS SITE

GRAPHIC SCALE
0 650 1300 FEET

Source: SEWRPC.

Table 7

RECREATIONAL USE SURVEY ON LITTLE MUSKEGO LAKE: 2002

Date and Time	Weekday Participants									
	Fishing from Shoreline	Pleasure Boating	Skiing/ Tubing	Sailing	Personal Watercraft	Swimming	Fishing Boat	Paddleboat	Other	Total
August 8, 2002										
9:00 a.m. to 11:00 a.m.	1	0	1/1	0	1	0	5	0	1[a]	10
1:00 p.m. to 3:00 p.m.	0	4	0/4	0	2	17	5	0	0	32
Total	1	4	6	0	3	17	10	0	1	42
Percent	2	11	14	0	7	40	24	0	2	100

Date and Time	Weekend Participants									
	Fishing from Shoreline	Pleasure Boating	Skiing	Sailing	Personal Watercraft	Swimming	Fishing Boat	Paddleboat	Other	Total
August 24, 2002										
9:30 a.m. to 11:30 a.m.	10	7	20	4	5	2	22	0	1[b]	71
1:30 p.m. to 3:30 p.m.	9	5	25	2	10	7	13	1	0	72
Total	19	12	45	6	15	9	35	1	1	143
Percent	13	8	31	5	10	7	24	1	1	100

[a]*One kayaker.*

[b]*One scuba diver.*

Source: SEWRPC

Table 8

WATERCRAFT ON LITTLE MUSKEGO LAKE: 2002

Type of Watercraft									
Power Boat	Fishing Boat	Pontoon Boat	Canoe	Paddleboat	Sailboat	Personal Watercraft	Kayak	Other	Total
207	121	240	55	99	23	112	12	6[a]	875

[a]*Five unknown watercraft, and one floating trampoline.*

Source: SEWRPC.

The City of Muskego has adopted a construction site erosion control ordinance that is administered and enforced by the City in both the shoreland and nonshoreland areas of the City of Muskego. This ordinance is based upon the model ordinance developed by Wisconsin Department of Natural Resources in cooperation with the League of Wisconsin Municipalities. The City also has a shoreland overlay district that provides additional protections to shoreland areas within the City with respect to lakeshore development. Shoreland wetlands are also protected pursuant to the requirements of Chapter NR 117 of the *Wisconsin Administrative Code*. Final state wetland inventory maps were delivered to both the City of Muskego and City of New Berlin during 1986, when the enabling ordinances were adopted.

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Chapter III

ALTERNATIVE AND RECOMMENDED AQUATIC PLANT MANAGEMENT PRACTICES

INTRODUCTION

The abundance of aquatic plants, including muskgrass, eel grass, coontail, Elodea, and Eurasian water milfoil, continues to be perceived as a nuisance by Little Muskego Lake users. Ongoing aquatic plant management measures have, in part, maintained the abundance and distribution of these plants in such a condition as to minimize user-related concerns. Notwithstanding, localized recreational use problems are experienced in various areas of the Lake. These problems depend on the uses in those portions of the Lake, but generally involve the abundant growths of coontail and Eurasian water milfoil. These plants often grow to the surface of the Lake, making certain recreational uses in those areas of the Lake less enjoyable, in addition to impairing the aesthetic quality of the Lake. These plants primarily interfere with recreational boating activities by entangling propellers and clogging cooling water intakes, impairing slow-speed boating activity, and impeding navigation by sailing vessels and human-powered watercraft. The shallow, northern portions of the Lake especially have severe boating limitations as a result of the extensive and abundant growths of aquatic plants in this area. Without control measures, this area could become impassable for navigation.

In addition to boating activities, use of the Lake for fishing and swimming also is adversely affected by aquatic plant growth. The swimming area at Idle Isle Park on the northern shore of the Lake is coincident with an area of Eurasian water milfoil dominance. Milfoil occurs in this area at swimming depth, and exists in portions of the Lake having water depths of up to about five feet. Other plants that are found at slightly deeper depths, nine feet to 11 feet, in this area include coontail, muskgrass, and a number of pondweeds. These plants also pose potential problems for swimming and can interfere with angling activities, especially in shoreline areas.

In general, the abundance of aquatic plants throughout the lake basin is perceived as adversely affecting the aesthetic enjoyment of lake residents and visitors to the Lake. Thus, aquatic plant management is an important issue to be considered.

Following a brief summary of the ongoing lake management program, alternatives and recommended refinements to the existing aquatic plant management element of the adopted lake management plan[1] are described in this chapter. The alternatives and recommendations set forth herein are focused on those measures which are

[1] *SEWRPC Community Assistance Planning Report No. 222,* A Lake Management Plan For Little Muskego Lake, Waukesha County, Wisconsin, *June 1996.*

applicable to the Little Muskego Lake Management District, with lesser emphasis given to measures which are applicable to others with jurisdiction within the drainage area tributary to Little Muskego Lake.

PAST AND PRESENT AQUATIC PLANT MANAGEMENT ACTIONS

The residents of Little Muskego Lake, in conjunction with the City of Muskego and in partnership with the Little Muskego Lake Association, have long recognized the importance of informed and timely action in the management of Little Muskego Lake. The Little Muskego Lake Management District was created as the principle organ for the conduct of lake management activities within the Little Muskego Lake basin. As noted in the aforereferenced adopted lake management plan, this District, in cooperation with the Little Muskego Lake Association, has undertaken regular water quality and aquatic plant monitoring. Some of these activities were conducted under the auspices of the Wisconsin Department of Natural Resources Self-Help Monitoring Program and Priority Watershed Program.[2] Since 1986, Little Muskego Lake participated in the U.S. Geological Survey trophic state monitoring program.[3]

Abundant aquatic plant growths in Little Muskego Lake led the Little Muskego Lake Management District to operate an aquatic plant harvester throughout the summer months, and treat specific areas of the Lake with chemical herbicides. Even so, concerns continue to exist over the lake water quality, primarily in relation to the control of aquatic plants. Therefore, this report is designed to supplement and refine the existing Little Muskego Lake management plan with respect to the management of aquatic plant communities in Little Muskego Lake.

AQUATIC PLANT MANAGEMENT MEASURES

Aquatic plant management[4] refers to a group of management and restoration measures aimed at both removal of nuisance vegetation and manipulation of species composition in order to enhance and provide for recreational water use and encourage the development of a natural plant community that will result in a healthy lake ecosystem. Generally, aquatic plant management measures are classed into four groups; namely, physical measures which include water level management; manual and mechanical measures which include harvesting and removal; chemical measures which include using aquatic herbicides; and biological controls which include the use of various organisms, including insects. These controls are stringently regulated and require a State permit pursuant to the provisions of Chapters NR 107 and/or NR 109 of the *Wisconsin Administrative Code.*

The costs of aquatic plant management actions range from minimal for manual removal of plants using rakes and hand-pulling to upwards of $120,000 for the purchase of a mechanical plant harvester with operational costs of about $40,000 per year or more, depending on staffing and operating policies. Harvesting is probably the measure best applicable to large areas, while chemical controls may be best suited to confined areas and initial control of invasive plants. Planting of native plant species and control of Eurasian water milfoil by the weevil, *Eurhychiopsis lecontei*, are largely experimental in lakes, but can be considered in specialized shoreland areas.

Aquatic Herbicides

Chemical treatment with aquatic herbicides is a short-term method of controlling heavy growths of aquatic macrophytes and algae. The use of herbicides can contribute to an ongoing aquatic plant problem by increasing the natural rates of accumulation of decaying organic matter, in turn contributing to an increased oxygen demand

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[2]*Wisconsin Department of Natural Resources Publication No. PUBL-WR-375-94,* A Nonpoint Source Control Plan for the Muskego-Wind Lakes Priority Watershed Project, *October 1993.*

[3]*See U.S. Geological Survey Open-File Report 95-190,* Water-Quality and Lake-Stage Data for Wisconsin Lakes, Water Year 1994, *1995, and subsequent editions through 2001.*

[4]*U.S. Environmental Protection Agency Report No. EPA-440/4-90-006,* The Lake and Reservoir Restoration Guidance Manual, *August 1990.*

which may cause anoxia. The use of herbicides can also potentially damage or destroy nontarget plant species that provide needed habitat for fish and other aquatic organisms. As a result, less desirable, invasive, introduced plant species may outcompete the more beneficial, native species. Hence, this is not a feasible management option to be used on a large scale. However, chemical control is often a viable technique for the control of the relatively small-scale infestations of Eurasian water milfoil and certain other plants such as curly-leaf pondweed and purple loosestrife. Chemicals are applied to the growing plants in either liquid or granular form. Chemical treatment can be administered at a relatively low cost and is, therefore, considered a viable management option to continue. This measure is considered as viable for selected areas in Little Muskego Lake.

Chemical applications should be conducted in accordance with current Department of Natural Resources administrative rules, under the authority of a State permit, and by a licensed applicator working under the supervision of WDNR staff. Records accurately delineating treated areas, and the type and amount of herbicide used in each area, should be carefully documented and used as a reference in applying for permits in the following year. A recommended checklist is provided as Figure 3.

Aquatic Plant Harvesting

On the basis of previous use of a mechanical harvester on Little Muskego Lake, mechanical harvesting of aquatic plants appears to be a practical and efficient means of controlling plant growth as it removes the plant biomass and nutrients from Little Muskego Lake. Aquatic macrophytes are mechanically harvested with specialized equipment consisting of a cutting apparatus which cuts up to five feet below the water surface and a conveyor system that picks up the cut plants and hauls them to shore. Harvesting leaves enough plant material in the lake to provide shelter for fish and other aquatic organisms and to stabilize sediments. Mechanical harvesting does have some potentially negative impacts to fish and other aquatic life, may cause fragmentation and spread of some plants, and could disturb loosely consolidated bottom sediments. However, if done correctly and carefully, it has shown to be of benefit in ultimately reducing the regrowth of nuisance plants. Mechanical harvesting is a recommended method to continue as a control of aquatic plants in Little Muskego Lake.

Manual Harvesting

Due to an inadequate depth of water, it is not always possible for harvesters to reach the shoreline of every property. Manual harvesting, using rakes or other devices, can be effective in these limited water depths. Specially designed rakes are available to manually remove aquatic plants from the shoreline area and can be purchased commercially. Should the Lake Management District acquire a number of these specialty rakes, the rakes could be made available for the riparian owners to use on a trial basis to test their operability before purchasing them individually. The advantage of the rake is that it is easy and quick to use, immediately removing the plants from the lakeshore. Using this method also removes the plants from the lake, avoiding the accumulation of organic matter on the lake bottom adding to the nutrients that favor more plant growth. This method also gives the harvester more time to cover larger areas of the lake as maneuvering between the piers takes time and skill, and increases risk of collateral damage to boats and property. Manual harvesting is considered a feasible aquatic plant management measure for shallow waters of limited surface area.

Biological Controls

Another approach to controlling nuisance aquatic plant conditions, particularly in the case of Eurasian water milfoil, is biological control. Classical biological control has been successfully used to control a variety of aquatic plants.[5] Recent documentation states that *Eurhychiopsis lecontei*, an aquatic weevil species, has potential as a biological control agent for Eurasian water milfoil.[6] However, very few studies have been completed in

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[5]*C.B. Huffacker, D.L. Dahlsen, D.H. Janzen, and G.G. Kennedy,* Insect Influences in the Regulation of Plant Population and Communities, *1984, pp. 659-696; C.B. Huffacker and R.L. Rabb, editors,* Ecological Entomology, *John Wiley, New York, New York, USA.*

[6]*Sally P. Sheldon, "The Potential for Biological Control of Eurasian Water Milfoil (*Myriophyllum spicatum*) 1990-1995 Final Report," Department of Biology Middlebury College, February 1995.*

Figure 3

DISTRICT CHECKLIST FOR HERBICIDE APPLICATION

- ☐ Nuisance report completed defining areas of potential treatment
- ☐ Permit filed with the Wisconsin Department of Natural Resources
- ☐ Certified applicator hired[a]
- ☐ Required public notice in the newspaper
- ☐ Public informational meeting (required if five or more parties request a meeting)
- ☐ Posting of areas to be treated in accordance with regulations (discussed previously in report)
- ☐ Weather conditions cooperating
  - Wind direction and velocity
  - Temperature

[a] *A licensed applicator will determine the amount of herbicide to be used, based upon discussions with appropriate staff from the Wisconsin Department of Natural Resources, and will keep records of the amount applied.*

Source: SEWRPC.

Wisconsin using *Eurhychiopsis lecontei* as a means of aquatic plant management control, with those studies that have been completed suggesting variable responses by in-lake aquatic plant communities to these aquatic insects. In general, these findings have indicated that the success of aquatic weevils for Eurasian water milfoil control in lakes that experience heavy boating traffic has been limited, with the insects being easily disturbed and washed off the plants by boat-generated wakes. Thus, use of biological controls is not recommended for use on Little Muskego Lake at this time. The Wisconsin Department of Natural Resources is conducting an evaluation of this measure on several Wisconsin lakes on an experimental basis. The findings of that program may be considered in the future to evaluate the viability of this measure to Little Muskego Lake. The use of grass carp, *Ctenopharyngodon idella*, is not permitted in Wisconsin.

Physical Barriers

Lake bottom covers and light screens provide limited control of rooted plants by creating a physical barrier which reduces or eliminates the sunlight available to the plants. They have been used to create swimming beaches on muddy shores, to improve the appearance of lakefront property, and to open channels for motorboating. Sand and gravel are usually readily available and relatively inexpensive to use as cover materials, but plants readily recolonize areas so covered in about a year. Synthetic materials, such as polyethylene, polypropylene, fiberglass, and nylon, can provide relief from rooted plants for several years. However, these structures must be placed and

removed annually. Because of the limitations involved, lake bottom covering as a method to control aquatic plant growth is not recommended for Little Muskego Lake.

Boating Ordinances
The promulgation of more stringent controls on the use of powered watercraft within Little Muskego Lake is one means of regulating the conduct of boat traffic which could be harmful to the most important ecologically valuable areas in the Lake. These areas include the WDNR-designated environmentally sensitive areas in the northern, eastern and western portions of the Lake basin and areas in which the greatest diversity of native aquatic plant species occurs. The major islands in the Lake basin are located within the WDNR-designated sensitive areas, and stabilization of erosional areas on their shorelines could also benefit from reduced wake waves in their vicinities.

Controls on boat traffic are currently set forth in Chapter 20, Public Waters and Beaches, of the City of Muskego ordinances, appended hereto as Appendix C. Additional controls could be put in place by amending the current provisions to further limit boating activity within specific areas of the Lake to defined traffic lanes within the Lake, thereby minimizing new colonization and proliferation of Eurasian water milfoil and the propagation of nuisance plant species by the operation of watercraft. This concept is inherent in the lake access zones previously identified in the adopted lake management plan, especially as they relate to habitat areas. Should such an alternative be considered, boat traffic lanes must be designated by approved regulatory markers and conform to Section NR 5.09 of the *Wisconsin Administrative Code*.[7] This section requires that restrictions placed on the use of the waters of the State be predicated upon the protection of public health, safety, or welfare. Boating ordinances, enacted in conformity with State law, must be clearly posted at public landings in accordance with the requirements of Section 30.77(4) of the *Wisconsin Statutes*. Notwithstanding, given the current level of regulation of public recreational boating traffic on the Lake, no further regulation appears to be warranted at this time on Little Muskego Lake.

Public Information
Aquatic plant management usually centers on the eradication of nuisance aquatic plants for the improvement of recreational lake use. The majority of the public views all aquatic plants as "weeds" and residents often spend considerable time and money removing desirable plant species from a lake without considering their environmental impacts. Thus, public information is an important component of an aquatic plant management program for Little Muskego Lake, and is recommended as an ongoing element of the aquatic plant management program on the Lake. Posters and pamphlets are available from the University of Wisconsin-Extension and Wisconsin Department of Natural Resources that provide information and illustrations of aquatic plants, their importance in providing habitat and food resources in aquatic environments, and the need to control the spread of undesirable and nuisance plant species.

RECOMMENDED AQUATIC PLANT MANAGEMENT MEASURES

The goal of the management program is to accommodate a range of recreational uses of the Lake to the extent practicable and to enhance the public perception of the Lake as a centerpiece of the City of Muskego, without inflicting irreparable damage to the ecosystem of Little Muskego Lake and its structure and functioning. To

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[7]*Two general types of buoyage exist: regulatory buoys, such as those used to demarcate slow-no-wake or exclusionary areas; and informational buoys, such as those used to enhance public awareness. Buoys must be white in color, cylindrical in shape, seven or more inches in diameter, and extend 36 or more inches above the water line. Regulatory buoys include buoys used to demarcate restricted areas, prohibit boating or types of boating activities in specific areas, and control the movements of watercraft. Regulatory buoys used to demarcate regulated areas display their instructions in black lettering. Some types of regulatory buoys display an orange diamond with an orange cross inside; others display an orange circle. Informational buoys are similar in construction to the regulatory buoys, but contain an orange square on the white background. Whereas regulatory markers are enforceable, informational buoys are not.*

accomplish this goal, specific control measures are recommended to be applied in various areas of the Lake. The refined recommended Little Muskego Lake aquatic plant management measures are graphically summarized on Map 8, and the recommended measures are summarized in Table 9. It is recommended that the Little Muskego Lake Management District continue to take the lead in implementing the refined plan.

Harvesting Plan

The recommended aquatic plant management plan consists of the integrated use of mechanical and manual harvesting, supplemented as necessary through the limited application of appropriate aquatic herbicides, designed to minimize the negative impacts on the ecologically valuable areas of the Lake while providing a level of control needed to facilitate the desired recreational uses of the Lake. In addition, such management measures are recommended to be supplemented by an informational and educational program.

In order to implement the recommended aquatic plant management program, the following management actions are recommended:

1. The continued operation by the Little Muskego Lake Management District of the existing harvesters and transport equipment, and replacement of that equipment as required.

2. The conduct of shoreline clean up activities to collect aquatic plant fragments and limit the spread of Eurasian water milfoil in the Lake; consideration should be given to the acquisition and operation of skimming equipment as one means of facilitating the collection and removal from the Lake of aquatic plant fragments that accumulate in nearshore areas.

3. The maintenance of the shared access channels, which should be harvested in such manner as to minimize the potential detrimental effects on the fish and invertebrate communities. Directing boat traffic through these common channels would help to delay the regrowth of vegetation in these areas.

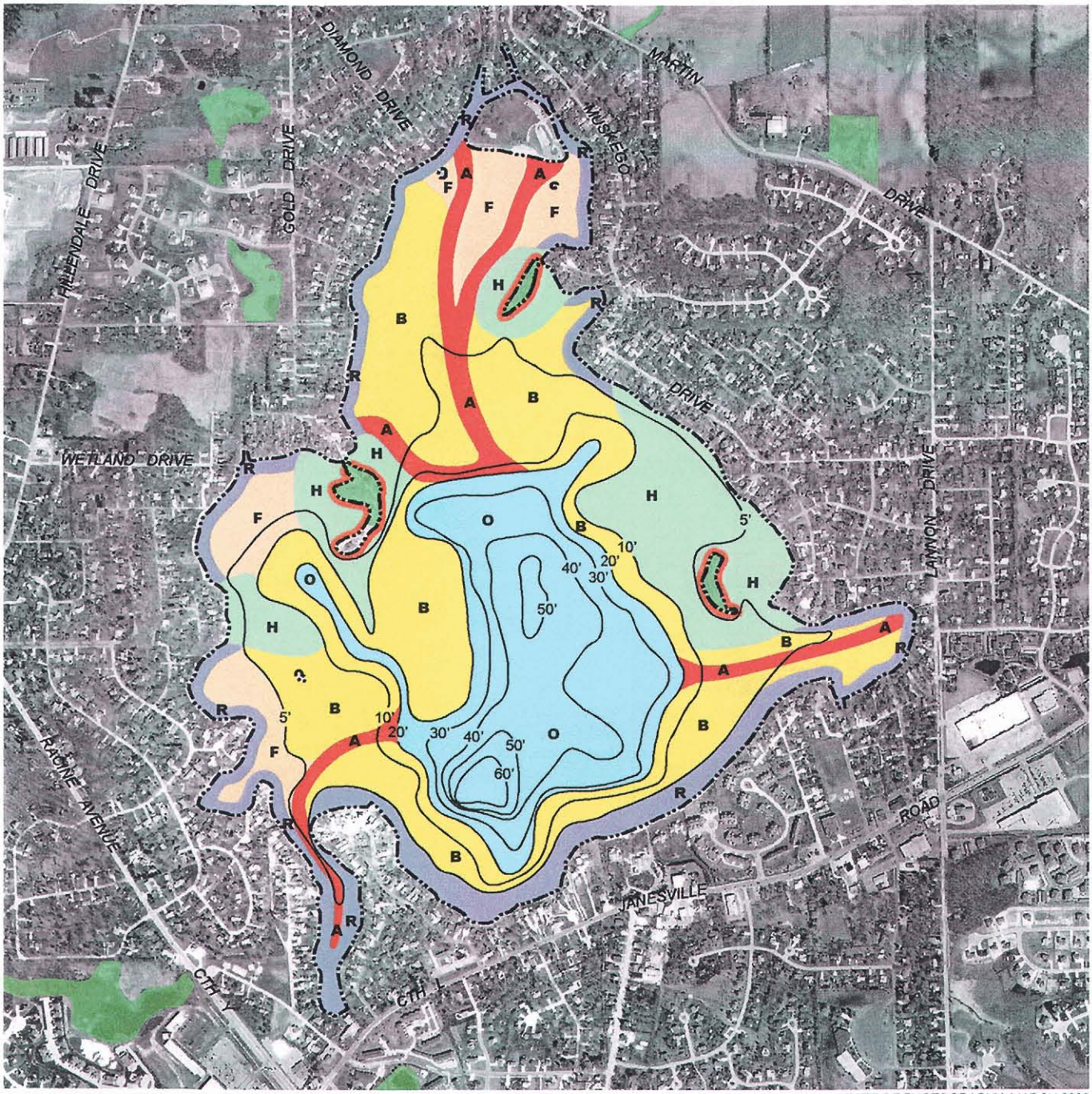
4. The control of State-designated nonnative aquatic plant species, including those currently proposed for specific control measures pursuant to Chapter NR 109 of the *Wisconsin Administrative Code*, Eurasian water milfoil and curly-leaf pondweed, using mechanical harvesting supplemented as appropriate by use of aquatic herbicide treatments throughout the Lake.

5. The use of shallow harvesting, cutting at approximately two feet to remove the surface canopy of nonnative plants such as Eurasian water milfoil, to provide a competitive advantage to the low-growing native plants in the Lake is recommended. By not disturbing these low-growing species, which generally grow within one to two feet of the lake bottom and in relatively low densities, and leaving the root stocks and stems of the cut plants in place, the resuspension of sediments in the Lake will be minimized. This type of harvesting should be focused, primarily, on boating channels around the perimeter of the principle lake embayments, and, secondarily, on other areas with extensive growths of Eurasian water milfoil.

6. The use of chemical herbicides, notwithstanding those applications indicated for the control of State-designated nonnative invasive species, should be limited elsewhere in the Lake, if found to be necessary, to controlling nuisance growths of aquatic plants in shallow water around docks and piers. Only herbicides that are selective in their control, such as 2,4-D and fluridone, should be used. Algicides, such as Cutrine Plus, generally are not recommended as algal blooms are rare in the Lake, and valuable macroscopic algae, such as *Chara* and *Nitella*, may be killed by this product. It is recommended that chemical applications, if required, should be made in early spring to maximize their effectiveness on nonnative plant species, minimize their impacts on native plant species, and act as a preventive measure to reduce the development of nuisance conditions.

Map 8

RECOMMENDED AQUATIC PLANT MANAGEMENT PLAN FOR LITTLE MUSKEGO LAKE



DATE OF PHOTOGRAPHY: MARCH 2000

—20'— WATER DEPTH CONTOUR IN FEET

REPAIR ERODED AREAS USING VEGITATION

AQUATIC PLANT MANAGEMENT

- **A** — ACCESS: HARVEST RECREATIONAL BOATING ACCESS CHANNELS APPROXIMATELY 50 FEET WIDE
- **B** — BOATING / RECREATION: SURFACE CUT OF EURASIAN WATER MILFOIL, HARVESTING MODERATE PRIORITY
- **R** — RIPARIAN ZONE: MAINTAIN SHORELINE PROTECTION STRUCTURES AS NECESSARY, INSTALL VEGETATIVE BUFFERS, MANUALLY HARVEST AQUATIC PLANTS AROUND PIERS AND DOCKS
- **O** — OPEN WATER: DEPTH GREATER THAN 20 FEET - NO AQUATIC MANAGEMENT MEASURES RECOMMENDED
- **F** — FISH BREEDING AND HABITAT/ANGLING AREAS - NO AQUATIC PLANT MANAGEMENT MEASURES RECOMMENDED DURING FISH BREEDING SEASON

Source: SEWRPC.

- **H** — WISCONSIN DEPARTMENT OF NATURAL RESOURCES -DELINEATED ENVIRONMENTALLY SENSITIVE AREAS RECOMMENDED FOR PROTECTION

LAND USE MANAGEMENT

- PROTECT ENVIRONMENTAL CORRIDORS
- OBSERVE GUIDELINES SET FORTH IN THE COUNTY DEVELOPMENT PLAN, MAINTAIN HISTORIC LAKEFRONT RESIDENTIAL DWELLING DENSITIES
- PROMOTE GOOD HOUSEKEEPING PRACTICES IN URBAN AREAS

WATER QUALITY MANAGEMENT

- CONTINUE PARTICIPATION IN WISCONSIN DEPARTMENT OF NATURAL RESOURCES SELF-HELP MONITORING PROGRAM

FISHERIES MANAGEMENT

- CONTINUE TO MONITOR FISH POPULATIONS, MODIFY STOCKING/ HARVESTING PROGRAM AND REGULATIONS, AS NECESSARY

PUBLIC INFORMATION AND EDUCATION

- CONTINUE PUBLIC AWARENESS PROGRAM

GRAPHIC SCALE

0 650 1300 FEET

Table 9

RECOMMENDED AQUATIC PLANT MANAGEMENT PLAN ELEMENTS FOR LITTLE MUSKEGO LAKE

Plan Element	Subelement	Location	Management Measures	Initial Estimated Cost	Management Responsibility
Recreational Use Management	Recreational use zoning	Entire Lake	Protect native aquatic plant communities, fish breeding and habitat areas, and designated environmentally sensitive areas as set forth in the adopted lake management plan	$ 500	Little Muskego Lake Management District, City of Muskego and WDNR
	Lakewide nonnative species management program	Eurasian water milfoil control zone, purple loosestrife and zebra mussel control	Prevent the spread of nonnative plants and animals through cleaning of boats, trailers and related facilities throughout the Lake; limited use of herbicides in spring, manual removal during summer and fall, is recommended	--	Little Muskego Lake Management District, City of Muskego and WDNR
	Public informational programming	Direct drainage area tributary to Little Muskego Lake	Continue public awareness and information programming	--	Little Muskego Lake Management District and Little Muskego Lake Association, Inc.
Aquatic Plant Management	Manual harvesting	Localized areas of shoreline	Harvest nuisance plants, including Eurasian water milfoil and purple loosestrife, as required around docks and piers; collect plant fragments arising from boating and harvesting activities	--[a]	Little Muskego Lake Management District and individuals
	Mechanical harvesting	Major and minor channel harvesting	Harvest nuisance plants, including Eurasian water milfoil, to maintain public recreational boating access promote public safety and convenience, and enhance angling opportunities	$40,000[b]	Little Muskego Lake Management District
	Chemical controls	Localized areas of the Lake, especially in proximity to docks and piers	Control aquatic plants through limited use of herbicides in spring; manual removal, as noted above, is recommended during summer and fall	$ 5,000	Little Muskego Lake Management District
	Eurasian water milfoil control	Lakewide	Control nonnative, invasive species as required to prevent the spread of nuisance species within the Lake; use of herbicides in spring to limit the volume of decomposing biomass and quantity of herbicides required is recommended	$10,000	Little Muskego Lake Management District and individuals
	Public informational programming	Direct drainage area tributary to Little Muskego Lake	Continue public awareness and information programming; continue monitoring of aquatic plant communities	$ 1,500[b,c]	Little Muskego Lake Management District and Little Muskego Lake Association, Inc.

[a] *Measures recommended generally involve low or no cost and would be borne by private property owners. Cost is included under public informational and educational component.*

[b] *Partial funding available through the Wisconsin Department of Natural Resources grant programs.*

[c] *Periodic additional surveys are recommended at five- to 10-year intervals.*

Source: SEWRPC.

7. The control of rooted vegetation between adjacent piers is recommended to be left to the riparian owners concerned, as it is time consuming and costly for the mechanical harvester to maneuver between piers and boats and such maneuvering may entail liability for damage to boats and piers. As an alternative, it is recommended that the Little Muskego Lake Management District obtain informational brochures regarding shoreline maintenance, such as information on hand-held specialty rakes made for this specific purpose, to be made available to these residents.

8. It is recommended that ecologically valuable areas be restricted from aquatic plant management activities, especially during fish spawning seasons in early summer and autumn.

9. The continuation by the Little Muskego Lake Management District and riparian communities of educational and informational programming within the aquatic plant management program for the Lake is recommended. Such programming can provide students and householders with information on the types of aquatic plants in Little Muskego Lake and the value of and the impacts of these plants on water quality, fish, and on wildlife; and on alternative methods for controlling existing nuisance plants, including the positive and negative aspects of each method. An organized aquatic plant identification "day" is one method of providing effective informational programming to lake residents. Other sources of information and technical assistance include the Department of Natural Resources Aquatic Plant Monitoring Program and the University of Wisconsin-Extension Service. The aquatic plant illustrations provided in Appendix A may assist individuals interested in identifying plants near their residences. Residents should be encouraged to observe and document changes in the abundance and types of aquatic plants in their part of the Lake on an annual basis.

As noted, mechanical controls, or aquatic plant harvesting, supplemented, as necessary, by manual removal of plants in shallow water areas or around piers and docks, are recommended as the primary aquatic plant management measure for Little Muskego Lake. The ecologically valuable areas, and identified Chapter NR 107 environmentally sensitive areas, should be restricted from harvesting. In addition, harvesting should not take place in shallow waters, generally three feet or less, to avoid disturbance of fish spawning areas and beds of native aquatic plants. Special care should be taken to avoid disturbing major spawning areas of bass in Little Muskego Lake during spring spawning season, May 1st to June 30th, annually.

The primary objective of the management program is to accommodate recreational uses of the Lake, and to enhance the public perceptions of the Lake, without inflicting irreparable damage to the structure and functioning of the lake ecosystem. To accomplish this objective, specific control measures should be applied in each of the lake zones as summarized in Table 10 and shown on Map 9. The Lake has been divided into high-, moderate-, and low-priority harvesting areas. High-priority harvesting areas are those areas that are used for public recreational boating access. Moderate-priority harvesting areas are the areas used for general recreation. Low-priority harvesting areas are areas that are used primarily for passive recreation and/or where plant growth is observed to be sparse. As noted in the adopted lake management plan, additional areas have been designated as "no control" areas, and include important areas for fish spawning and habitat. These spawning and habitat areas should not be subjected to aquatic plant control measures before mid-June of each year, except in Eurasian water milfoil control areas where the dense growths of Eurasian water milfoil can negatively affect such habitat.

Harvesting operations elsewhere in the Lake basin should continue to be timed to minimize any impact on the fish spawning season. For this reason, harvesting generally should begin in mid- to late-May of each year. Also, harvesting should not take place in shallow waters, generally three feet or less in depth, to avoid disturbance to fish habitat and beds of native aquatic plants. As is currently the practice in the ongoing aquatic plant harvesting operations of the District, harvesting activities within areas where operators observe significant capture of fishes, eggs, fry, or fingerlings should be immediately curtailed so as to minimize potential impacts on the Lake fishery. The refined plan better targets the nuisance aquatic plants such as Eurasian water milfoil (*Myriophyllum spicatum*) and curly-leaf pondweed (*Potamogeton crispus*), as well as dense growths of coontail (*Ceratophyllum demersum*). The recommended, generalized sequence of the harvester operations on Little Muskego Lake is set forth in Figure 4. The operators of the harvester will be provided with laminated copies of the approved harvesting plan showing the limits of harvesting operations, as shown on Map 9. A copy of this map is to be kept on the harvester at all times.

Depth of Harvesting and Treatment of Fragments

The Aquarius Systems model H-420 Aquatic Plant Harvester has a maximum cutting depth of five feet. While this exceeds the water depth of about one-third of the Lake, it is not the intention to clear the Lake of aquatic plants given the heavy angling use, its morphology (which, in places, is not conducive to unrestricted motorized

Table 10

RECOMMENDED AQUATIC PLANT MANAGEMENT TREATMENTS FOR LITTLE MUSKEGO LAKE

Zone and Priority	Recommended Aquatic Plant Management Treatment[a]
Zone B (Boating) Moderate-Priority Harvesting	Harvesting to be limited to maintaining 75-foot-wide navigational channels along the perimeter of the Lake, and 30-foot-wide shared access lanes perpendicular to the shoreline extending towards the center of the Lake to allow boat access to the open water area of the Lake
	Limited late season harvesting (late August to early September) may be necessary to maintain adequate open water areas in the central portion of the Lake
Zone F (Fishing) Low-Priority Harvesting	Zone F is intended to accommodate fishing from a boat
	It is recommended that approximately 15-foot-wide channels be harvested perpendicular to the shore at about 100-foot intervals
	Chemical use, if required, should be restricted to selective control of nuisance species near the public access sites; no chemical controls are recommended during fish spawning periods in early spring and late autumn
Zone H (Habitat) No Harvesting	Wisconsin Department of Natural Resources-delineated environmentally sensitive areas; these selected areas of the Lake are recommended to be preserved as high-quality habitat area
	No harvesting or in-lake chemical application should be permitted, except in special instances where selective herbicide application may be allowed for the control of nuisance species
	Debris and litter cleanup would be needed in some adjacent areas; the immediate shoreline should be preserved in natural, open use to the extent possible
Zone O (Open Water) Low-Priority Harvesting[b]	Harvesting should be conducted in selected areas of the deeper water to provide a larger shared space for boating and fishing
	Navigation channels approximately 30 feet in width, should be harvested
Zone R (Riparian Access) High-Priority Harvesting	Littoral zone. The entire area may not require intensive plant management
	Nuisance aquatic macrophyte growth within 150 feet of shoreline should be harvested to provide maximum opportunities for boating, fishing, and limited swimming
	Areas between piers should not be harvested due to potential liability and maneuverability problems. Residents are encouraged to manually harvest aquatic plants in these areas
	Additional 30-foot-wide shared access channels should be harvested to extend to the center of the Lake
Zone A (Recreational Boating Access) High-Priority Harvesting	Harvest a 75-foot-wide channel following the shorelines of the bays to connect to channels perpendicular to shore to allow access to the main body of the Lake
	Patterns of harvesting will vary yearly dependant on macrophyte abundance
	Chemical use, if required, should be restricted to pier and dock areas and should not extend more than 100 feet from shore; subject to permit requirements
Approximate Total Area to Be Harvested	230 acres

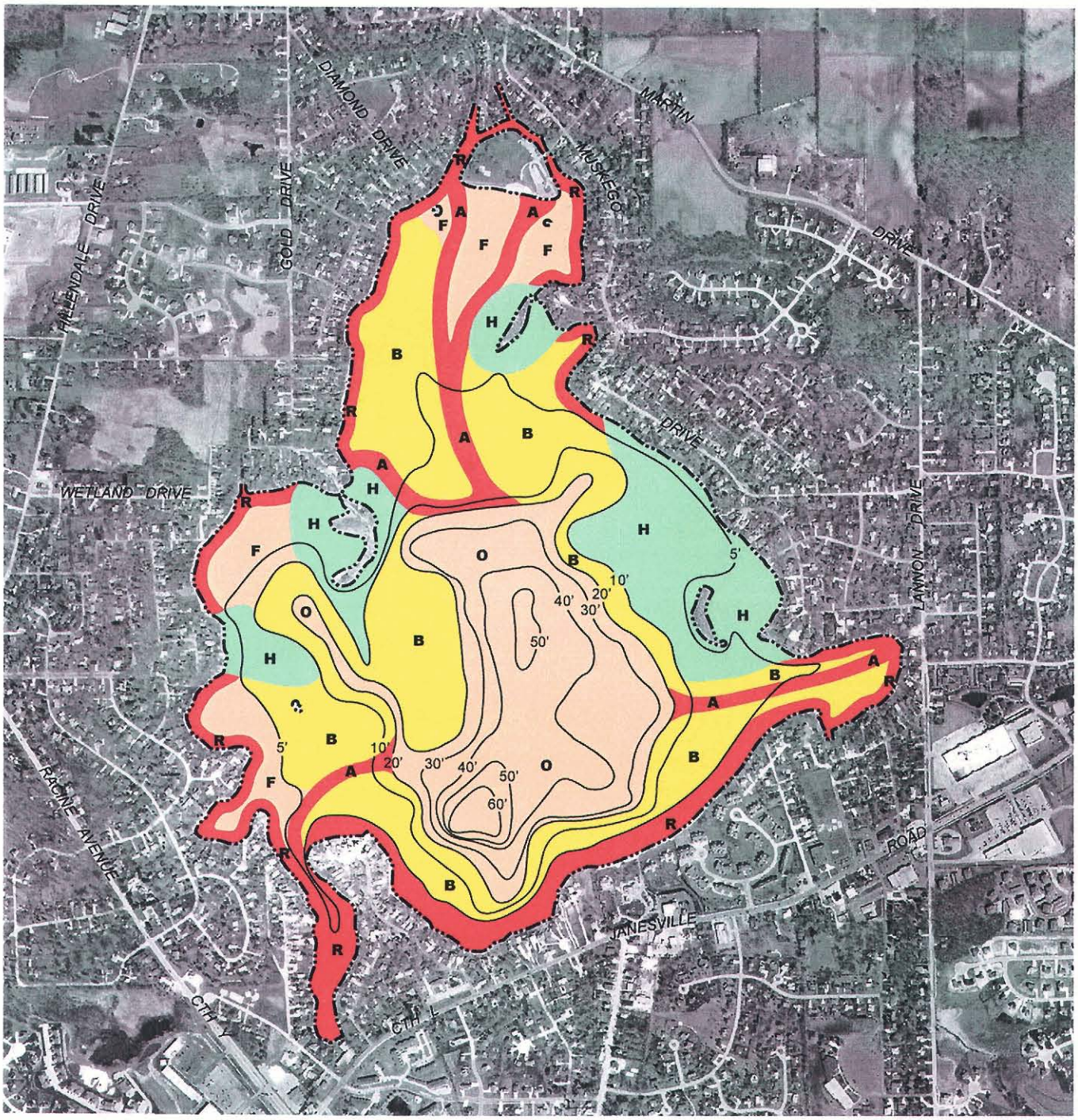
[a]*Control of State-designated nonnative aquatic plant species, currently including Eurasian water milfoil and curly-leaf pondweed, using appropriate aquatic plant control measures including harvesting, targeted herbicide treatment, and public informational programming, is recommended for lakewide application.*

[b]*Excludes areas greater than 15 feet which require no harvesting.*

Source: SEWRPC.

Map 9

AQUATIC PLANT HARVESTING ZONES FOR LITTLE MUSKEGO LAKE



DATE OF PHOTOGRAPHY: MARCH 2000

—20'— WATER DEPTH CONTOUR IN FEET

R AQUATIC PLANT MANAGEMENT ZONES AS DEFINED IN TABLES 10 AND 11

HIGH-PRIORITY HARVESTING: RIPARIAN AND ACCESS ZONES

MODERATE-PRIORITY HARVESTING: BOATING ZONE

LOW-PRIORITY HARVESTING: FISHING AND OPEN WATER ZONES

WISCONSIN DEPARTMENT OF NATURAL RESOURCES-DELINEATED ENVIRONMENTALLY SENSITIVE AREAS RECOMMENDED FOR PROTECTION

GRAPHIC SCALE

0 650 1300 FEET

Source: SEWRPC.

Figure 4

HARVESTING SEQUENCE FOR LITTLE MUSKEGO LAKE[a]

A. HARVEST NAVIGATIONAL CHANNELS IN **ZONE A**, TO 75 FEET IN WIDTH OR AS POSSIBLE, AS SHOWN ON MAP 9; MAINTAIN NAVIGATIONAL CHANNELS IN **ZONE B** IN LITTLE MUSKEGO LAKE.

B. HARVEST CHANNELS 30 FEET IN WIDTH PARALLEL TO THE SHORELINE AND 30-FOOT-WIDE SHARED-ACCESS LANES PERPENDICULAR TO THE SHORELINE EXTENDING TOWARDS THE CENTER OF THE LAKE, AS SHOWN IN **ZONE R** ON MAP 9. THIS ENTIRE AREA MAY NOT REQUIRE INTENSIVE MANAGEMENT

C. HARVEST FISH LANES OF ABOUT 15 FEET IN WIDTH AS NECESSARY TO PROMOTE ANGLING WITHIN **ZONE F**, AS SHOWN IN MAP 9. DO NOT CLEAR CUT

D. MANUALLY HARVEST MOORINGS AND BEACH AREAS OF NO MORE THAN 30 LINEAR FEET OF SHORELINE FOR RIPARIAN ACCESS IN **ZONE R**, AS SHOWN ON MAP 9. HARVESTING TO BE CARRIED OUT BY INDIVIDUAL HOUSEHOLDERS WITH PIERHEAD COLLECTION OF HARVESTED PLANTS BY LITTLE MUSKEGO LAKE MANAGEMENT DISTRICT

E. CONTROL STATE-DESIGNATED NONNATIVE INVASIVE SPECIES AS REQUIRED THROUGHOUT THE LAKE BASIN: CONTROL MEASURES MAY INCLUDE MANUAL HARVESTING, MECHANICAL HARVESTING, AND TARGETED HERBICIDE TREATMENTS, AND SHOULD INCLUDE PUBLIC INFORMATIONAL PROGRAMMING WITH APPROPRIATE SIGNAGE AT ACCESS SITES.

NOTE: Sequence A and B could be done concurrently in one area of the Lake as a time-saving measure.

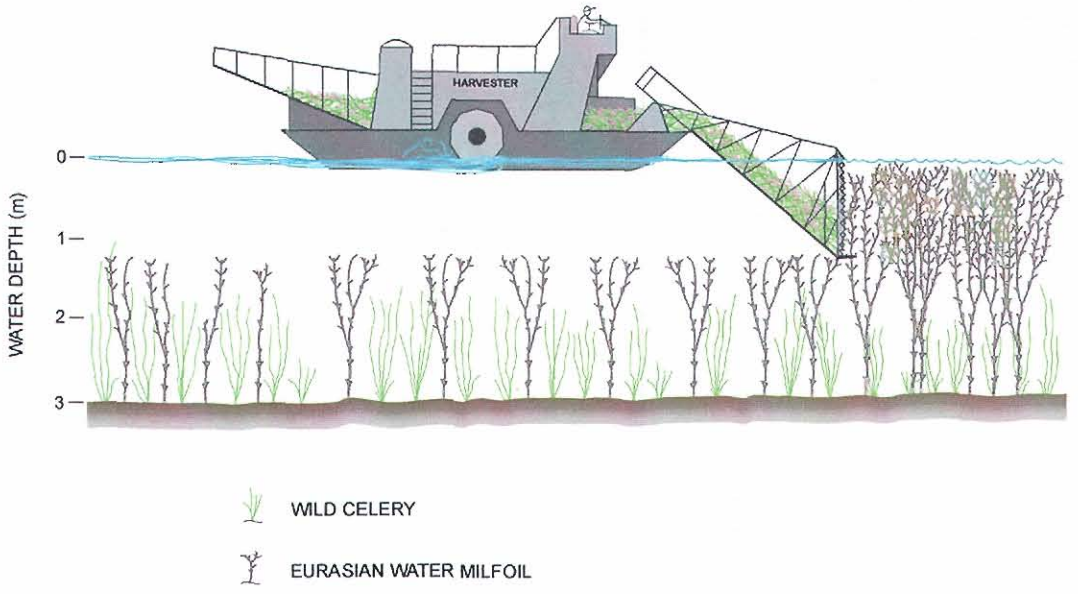
[a]No harvesting would be conducted in Zone H, within 100 feet of the island areas, or in Zone O, except as required for control of State-designated nonnative invasive species.

Source: SEWRPC.

boat traffic), and the program goals. Sufficient plant life will be retained in the Lake to minimize resuspension of lake bottom sediments, to maintain desirable plant communities, and to continue to provide adequate habitat for fish and aquatic life. To this end, top cutting of plants, such as Eurasian water milfoil, as shown in Figure 5, is recommended, especially in Zones B and F, where narrow channels could be harvested to provide navigational

Figure 18

PLANT CANOPY REMOVAL WITH AN AQUATIC PLANT HARVESTER



NOTE: *Selective cutting or seasonal harvesting can be done by aquatic plant harvesters. Removing the canopy of Eurasian water milfoil may allow native species to reemerge.*

Source: Wisconsin Department of Natural Resources and SEWRPC.

access and "cruising lanes" for predator fish to migrate into the macrophyte beds to feed on smaller fish. The harvester, supplemented where necessary by a mechanical skimmer specially designed to collect plant fragments, will collect all plant cuttings and fragments on site. The District or the riparian householders should collect fragments accumulating on the shore. Fragments can be used as garden mulch.

Buoyage

Temporary marker buoys may be used to direct harvesting operations in the Lake by marking the areas to be cut. However, the size of the Lake generally precludes the need for such buoys, except as they are required for the control of boating traffic. Demarcation of navigational channels within the boating access areas shown on Map 8, using regulatory buoys, is recommended to minimize the spread of nonnative plants, such as Eurasian water milfoil, within the Lake. The harvester operators will be provided with a laminated copy of the updated harvesting plan and made familiar with the plan and local landmarks to the degree necessary to carry out the plan without the use of buoys. District staff regularly supervise harvesting operations.

Harvested Plant Material Transfer and Disposal Sites

Off-loading of harvested plant material takes place at the boating access site, as shown on Map 9. Plant material is removed from the harvester, where it is transferred to a dump truck using a conveyor, and transported to disposal sites identified by the Little Muskego Lake Management District. Plant material should be collected and disposed of daily to avoid leaching of nutrients back into the Lake and to minimize the visual degradation of the area near the boat-launching site. The operators will strictly police the off-loading site to ensure minimal disruption of boaters and of the people using the riparian areas of the Lake.

Chemical Treatment

Chemical herbicides may be considered for the control of State-designated nonnative invasive species, currently including Eurasian water milfoil and curly-leaf pondweed, throughout the Lake basin. Use of targeted aquatic herbicides, approved for use within the State of Wisconsin, are recommended to be used as necessary to manage occurrences of designated nonnative species. Elsewhere, aquatic herbicides should be limited to controlling nuisance growths of exotic species in shallow water around docks and piers. As noted above, policies governing the use of these chemicals should first be developed by the Little Muskego Lake Management District, in consultation with the City of Muskego, Little Muskego Lake Association, and Wisconsin Department of Natural Resources. Only registered herbicides that are selective in their control, such as 2,4-D or fluridone,[8] should be used. Algicides, such as Cutrine Plus, are not generally recommended as there are no significant recurring blooms of filamentous or planktonic algae in the Lake.

The Little Muskego Lake Management District, City of Muskego, Little Muskego Lake Association and the Wisconsin Department of Natural Resources should work together to develop a reasonable herbicide usage policy to control the growth of purple loosestrife, curly-leaf pondweed and Eurasian water milfoil growths in and around the Lake. Early spring treatment to control Eurasian water milfoil and curly-leaf pondweed growth in the Lake has proven effective in other lakes in Southeastern Wisconsin and is recommended. It is recommended that chemical application be made in the early spring to maximize its effectiveness and to act as a preventive measure to target Eurasian water milfoil and curly-leaf pondweed. This treatment should be done in late May for best results. Treatment of purple loosestrife stands is recommended to be undertaken prior to the flowering of the plant; treatment conducted thereafter should be done in such manner as to ensure that the seed heads are "bagged" prior to cutting the plant and applying the herbicide to limit reseeding of the plant.

Precautions to Protect Wildlife, Fish, and Ecologically Valuable Areas

Harvester operators and chemical applicators will be provided with a laminated copy of the approved harvesting plan, set forth on Map 9. It is proposed that aquatic plant management activities be restricted in certain ecologically valuable areas of the Lake. The WDNR-delineated sensitive areas, generally, should be excluded from aquatic plant management, except insofar as necessary to maintain the existing boating access channels. Areas considered being important for fish spawning, areas of three feet or less in depth, should also be excluded from aquatic plant management operations. In addition to these generalized precautions, the Little Muskego Lake Management District trains staff to visually observe fishes and aquatic animals being captured during the harvesting operations, and adjust their operations accordingly; where numbers of juvenile or mature fishes and aquatic animals are observed, the harvester operators cease operations within the area and withdraw the harvester. Continuation of these practices is recommended to protect fish and wildlife within Little Muskego Lake, especially in proximity to WDNR-designated environmentally sensitive areas.

Harvesting Schedule

The harvesting season is recommended to begin in mid- to late-May to accommodate the fish spawning activities and should end no later than mid-September of each year. Harvesting should average between 30 and 35 hours per week over a five-day week, depending on weather conditions and plant growth, to minimize recreational use conflicts. In addition, harvesting will be confined to daylight hours to minimize public disturbances resulting from these operations.

Evaluation and Monitoring

Daily Record-Keeping Relating to the Harvesting Operation

The operators of the harvesting equipment will record daily harvesting activities in a harvesting log. This includes daily maintenance and service records showing engine hours, fuel consumed, and oil used. An annual summary of the harvesting program will be submitted to the Little Muskego Lake Management District Board of

[8] *As of 2004, the Wisconsin Department of Natural Resources considers the use of fluridone in Wisconsin to be experimental.*

Commissioners (or other designated committee) at the annual meeting of the District, and made available to the electors of the District at that time.

It is the intention of the Little Muskego Lake Management District to undertake a periodic, formal review of the harvesting program as set forth in the adopted lake management plan for Little Muskego Lake, a copy of which has been lodged with the Wisconsin Department of Natural Resources Southeast Region office. Further, it is the intention of the District to publish periodic refinements of the aquatic plant management element of the lake management plan as recommended in the adopted lake management plan. It recommended that a further inventory be prepared in two to three years to confirm that the changes in the plant community are for reasons other than annual variability. It should be noted that 2002 has been described as an "unusual" year in the Southeastern Wisconsin Region, with milfoil being well-above expected levels in historic milfoil lakes and algal problems being more widespread.

Recreational Use Management

Recommended actions for the management of ecologically valuable areas and aquatic plants should be effected by the City of Muskego through its existing boating ordinance. It is recommended that the City reduce motorized boat traffic within the Eurasian water milfoil control areas shown on Map 9 to essential traffic only and define watercraft transit speeds and lanes consistent with the milfoil control areas and established patterns of recreational boating usage on the Lake. Such regulation may require buoyage depending on the sufficiency of the signage and notices provided to lake users and the level of compliance achieved. Copies of such an ordinance must be placed at the public access site as set forth in Section 30.77(4) of the *Wisconsin Statutes*.

Public Information

It is the policy of the Little Muskego Lake Management District and City of Muskego to maintain an active dialogue with the community. This is done through the medium of the public press and through public meetings and other scheduled hearings. In addition, it is recommended that a public education and information program continue to be conducted. This program should discourage human disturbances in ecologically valuable areas, except as may be necessary to provide riparian residents with a reasonable level of access to the main body of the Lake, and encourage Lake residents and visitors to be made aware of the invasive nature of species such as purple loosestrife and Eurasian water milfoil. This effort should also include awareness of zebra mussel control and related efforts to minimize the further spread of other exotic or nonnative species. Posting appropriate signage at public recreational boating access sites around the Lake is recommended. In addition, citizens and visitors should be encouraged to participate in citizen-based control programs coordinated by the Wisconsin Department of Natural Resources and University of Wisconsin-Extension. Where necessary, personal contacts with homeowners should be made, most likely through the Little Muskego Lake Association.

SUMMARY

This plan, which documents the findings and recommendations of a study requested by the Little Muskego Lake Management District, is a refinement of the aquatic plant management measures recommended in the adopted lake management plan for Little Muskego Lake.

The refined Little Muskego Lake aquatic plant management plan, shown on Map 9 and summarized in Tables 9 and 10, recommends actions to be taken to limit further human impacts on the in-lake macrophyte beds and reduce human impacts on the ecologically valuable areas adjacent to the lake and in its watershed. The plan recommends continued reliance on aquatic plant harvesting as the primary aquatic plant management measure employed on Little Muskego Lake. In addition to aquatic plant harvesting, the plan recommends only limited additional aquatic plant management actions, including selected manual removal and surveillance activities at this time, mainly in the cases where purple loosestrife, curly-leaf pondweed and Eurasian water milfoil are present, with the limited use of chemical treatment only to treat such species, if needed. The plan also recommends the use of demarcated boating lanes to limit motorized boating traffic through macrophyte beds that contain Eurasian water milfoil (*Myriophyllum spicatum*) and curly-leaf pondweed (*Potamogeton crispus*) to attenuate the further proliferation of this plant. Support for the conservation of lands within the primary environmental corridors to

ensure the protection and preservation of ecologically valuable areas within the drainage area tributary to Little Muskego Lake is also recommended.

Finally, the recommended plan includes the continuation of an ongoing program of public information and education being provided to both riparian residents and lake users. For example, additional options regarding household chemical usage, lawn and garden care, shoreland protection and maintenance, and recreational usage of the Lake should be made available to riparian householders, thereby providing riparian residents with alternatives to traditional alternatives and activities. Informational programming on the control of nonnative or exotic species, such as Eurasian water milfoil and zebra mussel, designed to limit their spread and onward transmission from Little Muskego Lake to other lakes within the southeastern Wisconsin region, is also recommended.

This recommended plan refines the adopted lake management plan for Little Muskego Lake, and seeks to balance the demand for high-quality residential and recreational opportunities at Little Muskego Lake with the requirements for environmental protection.

APPENDICES

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Appendix A

ILLUSTRATIONS OF COMMON AQUATIC PLANTS FOUND IN LITTLE MUSKEGO LAKE

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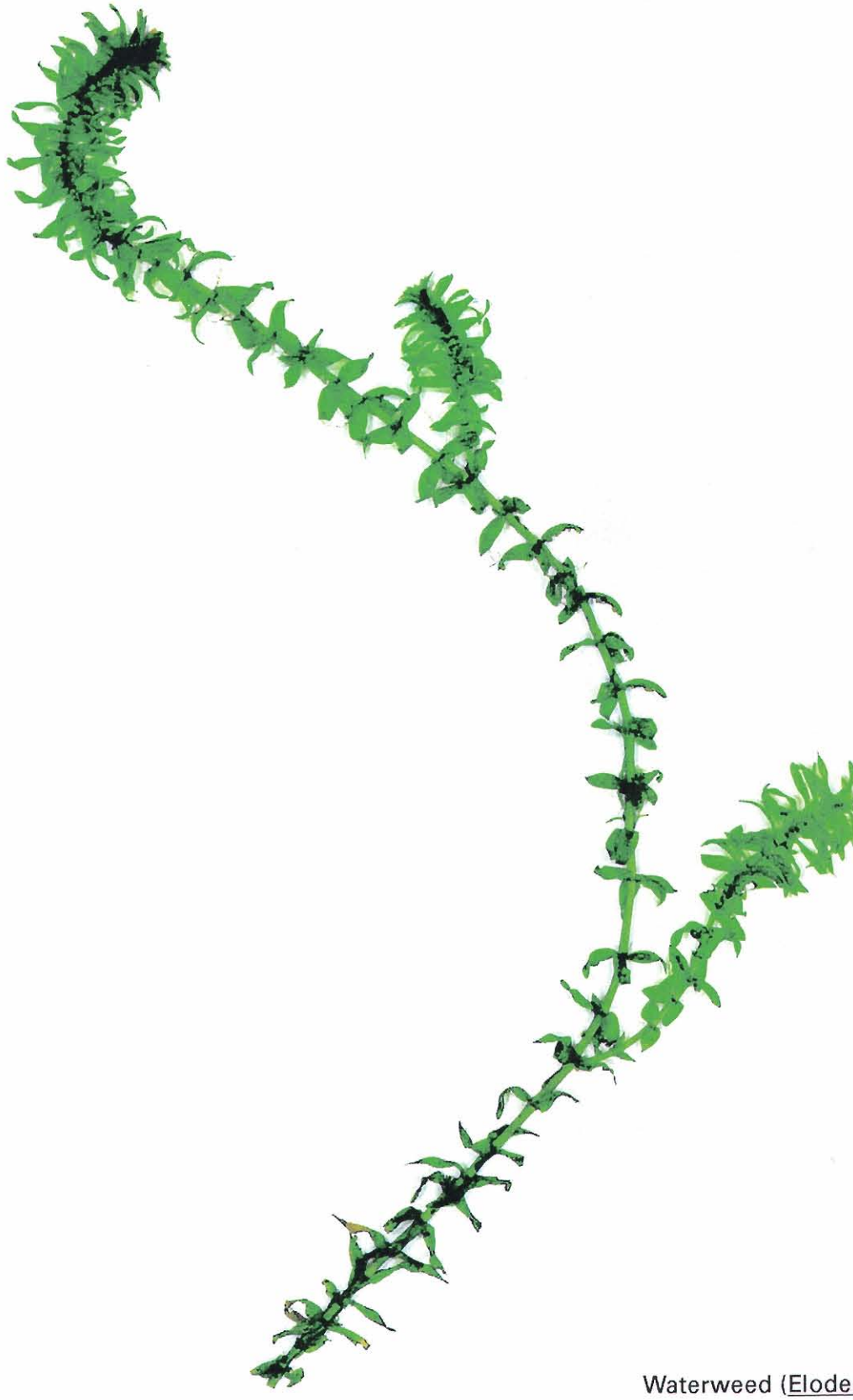
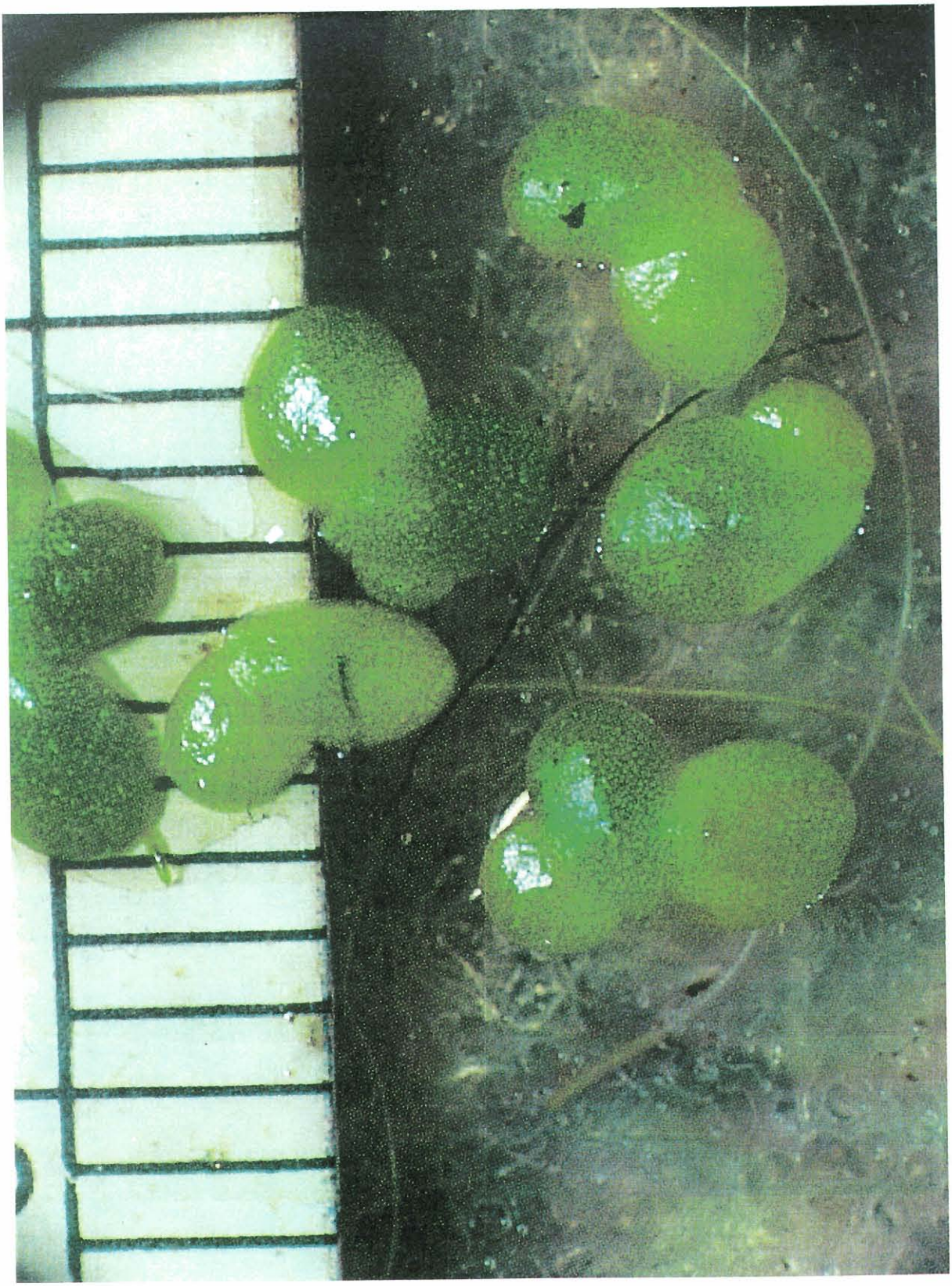
Coontail (Ceratophyllum demersum)

Muskgrass (Chara vulgaris)



Waterweed (Elodea canadensis)



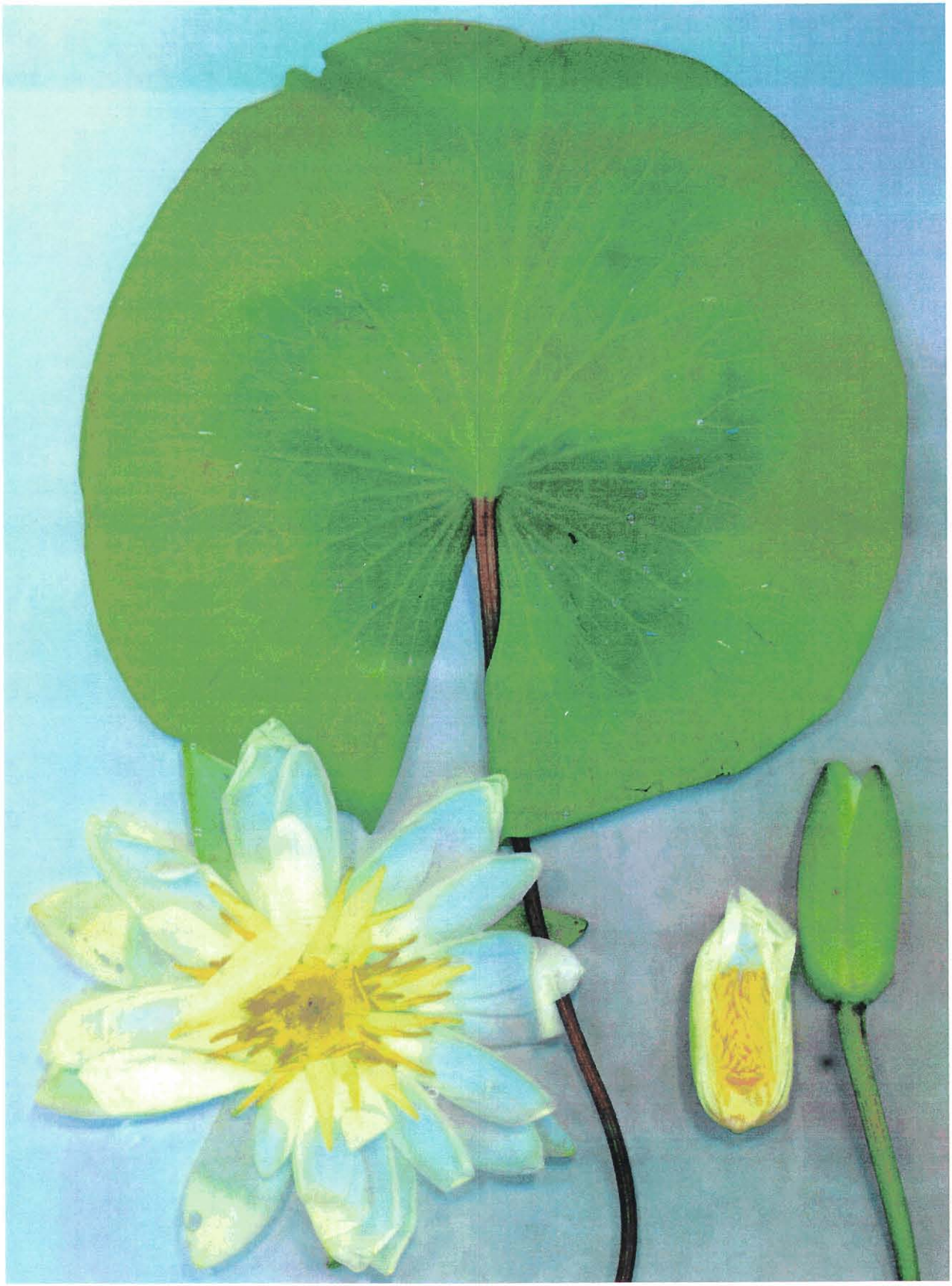
Lesser Duckweed (Lemna minor)

NOTE: Plant species in photograph are not shown proportionate to actual size

Source: Steve D. Eggers and Donald M. Reed, Wetland Plants and Plant Communities of Minnesota & Wisconsin, 2nd Edition, 1997

Eurasian Water Milfoil (Myriophyllum spicatum)

Bushy Pondweed (Najas flexilis)

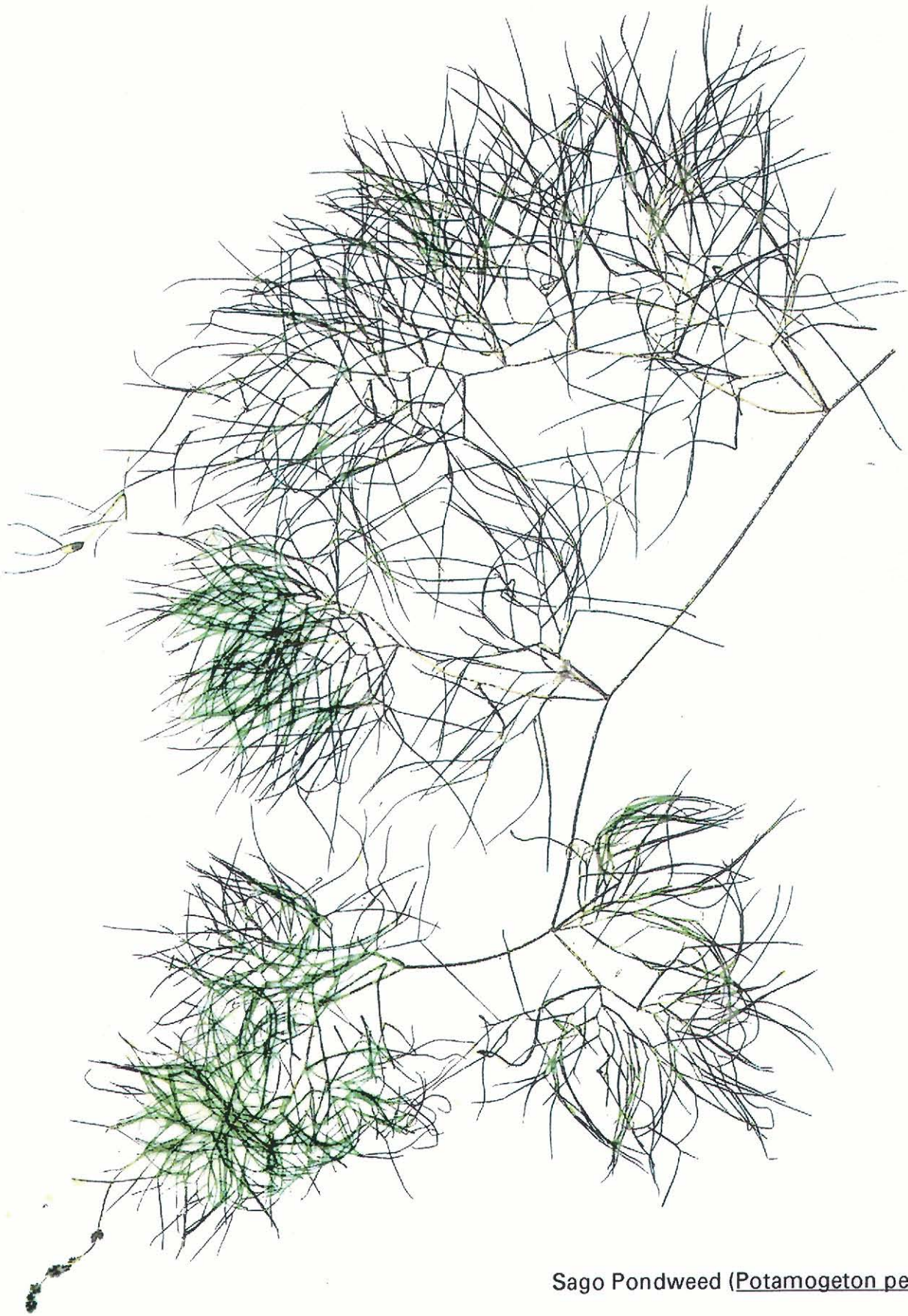


White Water Liliy (Nymphaea odorata)

Curly-Leaf Pondweed (Potamogeton crispus)

Variable Pondweed (Potamogeton gramineus)

Illinois Pondweed (Potamogeton illinoensis)



Sago Pondweed (Potamogeton pectinatus)

Small Pondweed (Potamogeton pusillus)

Clasping-Leaf Pondweed
(Potamogeton richardsonii)

Flat-Stem Pondweed (Potamogeton zosteriformis)

Yellow Water Crowfoot (Ranunculus flabellaris)

NOTE: Plant species in photograph are not to scale.

Source: Steve D. Eggers and Donald M. Reed, Wetland Plants and Plant Communities of Minnesota & Wisconsin, 2nd Edition, 1997.

Eel Grass / Wild Celery (Valisneria americana)

Water Stargrass (Zosterella dubia)

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Appendix B

PRELIMINARY VEGETATION SURVEYS OF WETLANDS ADJACENT TO LITTLE MUSKEGO LAKE

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PRELIMINARY VEGETATION SURVEY
LITTLE MUSKEGO LAKE WETLAND SHORELINE SURVEY

Date: August 6 and 8, 2002

Observer: Rachel E. Lang, Senior Specialist-Biologist
Southeastern Wisconsin Regional Planning Commission

Location: City of Muskego in parts of U.S. Public Land Survey Sections 4, 8, and 9, Township 5 North, Range 20 East, Waukesha County, Wisconsin.

Species List:

TYPHACEAE
Typha latifolia – Broad-leaf cat-tail
Typha angustifolia – Narrow-leaf cat-tail

SPARGANIACEAE
Sparganium eurycarpum – Common burreed

ALISMATACEAE
Sagittaria latifolia – Common arrowhead

GRAMINEAE
Phalaris arundinacea[1] – Reed canary grass

CYPERACEAE
Cyperus sp. – Nut sedge
Scirpus validus – Soft-stemmed bulrush
Scirpus acutus – Hard-stemmed bulrush
Carex spp. – Sedges

IRIDACEAE
Iris virginica – Virginia blueflag

SALICACEAE
Salix babylonica[1] – Weeping willow
Salix nigra – Black willow
Salix exigua – Sand-bar willow

POLYGONACEAE
Polygonum pensylvanicum – Pinkweed
Polygonum persicaria[1] – Lady's thumb

BALSAMINACEAE
Impatiens capensis – Jewelweed

VITACEAE
Vitis riparia – River-bank grape
Parthenocissus quinquefolia – Virginia creeper

OLEACEAE
Fraxinus pennsylvanica – Green ash

VERBENACEAE
Verbena hastata – Blue vervain

SOLANACEAE
Solanum dulcamara[1] – Deadly nightshade

COMPOSITAE
Bidens sp. – Beggars-ticks

Total number of plant species: 22
Number of nonnative plant species: 4 (18 percent)

The Little Muskego Lake wetland and shoreline plant community area consists of fresh (wet) meadow, second growth, Southern wet to wet-mesic lowland hardwoods, shallow marsh. Disturbances to the plant community area include mowing. No Federal- or State-designated Special Concern, Threatened, or Endangered species were observed during the field inspection.

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[1]Nonnative plant species

SVY2641

Appendix C

CITY OF MUSKEGO RECREATIONAL BOATING ORDINANCES APPLICABLE TO LITTLE MUSKEGO LAKE

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CITY OF MUSKEGO
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20.02...ADDITIONAL REGULATIONS - Motorboats. (Ord. #462 - 9-13-83) 1

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CITY OF MUSKEGO
CHAPTER 20 - PUBLIC WATERS AND BEACHES

20.01 STATE STATUTES ADOPTED

The statutory provisions describing and defining regulations with respect to boats and boating, and particularly Section 30.50 to 30.71, Wisconsin Statutes and any amendments thereto, exclusive of any provisions therein relating to the penalties to be imposed or the punishment for violation thereof, are hereby adopted. Any act required to be performed or prohibited by any such statute, which are incorporated herein by reference is required or prohibited by this section. (Ord. #725 - 5-12-92)

20.02 ADDITIONAL REGULATIONS - Motorboats. (Ord. #462 - 9-13-83)

(1) (2) and (4) are deleted. (Ord. #462 - 9-13-83)

(3) No person may operate a motorboat within 150 feet of any dock, pier, or buoyed restricted area at a speed in excess of slow-no-wake. (Ord. #983 - 04-13-99)

(5) Excessive Motor Noise. Motorboats shall not be continuously operated without the motor cover firmly secured.

(6) Mufflers. The engine of every motorboat propelled by an internal combustion engine shall be equipped with a muffler which is so constructed and kept in constant operation that it prevents excessive or unusual noise at all times while the engine is in operation. (Ord. #443 - 11-23-82)

20.025 LITTLE MUSKEGO LAKE - SPEED RESTRICTIONS. (Ord. #502 - 10-9-84)

No one shall operate a motorboat upon Little Muskego Lake between the hours of 8:30 P.M. and 8:00 A.M. at a speed in excess of slow-no-wake.

20.03 ADDITIONAL REGULATIONS - WATER SKIING (CR. #167)

(1) Whenever a boat is used for towing purposes, for water sports or otherwise, there shall be no less than 2 persons in the towing boat, one to operate the boat and one to be in charge of the tow line.

(2) When pulling a skier or another boat the tow rope shall not exceed 75 feet in length.

(3) Any person operating a boat or watercraft on Lake Denoon or Big Muskego Lake's Bass Bay which is towing a person or persons engaged in water skiing, aqua planing, or similar sport or activity must operate in a counterclockwise direction on the lake. A counterclockwise direction is determined by viewing the direction of travel of the boat or watercraft as viewed from a bird's-eye view of the entire lake. (Ord. #953 - 02/19/98)

20.04 EMERGENCY ASSISTANCE (Cr. #167)

When the operator of a boat observes the display on a boat or by a person with an orange flag approximately 18 by 30 inches, he shall render to the boat or person displaying the flag, such assistance as may be necessary to save the boat or persons, or to minimize the damages to them, in so far as is

possible to do so without serious danger to his own boat or the persons on board. No person shall display such a flag unless he is in need of assistance to prevent bodily injury or destruction of property.

20.05 WATER SKI JUMPS (Ord. #413 - 06-09-81)

(1) Permit Required. No person shall place or maintain or permit to be placed or maintained any so called "water ski jump" on any lake in the City without a permit from the Council. Such permit shall be for a period of not more than 6 months and shall state the limitations of use.

(2) Application. An application for a permit hereunder shall set forth the following:

(a) Name and address of the owner of the structure.
(b) A scale map of the location of the structure, drawn to a scale of not less than one inch to 200 feet.
(c) Proposed method of securing the structure.
(d) A description of the life and warning devices to be used which shall conform to the rules of the Wisconsin Department of Natural Resources and the U.S. Coast Guard.
(e) Length of time for which the permit is requested.
(f) A copy of a policy of public liability insurance applicable to the structure and its use in an amount of not less than $100,000.00.
(g) A proposed plan for safeguarding the area during jumps from 150 feet before the take off to 100 feet after the landing.
(h) The daylight hours during which the jump will be used.

(3) No person shall tow another person on water skis for the purpose of using a water ski jump which is in violation of this section.

(4) In granting such a license, the City expressly reserves the right to revoke any such license for any reason if it is felt by the City that said license is no longer in the best interest of the public.

(5) A permit fee of $10.00 shall be paid at the time of application. (Ord. #599 03-17-88)

20.06 RACES ON ICE

(1) License Required. No person shall sponsor, promote, participate or engage in any automobile or motorcycle race or other contest on the ice of any lake or other public waters located in the City of Muskego, unless said race or contest has first been specially licensed by the Council and the permit fee therefore as hereinafter provided, has been paid to the City of Muskego.

(2) Application. Application for such a license shall be made to the Council at least 20 days prior to the date on which said race or other contest is to be held. The application for such license shall state:

(a) The name of the person or organization promoting said race or contest;
(b) The type of race or contest and the number of vehicles to be involved;
(c) The names and addresses of the persons who will participate therein;
(d) The time and place of said race or contest;
(e) The number of persons who it is anticipated will attend said race of contest;
(f) The time at which said race or contest will conclude.

(3) License Fee. Each application for such permit shall be accompanied by cash or a certified check in the amount of $200.00, and if a license is granted, the minimum sum of $25 shall be retained

as and for the license fee and such an additional sums shall be retained as is necessary for the purposes stated in (4). (Ord. #523 - 04-09-85)

(4) Purposes of Section. The purpose of this section is to promote and protect the safety, health and welfare of the citizens of the City and persons attending such contest, and amount of license fee theretofore, provided is to be a reasonable sum for making an investigation as to the circumstances of the application to provide for necessary additional police protection and to clean up the area after the event. (Ord. #523 - 04-09-85)

20.07 OPERATION OF MOTOR VEHICLES ON ICE

(1) Operation prohibited on Bass Bay. No person shall use or operate any automobile or other motor driven vehicle in excess of 750 pounds gross vehicle weight upon the ice surface of that part of Big Muskego Lake known as Bass Bay, which is the Bay located at the Northwest end of said Big Muskego Lake.

(2) Operations Regulated. No person shall use or operate any automobile or other motor driven vehicle upon the ice surface of any lake or part thereof located in the City:

(a) In any manner so as to endanger persons engaged in skating or in any other winter sport or recreational activity being engaged in upon the ice.

(b) At a speed in excess of 10 miles per hour

(c) When more than 4 persons occupy said vehicle.

(d) To tow, pull or push any person or persons on sleds, skis, skates, toboggan or device or thing of any kind.

(e) Between the hours of 9:30 p.m. and 5:30 a.m. (Am #94)

(f) Unless the operator of the motor vehicle has a valid operator's license, if the motor vehicle is an automobile, truck, motorcycle or moped. (Ord. #597 - 03-03-88)

(3) Propeller driven vehicles prohibited. No person shall operate any propeller driven vehicle, device or thing, whether or not designed for the transporting of a person or persons upon the ice surface of any lake or part thereof located in the City.

(4) Definitions:

(a) The "automobile" as used in this section shall mean all motor vehicles of the type and kind permitted to be operated on the highways in the State of Wisconsin.

(b) "Motor Driven Vehicle", as used in this section, shall mean any kind of device or thing designed or utilized for propulsion or movement upon the ice using a motor, whether of internal combustion design or not.

(5) No City liability. All traffic on the ice-bound waters lying within the City shall be at the risk of the traveler as set forth in sec. 30.81(3), Wis. Stats., and nothing in this section shall be construed as rendering the enacting authority liable for any accident to those engaged in permitted traffic while this Code is in effect.

(6) Exceptions. Use of snowmobiles and all-terrain vehicles as defined by statutes of the State of Wisconsin, shall not be governed by this section. (Ord. #638 - 04-06-89)

20.08 SKIN DIVING (Ord. #417 - 01-26-82)

(1) No person may engage in underwater diving or swimming with the use of swimming fins or skin diving in waters other than marked swimming areas or within 150 feet of shoreline, and no person may engage in underwater diving or swimming with the use of self-contained underwater breathing apparatus in waters other than marked swimming areas, unless the location of such diving or swimming is distinctly marked by driver's flag, not less than 12 inches high and 15 inches long, displaying one diagonal white stripe 3 inches wide on a red background, and of height above the water so as to be clearly apparent at a distance of 100 yards under normal conditions, and so designed and displayed as to be visible from any point on the horizon. Except in case of emergency, anyone engaging in such diving or swimming shall not rise to the surface outside of a radius of 50 feet from such flag. No person engaged in such diving or swimming in established traffic lanes; nor shall any such person alone or with another, intentionally or unintentionally, block or obstruct any boat in any manner from proceeding to its destination where a reasonable alternative is unavailable. A reasonable alternative route is available when the otherwise unobstructed boat can proceed to its destination without reducing its lawful speed, by passing to the right or to the left of a marked diving operation.

(2) Swimming. When swimming without the use of self-contained underwater breathing apparatus, a suitable boat (motor or otherwise) shall accompany any person or persons swimming more than 150 feet from the shoreline or 75 feet from any anchored swimming raft on any waters within the City of Muskego, and upon adoption of an identical ordinance by the Town of Norway.

20.09 PERMITS REQUIRED FOR SWIMMING BEACHES.

(1) No person shall maintain a swimming beach which is open to the public upon payment of an entrance fee in the City without having first obtained a permit in writing therefore from the Council. Such permit, if issued, shall be for a period of not to exceed one year, and shall not be transferable or assignable.

(2) Before a permit will be issued, an application in writing must be filed with the City Clerk. Such application shall set forth in detail:

(a) The name and address of the owner of the property on which the commercial beach is to be operated.

(b) Length of time for which the permit is requested.

(c) The proposed plan for safeguarding the area during the hours of operation.

(d) The hours during which the commercial venture will be operated.

(3) No person shall operate a commercial beach unless the swimming area is distinctly and clearly marked off by buoys, and it is further required that during the hours that the beach is used by swimmers there shall be a lifeguard on duty who shall possess a Red Cross Life Saving Certificate or its equivalent and who shall be capable of rendering immediate assistance to persons in distress in the water. (Am. #167)

20.10 UNIFORM AIDS TO NAVIGATION: WATERWAY MARKERS. (Cr. #111)

(1) Definitions. A waterway marker is any device designed to be placed in, on or near any navigable water within the City, to convey an official message to a boat operator on matters which may affect health, safety or well-being. Aids to navigation refer to buoys, beacons and other fixed objects in the water which are used to mark obstructions to navigation or to direct navigation through safe channels.

(2) Waterway Markers Used On Waters Within The City. No waterway markers shall be placed in, on or near any navigable waters within the City, except such buoys or other markers as have been established by the Department of Natural Resources and the United States Coast Guard as uniform navigational aids. The rules and regulations of the Department of Natural Resources and the United States Coast Guard with respect to specifications, color schemes, lettering and marking requirements of waterway markers and aids to navigation shall be kept on file in the Office of the City Clerk. (Reference Wisconsin Administrative Code, Chapter WCD5, Boat Regulations and Registration)

(3) Display of Waterway Markers. No waterway marker shall be displayed, except in conformity with the requirements of the Department of Natural Resources. (Reference Wisconsin Administrative Code as per Section 2). The areas in Big Muskego Lake, Bass Bay, Little Muskego Lake, and Lake Denoon to be marked with regulatory markers requiring slow, no-wake speed shall be as from time to time established by Resolution of the Common Council. (Ord. #929 - 07-03-97)

(4) Authority To Place Markers: Permit Required.

(a) No person shall place any waterway marker or aid to navigation in any navigable waters within the City without a permit to do so issued by the Common Council. Application for a permit shall be made in duplicate on forms provided by the City and filed with the City Clerk. The application shall be set forth in detail:

1. The name and address of applicant.

2. Description of real estate of owner or occupant.

3. Type of marker requested.

4. A sketch showing proposed location of the markers.

(b) The application shall be accompanied by a permit fee as determined from time to time by the Common Council. The permit when authorized shall be issued by the City Clerk, and it shall not be transferable or assignable. The permit shall remain in effect unless surrendered by the applicant, or canceled or revoked by the Common Council for one year.

(5) Maintenance of Waterway Markers. Waterway markers shall be maintained in proper condition or be replaced or removed.

(6) Exemptions. The temporary placement of mooring buoys, race course markers and water ski course markers for special events may be reviewed and authorized by the Finance Committee on an annual basis. (Ord. #1067 - 05-03-2001)

20.11 ADDITIONAL REGULATIONS

The Common Council may from time to time adopt local regulations not contrary to or inconsistent with state statute relative to the equipment, use, or operation of boats, pursuant to Section 30.77(3) and (4) Statutes. Any regulations so adopted shall be promptly posted at all public access points within the jurisdiction of the City of Muskego and a copy thereof shall also be filed with the Department of Natural Resources. (Ord. #313; 6-8-76.)

20.12 NAMING OF PUBLIC WATERS (Ord. #979 - 02/18/99)

Note: Proposed names for public waters require approval of the Wisconsin Geographic Names Council in order to be recognized on maps outside the City.

(1) Requests to name or rename a creek, stream, river or lake shall be made in writing and brought before the Committee of the Whole for recommendation to the Common Council. The person(s) who submitted the request shall provide background information into the rationale behind the request, including biographical information if to be named after a person. Any letters from appropriate organizations and individuals which provide evidence of substantial local support for the proposal shall be submitted at that time. If the creek, stream, river or lake is included in a Lake Protection and Rehabilitation District, approval from the district must be obtained prior to the submittal of the request to the City. Upon approval of the Common Council, the proposed name change shall be submitted to the Wisconsin Geographic Names Council for approval. The Council meets every February to act on all requests.

(2) Once a public body of water is named after a person, the name of the public body of water cannot be changed for a period of one hundred years.

(3) All costs associated with the naming, including the cost of any recording necessary and the cost of signage shall be paid by the person(s) submitting the request. This cost may be waived by the Common Council.

20.13 PENALTIES (Ord. #979 - 02/18/99)

Wisconsin State boating penalties as found in Section 30.80 Wisconsin Statutes and deposits as established in the Uniform Deposit and Bail Schedule established by the Wisconsin Judicial Conference, are hereby adopted by reference with all references to fines amended to forfeitures and all references to imprisonment deleted. The penalty for violation of local regulations not contrary to or inconsistent with State Statute shall be as provided in Chapter 25 of the Municipal Code, unless a specific penalty for a specific ordinance or regulation contained in Chapter 20 or adopted pursuant thereto is adopted. (Ord. #942 - 08-21-97)