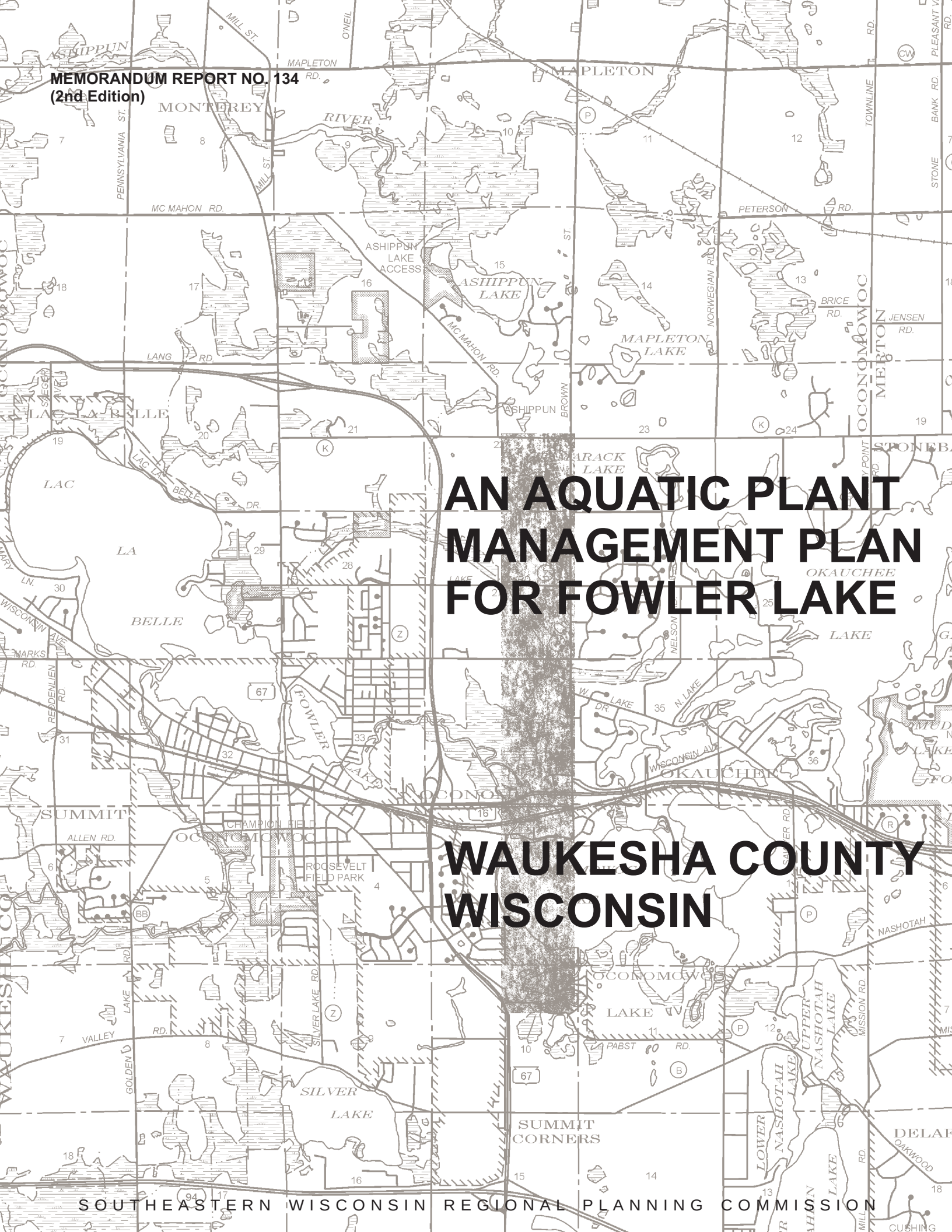

MEMORANDUM REPORT NO. 134
(2nd Edition)
AN AQUATIC PLANT MANAGEMENT PLAN FOR FOWLER LAKE
WAUKESHA COUNTY WISCONSIN
SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

KENOSHA COUNTY
Kimberly L. Breunig
Adelene Greene,
Secretary
Robert W. Pitts

RACINE COUNTY
Gilbert B. Bakke
David L. Eberle
Peggy L. Shumway

MILWAUKEE COUNTY
William R. Drew,
Vice-Chairman
John Rogers
John F. Weishan, Jr.

WALWORTH COUNTY
Charles L. Colman
Nancy Russell,
Treasurer
Linda J. Seemeyer

OZAUKEE COUNTY
Thomas H. Buestrin
William E. Johnson
Gustav W. Wirth, Jr.

WASHINGTON COUNTY
Daniel S. Schmidt
Daniel W. Stoffel
David L. Stroik,
Chairman

WAUKESHA COUNTY
Michael A. Crowley
José M. Delgado
James T. Dwyer

CITY OF OCONOMOWOC AND FOWLER LAKE MANAGEMENT DISTRICT

MAYOR AND CHAIRMAN

James Daley

ALDERPERSONS AND COMMISSIONERS

Rich Allen
Lora Mae Cochrane
James Larson
Michael Miller
Robert Morgan
David Nold
Jim Preston
Cathleen Slattery

Special acknowledgement is due to Mr. Mark Frye, Director of Public Works, Mr. James Lamp, Engineering Operations Administrator, and Mr. Gary Wohlfeil, DPW Supervisor, of the City of Oconomowoc Department of Public Works for their assistance in this planning project.

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION STAFF

Kenneth R. Yunker, PE ..... Executive Director

Stephen P. Adams.....Public Involvement and Outreach Manager

Nancy M. Anderson, AICP .....Chief Community Assistance Planner

Michael G. Hahn, PE, PH..... Chief Environmental Engineer

Christopher T. Hiebert, PE ..... Chief Transportation Engineer

Elizabeth A. Larsen .....Business Manager

John G. McDougall ..... Geographic Information Systems Manager

John R. Meland ..... Chief Economic Development Planner

Dr. Donald M. Reed.....Chief Biologist

Donald P. Simon, RLS..... Chief Planning Illustrator

William J. Stauber..... Chief Land Use Planner

Special acknowledgement is due to Dr. Jeffrey A. Thornton, PH, CLM, and Dr. Thomas M. Slawski, SEWRPC Principal Planners; Mr. Edward J. Schmidt, SEWRPC GIS Planning Specialist; and Mr. Michael A. Borst, SEWRPC Research Aide, for their contributions to the conduct of this study and the preparation of this report.

MEMORANDUM REPORT
NUMBER 134, 2nd Edition

AN AQUATIC PLANT MANAGEMENT PLAN FOR FOWLER LAKE

WAUKESHA COUNTY, WISCONSIN

Prepared by the

Southeastern Wisconsin Regional Planning Commission
W239 N1812 Rockwood Drive
P.O. Box 1607
Waukesha, Wisconsin 53187-1607
www.sewrpc.org

The preparation of this publication was financed in part through a grant from the Wisconsin Department of Natural Resources Lake Management Planning Grant Program.

July 2012

$10.00

(This Page Left Blank Intentionally)

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF TABLES

LIST OF FIGURES

LIST OF MAPS

Chapter III

(This Page Left Blank Intentionally)

Chapter I

INTRODUCTION

BACKGROUND

Fowler Lake, located in the heart of the City of Oconomowoc, Waukesha County, Wisconsin, is a 99-acre drainage, or flow-through, lake system comprised of a 78-acre main basin with an extended 21-acre inlet lying along the Oconomowoc River. Fowler Lake is the fifth in a chain of six lakes—comprised of Friess, North, Okauchee, Oconomowoc, Fowler, and La Belle Lakes—located within the Southeastern Wisconsin Region. The Lake is located in U.S. Public Land Survey Section 33, Township 8 North, Range 17 East, in northeastern Waukesha County.

Fowler Lake is situated within easy reach of the greater Milwaukee metropolitan area, as well as within a rapidly developing part of Waukesha County,[1] and is a valuable natural resource offering a variety of recreational and related opportunities to the resident community and its visitors. As is the case with many of the lakes in the Region, Fowler Lake experiences a continuing demand for urban-density residential development in the vicinity of the Lake, especially in areas adjacent to the incorporated municipalities within its extensive watershed. Such development brings with it concomitant demands for water-based and water-oriented recreational opportunities. These opportunities currently include amenities associated with "downtown" Oconomowoc, such as restaurants and coffee shops, sporting goods outlets, and other specialty shops, as well as a range of water sports. Municipal parklands provide several points of access for residents and visitors.

Seeking to keep pace with this demand for both residential development and lake-related recreation, the Fowler Lake community, through the City of Oconomowoc, and in cooperation with the Fowler Lake Management District (FLMD), continues to undertake an annual program of lake and aquatic plant management to improve the usability and prevent the deterioration of the Lake and its natural resource potential. This plan is the fourth in a series of aquatic plant management plans prepared by the Southeastern Wisconsin Regional Planning Commission (SEWRPC) for Fowler Lake.[2]

---

[1]*SEWRPC Planning Report No. 48,* A Regional Land Use Plan for Southeastern Wisconsin: 2035, *June 2006.*

[2]*SEWRPC Community Assistance Planning Report No. 187,* A Management Plan for Fowler Lake, Waukesha County, Wisconsin, *March 1994; SEWRPC Memorandum Report No. 134,* An Aquatic Plant Management Plan for Fowler Lake, Waukesha County, Wisconsin, *October 2000; and, SEWRPC Staff Memorandum, "An Aquatic Plant Management Plan Update for Fowler Lake, Waukesha County, Wisconsin: 2008," September 2008.*

Specifically, this report represents part of the ongoing commitment of the Fowler Lake community and the City of Oconomowoc to sound planning with respect to the Lake. The report sets forth inventories of the aquatic plant communities present within the Lake. Those inventories were prepared by Commission staff and include the results of field surveys conducted by Commission staff during the summer of 2011. The aquatic plant surveys were conducted by Commission staff using the Wisconsin Department of Natural Resources (WDNR)-approved, grid-based sampling methodology, enhanced with position data for each sampling location as determined by a global positioning system.[3] The planning program was funded, in part, through a Chapter NR 190 Lake Management Planning Grant awarded to the City of Oconomowoc during 2011 and administered by the WDNR.

ANTECEDENTS AND SCOPE OF THIS REPORT

Fowler Lake was included in the WDNR Oconomowoc River Priority Watershed Project Area.[4] Fowler Lake has also been the subject of a comprehensive lake management plan prepared by SEWRPC.[5] The comprehensive lake management plan included an aquatic plant management plan element that was adopted and implemented by the City of Oconomowoc and FLMD. During 2000, SEWRPC prepared an updated and refined aquatic plant management plan for Fowler Lake[6] based on the aquatic plant management plan element of the original report. Pursuant to the recommendations set forth in the comprehensive lake management plan, it was recommended that the aquatic plant management plan element be reviewed and refined at approximately five-year intervals. Subsequently, the Commission conducted an aquatic plant reconnaissance in 2007 and prepared an aquatic plant management plan update for FLMD in 2008.[7] In response to recommendations contained in the previous aquatic plant management plans and those in the update, the City of Oconomowoc entered into an agreement with SEWRPC during 2010, under which SEWRPC would prepare an updated aquatic plant management plan for Fowler Lake. This report represents a refined aquatic plant management plan for Fowler Lake, provides information on the condition of the aquatic plant communities in Fowler Lake through 2011, and provides the basis for the ongoing implementation of an aquatic plant management program within the Lake.

The scope of this report is limited to a consideration of the aquatic plant communities present within Fowler Lake, the documentation of changes in the aquatic plant communities based upon existing and historic data and information, and the refinement of those management measures which can be effective in the control of nuisance and nonnative aquatic plant growths as defined in Chapters NR 40, NR 107, NR 109 and NR 198 of the *Wisconsin Administrative Code*. The recommendations made focus primarily on the aquatic plant management program of the City of Oconomowoc, informational programming by the City of Oconomowoc and the FLMD, and the lake and land management actions of the City of Oconomowoc, among others.

---

[3]*Wisconsin Department of Natural Resource , Publication No. PUB-SS-1068,* Recommended Baseline Monitoring of Aquatic Plants in Wisconsin: Sampling Design, Field and Laboratory Procedures, Data Entry and Analysis, and Applications, *2010.*

[4]*Wisconsin Department of Natural Resources Publication No PUBL-WR-194-86,* A Nonpoint Source Control Plan for the Oconomowoc River Priority Watershed Project, *March 1986.*

[5]*SEWRPC Community Assistance Planning Report No. 187,* op. cit.

[6]*SEWRPC Memorandum Report No. 134,* op. cit.

[7]*SEWRPC Staff Memorandum, "An Aquatic Plant Management Plan Update for Fowler Lake, Waukesha County, Wisconsin: 2008," September 2008; this use of a SEWRPC Staff Memorandum, as an interim mechanism to update and refine aquatic plant management plans on a five-year basis between editions of the aquatic plant management plans published as SEWRPC Memorandum Reports, was agreed pursuant to conversations between Wisconsin Department of Natural Resources staff and SEWRPC staff.*

AQUATIC PLANT MANAGEMENT PROGRAM GOALS AND OBJECTIVES

The lake use goals and objectives for Fowler Lake were developed initially in consultation with the City of Oconomowoc during the formulation of the comprehensive lake management plan.[8] The agreed goals and objectives are:

1. To 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 Fowler Lake;

2. To provide for high-quality, water-based recreational experiences by residents and visitors to Fowler Lake, and manage the Lake in an environmentally sound manner; and

3. To effectively maintain the water quality of Fowler 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.

The inventory and aquatic plant management plan elements presented in this report conform to the requirements and standards set forth in the relevant *Wisconsin Administrative Codes.*[9] Implementation of the recommended actions set forth herein should continue to serve as an important step in achieving the stated lake use objectives over time.

---

[8]*SEWRPC Community Assistance Planning Report No. 187,* op. cit.

[9]*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 40, "Invasive species identification, classification and control;" Chapter NR 103, "Water quality standards for wetlands;" Chapter NR 107, "Aquatic plant management;" Chapter NR 109, "Aquatic plants introduction, manual removal and mechanical control regulations;" and, NR 198, "Aquatic invasive species prevention and control grants."*

(This Page Left Blank Intentionally)

Chapter II

INVENTORY FINDINGS

INTRODUCTION

Fowler Lake is located in the heart of the City of Oconomowoc, in the northwestern portion of Waukesha County, Wisconsin, as shown on Map 1. Fowler Lake is the fifth in a chain of six lakes—comprised of Friess, North, Okauchee, Oconomowoc, and Fowler Lakes, and Lac La Belle—located within the Southeastern Wisconsin Region. These lakes are situated along the Oconomowoc River upstream of its confluence with the mainstem of the Rock River. The Oconomowoc River forms the outlet of both Fowler Lake and Lac La Belle, and ultimately discharges into the Rock River at Pipersville in Jefferson County, approximately five miles downstream from the Lac La Belle outlet.

Fowler Lake has a surface area of 99 acres, 21 acres of which form an area at the top end of the Lake known locally as the inlet. As a through-flow, or drainage lake system, Fowler Lake has both a defined inlet and outlet. The Oconomowoc River is the principle inflow to the Lake, entering from the east. The lake outflow is controlled by two hydraulic structures consisting of a dam and the former mill race, a fixed-height overflow structure, both located on the western side of Fowler Lake just upstream of North Lake Road in the City of Oconomowoc. The dam discharges in a westerly direction through a 60-foot-wide channel directly into Lac La Belle.

Fowler Lake has been the subject of previous studies and plans, including a plan carried out by the Wisconsin Department of Natural Resources (WDNR) under the Oconomowoc River Priority Watershed Project,[1] a comprehensive lake management plan,[2] and an aquatic plant management plan.[3] This plan further refines the aquatic plant management plan prepared during 2000, taking into consideration the findings of the 2008 SEWRPC staff memorandum which served as an interim update of the aquatic plant management plan for Fowler Lake.

---

[1]*Wisconsin Department of Natural Resources Publication No. WR-194-86,* A Nonpoint Source Control Plan for the Oconomowoc River Priority Watershed Project, *March 1986.*

[2]*SEWRPC Community Assistance Planning Report No. 187,* A Management Plan for Fowler Lake, Waukesha County, Wisconsin, *March 1994.*

[3]*SEWRPC Memorandum Report No. 134,* An Aquatic Plant Management Plan for Fowler Lake, Waukesha County Wisconsin, *October 2000; see also SEWRPC Staff Memorandum, "An Aquatic Plant Management Plan Update for Fowler Lake, Waukesha County, Wisconsin: 2008," October 2008.*

Map 1

LOCATION AND TOTAL AND DIRECT TRIBUTARY AREAS OF FOWLER LAKE

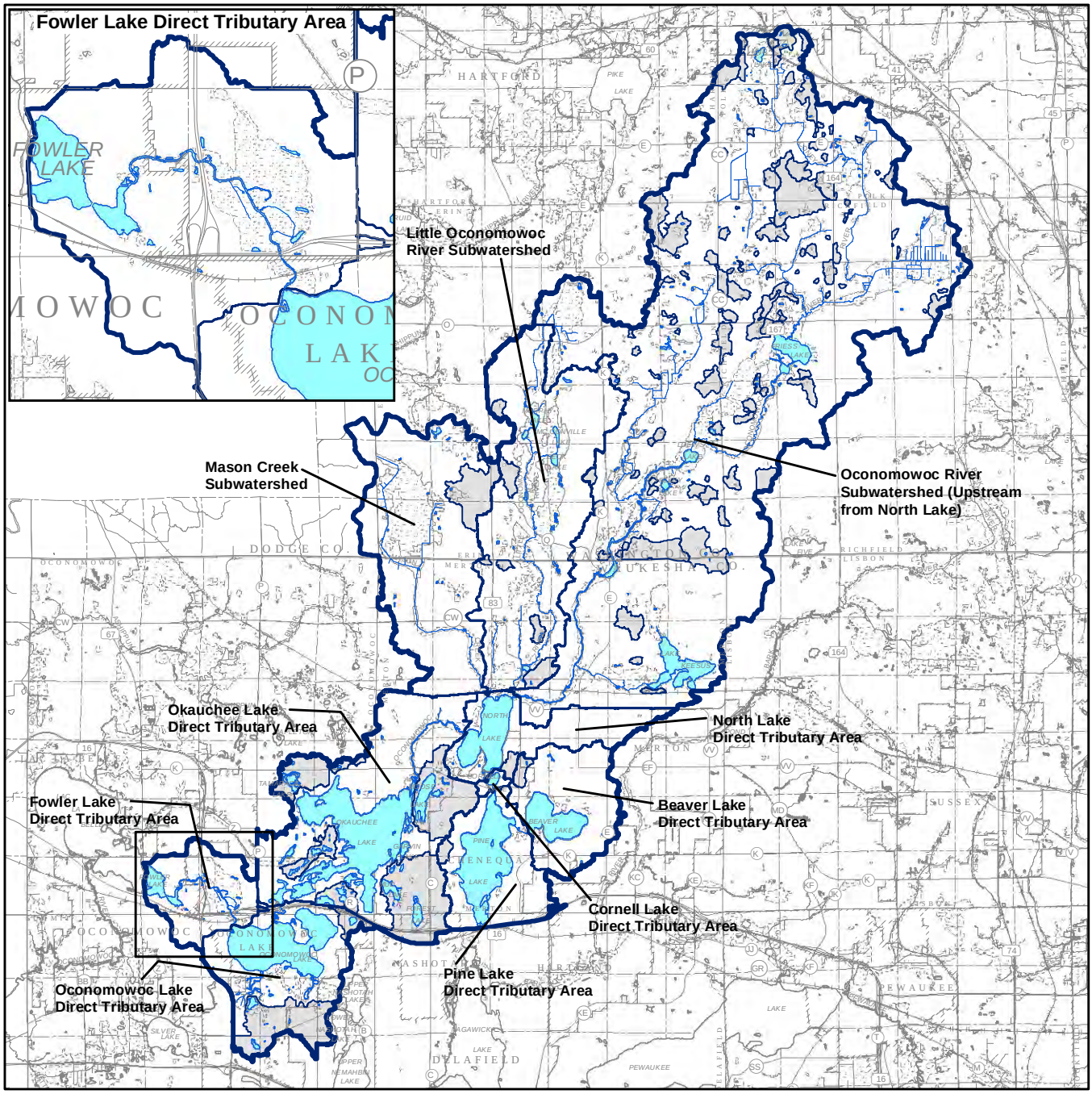


Table 1

HYDROLOGY AND MORPHOMETRY OF FOWLER LAKE

Parameter	Fowler Lake
Size	
Surface Area of Lake[a]	99 acres
Total Tributary Area[b]	51,453 acres
Lake Volume	1,074 acre-feet
Residence Time[c]	6.9 years
Shape	
Length of Lake	0.6 mile
Width of Lake	0.35 mile
Length of Shoreline	1.7 miles
Shoreline Development Factor[d]	2.4
General Lake Orientation	NW-SE
Depth	
Mean Depth	13 feet
Maximum Depth	50 feet
Portion of Lake Less than Five Feet	33 percent
Between Five and 10 Feet	23 percent
Between 10 and 15 Feet	16 percent
Between 15 and 25 Feet	13 percent
Greater than 25 Feet	15 percent

[a]*The surface area of Fowler Lake is comprised of a 78-acre main basin and an extended 21-acre inlet.*

[b]*The total tributary area for Fowler Lake was recorded in the previous SEWRPC report as 49,757 acres based upon U.S. Geological Survey 10-feet contour interval topographic mapping. The current measurement is based on elevation refinements made possible through the updated SEWRPC digital terrain modeling analysis with a contour interval of two feet.*

[c]*Residence time is estimated as the time period required for a volume of water equivalent to the volume of the lake to enter the lake during years of normal precipitation.*

[d]*Shoreline development factor is the ratio of the shoreline length to the circumference of a circular lake of the same area.*

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

WATERBODY CHARACTERISTICS

The hydrographical characteristics of Fowler Lake are set forth in Table 1. The Lake is aligned in an approximately northwest-southeast orientation, with a maximum depth of approximately 50 feet and a mean depth of about 13 feet. The bathymetry of the Lake is shown on Map 2. Fowler Lake has a total surface area of 99 acres, a total volume of 1,074 acre-feet, and a shoreline of approximately 1.7 miles in total length. The system has a shoreline development factor (SDF) of about 2.4, indicating that, due to the irregularities of its shoreline, the perimeter of the Lake is more than twice as long as the perimeter of a perfectly circular lake of the same area. By contrast, the two closest upstream lakes, Oconomowoc Lake and Okauchee Lake, have shoreline development factors of about 1.8, reflecting Oconomowoc Lake's more nearly circular shape, and of 3.1, reflecting the many irregularities and embayments of Okauchee Lake.

The SDF often is related to the level of biological activity in a lake: the greater a lake's shoreline development factor (due to greater shoreline irregularity), the greater is the likelihood that the lake contains shallow, nearshore areas—the places usually containing habitat more suitable for plant and animal life—and, therefore, the greater is the biological productivity of the lake. With a development factor of 2.4, Fowler Lake would be expected to have a moderate level of biological productivity compared to other lakes in the area.

Biological activity in a lake also can be influenced by other physical factors, such as bottom sediment composition and lake-basin contours. In Fowler Lake, the littoral, or shallow nearshore, zone would extend from the normal lake level as defined by the WDNR-delineated ordinary high water mark out to a depth of about 10 feet.[4] As shown in Table 1, over 50 percent of Fowler Lake has a water depth of 10 feet or less. Map 2 reveals most of the areas in the Lake with a depth of 10 feet or less are located in the bays, specifically the bays located at the southwestern end of the Lake, at the northwestern end of the Lake leading to the outlet, and at the southern end of the Lake, including the extended inlet.

TRIBUTARY AREA AND LAND USE CHARACTERISTICS

The "tributary area" of a lake is comprised of all that land that drains to the lake or into other waterbodies (creeks, rivers, lakes) that drain into that lake. In through-flow lakes, such as Fowler Lake, where the lake is situated along

[4]Ibid.

Map 2

BATHYMETRIC MAP OF FOWLER LAKE

DATE OF PHOTOGRAPHY: APRIL 2010

—20'— WATER DEPTH CONTOUR IN FEET

MONITORING SITE

RECREATIONAL AREA

PUBLIC ACCESS

N

0 300 600 Feet

Source: U.S. Geological Survey and SEWRPC.

a river, the total land surface that drains into the lake can be quite large depending on the length of the upstream portion of the river-lake system. In such cases, it is often meaningful to differentiate between the land area immediately surrounding and contiguous with the lake shoreline—the "direct" tributary area—and the "total" tributary area which may extend many miles removed from the lake itself. For purposes of identifying those factors likely to have the greatest impacts on a lake, these often are located in the area closest to the lake, or its direct tributary area.

As shown on Map 1, the area directly tributary to Fowler Lake is situated entirely within Waukesha County and mostly within the city limits of the City of Oconomowoc. Fowler Lake is truly a lake in an urban setting.

Those civil division boundaries located within the Lake's total tributary area are displayed on Map 3. This area is approximately 56,314 acres, or about 88 square miles, in areal extent. As noted, this total tributary area to Fowler Lake includes all of the area upstream of Fowler Lake drained by the Oconomowoc River, including the areas draining to Friess Lake, North Lake, Okauchee Lake, and Oconomowoc Lake. Approximately 13 percent of this tributary area is considered to be internally drained, contributing water to the river system only under the most extreme events. This total tributary area also is shown on Map 1.

The drainage area tributary to Fowler Lake was reevaluated as part of this planning program. The initial tributary drainage area to the Lake was delineated using U.S. Geological Survey (USGS) 7.5 minute quadrangle topographic mapping with 10 feet contour intervals. Subsequently, topographic mapping has been enhanced with the result that topographic mapping is currently available with a contour interval of two feet. This greater detail allows the definition of watershed boundaries with more precision than was possible using the 10 feet contour interval topography. This refined drainage area is utilized in this plan.

Population

The population and the numbers of households and housing units within the Fowler Lake system tributary area have all generally increased since 1960, as shown in Table 2. These increases continue to place pressures on the City's water resources and park and open space system.

Land Uses

Adjacent to Fowler Lake, the land uses in the direct tributary area are largely urban in character, with residential uses and transportation corridors comprising the largest categories of urban land use, as tabulated in Table 3. Within the total area tributary to Fowler Lake, the land uses are primarily rural, with agricultural uses being the dominant rural land use, as documented in Table 4. The dominant urban-density usage in the total area tributary to Fowler Lake is residential use. Map 4 shows the existing land uses within the tributary area as of 2000, and summarized in Tables 3 and 4.

The shoreland areas of Fowler Lake are comprised of a variety of land uses, including governmental, institutional (churches), commercial, and residential uses, including park and open space lands. Residential and agricultural uses dominate away from the Lake. There are a several fairly large woodland tracts within the tributary area.

Future changes in land use within the area tributary to the Lake are expected to include further urban development, especially in the areas contiguous to existing urban lands within the incorporated municipalities, infilling of already platted lots, and possible redevelopment of existing properties. Under proposed year 2035 conditions, as shown on Map 5 and summarized in Tables 3 and 4, overall urban land uses are expected to increase substantially. Among the rural land uses, agricultural uses are anticipated to decrease during this period. As discussed further below, these land use changes have the potential to modify the nature and delivery of nonpoint source contaminants to the system, with concomitant impacts on the aquatic plant communities within the waterbody.

Map 3

CIVIL DIVISION BOUNDARIES WITHIN THE FOWLER LAKE TOTAL AND DIRECT TRIBUTARY AREAS

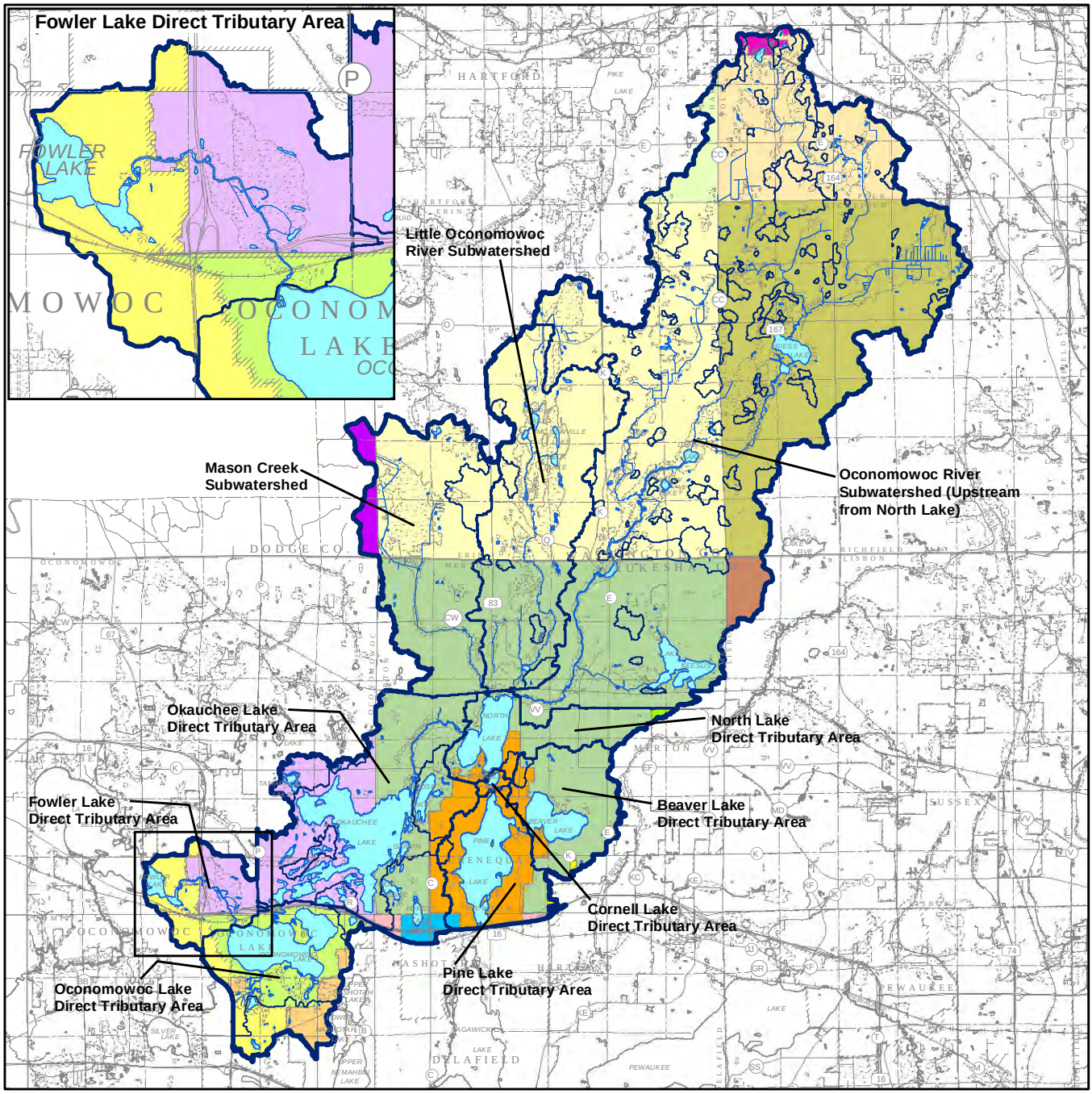


Table 2

POPULATION, HOUSEHOLDS AND TOTAL HOUSING UNITS IN THE FOWLER LAKE AREA: 1960-2000

Year	Population	Households (occupied housing units)
1960	4,720	1,450
1970	4,950	1,780
1980	4,890	1,820
1990	4.810	1,910
2000	5,490	2,260

Source: U.S. Bureau of Census and SEWRPC.

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 the Fowler Lake shoreline conducted by Southeastern Wisconsin Regional Planning Commission (SEWRPC) staff in June 1997 identified few areas with natural shorelines,[5] except in the expanded inlet. Most of the lake shoreline was determined to be protected by riprap and bulkheads. There were no severe shoreline erosion-related problems observed during the 1997 survey.

During the 2011 shoreline protection structure survey conducted by SEWRPC staff, shoreline protection techniques observed along the Fowler Lake shoreline included riprap, bulkheads, revetments, beaches, and areas of natural shoreline, as shown on Map 6. Other than a few small stretches of shoreline where riprap had been used to replace some bulkhead and natural shoreline, there were few differences between the structures observed during the previous SEWRPC survey and the current survey. The principle area of change was located adjacent to Fowler Lake Park, where areas of erosion were identified during the 1997 survey. The City of Oconomowoc has stabilized this shoreline using riprap. Consequently, there were areas of no severe shoreline erosion observed during 2011.

WATER QUALITY

Limited water quality data are available for Fowler Lake. The most comprehensive data set was compiled during the period of the Oconomowoc River Priority Watershed planning program, when water quality samples were taken from the main basin of the Lake every two weeks from April through November 1984, monthly during the rest of 1984, once per season during the 1987 through 1990 monitoring periods, and five times per year from October 1995 through September 1996. These data are summarized in various USGS data reports and in the comprehensive lake management plan.[6] Subsequently, data on lake water quality have been limited to satellite-derived water clarity observations.[7]

Water clarity, or transparency, is often used as an indicator of water quality. Transparency can be affected by physical factors, such as water color and suspended particulates, and by various biological factors, including seasonal variations in planktonic algal populations living in the lake. Water clarity typically is measured with a Secchi disk, a black-and-white, eight-inch-diameter disk, which is lowered into the water until a depth is reached

[5]*SEWRPC Memorandum Report No. 134,* op. cit.

[6]*U.S. Geological Survey, Water Resources Investigations Report No. 91-4076,* Hydrology, Water Quality, Trophic Status, and Aquatic Plants of Fowler Lake, Wisconsin, *1993; U.S. Geological Survey Water Data Reports,* Water Resources Data Wisconsin, *Water Year 1987 through Water Year 1991; SEWRPC Community Assistance Planning Report No. 187,* op. cit.

[7]*Thomas M. Lillesand and Jonathan W. Chipman, "Satellite-assisted Lake Water Quality Monitoring," University of Wisconsin-Madison, accessed as:* http://dnr.wi.gov/lakes/clmn/remotesensing/satellitepaper.html.

Table 3

EXISTING AND PLANNED LAND USE WITHIN THE AREA DIRECTLY TRIBUTARY TO FOWLER LAKE: 2000 AND 2035

Land Use Categories[a]	2000 Fowler Lake (acres)	2035 Fowler Lake (acres)
Urban		
Residential	362	464
Commercial	80	94
Industrial	31	39
Governmental and Institutional	67	78
Transportation, Communication, and Utilities	244	307
Recreational	106	107
Subtotal	890	1,089
Rural		
Agricultural	269	69
Wetlands	219	238
Woodlands	62	43
Water	118	119
Open Lands	- -	- -
Subtotal	668	469
Total	1,558	1,558

[a]*Parking included in associated use.*

Source: SEWRPC.

at which the disk is no longer visible. This depth is known as the "Secchi-disk reading." Such measurements comprise an important part of the University of Wisconsin-Extension (UWEX) Citizen Lake Monitoring Network (CLMN) program in which citizen volunteers assist in lake water quality monitoring efforts.

Secchi-disk transparency measurements of Fowler Lake were obtained by the USGS.[8] These readings were consistently greater than nine feet, and often between 12 and 13 feet. Such transparencies are indicative of a waterbody with good water quality, as shown in Figure 1. Secchi-disk readings in excess of 10 feet suggest that the Lake had relatively low concentrations of algae and suspended sediment in the water column.

During and preceding the current study period, between July 1999 and August 2009, water clarity estimates based upon the satellite telemetry ranged from a minimum depth of 4.4 feet in August 2009 to a maximum depth of 12.5 feet in July 2001, with an average value during this period of 7.6 feet. These observations are generally within the historic range of transparency observations on Fowler Lake, which ranged from six feet to 25 feet,[9] but are on the lower end of the recorded water clarity observations, suggesting a decline in water quality during the last 15 years. It should be noted, however, that the satellite-derived transparency data have typically underestimated the transparency of Fowler Lake relative to water clarity readings obtained on the Lake with the Secchi disk. Further water clarity monitoring under the auspices of the UWEX CLMN program is recommended to identify changes in lake water quality.

A further factor influencing water clarity in Fowler Lake is an established population of zebra mussels (*Dreissena polymorpha*), which have been observed to be present in the Lake since 2002. Zebra mussels, a nonnative species of shellfish with known negative impacts on native benthic organism populations, have had a varied impact on the inland lakes of the Upper Midwest, disrupting the food chain by removing significant amounts of bacteria and smaller phytoplankton which serve as food for a variety of other aquatic organisms, including larval and juvenile fishes and many forms of zooplankton. As a result of the filter feeding proclivities of these animals, many lakes have experienced improved water clarity. This improved water clarity, in turn, has led to increased growths of rooted aquatic plants, including Eurasian water milfoil. Curiously, within the Southeastern Wisconsin Region, zebra mussels have been observed attaching themselves to the stalks of the Eurasian water milfoil plants, dragging the stems out of the zone of light penetration due to the weight of the zebra mussel shells, and interfering with the

[8]*U.S. Geological Survey Water-Resources Investigations Report 91-4076,* Hydrology, Water Quality, Trophic Status, and Aquatic Plants of Fowler Lake, Wisconsin, *1993.*

[9]*SEWRPC Community Assistance Planning Report No. 187,* op. cit.

Table 4

EXISTING AND PLANNED LAND USE WITHIN THE TOTAL AREA TRIBUTARY TO FOWLER LAKE: 2000 AND 2035

Land Use Categories[a]	2000			2035		
	Fowler Lake (acres)	Internally Drained Area (acres)	Total (acres)	Fowler Lake (acres)	Internally Drained Area (acres)	Total (acres)
Urban						
Residential	7,396	966	8,362	10,678	1,589	12,267
Commercial	168	30	198	357	99	456
Industrial	70	33	103	184	75	259
Governmental and Institutional	248	33	281	441	94	535
Transportation, Communication, and Utilities	2,373	517	2,890	3,362	745	4,107
Recreational	660	138	798	904	209	1,113
Subtotal	10,915	1,717	12,632	15,926	2,811	18,737
Rural						
Agricultural	20,624	3,540	24,164	15,793	2,486	18,279
Wetlands	6,327	219	6,546	6,393	239	6,632
Woodlands	6,576	1,505	8,081	6,134	1,456	7,590
Water	4,398	269	4,667	4,412	292	4,704
Open Lands	62	161	223	244	128	372
Subtotal	37,987	5,694	43,681	32,976	4,601	37,577
Total	48,902	7,412	56,314	48,902	7,412	56,314

[a]*Parking included in associated use.*

Source: SEWRPC.

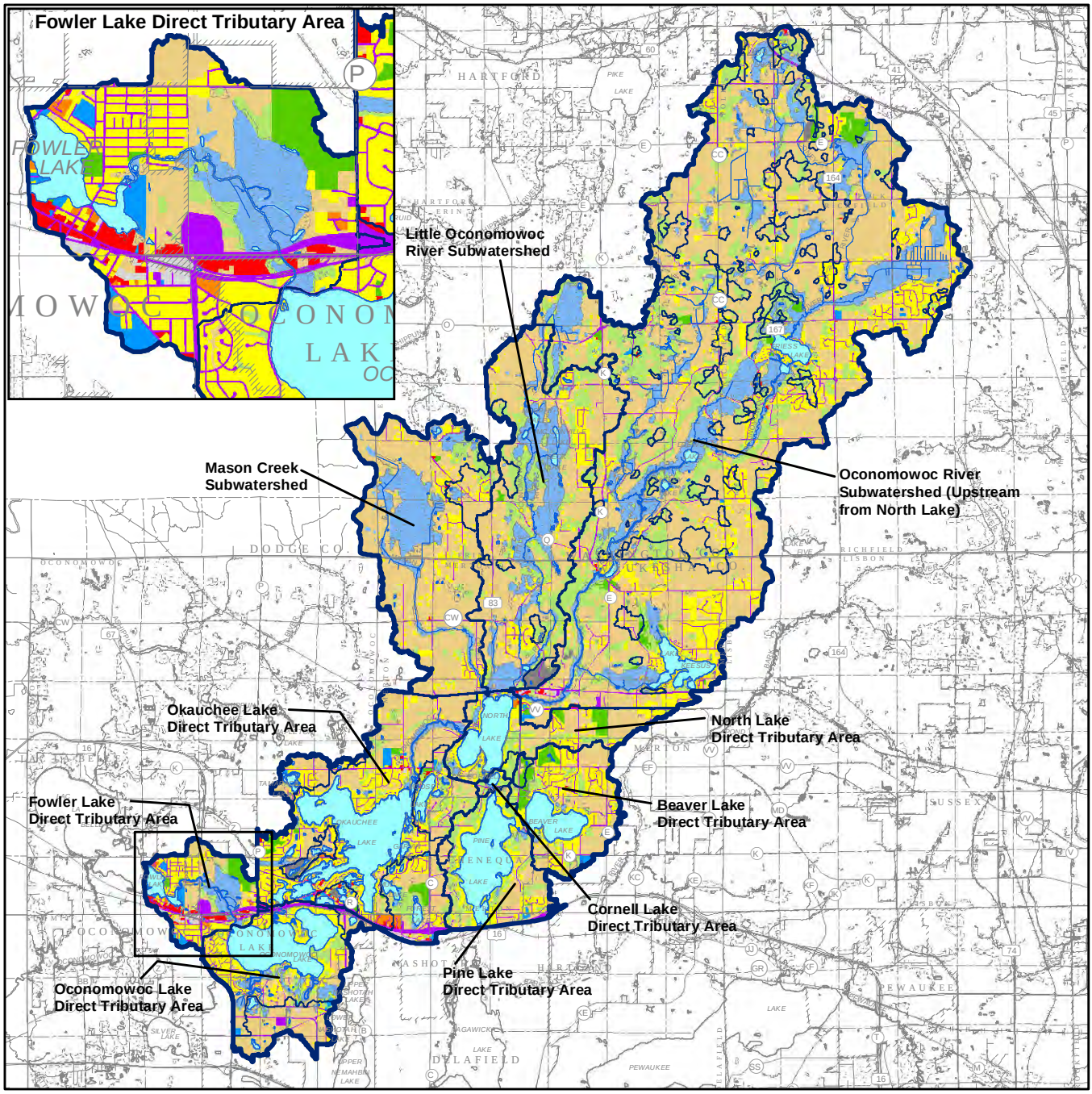
competitive strategy of the Eurasian water milfoil plants. This has contributed to improved growths of native aquatic plants in some cases, and to the growths of filamentous algae too large to be ingested by the zebra mussels in others. In Fowler Lake, the presence of these animals seems to have led to the proliferation of eel-grass (*Valisneria americana*), which has been observed to grow to more than 15 feet in length. Nevertheless, regardless as to the seeming beneficial impacts of these animals, the overall effect of their presence has been negative, increasing environmental, aesthetic, and economic costs to water users.

POLLUTION LOADINGS AND SOURCES

Pollutant loads to a lake are generated by various natural processes and human activities that take place in the area tributary to a lake. These loads are transported to a lake through the atmosphere, across the land surface, and by way of inflowing streams. Pollutants transported by the atmosphere are deposited onto the surface of a lake as dry fallout and direct precipitation. Pollutants transported across the land surface enter a lake directly as surface runoff and, indirectly, as groundwater inflows, including drainage from onsite wastewater treatment systems. Pollutants transported by streams also enter a lake as surface water inflows. Lakes, as accreting systems, retain some of these contaminants in proportion to the rate and volume of water flowing through the waterbodies. Seepage lakes without an outflow retain the greatest percentage of the contaminant loads, while through-flow lakes with short retention times retain the least.

Map 4

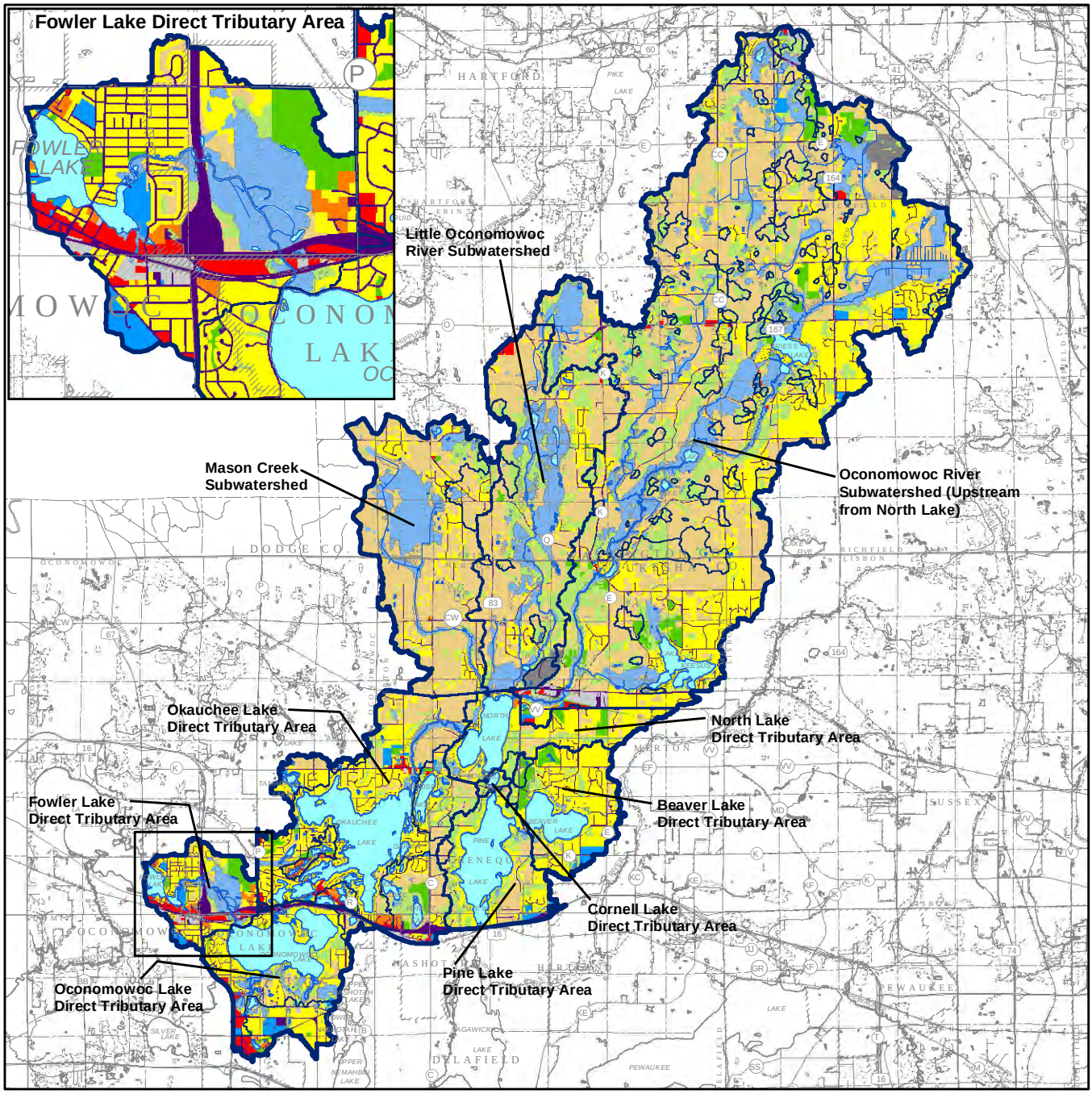
EXISTING LAND USE WITHIN THE FOWLER LAKE TOTAL AND DIRECT TRIBUTARY AREAS: 2000



Source: SEWRPC.

Map 5

PLANNED LAND USE WITHIN THE FOWLER LAKE TOTAL AND DIRECT TRIBUTARY AREAS: 2035



Source: SEWRPC.

Map 6

SHORELINE PROTECTION STRUCTURES ON FOWLER LAKE: 2011

DATE OF PHOTOGRAPHY: APRIL 2010

RIPRAP
BEACH
NATURAL
BULKHEAD
REVETMENT

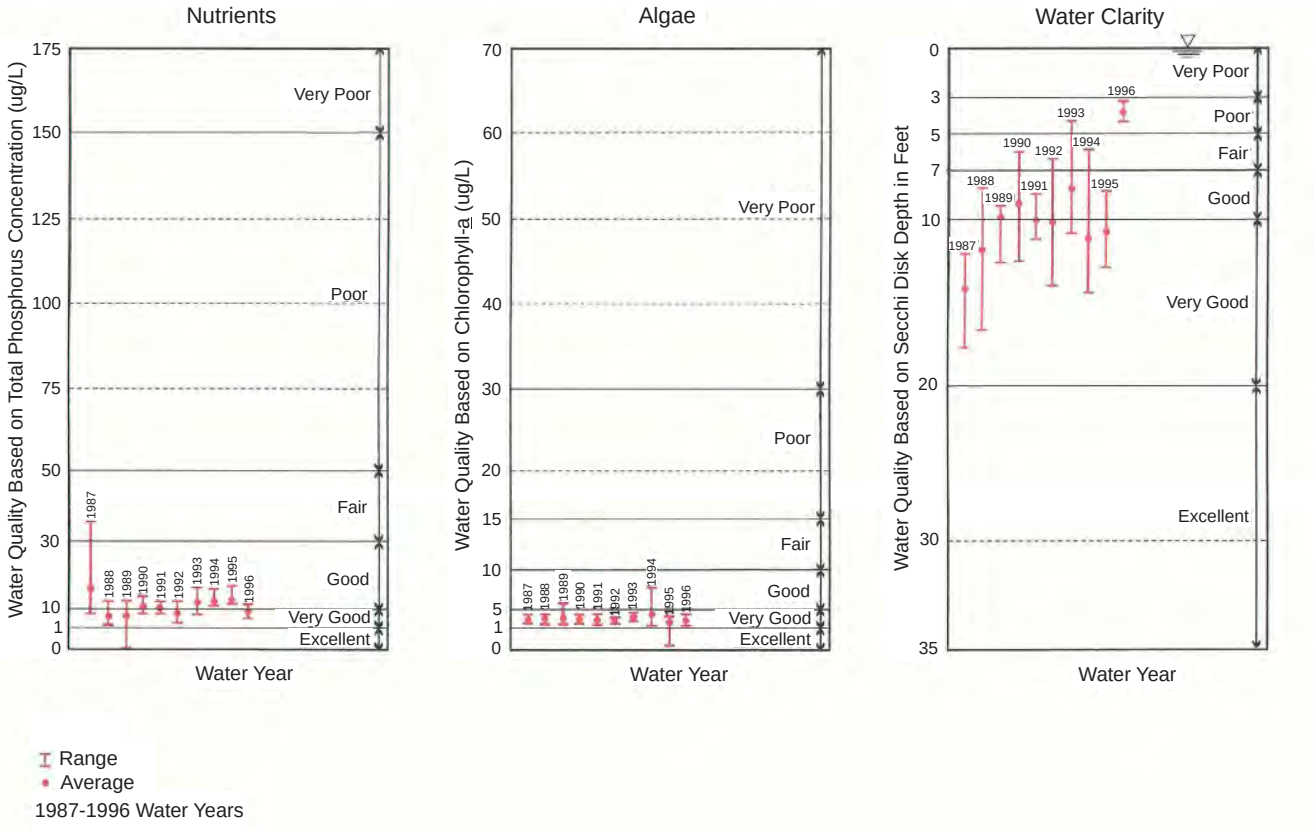
N

0 300 600
Feet

Source: SEWRPC.

Figure 1

FOWLER LAKE PRIMARY WATER QUALITY INDICATORS: 1987-1996



Source: U.S. Geological Survey and SEWRPC.

In through-flow lakes, like Fowler Lake, pollutant loads transported by inflowing streams, by precipitation falling directly onto the lake surface, and by runoff from the tributary area immediately surrounding the Lake, in the absence of identifiable or point source discharges from industries or wastewater treatment facilities, comprise the principal routes by which contaminants enter the waterbody.[10] Currently, there are no significant point source discharges of pollutants into Fowler Lake. For this reason, the discussion that follows is based upon nonpoint source pollutant loadings to the system.

Nonpoint sources of water pollution include urban sources, such as stormwater runoff from residential, commercial, transportation, construction, and recreational activities; and rural sources, such as runoff from agricultural lands. Nonpoint source phosphorus, suspended solids, and urban-derived metals inputs to Fowler Lake were

[10]*Sven-Olof Ryding and Walter Rast, "The Control of Eutrophication of Lakes and Reservoirs,"* Unesco Man and the Biosphere Series, *Volume 1, Parthenon Press, Carnforth, 1989; Jeffrey A. Thornton, Walter Rast, Marjorie M. Holland, Geza Jolankai, and Sven-Olof Ryding, "The Assessment and Control of Nonpoint Source Pollution of Aquatic Ecosystems,"* Unesco Man and the Biosphere Series, *Volume 23, Parthenon Press, Carnforth, 1999.*

estimated using the Wisconsin Lake Modeling Suite (WILMS version 3.0),[11] and the unit area load-based models developed for use within the Southeastern Wisconsin Region. The pollutant loads for Fowler Lake are presented in Table 5. These loads have been adjusted for retention of contaminants in the upstream waterbodies that form the Oconomowoc River chain-of-lakes, using the long-term water residence time for each of the upstream waterbodies. Overall, the net sediment and phosphorus loadings to Fowler Lake are anticipated to decline as agricultural land uses are replaced by urban land uses. This shift in land use, however, does imply some increase in urban-related contaminants loads, such as the loads of metals arising from the greater use of these elements in urban construction, among other impacts. This increase is most clearly shown in the estimated increase in copper loads to Fowler Lake, noted in Table 5.

The comprehensive lake management plan for Fowler Lake notes that most of the tributary area has been provided with public sanitary sewer service and wastewater treatment by the City of Oconomowoc.[12] Consequently, those few onsite sewage systems that remained were almost exclusively in rural areas and whatever contribution of phosphorus to the Lake made by them was considered insignificant. Similarly, while an increasing utilization of agro-chemicals in urban landscaping may offset some of the benefits achieved through introduction of integrated agricultural nutrient and pest management practices;[13] the stormwater management requirements set forth in Chapter NR 151 of the *Wisconsin Administrative Code*; and, the limits established by the Wisconsin Legislature on the use and sale of fertilizer containing phosphorus in turf fertilizers to be used in urban areas, pursuant to 2009 *Wisconsin Act* 9, and on the amount of phosphorus in certain cleaning agents, pursuant to 2009 *Wisconsin Act* 63, may be expected to further decrease the phosphorus loads to Fowler Lake.

TROPHIC STATUS

Lakes are commonly classified according to their degree of nutrient enrichment, or trophic status. The ability of lakes to support a variety of recreational activities and healthy fish and other aquatic life communities is often correlated to the degree of nutrient enrichment that has occurred. There are three terms generally used to describe the trophic status of a lake: oligotrophic, mesotrophic, and eutrophic.

Oligotrophic lakes are nutrient-poor lakes. These lakes characteristically support relatively few aquatic plants and often do not contain very productive fisheries. Oligotrophic lakes may provide excellent opportunities for swimming, boating, and waterskiing. Because of the naturally fertile soils and the intensive land use activities, there are relatively few oligotrophic lakes in southeastern Wisconsin.

Mesotrophic lakes are moderately fertile lakes which may support abundant aquatic plant growths and productive fisheries. However, nuisance growths of algae and macrophytes are usually not exhibited by mesotrophic lakes. These lakes may provide opportunities for all types of recreational activities, including boating, swimming, fishing, and waterskiing. Many lakes in southeastern Wisconsin are mesotrophic.

---

[11] *John C. Panuska and Jeff C. Kreider, Wisconsin Department of Natural Resources Publication No. PUBL-WR-363-94,* Wisconsin Lake Modeling Suite Program Documentation and User's Manual, Version 3.3 for Windows, *August 2002*.

[12] *SEWRPC Community Assistance Planning Report No. 172, 2nd Edition,* Sanitary Sewer Service Area for the City of Oconomowoc and Environs, Waukesha County, Wisconsin, *September 1999, as amended.*

[13] *U.S. Geological Survey Water-Resources Investigations Report No. 02-4130,* Effects of Lawn Fertilizer on Nutrient Concentration in Runoff from Lakeshore Lawns, Lauderdale Lakes, Wisconsin, *July 2002.*

Table 5

ESTIMATED ANNUAL POLLUTANT LOADINGS BY LAND USE CATEGORY WITHIN THE TOTAL AREA TRIBUTARY TO FOWLER LAKE: 2000 AND 2035[a]

Land Use Category	Pollutant Loads: 2000			
	Sediment (tons)	Phosphorus (pounds)	Copper (pounds)	Zinc (pounds)
Urban				
Residential	55	1,055	1	26
Commercial	51	161	11	88
Industrial	21	78	4	37
Governmental	48	203	- -	- -
Transportation	7	255	5	69
Recreational	6	134	- -	- -
Subtotal	188	1,886	21	220
Rural				
Agricultural	3,480	12,429	- -	- -
Wetlands	12	190	- -	- -
Woodlands	13	196	- -	- -
Water	310	414	- -	- -
Open Lands	1	7	- -	- -
Subtotal	3,816	13,236	- -	- -
Total	4,004	15,122	21	220

Land Use Category	Pollutant Loads: 2035			
	Sediment (tons)	Phosphorus (pounds)	Copper (pounds)	Zinc (pounds)
Urban				
Residential	79	1,602	1	52
Commercial	107	318	52	264
Industrial	53	158	25	136
Governmental	12	275	- -	- -
Transportation	87	441	12	174
Recreational	8	181	- -	- -
Subtotal	346	2,975	90	626
Rural				
Agricultural	2,700	10,184	- -	- -
Wetlands	9	191	- -	- -
Woodlands	9	184	- -	- -
Water	316	427	- -	- -
Open Lands	1	14	- -	- -
Subtotal	3,035	11,000	- -	- -
Total	3,381	13,975	90	626

[a]*Loads are inclusive of retention of contaminants within the upstream impoundments on the Oconomowoc River upstream of Fowler Lake.*

Source: SEWRPC.

Eutrophic lakes are nutrient-rich lakes. These lakes often exhibit excessive aquatic macrophyte growths and/or experience frequent algae blooms. If the lakes are shallow, fish winterkills may be common. While portions of such lakes are not ideal for swimming and boating, eutrophic lakes may support very productive fisheries. Although some eutrophic lakes are present in the Region, severely eutrophic lakes are rare, especially since the regionwide implementation of recommendations put forth in the regional water quality management plan. Severely enriched lakes are sometimes referred to as being hypertrophic.

Several numeric "scales," based on one or more water quality indicators, have been developed to define the trophic condition of a lake. Because trophic state is actually a continuum from very nutrient poor to very nutrient rich, a numeric scale is useful for comparing lakes and for evaluating trends in water quality conditions. Care must be taken, however, that the particular scale used is appropriate for the lake to which it is applied. In this case, two indices appropriate for Wisconsin lakes have been used; namely, the Vollenweider-OECD open-boundary trophic classification system,[14] and the Carlson Trophic State Index (TSI),[15] with a variation known as the Wisconsin Trophic State Index value (WTSI).[16] The WTSI is a refinement of the Carlson TSI and is designed to account for the greater humic acid content—brown water color—present in Wisconsin lakes; it has been adopted by the WDNR for use in lake management investigations.

The WTSI value based on total phosphorus concentration for Fowler Lake at the time of the previous SEWRPC report was 46.7, as shown in Figure 2, which places Fowler Lake into the mesotrophic classification.[17] This was not inconsistent with the TSI value derived from the aforementioned ERSC satellite remote sensing study, which was estimated to be 52, a value associated with meso-eutrophic lakes. During the current study period, the average Secchi-disk transparency value of 7.6 feet derived from the satellite telemetry, as noted above, results in a WTSI value of 47.9. These values suggest that water quality in Fowler Lake has remained relatively stable over an approximately 40-year period, since the initial studies conducted in 1973.

AQUATIC PLANTS: DISTRIBUTION AND MANAGEMENT AREAS

Aquatic macrophytes, including emergent species, such as rushes and cattails; floating-leaved species, such as lily pads; and submergent species, such as pondweeds, coontail, and water milfoil, play an important role in the ecology of southeastern Wisconsin lakes. Depending on their types, abundance and distribution, they can be either beneficial or a nuisance. Macrophytes growing in reasonable densities in lakes are beneficial in maintaining lake fisheries and wildlife populations, providing habitat for a variety of aquatic organisms. They also remove nutrients from the water that otherwise would contribute to excessive algal growth. Aquatic plants can become a nuisance when their densities become so great as to interfere with swimming and boating activities, when their growth forms limit habitat diversity, and when the plants reduce the aesthetic appeal of the resource. Many factors, including lake configuration, depth, water clarity, nutrient availability, bottom substrate, wave action, and type and size of fish populations present, determine the distribution and abundance of aquatic macrophytes in lakes. In southeastern Wisconsin, most lakes naturally support an abundant and diverse aquatic plant community.

---

[14]*Organization for Economic Cooperation and Development-OECD,* Eutrophication of Waters: Monitoring, Assessment and Control*, OECD, Paris, 1982; H. Olem and G. Flock, U.S. Environmental Protection Agency Report EPA-440/4-90-006,* op. cit.

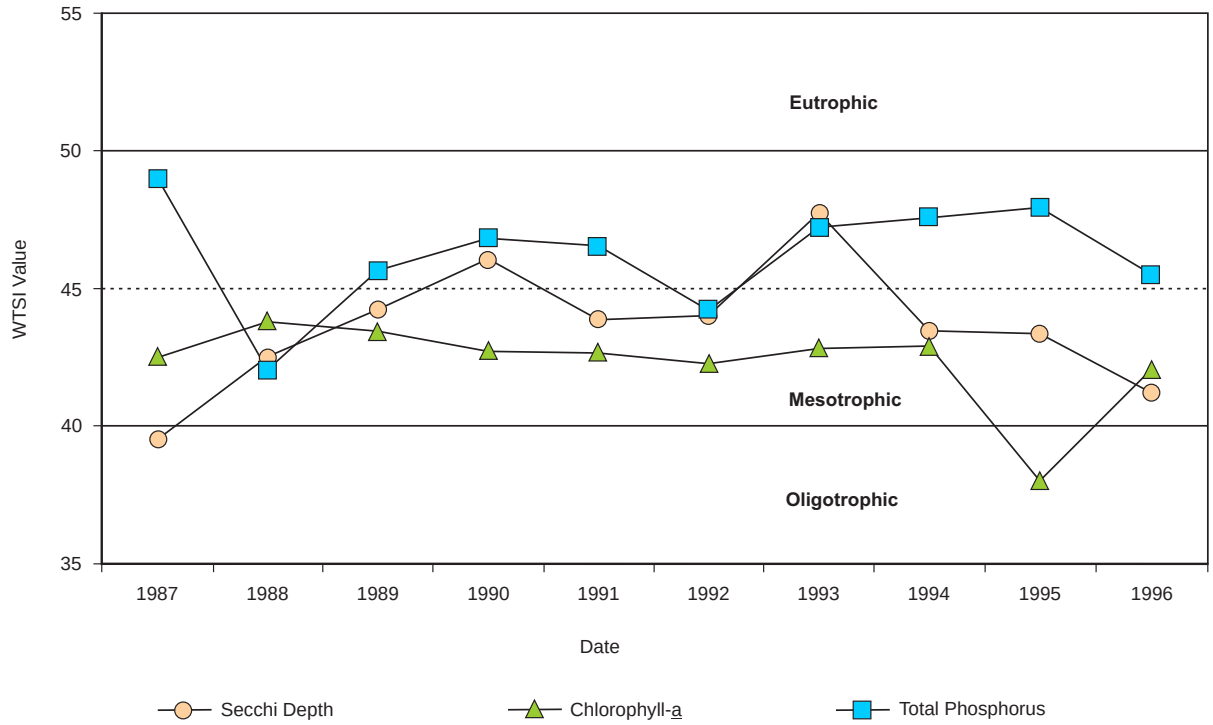
[15]*R.E. Carlson, "A Trophic State Index for Lakes,"* Limnology and Oceanography, *Vol. 22, No. 2, 1977.*

[16]*See R.A. Lillie, S. Graham, and P. Rasmussen, "Trophic State Index Equations and Regional Predictive Equations for Wisconsin Lakes,"* Research and Management Findings*, Wisconsin Department of Natural Resources Publication No. PUBL-RS-735 93, May 1993.*

[17]*A value above 50 is generally indicative of the enriched conditions associated with eutrophic lakes.*

Figure 2

TROPHIC STATE INDEX FOR FOWLER LAKE: 1987-1996



Source: U.S. Geological Survey and SEWRPC.

Past and Present Aquatic Plant Communities in Fowler Lake

Several surveys of aquatic plant communities in Fowler Lake have been conducted, beginning with the comprehensive survey of Sorge and Lowry, conducted in 1984,[18] and continuing through the survey conducted by the SEWRPC staff during June 1997,[19] the SEWRPC-conducted aquatic plant reconnaissance of 2007, and the comprehensive aquatic plant survey of 2011 also conducted by SEWRPC staff. Representative illustrations of these aquatic plants can be found in Appendix A. Species lists, comparing the results of these aquatic plant surveys, are set forth in Table 6. It is important to note that floating plant varieties including duckweed (*Lemna spp.*), yellow water lily (*Nuphar adveno*), and white water lily (*Nymphaea odorata*) species have been inconsistently surveyed over time. Therefore, although these species have always been present and an important component of the overall biological diversity within Fowler Lake, their exact abundance and distributions have not always been determined as shown in Table 6. The aquatic plant community distribution maps associated with the various surveys are set forth as Maps 7 through 10. For purposes of comparison, the various aquatic plant maps referenced in this section have been presented in the "traditional" manner of utilizing lines, colors and other markings to display information on the aquatic plant communities. Maps 7 through 9 were developed from data

[18]*Patrick Sorge and Timothy Lowry,* Aquatic Plant and Sediment Survey on Fowler Lake, *1984.*

[19]*SEWRPC Community Assistance Planning Report No. 187,* op. cit.*; SEWRPC Memorandum Report No. 134,* op. cit.

Table 6

RELATIVE FREQUENCY OF OCCURRENCE[a] OF AQUATIC PLANT SPECIES OBSERVED IN FOWLER LAKE: 1984-2011

Aquatic Plant Species	1984	1997	2007[b]	2011
Floating Plants				
Lemna spp. (duckweed)	- -[c]	- -[c]	- -[c]	0.3
Nuphar advena (yellow water lily)	- -[c]	- -[c]	- -[c]	0.4
Nymphaea odorata (white water lily)	- -[c]	- -[c]	- -[c]	0.7
Subtotal Number of Species	3	3	3	3
Submerged Plants				
Ceratophyllum demersum (coontail)	14.6	9.4	19.6	10.0
Chara spp. (muskgrass)	27.0	16.1	6.0	15.6
Eleocharis acicularis (needle spikerush)	- -	- -	- -	0.4
Elodea canadensis (waterweed)	- -	4.8	0.9	1.4
Myriophyllum sibiricum (northern water milfoil)[d]	- -	- -	18.8	2.1
Myriophyllum spicatum (Eurasian water milfoil)	21.3	14.2	4.3	18.1
Najas flexilis (bushy pondweed)	- -	8.5	6.0	5.6
Najas marina (spiny naiad)	0.8	1.2	- -	1.7
Nitella spp. (stonewort)	2.7	- -	- -	- -
Potamogeton amplifolius (large-leaf pondweed)	- -	0.6	1.7	- -
Potamogeton crispus (curly-leaf pondweed)	2.2	3.6	3.4	0.8
Potamogeton foliosus (leafy pondweed)	- -	- -	1.8	0.8
Potamogeton gramineus (variable pondweed)	- -	- -	3.4	4.3
Potamogeton illinoensis (Illinois pondweed)	6.2	- -	8.5	1.3
Potamogeton pectinatus (Sago pondweed)	8.4	7.0	8.5	6.7
Potamogeton praelongus (white-stem pondweed)	- -	8.2	- -	- -
Potamogeton pusillus (small pondweed)	- -	- -	- -	1.7
Potamogeton richardsonii (clasping-leaf pondweed)	1.8	0.6	5.1	2.5
Potamogeton zosteriformis (flat-stem pondweed)	- -	7.0	0.9	0.4
Utricularia vulgaris (bladderwort)	4.8	6.4	4.3	5.3
Vallisneria americana (eel-grass/wild celery)	10.2	12.4	18.8	19.2
Zosterella dubia (water stargrass)	- -	- -	2.6	0.7
Subtotal Number of Species	11	14	17	19
Total Number of Species	14	17	20	22

NOTE: The 1984 survey was conducted by Sorge and Lowry; the 1997 and 2011 surveys were conducted by SEWRPC. The 1997 survey was conducted using the WDNR modified Jesson and Lound transect methodology utilizing 280 samples. In 2010, the WDNR revised the methodology for aquatic plant surveys to a grid-based point-intercept method. The 2011 survey was conducted by SEWRPC staff using the point-intercept method utilizing 187 samples. Statistical data gathered using these two differing methodologies may not be completely comparable. Empirical data gathered using each method may reflect similar overall trends in species composition in the aquatic plant community and, thus, yield results compatible with determining effective aquatic plant management recommendations.

[a]*Relative frequency of occurrence is the frequency of a species divided by the total frequency of all species. This statistic presents an indication of how the plants occur throughout a lake in relation to each other.*

[b]*The 2007 data was collected as part of an aquatic plant reconnaissance utilizing an abbreviated number of sampling sites; sampling was done in the fall of the year rather than traditional summer sampling. Populations of many species of aquatic plants, most notably the pondweeds, regularly exhibit seasonal variation.*

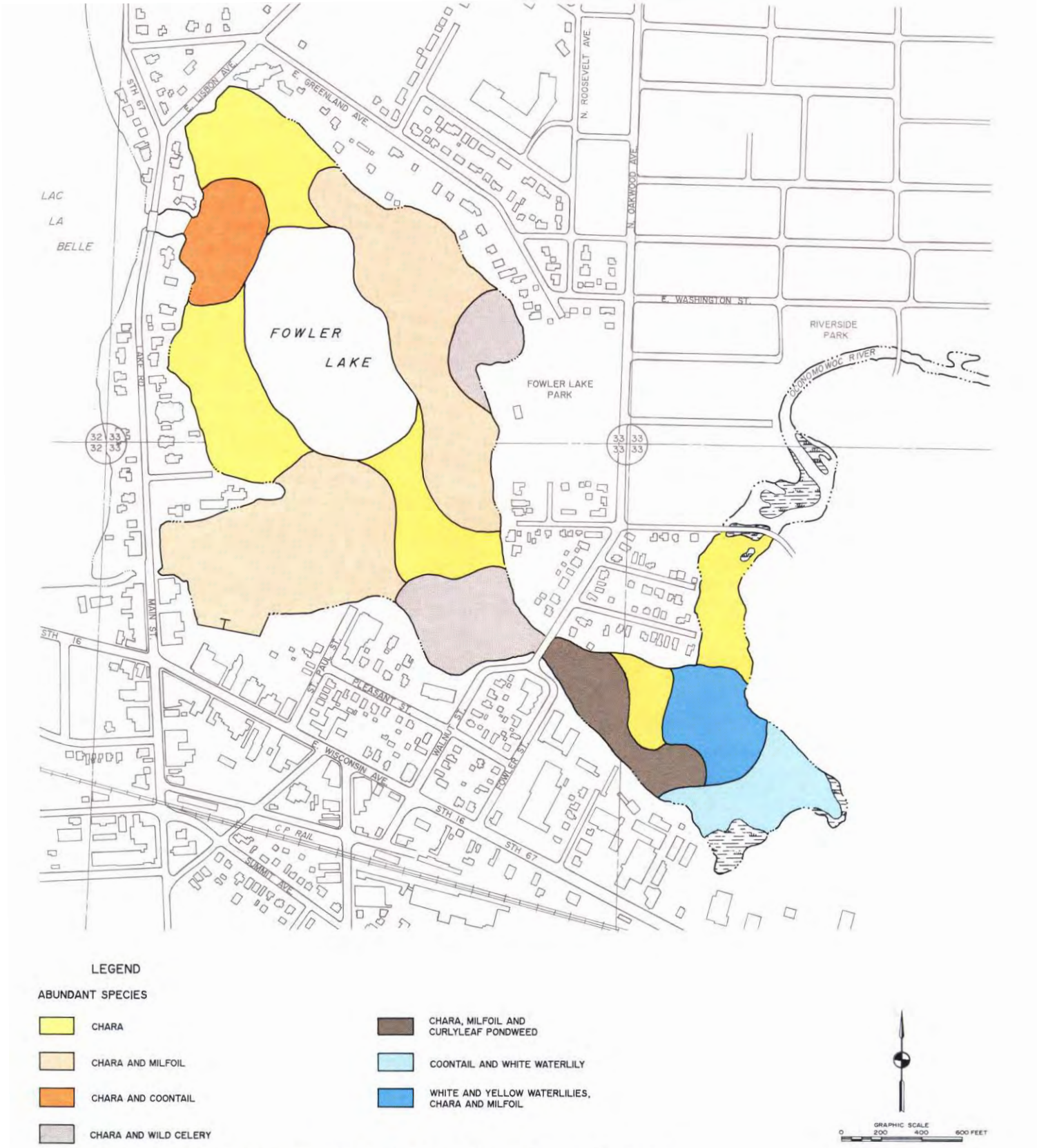
[c]*These species were present, but not quantified.*

[d]*Formerly known as* Myriophyllum exalbescens.

Source: SEWRPC.

Map 7

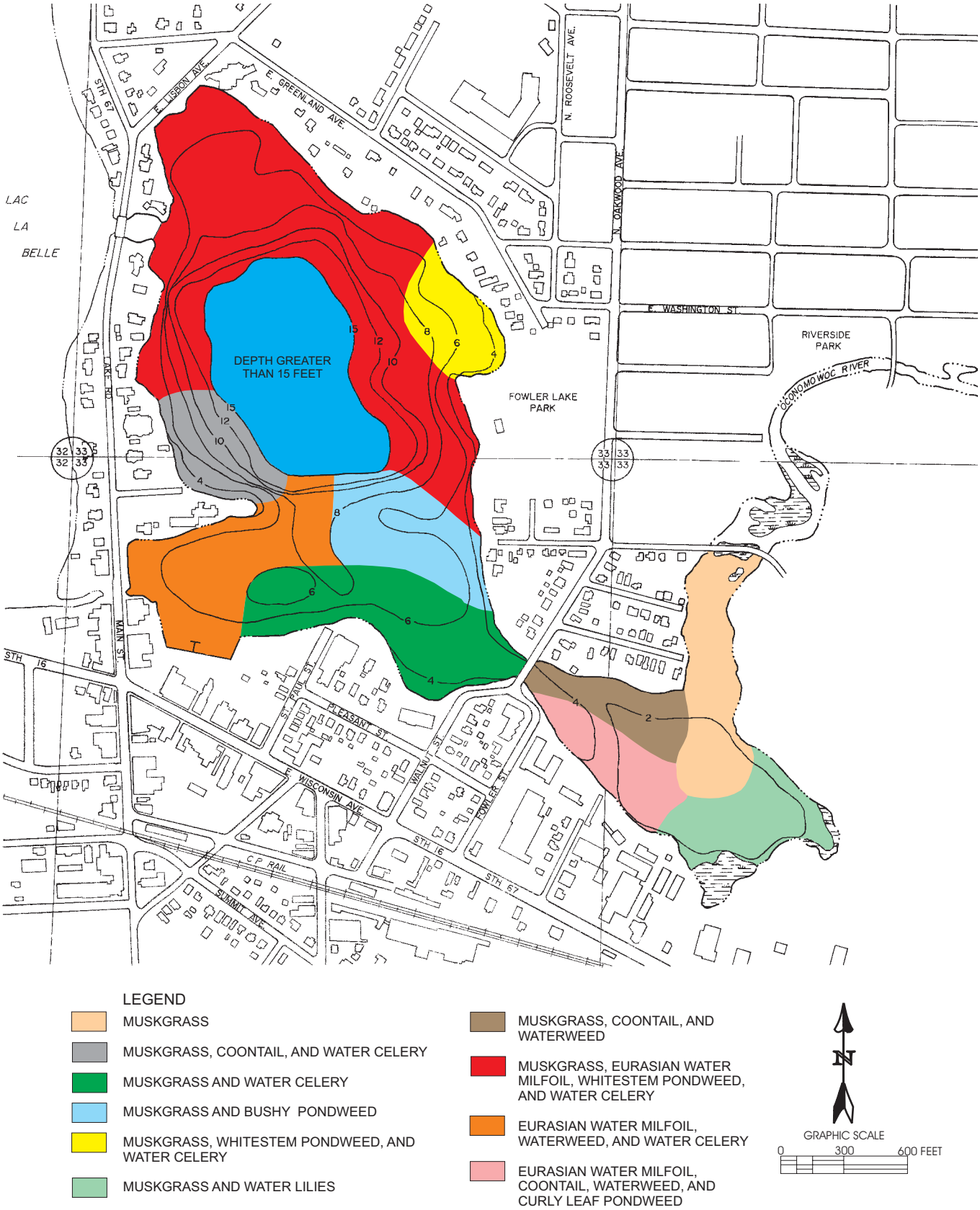
MACROPHYTE DISTRIBUTION IN FOWLER LAKE: JUNE 1984



Source: Patrick Sorge and Timothy Lowry, Aquatic Plant and Sediment Survey on Fowler Lake.

Map 8

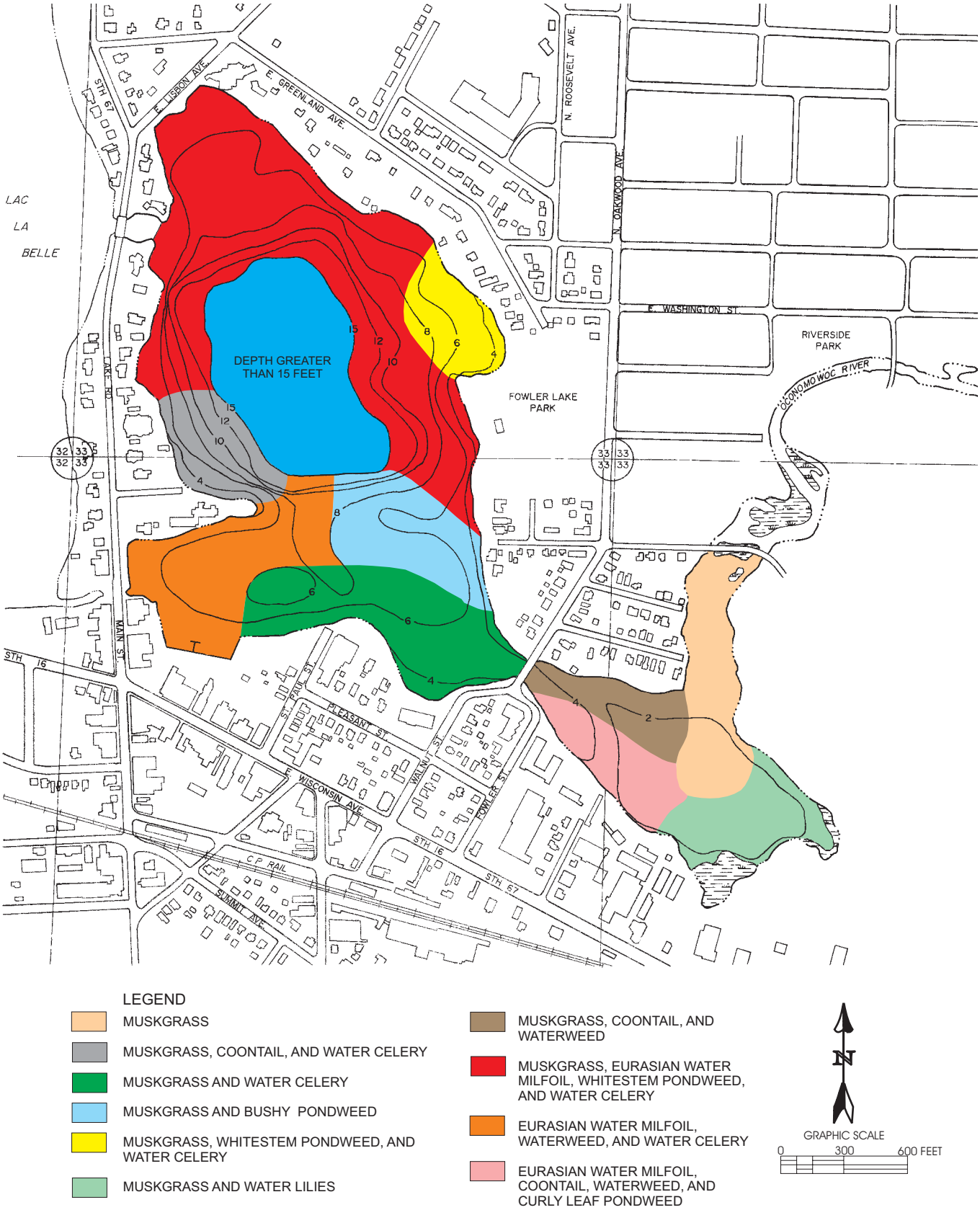
AQUATIC PLANT COMMUNITY DISTRIBUTION IN FOWLER LAKE: 1997



Source: SEWRPC.

Map 9

AQUATIC PLANT COMMUNITY DISTRIBUTION IN FOWLER LAKE: 2007



LEGEND

- MUSKGRASS
- MUSKGRASS, COONTAIL, AND WATER CELERY
- MUSKGRASS AND WATER CELERY
- MUSKGRASS AND BUSHY PONDWEED
- MUSKGRASS, WHITESTEM PONDWEED, AND WATER CELERY
- MUSKGRASS AND WATER LILIES
- MUSKGRASS, COONTAIL, AND WATERWEED
- MUSKGRASS, EURASIAN WATER MILFOIL, WHITESTEM PONDWEED, AND WATER CELERY
- EURASIAN WATER MILFOIL, WATERWEED, AND WATER CELERY
- EURASIAN WATER MILFOIL, COONTAIL, WATERWEED, AND CURLY LEAF PONDWEED

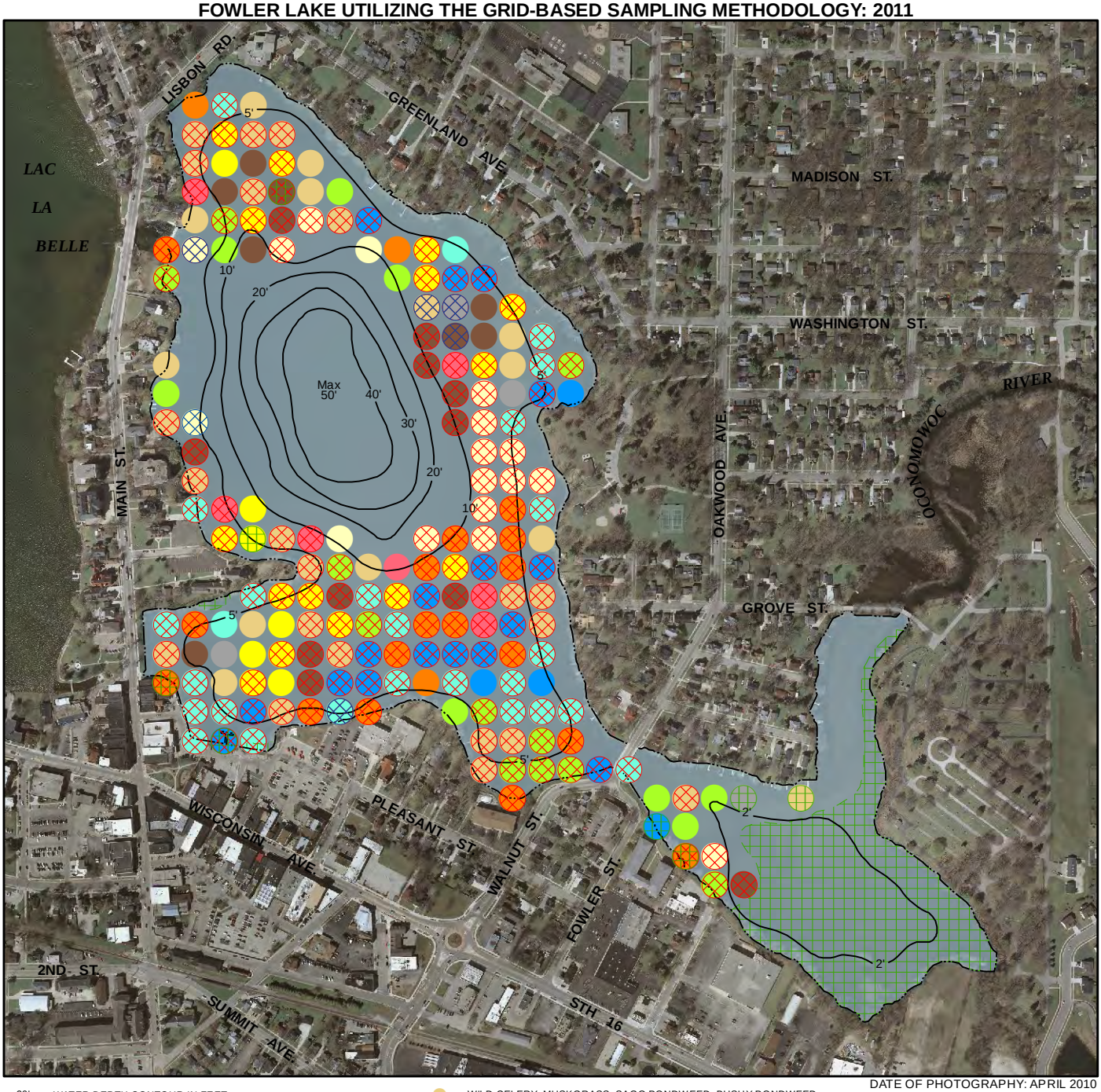
N

GRAPHIC SCALE
0 300 600 FEET

Source: SEWRPC.

Map 10

AQUATIC PLANT COMMUNITY DISTRIBUTION OBSERVED IN FOWLER LAKE UTILIZING THE GRID-BASED SAMPLING METHODOLOGY: 2011



DATE OF PHOTOGRAPHY: APRIL 2010

— 20' — WATER DEPTH CONTOUR IN FEET

OPEN WATER

WATER LILIES

EURASAIN WATER MILFOIL

CURLY LEAF PONDWEED

WILD CELERY, MUSKGRASS, COONTAIL, BUSHY PONDWEED, BLADDERWORT, CLASPING LEAF PONDWEED, AND WATERWEED

WILD CELERY, MUSKGRASS, COONTAIL, BUSHY PONDWEED, SAGO PONDWEED, BLADDERWORT, VARIABLE PONDWEED, SPINY NAIAD, AND CLASPING LEAF PONDWEED

WILD CELERY, MUSKGRASS, COONTAIL, BUSHY PONDWEED, SAGO PONDWEED, VARIABLE PONDWEED, BLADDERWORT, AND SPINY NAIAD

WILD CELERY, MUSKGRASS, SAGO PONDWEED, BUSHY PONDWEED VARIABLE PONDWEED, BLADDERWORT, SPINY NAIAD, CLASPING LEAF PONDWEED, NATIVE WATER MILFOIL, SMALL PONDWEED, ILLINOIS PONDWEED, AND LEAFY PONDWEED

WILD CELERY, MUSKGRASS, COONTAIL, BUSHY PONDWEED, VARIABLE PONDWEED, BLADDERWORT, CLASPING LEAF PONDWEED, NATIVE WATER MILFOIL, AND WATERWEED

WILD CELERY, COONTAIL, BUSHY PONDWEED, BLADDERWORT, NATIVE WATER MILFOIL, WATERWEED, AND ILLINOIS PONDWEED

WILD CELERY, BUSHY PONDWEED, VARIABLE PONDWEED, CLASPING LEAF PONDWEED, NATIVE WATER MILFOIL, WATERWEED, AND ILLINOIS PONDWEED

MUSKGRASS, COONTAIL, SAGO PONDWEED, BUSHY PONDWEED, SPINY NAIAD, VARIABLE PONDWEED, BLADDERWORT, AND SMALL PONDWEED

COONTAIL, BLADDERWORT, NEEDLE SPIKE RUSH, AND FLAT STEM PONDWEED

SAGO PONDWEED, BLADDERWORT, SPINY NAIAD, AND FLAT STEM PONDWEED

N

0 300 600 Feet

Source: SEWRPC.

acquired using the transect-based aquatic plant community survey methodology,[20] while the current aquatic plant community map, Map 10, was developed from data acquired using the grid-based, "point-intercept" methodology.[21] The data acquired using this grid-based methodology are shown in Appendix B in a sample point, "dot" format.

1984 Survey

The 1984 survey of Sorge and Lowry identified 11 species of submerged aquatic plants, many of which were described as being common to abundant, with muskgrass (*Chara* sp.) and Eurasian water milfoil (*Myriophullum spicatum*) being dominant.[22] A number of these species are known to interfere with the recreational and aesthetic use of the Lake, with Eurasian water milfoil and curly-leaf pondweed (*Potamogeton crispus*) being designated nonnative invasive species pursuant to Chapter NR 109 of the *Wisconsin Administrative Code*. The most abundant plant growth occurred in the southwest bay by the boardwalk and the southeast bay upstream of the Oakwood Avenue bridge, as shown on Map 7. During this initial survey, aquatic plant growth occurred in water up to 22 feet deep, but was concentrated in those areas of less than 15 feet deep.

1997 Survey

In 1997, muskgrass (*Chara* sp.), coontail (*Ceratophyllum demersum*), and eel-grass (*Vallisneria americana*) were abundant at all depths and were found in the highest frequency throughout the Lake.[23] Eel-grass and muskgrass are low-growing plants that pose few problems for recreational lake users. Eurasian water milfoil was also common in much of the Lake. In addition, Fowler Lake contained significant numbers of bladderwort (*Utricularia vulgaris*), waterweed (*Elodea canadensis*) and numerous species of pondweed (*Potamogeton* spp.), that provide good fish and aquatic wildlife habitat and little interference with the recreational uses of the Lake. Pondweed dominated plant communities tended to be situated in the shallow water areas of the Lake, with fringing beds of Eurasian water milfoil and coontail in the deeper, offshore areas of up to 15 feet in depth, as shown on Map 8.

2007 Survey

During the 2007 reconnaissance, 17 species of submerged aquatic plants were observed.[24] The distribution of these plants is shown on Map 9. Coontail, eel-grass, and northern water milfoil (*Myriophyllum sibiricum*) were the dominant species, with the three species comprising at about 60 percent of aquatic plant population of the Lake. Pondweeds, bushy pondweed (*Najas flexilis)*, and muskgrass were also common comprising a further approximately one-third of the aquatic plant community. These plants are generally considered to provide good habitat for fishes and other aquatic life, and generally interfere little with recreational activities. It should be noted that the eel-grass sampled from Fowler Lake grows to extreme lengths, and, during late summer and autumn, it is known to extend reproductive structures above the water surface.

---

[20]*Memo from Stan Nichols to J. Bode, J. Leverence, S. Borman, S. Engel, and D. Helsel, entitled "Analysis of Macrophyte Data for Ambient Lakes-Dutch Hollow and Redstone Lakes Example," Wisconsin Geological and Natural History Survey, University of Wisconsin-Extension, February 4, 1994.*

[21]*Wisconsin Department of Natural Resources, Publication No. PUB-SS-1068 2010,* Recommended Baseline Monitoring of Aquatic Plants in Wisconsin: Sampling Design, Field and Laboratory Procedures, Data Entry and Analysis, and Applications, *2010.*

[22]*SEWRPC Community Assistance Planning Report No. 187,* op. cit.

[23]*SEWRPC Memorandum Report No. 134,* op. cit.

[24]*SEWRPC Staff Memorandum,* op. cit.

Table 7

AQUATIC PLANT SPECIES OBSERVED IN FOWLER LAKE: JULY 2011

Aquatic Plant Species	Frequency of Occurrence[a]	Relative Density[b]	Importance Value[c]
Ceratophyllum demersum (coontail)	41.2	2.3	94.7
Chara spp. (muskgrass)	64.7	3.7	238.0
Eleocharis acicularis (needle spikerush)	1.6	4.3	7.0
Elodea canadensis (waterweed)	5.9	1.9	11.2
Lemna spp. (duckweed)	1.1	5.0	5.3
Myriophyllum sibiricum (northern water milfoil)[d]	8.6	1.6	13.9
Myriophyllum spicatum (Eurasian water milfoil)	74.9	2.6	194.1
Najas flexilis (bushy pondweed)	23.5	1.9	45.5
Najas marina (spiny naiad)	7.5	3.5	26.2
Nuphar advena (yellow water lily)	1.6	3.3	5.3
Nymphaea odorata (white water lily)	2.7	2.0	5.3
Potamogeton crispus (curly-leaf pondweed)	3.2	1.2	3.7
Potamogeton foliosus (leafy pondweed)	3.2	1.3	4.3
Potamogeton gramineus (variable pondweed)	17.6	2.1	37.4
Potamogeton illinoensis (Illinois pondweed)	5.3	1.9	10.2
Potamogeton pectinatus (Sago pondweed)	27.8	2.2	61.0
Potamogeton pusillus (small pondweed)	7.0	1.5	10.2
Potamogeton richardsonii (clasping-leaf pondweed)	10.2	1.5	15.5
Potamogeton zosteriformis (flat-stem pondweed)	1.6	2.3	3.7
Utricularia vulgaris (bladderwort)	21.9	1.3	28.3
Vallisneria americana (eel-grass/wild celery)	79.1	3.5	275.9
Zosterella dubia (water stargrass)	2.7	1.6	4.3

NOTE: Sampling occurred at 187 sampling points within a 316 point grid.

[a]*The frequency of occurrence is the percentage of times a particular species occurred at a sampling point when there was aquatic vegetation present at that point.*

[b]*The relative density presents an indication of how abundant the growth of a particular plant is throughout the lake. This measure along with the frequency of occurrence gives a good indication of the distribution of aquatic plant communities in a lake.*

[c]*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.*

[d]*Formerly known as* Myriophyllum exalbescens.

Source: SEWRPC.

The 2007 reconnaissance was conducted in early autumn. Consequently, some differences in species composition could be expected due simply to the fact that the aquatic plants are seasonal in their occurrences and abundances. Data from the National Weather Service would suggest that October 2007 was an unusually mild month. Temperature data reported from the Oconomowoc weather station indicate that temperatures were approximately six degrees Fahrenheit warmer than the 30-year (1971-2000) average for the month of October, placing the air temperatures observed during the early part of the month well into the range of air temperatures typically observed during September.

2011 Survey

Statistical data compiled as a result of the July 2011 aquatic plant survey are shown in Table 7, while the distribution of aquatic plant communities in Fowler Lake is displayed on Map 10. The ecological significance of each of the aquatic plant species identified during the 2011 survey is set forth in Table 8.

Table 8

POSITIVE ECOLOGICAL SIGNIFICANCE OF AQUATIC PLANT SPECIES PRESENT IN FOWLER LAKE: 2011

Aquatic Plant Species Present	Ecological Significance
Ceratophyllum demersum (coontail)	Provides good shelter for young fish; supports insects valuable as food for fish and ducklings; native
Chara spp. (muskgrass)	A favorite waterfowl food and fish habitat, especially for young fish; native
Eleocharis acicularis (needle spikerush)	Provides food for a variety of waterfowl and habitat for invertebrates; native
Elodea canadensis (waterweed)	Provides shelter and support for insects which are valuable as fish food; native
Lemna spp (duckweed)	Provides most nutritional needs for ducks and geese; also provides food for muskrat, fish, and beaver and offers shade and cover for fish; native
Myriophyllum sibiricum (northern water milfoil)[a]	Leaves and fruit provide food for waterfowl; foliage provides habitat for invertebrates; offers shade, shelter and foraging for fish; native
Myriophyllum spicatum (Eurasian water milfoil)	None known; nonnative
Najas flexilis (bushy pondweed)	Important food source for waterfowl, marsh birds, and muskrats; provides food and shelter for fish; native
Najas marina (spiny naiad)	Important food source for waterfowl, marsh birds, and muskrats; provides food and shelter for fish; native
Nuphar advena (yellow water lily)	Seeds provide food for waterfowl; leaves, stems, and flowers are food for deer; rhizomes are food source for muskrats and beaver; leaves provide shelter and shade for fish and habitat for invertebrates; native
Nymphaea odorata (white water lily)	Seeds provide food for waterfowl; leaves, stems, and flowers are food for deer; rhizomes are food source for muskrats and beaver; leaves provide shelter and shade for fish and habitat for invertebrates; native
Potamogeton crispus (curly-leaf pondweed)	Nonnative
Potamogeton foliosus (leafy pondweed)	Fruit provides food for a variety of waterfowl; provides cover for invertebrates; native
Potamogeton gramineus (variable pondweed)	The fruit is an important food source for waterfowl; the stem and leaves supply food for muskrat, beaver, deer, and moose and provide forage and cover for fish; native
Potamogeton illinoensis (Illinois pondweed)	Provides shade and shelter for fish; harbor for insects; seeds are eaten by wildfowl; native
Potamogeton pectinatus (Sago pondweed)	This plant is the most important pondweed for ducks, in addition to providing food and shelter for young fish; native
Potamogeton pusillus (small pondweed)	Provides food for ducks, geese, muskrat, beaver, and deer, and provides food and shelter for fish; native
Potamogeton richardsonii (clasping-leaf pondweed)	The fruit is an important food source for waterfowl; the stem and leaves supply food for muskrat, beaver, deer, and moose and provide forage and cover for fish; native
Potamogeton zosteriformis (flat-stem pondweed)	Provides some food for ducks; native
Utricularia vulgaris (bladderwort)	Stems provide food and cover for fish; native
Vallisneria americana (eel-grass/wild celery)	Provides good shade and shelter, supports insects, and is valuable fish food; native
Zosterella dubia (water stargrass)	Locally important food source for waterfowl and forage for fish; native

NOTE: 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.

[a]*Formerly known as* Myriophyllum exalbescens.

Source: SEWRPC.

As shown in Table 6, statistical data indicate that eel-grass, muskgrass, and Eurasian water milfoil continue to be dominant in the Fowler Lake aquatic plant community. As can be seen from the summaries in Table 6, these three plant species, along with coontail, have consistently been the dominant aquatic plant species in Fowler Lake since the 1984 aquatic plant survey. Samples from waters as deep as 14 feet contained aquatic vegetation. The SEWRPC staff estimated that plants were present at greater depths, although limitations imposed by sampling apparatus did not allow for retrieval of samples beyond a depth of 14 feet. The average depth of water containing plants was 6.5 feet.

The results of the 2011 survey, set forth in Tables 6 and 7, also indicate that two species—white-stem pondweed (*Potamogeton praelongus*) and large-leaf pondweed (*Potamogeton amplifolius*)—which have been present in earlier surveys, were absent from plants observed in 2011. These two species are especially beneficial for aquatic organisms, as will be discussed below, and their absence from the 2011 survey may be an indication of changing water quality conditions in Fowler Lake.[25]

Aquatic Plant Diversity in Fowler Lake

A critical key to the ability of an ecosystem, such as a lake, to maintain its ecological integrity is through *biological diversity*. Conserving the biological diversity, or biodiversity, of an ecosystem, based on the numbers of different species observed, not only helps to sustain the system, but preserves a spectrum of options for future decisions regarding the management of that system. This is particularly significant in the area of aquatic plant management.

Over the years, since the 1984 survey, Fowler Lake has had an increasingly diverse submerged aquatic plant community overall: in 1984, a total of 11 different aquatic plant species were observed; in 1997, 14 species were observed; in the 2007 reconnaissance, 17 species were observed; and, in the 2011 survey, 19 species were observed. Three species of emergent plants were observed in all sampling years and included in each of the surveys, but for the sake of comparison, were not included in the above counts which are based upon the submergent aquatic flora of the Lake. By comparison, Oconomowoc Lake, just upstream of Fowler Lake, was reported to have 18 species of submergent aquatic plants in a survey conducted during 2005,[26] and Lac La Belle, just downstream of Fowler Lake, was reported to contain 15 species of submergent aquatic plants in a survey conducted during 2001.[27]

The total numbers of aquatic plant species found in a lake, although important, are not the sole determinant of the degree of species richness in a lake. Aquatic plants in lakes and waterways have specific requirements for sunlight and substrate and, consequently, plant communities vary with depth, water quality, and other "drivers" that affect the ability of the plants to succeed in a specific locality. For these reasons, some areas of a lake may contain plant communities with very little diversity, while other areas of a lake may exhibit good diversity. In Fowler Lake, even though the overall total number of different plant species is high (19), no areas of the lake actually contained all 19 species. In fact, a review of the numbers of species found at each sampling point in the Lake that contained aquatic vegetation, revealed a range of from one to eight species at any given sampling point. Consequently, Map 11, which compares the relative aquatic plant species richness in different areas of the Lake, was based on a

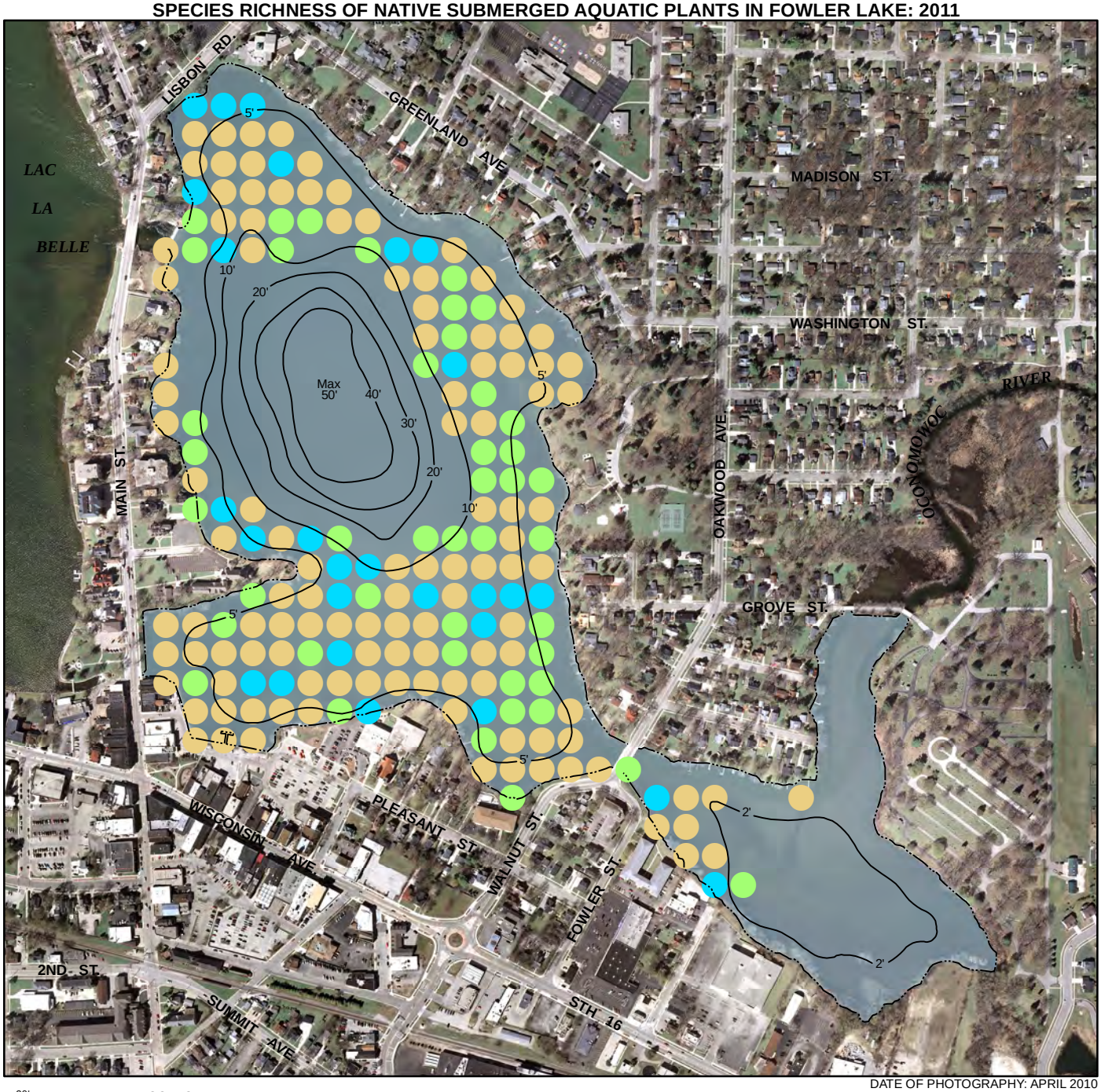
[25]*It should be noted that the numerous species of pondweeds that occur in Wisconsin lakes are highly seasonal in their occurrence; the presence or absence of a specific species in an individual survey may simply reflect this seasonality. Nevertheless, their occurrence in subsequent surveys should be monitored.*

[26]*SEWRPC Community Assistance Planning Report No. 181, 2nd Edition,* A Water Quality Management Plan for Oconomowoc Lake, Waukesha County, Wisconsin, *July, 2009.*

[27]*SEWRPC Community Assistance Planning Report No. 47, 2nd Edition,* A Community Assistance Planning Report for Lac La Belle, Waukesha, Wisconsin, *May, 2007.*

Map 11

SPECIES RICHNESS OF NATIVE SUBMERGED AQUATIC PLANTS IN FOWLER LAKE: 2011



DATE OF PHOTOGRAPHY: APRIL 2010

— 20' — WATER DEPTH CONTOUR IN FEET

OPEN WATER

SPECIES RICHNESS

- LOW: LESS THAN TWO SPECIES AT A SITE
- MODERATE: THREE TO FOUR SPECIES AT A SITE
- HIGH: GREATER THAN FIVE SPECIES AT A SITE

N

0 300 600 Feet

Source: SEWRPC.

scale in which two species at a sampling point indicated low plant diversity or species richness; three to four species indicated moderate diversity; and, five to eight species indicated high diversity. Only one sampling point contained a maximum number observed of eight total native species, however, if you include the presence of the invasive nonnative species Eurasian water milfoil there was actually nine total species at that location.

Aquatic Plant Species of Special Significance

Beneficial Native Aquatic Plants

There are three native aquatic plant species found in some southeastern Wisconsin lakes that are of exceptionally high ecological value: muskgrass, white-stem pondweed, and large-leaf pondweed. All three of these species have, at one time or another, been observed in Fowler Lake.

The macro-alga, muskgrass, is a favorite waterfowl food source and, although it lacks a root system, is an effective bottom sediment stabilizer, benefitting water quality. Its prevalence in the aquatic plant communities of a lake may be a significant factor contributing to establishing and maintaining good water quality in a lake and, consequently, in establishing water quality conditions that assist native plant species to successfully compete with nonnative species. Muskgrass has been observed in Fowler Lake in all plant surveys since 1984 and, indeed, has been considered one of three consistently dominant plant species in the Lake since that time. Map 12 shows the distribution of muskgrass in Fowler Lake in 2011.

Large-leaf pondweed, also known as musky weed or bass weed, is another native species of high value in natural communities. Although not observed in the 2011 survey, this species was recorded as being present in the 1997 survey and in the 2007 reconnaissance. This plant enjoys a reputation as highly valuable fish habitat. Additionally, this plant has achieved some measure of success as an introduced aquatic plant in transplanting efforts in Lac La Belle and Okauchee Lake, in Waukesha County, Wisconsin, making it a potentially valuable partner in littoral zone restoration projects.[28]

White-stem pondweed, because of its sensitivity to changes in water quality and intolerance of turbidity, is considered an excellent indicator species; its disappearance from water systems is an indication of declining water quality in disturbed systems. This species was observed in Fowler Lake in the 1997 survey, but not in the 2007 reconnaissance, nor in the 2011 survey. Its absence from the 2011 survey may not necessarily be an indication of deteriorating water quality conditions in the Lake, although, as noted above, water clarity estimates based upon the satellite telemetry ranged from a minimum depth of 4.4 feet in August 2009 to a maximum depth of 12.5 feet in July 2001, in contrast to the historic range of transparency observations in Fowler Lake, which ranged from six feet to 25 feet.[29] Pondweeds in general are known to undergo seasonal population variations, and it may be that the species was present during the recent surveys, but in such small numbers as to have escaped being sampled. Its presence or absence in future surveys will offer a clearer picture of this species' status in Fowler Lake and provide a better indication of the direction of possible changing water quality conditions in the Lake.

Deleterious Nonnative Species

As early as the 1984 aquatic plant survey of Fowler Lake, two nonnative aquatic plant species of special significance were observed: Eurasian water milfoil and curly-leaf pondweed. These species are considered detrimental to the ecological health of the Lake and are declared nuisance species in Chapters NR 40 and NR 109 of the *Wisconsin Administrative Code*. The distributions of the plants in Fowler Lake during the 2011 aquatic plant survey are shown on Maps 13 and 14, respectively.

---

[28]*Wisconsin Lakes Partnership,* Through the Looking Glass…A Field Guide to Aquatic Plants, Wisconsin Lakes Partnership, University of Wisconsin-Extension, *1999.*

[29]*SEWRPC Community Assistance Planning Report No. 187,* op. cit.

Map 12

DISTRIBUTION OF MUSKGRASS IN FOWLER LAKE: 2011

DATE OF PHOTOGRAPHY: APRIL 2010

— 20' — WATER DEPTH CONTOUR IN FEET

MUSKGRASS

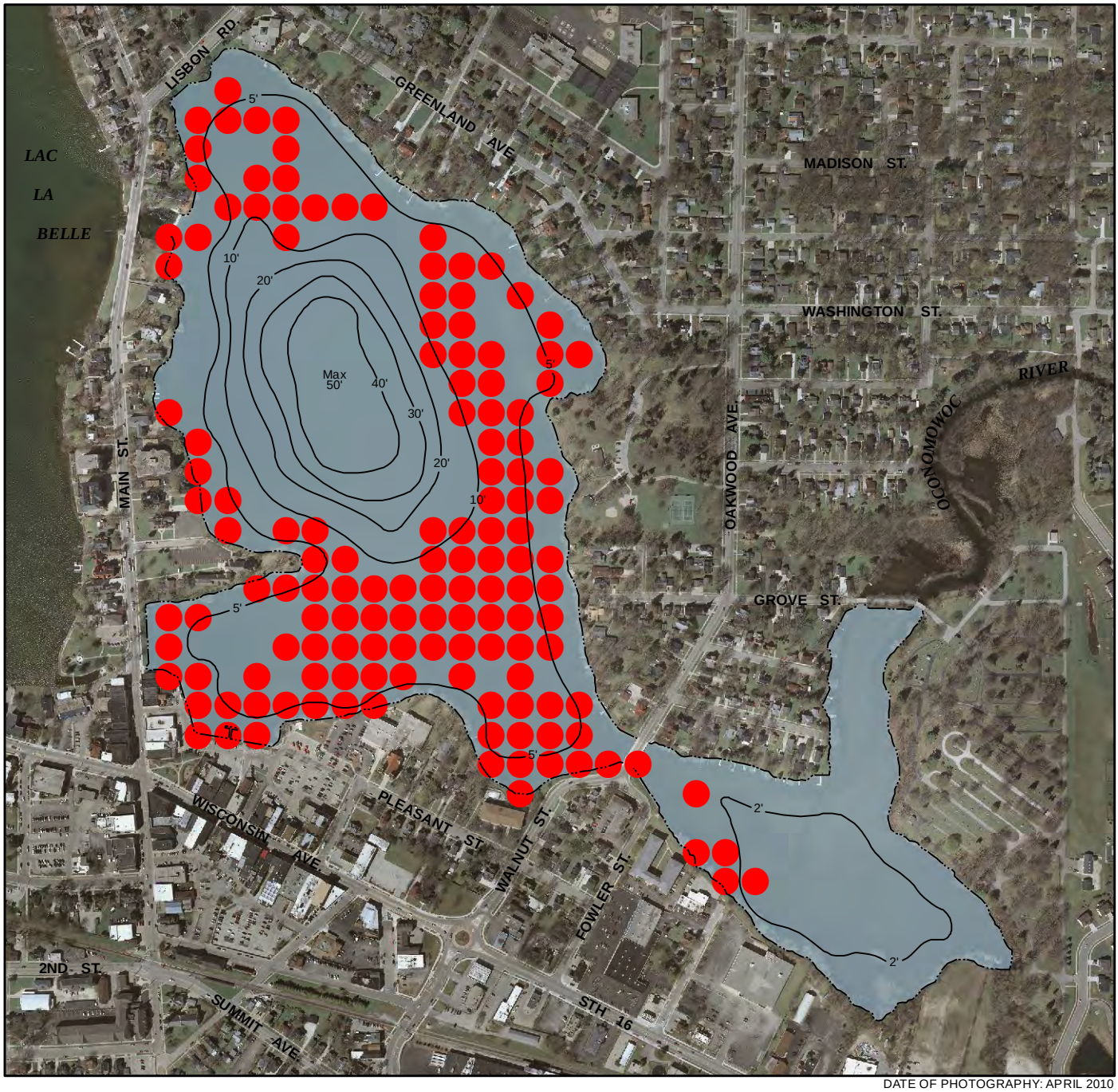
Source: SEWRPC.

N

0 300 600 Feet

Map 13

DISTRIBUTION OF EURASIAN WATER MILFOIL IN FOWLER LAKE: 2011



DATE OF PHOTOGRAPHY: APRIL 2010

— 20' — WATER DEPTH CONTOUR IN FEET

● EURASIAN WATER MILFOIL

Source: SEWRPC.

N

0 300 600 Feet

Map 14

DISTRIBUTION OF CURLY-LEAF PONDWEED IN FOWLER LAKE: 2011

DATE OF PHOTOGRAPHY: APRIL 2010

— 20' — WATER DEPTH CONTOUR IN FEET

CURLY-LEAF PONDWEED

Source: SEWRPC.

N

0 300 600 Feet

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 growth, which can be explosive under suitable conditions. The plant exhibits this characteristic growth pattern in lakes with organic-rich sediments, or where the lake bottom has been disturbed. It frequently has been reported as a colonizing species following dredging, unless its growth is anticipated and controlled. Eurasian water milfoil populations can 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 South-eastern 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 such reasons, 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. Pursuant to Section NR 40.07 of the *Wisconsin Administrative Code*, all aquatic plant fragments must be removed from vessels, vehicles, and trailers prior to launching a boat and after retrieving a boat and before transporting the boat on the public highways. In acknowledgment of this, the WDNR encourages the conduct of its Clean Boats-Clean Waters Program at public recreational boating access sites across the State. In use on many lakes within the Region, this program enlists the help of volunteers to maintain a presence at public boat launch sites during peak periods to perform boat and trailer checks, and to distribute informational materials to inform boaters on how to prevent the spread of aquatic invasive species, such as Eurasian water milfoil. Map 13 shows the distribution of Eurasian water milfoil in Fowler Lake based on data from the 2011 aquatic plant survey.

Curly-leaf pondweed is a plant that thrives in cool water and exhibits a peculiar split-season growth cycle that helps give it a competitive advantage over native plants. This growth cycle also makes management of this species problematical. In late summer, the plant produces specialized overwintering structures, or "turions," following the production of which the main body of the plant dies off and drops to the bottom where the turions lie dormant until the cooler fall water temperatures trigger the turions to germinate. Over the winter, the turions produce a winter foliage that can thrive under the ice. In spring, when water temperatures begin to rise again, the plant has a head start on the growth of native plants and quickly grows to full size, producing flowers and fruit earlier than its native competitors. Because it can grow in more turbid waters than many native plants, protecting or improving water quality is an effective method of control of this species. Clearer waters in a lake can help native plants compete more effectively with curly-leaf pondweed. Distribution of curly-leaf pondweed in Fowler Lake is shown on Map 14.

Changes in the Fowler Lake Aquatic Plant Community

In the previous report,[30] a statistical analysis was presented comparing aquatic plant communities observed during the 1984 survey with those in the 1997 survey. That analysis concluded that, over the 13-year time period, the major changes in the plant community had been in the structure and distribution of the plants. When the 1984 survey was conducted, muskgrass and Eurasian water milfoil dominated the aquatic plant community. By 1997, these two species continued to be the two plants that occurred most often; however, the average density of Eurasian water milfoil had decreased while that of the muskgrass had increased, particularly in the inlet area upstream of the Oakwood Avenue bridge. Even though the Eurasian water milfoil was continuing to spread in the Lake, its growth was not as dense. Further, what had been monospecific stands of the plant in the 1970s and 1980s were now interspersed with native plant species. This was viewed as an overall shift toward a healthier,

[30] *SEWRPC Memorandum Report No. 134,* op. cit.

more-diverse plant community. Changes in the importance values (a statistical datum) of Eurasian water milfoil and muskgrass showed that these two species did not dominate the aquatic plant communities in 1997 to the same extent they had in 1984. This was another change considered representative of a healthier lake ecosystem. Other statistical data, along with a marked increase in several beneficial species and the appearance of large-leaf pondweed, all seemed to reinforce the trend toward healthier, more-balanced aquatic plant communities in Fowler Lake.

Aquatic plant communities do undergo cyclical and periodic changes, which reflect, in part, changing climatic conditions on an interannual scale, as well as the evolution of the aquatic plant community in response to such factors as changes in long-term nutrient loading, sedimentation rates, and recreational use patterns. The former, interannual, changes occur over a period of three to seven years and may be temporary; the latter, evolutionary changes occur over a decadal period or longer and are longer-lasting. For example, the change in the Eurasian water milfoil population in a lake may reflect the results of aquatic management practices and/or may be a reflection of a periodicity the species naturally experiences. Such periodicity, especially in Eurasian water milfoil populations, has been observed elsewhere in southeastern Wisconsin, and potentially reflects the influences of a combination of stressors. These stressors include biological factors, such as the activities of naturally occurring Eurasian water milfoil weevils, as well as climatic and limnological factors, such as insolation (i.e., solar radiation or exposure to sunlight), water temperature, and lake circulation patterns. Also, some species, such as the pondweeds, exhibit distinct seasonality, with individual species having well-defined growing periods that reflect water temperature, insolation, and other factors. Variations in the occurrence of pondweed species in lakes are not unusual. Such variations are frequently reported and reflect anticipated interannual variability within the lakes. Such variability is related to weather conditions, insolation or the availability of sunlight, and related climatic factors, as well as to sampling effort. With regard to the latter, rare species may be under-sampled. Consequently, variations in occurrences of pondweed species, in particular, rarely reflect long-term changes in a lake ecosystem.

To determine the nature of changes occurring in aquatic plant communities, successive surveys, utilizing similar methods, need to be conducted every three to five years. The modified Jesson and Lound transect method,[31] as promulgated by the WDNR and widely used throughout the Southeastern Wisconsin Region by SEWRPC staff prior to 2010, including in the conduct of the 1997 survey and the 2007 reconnaissance, when utilized in successive aquatic plant surveys, allows the statistical evaluation of changes in the aquatic plant community within the Lake.[32] However, in 2010, the WDNR reverted to a grid-based sampling methodology.[33] Consequently, the 2011 SEWRPC-conducted survey was accomplished using this revised grid-based methodology. Comparing the 1984 and 1997 surveys which were conducted using identical methodologies reveals a marked decrease in the frequency of occurrence of aquatic plants in Fowler Lake over that time period. In 1984, aquatic plants occurred in 93 of 95 points, or at 97.8 percent of sites sampled; during the 1997 survey, aquatic plants occurred at 70 of the 104, or 67.3 percent, of the sites sampled. The 2011 survey, conducted utilizing a different methodology at different sampling sites than the previous surveys, found aquatic plants at 187 of 316, or 59.1 percent, of the sites located at predetermined points on a grid covering the entire basin of Fowler Lake. In future years, as successive surveys are conducted at these same sampling points on the Fowler Lake grid, more meaningful comparisons of empirical data will be possible.

---

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

[32] *Memo from Stan Nichols to J. Bode, J. Leverence, S. Borman, S. Engel, and D. Helsel,* op. cit.

[33] *Wisconsin Department of Natural Resources, Publication No. PUB-SS-1068 2010,* op. cit.

Comparison of the Transect- and Grid-Based Methodologies

That the two methodologies should provide somewhat differing levels of information about the aquatic plant community should be anticipated. The transect method, adapted from terrestrial ecology and adopted to overcome the limitations inherent in a grid-based system, uses four aquatic plant samples collected at each sampling point to determine if a plant species is "present" or "absent" in each sample. This methodology provides an objective means of determining the abundance of a plant species; subsequently, the various other statistical measures—relative density, frequency of occurrence, and importance value—can be used in analyzing aquatic plant communities, since they are based on this initial objective observation. The method provides a fairly reliable and objective assessment of plant community composition. Further, since the "present" or "absent" determination is objectively made, the accuracy of this method is unlikely to be affected by different observers. Quite simply, the species is either in the sample or it is not, and any errors made are due to either misidentification or inadvertently overlooking a small fragment of a species present in the sample.

The grid-based methodology, in which only one sample is collected at each sampling point and field staff make subjective evaluations as to the abundance of each species observed using a five-point scale without the benefit of objective descriptors for assigning these values, objectively notes only presence or absence data. Other data, such as relative density, importance value, and the like, are less objective since they are dependent on the initial subjective field assessment of abundance. For this reason, different observers may assign differing scores for density. The WDNR staff, themselves, note that "the presence/absence data cannot be used to estimate biomass or percent cover, [and] it is less sensitive to interannual or seasonal variations in plant abundance."[34] The WDNR staff also note that "the method is relatively rapid and cost-effective and can be used on the large scale to collect baseline data and statistically compare communities over time,"[35] which seems to be its principal attribute when compared with the transect-based methodology.

In 2010, a comparative study of the transect-based and grid-based methodologies was conducted on Powers Lake in Kenosha County, Wisconsin. Results of this study suggested that both the grid-based and transect-based methodologies provide essentially the same information with regard to the numbers and types of aquatic plant species observed in Powers Lake that year. Both sampling methods resulted in muskgrass being identified as the dominant aquatic plant species in the Lake, with bladderwort being the next most frequently encountered species. The two methodologies, however, differed in terms of the third most frequently encountered species, with the transect method identifying coontail while the grid method identified eel-grass (water celery). Both aquatic plants are considered to be of high value for fishes and other aquatic organisms, so these differences are not considered to be significant for purposes of aquatic plant management in Powers Lake. Other minor differences in the aquatic plant data produced by the two methodologies, such as frequency of occurrence and pattern of distribution, from the point of view of aquatic plant management, were not considered to be significant in the Powers Lake study.

However, the agreement with respect to the dominant aquatic plant species and their relative areas of distribution indicated by both methodologies is important; an important objective of aquatic plant management practices is to address recreational and other use impairments that arise as a result of certain aquatic plants being dominant in a lake to the point where their abundance reaches nuisance levels. This is especially significant when the plants that dominate are nonnative species, such as Eurasian water milfoil. Oftentimes the nonnative species flourishes at the expense of native species. As a consequence, whole ecosystems within a lake can be disrupted as native plant

---

[34]*See also J.D. Madsen, "Point Intercept and Line Intercept Methods for Aquatic Plant Management," U.S. Army Corps of Engineers Waterways Experiment Station Aquatic Plant Control Technical Note No. MI-02, 1999; and L. Dodd-Williams, G.O. Dick, R.M. Smart, and C.S. Owens, "Point Intercept and Surface Observation GPS (SOG): A Comparison of Survey Methods—Lake Gaston, NC/VA," U.S. Army Corps of Engineers Research and Development Center Report No. ERDC/TN APCRP-EA-19, 2008.*

[35]*Wisconsin Department of Natural Resources, Publication No. PUB-SS-1068 2010,* op. cit.

Table 9

CHEMICAL CONTROLS ON FOWLER LAKE: 1950-2011

Year	Algae Control		Macrophyte Control					
	Cutrine-Plus (gallons)	Copper Sulfate (pounds)	Sodium Arsenite (pounds)	2,4-D (gallons)	Hydrothol (gallons)	Diquat (gallons)	Glyphosate (gallons)	Endothall/ Aquathol (gallons)
1950-1969	- -	2,506	87,456	- -	- -	- -	- -	- -
1970-1979	20.0	- -	- -	28.0	20.0	124.8	- -	194.0
1980-1989	40.3	- -	- -	285.5	4.5 + 610.0 pounds	68.0	- -	137.5
1990	- -	- -	- -	64.5	- -	- -	- -	- -
1991	- -	- -	- -	47.8	- -	- -	- -	- -
1992	- -	- -	- -	57.0	- -	- -	- -	- -
1993[a]	- -	- -	- -		- -	- -	- -	- -
1994	- -	- -	- -	2.5	- -	- -	- -	- -
1995[a]	- -	- -	- -		- -	- -	- -	- -
1996	- -	- -	- -	75.0	- -	- -	- -	- -
1997-2010[a]	- -	- -	- -	- -	- -	- -	- -	- -
Total	60.3	2,506	87,456	465.3	24.5 + 610 pounds	192.8	- -	331.5

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

Source: Wisconsin Department of Natural Resources and SEWRPC.

species which provide normal food, shelter, and other things and to which native aquatic animal life are adapted to and depend upon for survival, become replaced with nonnative species that do not provide these same requirements. Aquatic plant management works to develop strategies aimed at restoring the balance between desirable native aquatic plant species and other species as a basis to support and sustain a range of lake uses that include recreational activities, such as swimming, fishing, and recreational boating, among others.

Past and Present Aquatic Plant Management Practices

All forms of aquatic plant management currently are subject to permitting by the WDNR pursuant to authorities granted the WDNR under Chapters NR 107 and NR 109 of the *Wisconsin Administrative Code.* Aquatic plant management practices include manual and mechanical measures, chemical herbicides, physical barriers, and biological interventions. The use of chemicals to control aquatic plants and algae in Wisconsin has been regulated since 1941, even though records of aquatic herbicide applications have only been maintained by the WDNR since 1950. Prior to 1950, aquatic plant management interventions, while likely, were not recorded.

A WDNR-approved aquatic plant control program has been undertaken on Fowler Lake since the 1950s, when records of such control programs began to be kept by the WDNR. However, aquatic plant control programs on Fowler Lake probably predate the WDNR recordkeeping system by several decades. This program initially involved the chemical treatment of aquatic plant growths with sodium arsenite. Fowler Lake was one of the 10 most heavily dosed waterbodies in Wisconsin, receiving more than 40 tons of sodium arsenite during the 20-year period from 1950 to 1969. Applications of sodium arsenite were discontinued in 1969 after arsenic accumulations were found in lacustrine sediments and concerns were expressed over possible human health impacts.

More recently, chemical treatments have consisted of systemic herbicides such as 2,4-D, as set forth in Table 9. All chemical treatments to Fowler Lake are applied by State-licensed applicators and conform to the requirements of the Chapter NR 107 permit held by the City of Oconomowoc. Chemical applications are normally made in late

Table 10

AMOUNT OF AQUATIC PLANT MATERIAL HARVESTED FROM FOWLER LAKE

Year	Acres Harvested	Plant Material Removed (cubic feet)	Plant Material Removed (pounds)
2006	44	95,742	3,546
2007	44	89,308	3,308
2008	44	64,689	2,396
2009	44	96,379	3,570
2010	44	97,951	3,628
2011	44	54,999	2,037

NOTE: Volumes of aquatic plant materials removed from Fowler Lake are measured in cubic feet of wet plant materials; the mass of aquatic plants is estimated from these volumetric measurements.

Source: Wisconsin Department of Natural Resources and SEWRPC.

spring/early summer as the plants begin to grow, with occasional follow-up treatments being applied in midsummer. Copper-based algicides, such as Cutrine, have also been applied to Fowler Lake to control the growth of the macroscopic alga, *Chara* sp., and are set forth in Table 9.

From the mid-1980s through the mid-1990s, harvesting was used in concert with an annual herbicide treatment to control aquatic plant growth in Fowler Lake. The City of Oconomowoc has purchased and operates an Aquamarine H5-200 harvester on the Lake; according to WDNR permit records, chemical treatments on the Lake have not occurred since 1996. Table 10 shows the amount of aquatic vegetation harvested from Fowler Lake as reported since 2006.

FISH AND WILDLIFE

Fishes of Fowler Lake

A survey conducted by the WDNR in 1911 found cisco, or lake herring, in Fowler Lake. However, the presence of these species in the Lake has not been confirmed in the subsequent surveys. As noted in the adopted lake management plan, the Lake is managed for bluegill, largemouth bass, and northern pike production. In addition, the WDNR has stocked walleye, brown trout, and rainbow trout in order to enhance and maintain the sportfishing opportunities for anglers using Fowler Lake.

In the fall of 1998, a two-night electrofishing survey was conducted by WDNR staff on Fowler Lake.[36] During this survey, 11 different species of fish were observed, bluegill being the most abundant species. Perch and crappie caught were small; carp collected were all large—none under 20 inches—but, although common in the shallow bays, were not abundant anywhere in the Lake. Only one walleye and one musky were caught. All northern pike caught were small. It was theorized that "Fowler Lake may be receiving most of its gamefish from those stocked in lakes above it in the watershed." At the time, it was recommended that a stocking program on Fowler Lake should be established that included biennial walleye stocking and annual northern pike stocking at recommended rates. Stocking records for the years 1985 through 2011 are presented in Table 11.

Currently, the WDNR lists panfish as "abundant," northern pike, walleye, and largemouth bass as "common;" and Muskie as "present."[37]

Wildlife in the Fowler Lake Area

With respect to wildlife, and given the urbanization of land uses present around the shorelands of Fowler Lake, most of the wildlife remaining would be expected to be urban-tolerant species: smaller animals and waterfowl would be expected to inhabit the lakeshore areas; muskrats, grey and fox squirrels, and cottontail rabbits are likely

[36]*Wisconsin Department of Natural Resources Correspondence/Memorandum, File Reference 3600, to Randy Schumacher from Sue Beyler and Steve Gospodarek, "Fall, 1998 Electrofishing Survey on Fowler Lake, WBIC 0849400."*

[37]*Wisconsin Department of Natural Resources Publication No. PUBL-FM-800-2005,* Wisconsin Lakes, *2005*.

Table 11

FISH STOCKED INTO FOWLER LAKE

Year	Species Stocked	Number
1985	Walleye	4,000
1986	Walleye	4,000
1989	Walleye Brown trout Rainbow trout	7,350 3,000 3,000
1990	Brown trout	6,500
1991	Brown trout Rainbow trout	4,000 2,850
1992	Walleye Brown trout Rainbow trout	5,000 3,000 3,000
1993	Rainbow trout	6,000
1994	Brown trout Rainbow trout	7,500 2,200
2000	Walleye	7,800
2002	Walleye Brown trout Rainbow trout	7,800 3,000 3,000
2003	Brown trout Rainbow trout	3,000 2,572
2006	Walleye Brown trout Rainbow trout	3,900 2,190 2,200
2007	Brown trout Rainbow trout	3,000 3,500
2008	Brown trout Rainbow trout	3,000 3,068
2009	Brown trout Rainbow trout	3,000 3,000
2010	Walleye Rainbow trout	2,730 3,029
2011	Brown trout Rainbow trout	954 1,372

Source: Wisconsin Department of Natural Resources and SEWRPC.

the most abundant and widely distributed fur-bearing mammals in the immediate riparian areas; and, larger mammals, such as the whitetail deer, are likely to be confined to the larger wooded areas and the open meadows found within the more undeveloped areas in the upstream reaches of the Lake's tributary area.

The Fowler Lake tributary area supports a significant population of waterfowl, including mallards, wood duck, and blue-winged teal, as well as an abundance of a Canada goose species that has increased to nuisance levels in recent years throughout the Region. During the migration seasons a greater variety of waterfowl may be present and in greater numbers.

Amphibians—frogs, toads, and salamanders—and reptiles—turtles and snakes—are vital components of the Fowler Lake ecosystem. About 14 species of amphibians and 16 species of reptiles would normally be expected to be present in the Fowler Lake area.

WDNR-Designated Sensitive Areas and Critical Species Habitat

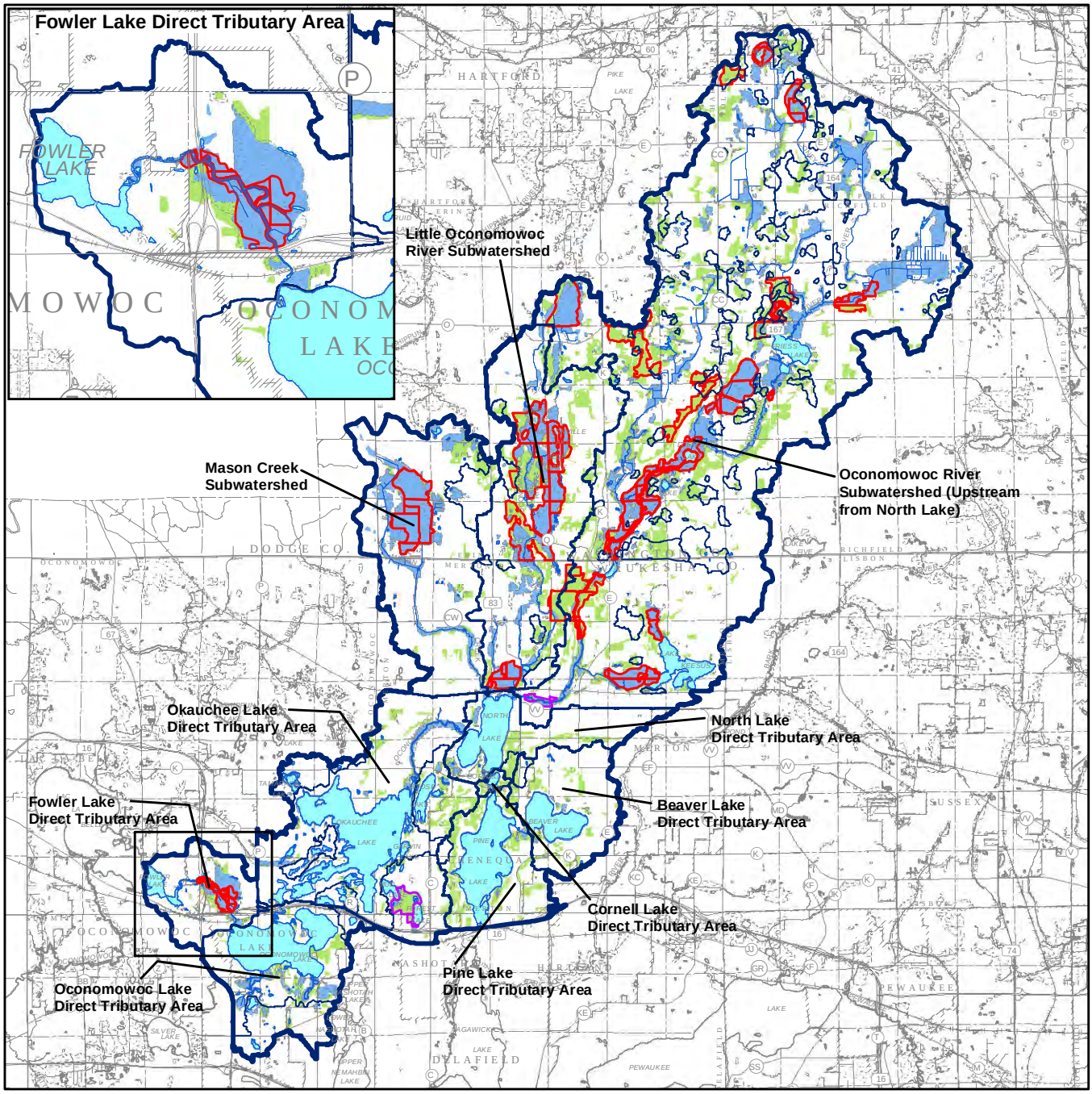
Within or immediately adjacent to bodies of water, the WDNR identifies sites that have special importance biologically, historically, geologically, ecologically, or even archaeologically. Such areas are defined as "areas of aquatic vegetation identified by the WDNR as offering critical or unique fish and wildlife habitat, including seasonal or life-stage requirements, or offering water quality or erosion control benefits of the body of water" and, after comprehensive examination and study is completed by WDNR staff from many different disciplines and fields of study, are identified as "sensitive areas" pursuant to Chapter NR 107 of the *Wisconsin Administrative Code*. In an effort to protect and maintain these sensitive areas, Chapter NR 107 authorizes the WDNR to undertake various management measures, such as 1) restricting chemical treatment of aquatic plants in sensitive areas on lakes and 2) requiring that alternatives to chemical treatment of aquatic plants be evaluated. As of 2011, no WDNR-delineated sensitive areas were demarcated on Fowler Lake.

SEWRPC also has identified natural areas and critical species habitat areas within the Southeastern Wisconsin Region.[38] Map 15 shows those natural areas and critical species habitat sites within the area tributary to Fowler Lake. The Oconomowoc River Marsh, a 100-acre wetland complex along the Oconomowoc River at the outlet to

[38]*SEWRPC Planning Report No. 42,* A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin, *September 1997, as amended.*

Map 15

NATURAL AREAS AND CRITICAL SPECIES HABITAT WITHIN THE FOWLER LAKE TOTAL AND DIRECT TRIBUTARY AREAS



NOTE: Except for wetlands, data for the portion of Dodge County is unavailable.

Source: SEWRPC.

Oconomowoc Lake upstream of Fowler Lake, has received a rating of NA-3, designating it as a natural area of local significance. This area is a cattail-dominated deep and shallow marsh bordering the Oconomowoc River, disturbed by channelizing and highway construction.

SEWRPC also has identified other natural areas and critical species habitat areas along the Oconomowoc River upstream of Fowler Lake. These include: the NA-3 designated Chenequa Wetland Complex, a 111-acre lowland shrub-carr-sedge meadow-shallow marsh-tamarack relict located at the outlet of Mason Creek into North Lake; the NA-1 designated Monches Woods, a 322-acre dry-mesic and mesic hardwood community located along the Oconomowoc River near the boundary of Washington and Waukesha Counties; the NA-2 designated Loew's Lake Wetland Complex, a 481-acre diverse wetland community; the NA-3 designated CTH J Swamp, a 100-acre shrub-carr-lowland hardwood-mesic hardwood woodland located immediately south of Friess Lake; and, the NA-3 designated, seven-acre Hubertus Road Sedge Meadow located immediately north of Friess Lake, in Washington County.

RECREATIONAL USES AND FACILITIES

Fowler Lake is a popular recreational lake situated in the heart of the City of Oconomowoc and within easy reach of the Milwaukee metropolitan area. As set forth in the regional water quality management plan, Fowler Lake is a multi-purpose waterbody recommended for the maintenance of a warmwater sportfishery and full recreational use in addition to serving year-round as a visual amenity.[39] Active recreational uses include boating, waterskiing, swimming, and fishing during the summer months; and cross-country skiing, snowmobiling, and ice-fishing during the winter. Popular passive recreational uses include walking, bird watching, and picnicking. The Lake experiences moderate recreational boating use during open-water periods, somewhat more so on weekends and holidays as is normal for lakes in the Region.

Parks and Public Access

Fowler Lake is served by several public parks located on the shores of the Lake, as shown on Map 2. The Lake has adequate public recreational boating access that predates the promulgation of Chapter NR 1 of the *Wisconsin Administrative Code*, which establishes quantitative standards for determining the adequacy of public recreation boating access, setting maximum and minimum standards based upon available parking facilities for car-top and car-trailer units. This site provides a paved boat ramp with dock and paved parking area, boardwalk, and gazebo, all located on the southern shore of the Lake adjacent to the City of Oconomowoc City Hall.

Fowler Lake Park comprises a substantial proportion of the eastern shore of the Lake, as shown on Map 2, and provides a picnic area, pavilion, bank fishing, playground area, and tennis courts. The park is a popular facility used for a variety of community gatherings, including such things as midnight movies and the festival of arts.

Recreational Use

Fowler Lake plays host to a variety of water-based outdoor recreational activities. During the summer of 2011, SEWRPC staff conducted recreational surveys on the Lake to determine the types and degree of recreational uses of the Lake and parks on a typical summer weekday and weekend day. These surveys were conducted in August 2011, the results of which are shown in Tables 12 through 14.

As shown in Table 12, about 119 watercraft were moored on the Lake or stored on shore during August of 2011. The types of watercraft docked or moored on a lake, as well as the relative proportion of nonmotorized to motorized watercraft, reflect the attitudes of the primary users of the lake, the lake residents. The 2011 riparian watercraft survey on Fowler Lake showed motorized watercraft capable of high speed accounted for nearly half of

---

[39]*SEWRPC Planning Report No. 30,* op. cit. *See also SEWRPC Memorandum Report No. 93,* A Regional Water Quality Management Plan for Southeastern Wisconsin: An Update and Status Report, *March 1995.*

Table 12

WATERCRAFT DOCKED OR MOORED ON FOWLER LAKE: AUGUST 2011[a]

Type of Watercraft									
Powerboat	Fishing Boat	Pontoon Boat	Personal Watercraft	Canoe	Sailboat	Kayak	Paddleboat	Rowboat	Total
20	4	22	9	18	8	20	13	5	119

[a]*Including trailered watercraft and watercraft on land observable during survey.*

Source: SEWRPC.

Table 13

WATERCRAFT IN USE ON FOWLER LAKE: SUMMER 2011

Date and Time	Powerboat	Pontoon Boat	Fishing Boat	Personal Watercraft	Sailboat	Canoe/ Kayak	Wind Surf Board	Paddleboat	Total
Thursday, August 13									
9:30 a.m. to 10:30 a.m.	1	0	1	0	0	0	0	0	2
2:00 p.m. to 3:00 p.m.	1	0	2	0	0	5	0	0	8
Total for the Day	2	0	3	0	0	5	0	0	10
Percent	20	0	30	0	0	50	0	0	100
Saturday, August 15									
9:30 a.m. to 10:30 a.m.	0	0	3	0	0	0	0	0	3
1:30 p.m. to 2:30 p.m.	1	1[a]	1	2	0	11[b]	0	0	16
Total for the Day	1	1	4	2	0	11	0	0	19
Percent	5	5	20	10	0	60	0	0	100

NOTE: Weather often plays a significant role in influencing the pursuit of outdoor recreational activities. Thursday, August 13, was a sunny, clear day with a mild breeze and a high temperature of about 80°F—what many people would consider a "perfect summer day". Saturday, August 15, was overcast with thunder showers off and on throughout the morning until about noon, temperatures in the low 70s; the afternoon temperatures warmed up to the mid-70s under clearing skies and mild to calm winds, hence the low number of people engaged in recreational activities in the morning compared to the afternoon.

[a]*Although several pontoon boats were observed docked along the shoreline of Fowler Lake, the only pontoon boat observed to be in use during the times of this survey appeared to be owned by a local marina and was engaged taking groups of about 10 passengers on excursions around the Lake; in total, three excursions by the same pontoon boat were observed during the survey on Saturday afternoon.*

[b]*The majority of kayaks appeared to be rentals from a commercial enterprise located in the area of the boardwalk just west of the public boat launch; only two kayaks appeared to be privately owned.*

Source: SEWRPC.

all types of watercraft, with pontoon boats comprising the single largest category. The term "powerboat" can include speed ("ski") boats, as well as cruising boats. The term "fishing boat" includes both the small traditional type of rowboat possibly outfitted with a small outboard motor of about 10 horsepower, as well as the high-speed "bass boats" of 16 feet or more in length powered by larger engines of 50 to 150 horsepower. For purposes of this report, it was assumed that approximately 50 percent of boats classified as "fishing boats" are of the latter type and capable of high-speed operation. With nearly half of all riparian boats docked or moored along the shores of Fowler Lake capable of high-speed operation, it is likely that high-speed recreational boating is a popular recreational activity on Fowler Lake.

Table 14

RECREATIONAL USE IN/ON FOWLER LAKE: SUMMER 2011

Date and Time	Participants									
	Fishing from Shoreline	Pleasure Boating	Skiing/ Tubing	Sailing	Operating Personal Watercraft	Swimming	Fishing from Boats	Canoeing/ Paddle Boating	Park Goers[a]	Total
Thursday, August 13										
9:30 a.m. to 10:30 a.m.	6	2	0	0	0	0	3	0	34	45
2:00 p.m. to 3:00 p.m.	6	0	5	0	0	5	3	6	25	50
Total for the Day	12	2	5	0	0	5	6	6	59	95
Percent	13	2	5	0	0	5	6	6	63	100
Saturday, August 15										
9:30 a.m. to 10:30 a.m.	4	0	0	0	0	0	8	0	9	21
1:30 p.m. to 2:30 p.m.	3	30[b]	8	0	5	0	2	14[c]	11	73
Total for the Day	7	30	8	0	5	0	10	14	20	94
Percent	7	32	8	0	5	0	11	15	22	100

NOTE: Weather often plays a significant role in influencing the pursuit of outdoor recreational activities. Thursday, August 13, was a sunny, clear day with a mild breeze and a high temperature of about 80°F—what many people would consider a "perfect summer day". Saturday, August 15, was overcast with thunder showers off and on throughout the morning until about noon, temperatures in the low 70s; the afternoon temperatures warmed up to the mid/upper-70s under clearing skies and mild to calm winds, hence the low number of people engaged in recreational activities in the morning compared to the afternoon.

[a]*Fowler Lake Park is the main public park on Fowler Lake; Nearly all park goers counted were in Fowler Lake Park with only one or two individuals in other public access areas of the Lake, such as the boat landing area boardwalk and gazebo. Also, on Saturday, August 13, there was a car show taking place at Fowler Lake Park; inclement weather no doubt played a role in depressing the number of participants in the show during the morning; only three additional people were observed in the morning and about 16 additional people during the afternoon—these counts being in addition to those recorded in the table above.*

[b]*Although several pontoon boats were observed docked along the shoreline of Fowler Lake, the only pontoon boat observed to be in use during the times of this survey appeared to be owned by a local marina and was engaged taking groups of about 10 passengers on excursions around the Lake; in total, three excursions by the same pontoon boat were observed during the survey.*

[c]*The majority of kayaks appeared to be rentals from a commercial enterprise located in the area of the boardwalk just west of the public boat launch; only two kayaks appeared to be privately owned.*

Source: SEWRPC.

That said, the nonmotorized watercraft observed in this same survey accounted for the remaining one-half of the recreational watercraft. Kayaks and canoes represented the most popular boat types. Thus, with about one-half the watercraft on the Lake being nonmotorized, the recreational activities as afforded by this type of watercraft appear to be as popular as those provided by high-speed boats. Such a large proportion of nonmotorized watercraft is somewhat unusual when compared to the other nearby lakes in the Oconomowoc River chain. On both the upstream Oconomowoc Lake and downstream Lac La Belle, high-speed watercraft are in the clear majority. Such a large proportion of nonmotorized watercraft on Fowler Lake may be a reflection of the relatively small size of the Lake—78 acres of navigable lake basin—compared to its neighbors.

To assess the degree of recreational boating use on a lake, recreational use counts have formed an important part of the SEWRPC lake management planning program. Based on the data collected during the course of this program, it has been estimated that, in the Southeastern Wisconsin Region, the numbers of watercraft operating on a lake at any given time range between 2 percent and 5 percent of the total number of watercraft docked and moored. On Fowler Lake, this percentage would suggest that somewhere between two and six watercraft of all types would be in operation at any given time. Based upon the ratio of powered to nonpowered watercraft observed on the Lake, it also could be assumed that about 45 percent of the watercraft would be motorized and capable of high-speed operation.

There is a range of opinions on the issue of what constitutes optimal boating density, or number of acres of open water available in which to operate a boat on a lake. In this regard, during the mid-1970s, the regional park and open space plan suggested an area of 40 acres per boat as the minimum area necessary for safe operation of high-speed watercraft used for waterskiing and fast boating.[40] Based upon these guidelines and on the counts of riparian watercraft docked or moored around the Lake set forth above, the estimated density of boats capable of high speeds on Fowler Lake would be between one boat per 26 acres to one boat per 78 acres. Such estimates would place the average boating density on Fowler Lake to be within the range considered necessary for safe operation.

More recently, during 1994, the WDNR promulgated minimum and maximum recreational boating access standards for waterbodies in the State based upon their "boatable" surface area. Sections NR 1.91 through NR 1.93 of the *Wisconsin Administrative Code* sets a minimum level of access to lakes of between 50 and 100 acres as "one or more access sites which in total provide a combination of five vehicle and car-trailer units" and a maximum level of access as "one or more access sites which in total provide five car-trailer units." In addition, one handicapped-accessible parking space would be required, providing for a total population of watercraft anticipated to utilize Fowler Lake of six watercraft. This requirement is consistent with the anticipated level of lake usage determined from the total population of watercraft observed around Fowler Lake.

During 2011, surveys to assess the types of watercraft in use on a typical summer weekday and a typical summer weekend day were conducted by SEWRPC staff. The results of these surveys are shown in Table 13. As shown in Table 13, based on number of watercraft of all types in use, kayaks were the most popular boats being used on the Lake during both weekdays and weekend days. Of the motorized watercraft, fishing boats represented about 30 percent of all types of boats in use on weekdays and about 20 percent of all types of boats in use on weekends. Based on counts of boats actually in use on the days of the survey, the density of high-speed watercraft on the Lake on weekdays was about 78 acres per boat in the morning and 39 acres per boat in the afternoon; on weekends, the densities were about 39 acres per boat in the morning and 26 acres per boat in the afternoon. In general, the afternoon appeared to be a slightly more busy time on the water during weekdays, with watercraft being mainly fishing boats and kayaks; while, on weekends, the afternoon also was the busier time with powerboats, fishing boats, and pontoon boats coming onto the Lake. As noted in Table 13, weather conditions at the time of the surveys probably played a major role in influencing boat activity on the Lake. High-speed boat densities on weekdays and weekends, based on the observations reported in Table 13, appear to be generally within the density considered appropriate for the conduct of safe high-speed boating activities. It is noted, however, that the higher degree of boating activity that often occurs on regional lakes during holiday weekends may produce high-speed boating densities that temporarily exceed the guideline values.

Table 14 supplements the assessment of observed recreational uses of Fowler Lake during a typical summer weekday and a typical summer weekend day in 2011 by presenting a census of individuals engaged in various recreational pursuits on and around the Lake. The most popular recreational activity, both on weekdays and weekends, was various kinds of park-related activities documented as "park-goer." Fowler Lake Park formed the central site for such activities, including park-going activities, such as playing tennis, fishing from the bank, using the playground equipment, picnicking, and swimming off the shore of the park. Although there is no designated beach area at Fowler Lake Park, swimmers were observed floating on inflatable rafts off the point at the north end of the Park and wading along the shoreline. Other popular activities observed included fishing from boats, kayaking, pleasure boating, waterskiing/tubing, and operating personal watercraft.

[40]*See SEWRPC Planning Report No. 27,* A Regional Park and Open Space Plan for Southeastern Wisconsin: 2000, *November 1977.*

Table 15

LAND USE REGULATIONS WITHIN THE AREA TRIBUTARY TO FOWLER LAKE IN WAUKESHA COUNTY BY CIVIL DIVISION

Community	Type of Ordinance				
	General Zoning	Floodland Zoning	Shoreland or Shoreland-Wetland Zoning	Subdivision Control	Construction Site Erosion Control and Stormwater Management
Waukesha County	Adopted	Adopted	Adopted and approved by WDNR	Floodland and shoreland only	Adopted
City of Delafield	Adopted	Adopted	Adopted	Adopted	Adopted
City of Oconomowoc	Adopted	Adopted	Adopted	Adopted	Adopted
Village of Chenequa	Adopted	None	Adopted	None	Adopted
Village of Hartland	Adopted	Adopted	Adopted	Adopted	Adopted
Village of Merton	Adopted	Adopted	Adopted	Adopted	None
Village of Nashotah	Adopted	None	Adopted and approved by WDNR	Adopted	None
Village of Oconomowoc Lake	Adopted	Adopted	Adopted	Adopted	None
Village of Summit	Adopted	Adopted	Adopted and approved by WDNR	Adopted	Adopted
Town of Lisbon	Adopted	County ordinance	County ordinance	Adopted	Adopted
Town of Merton	Adopted	County ordinance	County ordinance	Adopted	None
Town of Oconomowoc	County ordinance	County ordinance	Adopted and approved by WDNR	Adopted	Adopted
Washington County	Adopted	Adopted	Adopted and approved by WDNR	Floodland and shoreland only	Adopted
Village of Richfield	Adopted	Adopted	Adopted	Adopted	Adopted
Village of Slinger	Adopted	Adopted	Adopted	Adopted	None
Town of Erin	Adopted	County ordinance	County ordinance	Adopted	County ordinance
Town of Hartford	Adopted	County ordinance	County ordinance	County ordinance	County ordinance
Town of Polk	Adopted	County ordinance	County ordinance	Adopted	County ordinance

Source: SEWRPC.

LOCAL ORDINANCES

Fowler Lake is subject to a boating ordinance promulgated by the City of Oconomowoc. This ordinance provides generally applicable rules for all waters within the jurisdiction of the City, as appended hereto in Appendix C. These rules limit the times during which boats may operate on Fowler 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.*

Land use regulations applicable to the Fowler Lake tributary area are summarized in Table 15.

(This Page Left Blank Intentionally)

Chapter III

ALTERNATIVE AND RECOMMENDED AQUATIC PLANT MANAGEMENT PRACTICES

INTRODUCTION

Fowler Lake contains a diverse aquatic plant community capable of supporting a warmwater fishery, albeit with some areas that suffer impairment of recreational opportunities and other lake-oriented activities due to an overabundance of aquatic macrophytes. For example, in those areas of the Lake where Eurasian water milfoil (*Myriophyllum spicatum*) is abundant, certain recreational uses are limited, the aesthetic quality of the Lake is impaired, and in-lake habitat degraded. This plant primarily interferes with recreational boating activities by encumbering propellers, clogging cooling water intakes, snagging paddles, and slowing sailboats by wrapping around keels and control surfaces. The plant also causes concern among swimmers who can become entangled within the plant stalks. Thus, without control measures, these areas can become problematic for navigation, fishing, and swimming. Native aquatic plants, generally found at slightly deeper depths, pose fewer potential problems for navigation, swimming, and fisheries, and generally have attributes that sustain a healthy fishery. Many native aquatic plants provide fish habitat and food resources, and offer shelter for juvenile fishes and young-of-the-year fish.

In this chapter, alternative and recommended actions for addressing the issues of concern described in Chapters I and II of this report, are presented. These measures are focused primarily on those measures which can be implemented by the City of Oconomowoc and the Fowler Lake Management District (FLMD), with lesser emphasis given to those measures which are applicable to other agencies having jurisdiction within the area tributary to the Lake.

AQUATIC PLANT MANAGEMENT MEASURES

As stated in Chapter II of this report, recent aquatic plant management measures on Fowler Lake can be categorized as primarily based on mechanical harvesting to manage nuisance levels of aquatic plant growth in the Lake. In addition, individual householders on Fowler Lake are known to have engaged in manual harvesting in the vicinities of their piers and docks.

The goal of the aquatic plant management program being implemented in Fowler Lake by the City of Oconomowoc and the FLMD is to promote the multiple-purpose use of Fowler Lake in a manner consistent with the maintenance of the integrity of the Lake's ecosystem. The objectives of the FLMD were developed in consultation with the City of Oconomowoc. The objectives are to:

- Effectively control the quantity and density of aquatic plant growths in portions of Fowler Lake to improve the water-related recreation opportunities, to improve the aesthetic value of the resource to the community, and to enhance the resource value of the waterbody;

- Manage the Lake in an environmentally sound manner, pursuant to the standards and requirements set forth in Chapters NR 103, "Water Quality Standards for Wetlands," NR 107, "Aquatic Plant Management," and NR 109, "Aquatic Plants: Introduction, Manual Removal & Mechanical Control Regulations," of the *Wisconsin Administrative Code,* to preserve and enhance the water quality and biotic communities, their habitats, and essential structure and function in the waterbody and adjacent areas, as determined by the overall Lake management plan set forth in SEWRPC Community Assistance Planning Report No. 187, *A Management Plan for Fowler Lake, Waukesha County, Wisconsin,* as amended;

- Protect and maintain public health and to promote public comfort, convenience, and welfare in concert with the natural resource through the environmentally sound management of native vegetation, fishes, and wildlife in and around Fowler Lake; and

- Promote a quality water-based experience for residents and visitors to Fowler Lake consistent with the policies and practices of the Wisconsin Department of Natural Resources (WDNR), as set forth in the regional water quality management plan, SEWRPC Planning Report No. 30, *A Regional Water Quality Management Plan for Southeastern Wisconsin—2000,* as amended.

The shoreland and aquatic macrophyte management elements of this plan consider alternative management measures consistent with the provisions of Chapters NR 103, NR 107, and NR 109 of the *Wisconsin Administrative Code*. Further, the alternative aquatic plant management measures are consistent with the requirements of Chapter NR 7 of the *Wisconsin Administrative Code* governing recreational boating facilities, and with the public recreational boating access requirements set forth under Chapter NR 1 of the *Wisconsin Administrative Code.* Finally, the recommendations set forth herein acknowledge the goals of Chapter NR 40 of the *Wisconsin Administrative Code* insofar as they relate to limiting the occurrence and spread of nonnative and invasive aquatic organisms.

Array of Management Measures

Aquatic plant management measures can be classed into four groups: ***physical measures***, which include lake bottom coverings and water level management; ***biological measures***, which include the use of various organisms, including herbivorous insects and plantings of aquatic plants; ***manual*** and ***mechanical measures***, which include harvesting and removal of aquatic plants; and ***chemical measures***, which include the use of aquatic herbicides. All control measures are stringently regulated and require a State of Wisconsin permit. Chemical controls are regulated under Chapter NR 107 of the *Wisconsin Administrative Code,* and other aquatic plant management practices, with the exception of the placement of bottom covers, are regulated under Chapter NR 109 of the *Wisconsin Administrative Code.* Placement of bottom covers, a physical measure, also requires a WDNR permit under Chapter 30 of the *Wisconsin Statutes*. Costs range from minimal for manual removal of plants using rakes and hand-pulling, to upwards of $75,000 for the purchase of a mechanical plant harvester, for which the operational costs can approach $2,500 to $25,000 per year, depending on staffing and operation policies.

Physical Measures

Physical measures include a range of interventions aimed at physically obstructing the growth of aquatic plants by interfering with access by the plants to sunlight or other necessary growth substances. 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. Sand and gravel are usually widely available and relatively inexpensive to use as cover materials, but plants readily recolonize areas and these areas often become covered again within about a year. In addition, sand blankets can act to smother developing fish eggs. Synthetic materials, such as polyethylene, polypropylene, fiberglass, and nylon, can provide relief from rooted plants for several years. However, such materials, known as bottom screens, or barriers, generally have to be placed and removed

annually. Such barriers also are susceptible to disturbance by watercraft propellers or the buildup of gasses from decaying plant biomass trapped under the barriers. Other physical alternatives include the use of dyes to reduce the penetration of sunlight into a lake to limit the growth of bottom dwelling aquatic plants and algae, and the use of flocculent aids to adsorb nutrients and other growth substances limiting their availability to aquatic plants. An example of the latter type of control agent is the use of alum, or aluminium sulphate. The aluminium binds the phosphorus present in the water column and surfacial sediments so that this growth nutrient is no longer available in sufficient quantity to sustain plant growth.

In the case of Fowler Lake, however, the application of physical aquatic plant management measures to control aquatic plant growth does not appear to be warranted. Thus, such measures are not considered for Fowler Lake.

Biological Measures

Biological measures utilize natural predators or grazing behaviors to control aquatic plants. Biological controls offer an alternative approach to other methods of controlling nuisance plants, particularly purple loosestrife (*Lythrum salicaria*), an invasive shoreland wetland plant, and Eurasian water milfoil. Classic biological control techniques have been successfully used to control both nuisance plants with herbivorous insects.[1] Recent evidence shows that *Galerucella pucilla* and *Galerucella calmariensis*, beetle species, and *Hylobius transversovittatus* and *Nanophyes brevis*, weevil species, have potential as biological control agents for purple loosestrife.[2] Extensive field trials conducted by the WDNR in southeastern Wisconsin since 1999 have indicated that these insects can provide effective management of large infestations of purple loosestrife. In contrast, the few studies of Eurasian water milfoil control utilizing *Eurhychiopsis lecontei*, an aquatic weevil species, have resulted in variable levels of control, with little control being achieved on those lakes having extensive motorized boating traffic. Thus, while the use of insects as a means of shoreland wetland plant management is considered to be viable, the use of *Eurhychiopsis lecontei* as a means of aquatic plant management control, is not considered a viable option for use on Fowler Lake at this time, given the extensive use of motorized watercraft on this lake.

The use of grass carp, *Ctenopharyngodon idella*, an alternative biological control used elsewhere in the United States, is not permitted in Wisconsin. This voracious herbivore has been shown to denude lakes and ponds of aquatic vegetation, exposing lake bottom sediments to wind erosion and increasing turbidity in lakes and ponds, and enhancing the likelihood of occurrence of nuisance algal blooms.[3]

A variation on the theme of biological control is the introduction of aquatic plants into a waterbody as a means of encouraging or stimulating the growth of desirable native aquatic plant species in a lake. While few projects of this nature have been undertaken in the Southeastern Wisconsin Region, the Lac La Belle Management District, in partnership with the WDNR and University of Wisconsin-Milwaukee, attempted to supplement the aquatic

---

[1]*B. Moorman, "A Battle with Purple Loosestrife: A Beginner's Experience with Biological Control,"* Lake Line, *Vol. 17, No. 3, September 1997, pages 20-21, 34-3; see also, C.B. Huffacker, D.L. Dahlsen, D.H. Janzen, and G.G. Kennedy,* Insect Influences in the Regulation of Plant Population and Communities, *1984, pages 659-696; and C.B. Huffacker and R.L. Rabb, editors,* Ecological Entomology, *John Wiley, New York, New York, USA.*

[2]*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.*

[3]*C. Holdren, W. Jones and J. Taggart,* Managing Lakes and Reservoirs, *Third Edition, North American Lake Management Society, Terrene Institute, and U.S. Environmental Protection Agency, 2001.*

plant community of Lac La Belle by selectively planting pondweeds (*Potamogeton* spp.).[4] Several hundred pondweeds were transplanted into Lac La Belle, and while there is some evidence that a few of these transplants were successful, the net outcome of the project was disappointing. Few of the introduced plants were observed in subsequent years.[5] Given the extensive and diverse aquatic plant community present in Fowler Lake, supplemental plantings are not considered to be a viable aquatic plant management option.

Manual and Mechanical Measures

The physical removal of specific types of vegetation by selective harvesting of plants provides a highly effective means of controlling the growths of nuisance aquatic plant species, including purple loosestrife and Eurasian water milfoil. Pursuant to Chapter NR 109 of the *Wisconsin Administrative Code*, manual harvesting of aquatic plants within a 30-foot-wide corridor along the shoreline would be allowed without a WDNR permit, provided the plant material is removed from a lake. Any other manual harvesting would require a State permit, unless employed in the control of designated nonnative invasive species, such as Eurasian water milfoil or curly-leaf pondweed.

In the shoreland area, where purple loosestrife may be expected to occur, bagging and cutting loosestrife plants prior to the application of chemical herbicides to the cut ends of the stems, can be an effective control measure for small infestations of this plant. Loosestrife management programs, however, should be followed by an annual monitoring and control program for up to 10 years following the initial control program to manage the regrowth of the plant from seeds. Manual removal of such plants is recommended for isolated stands of purple loosestrife. For larger stands, as noted above, biological control agents form an effective management tool.

In the nearshore area, specially designed rakes are available to assist in the manual removal of nuisance aquatic plants, such as Eurasian water milfoil. The use of such rakes also provides a safe and convenient method of controlling aquatic plants in deeper nearshore waters around piers and docks. The advantage of the rakes is that they are relatively inexpensive, easy and quick to use, and immediately remove the plant material from a lake. Removal of the plants from a lake avoids the accumulation of organic matter on the lake bottom, which adds to the nutrient pool that favors further plant growth. State permitting requirements for manual aquatic plant harvesting mandate that the harvested material be removed from the lake. Should the City of Oconomowoc or FLMD acquire a number of these specially designed rakes, they could be made available for the riparian owners to use on a trial basis to test their operability before purchasing them.

Hand-pulling of stems, where they occur in isolated stands, provides an alternative means of controlling plants, such as Eurasian water milfoil, in a lake, and purple loosestrife, on the lakeshore. Because this is a more selective measure, the rakes being nonselective in their harvesting, manual removal of Eurasian water milfoil is considered a viable option in Fowler Lake, where practicable and feasible.

Aquatic macrophytes also may be harvested mechanically with specialized equipment consisting of a cutting apparatus, which cuts up to about five feet below the water surface, and a conveyor system that picks up the cut plants. Mechanical harvesting can be a practical and efficient means of controlling plant growth as it removes the

---

[4]*Donald H. Les and Glenn Guntenpergen, "Laboratory Growth Experiments for Selected Aquatic Plants, Final Report, July 1989-June 1990 (Year 1),"* Report to the Wisconsin Department of Natural Resources, *June 1990; Wisconsin Department of Natural Resources*, Environmental Assessment: Improvement of the Water Quality and Fisheries Habitat of Lac La Belle [sic] and the Lower Oconomowoc River, s.d.

[5]*At the 2003 annual meeting of the Lac La Belle Management District, a citizen reported observing a herbicide application in the vicinity of the planted area of the Lake. Such an application might explain the observed lack of success of this management measure. See SEWRPC Community Assistance Planning Report No. 47, 2nd Edition,* A Water Quality Management Plan for Lac La Belle, Waukesha County, Wisconsin, *May 2007.*

plant biomass and nutrients from a lake. Mechanical harvesting is particularly effective as a measure to control large-scale growths of aquatic plants. Narrow channels can be harvested to provide navigational access and "cruising lanes" for predator fish to migrate into the macrophyte beds to feed on smaller fish. The harvesting of water lilies and other emergent native plants should be avoided.

"Clear cutting" aquatic plants and denuding the lake bottom of flora, using either manual or mechanical harvesting, should be avoided. However, top cutting of plants, such as Eurasian water milfoil, using mechanical harvesters, as shown in Figure 3, has proven to be beneficial in some lakes as a means of minimizing the competitive advantage of the Eurasian water milfoil plant and encouraging native aquatic plant growths.[6]

An advantage of mechanical aquatic plant harvesting is that the harvester typically leaves enough plant material in a lake to provide shelter for fish and other aquatic organisms, and to stabilize lake bottom sediments. Aquatic plant harvesting also has been shown to facilitate the growth of native aquatic plants in harvested areas by allowing light penetration to the lakebed.[7] Many native aquatic plants are low-growing species that are less likely to interfere with human recreational and aesthetic uses of a lake. By removing the competitive advantage created by the growth strategy of Eurasian water milfoil, and allowing sunlight to penetrate to the lakebed, native plants have an opportunity to resurge.[8]

Repeated harvesting and removal of aquatic plants from a lake system also has proven to be an effective means of encouraging native plant growth.[9] While the occurrence and abundance of aquatic plants reflects season and opportunity for growth, repeated harvesting can provide additional opportunities for the growths of native aquatic plants. Harvesting combined with the collection of floating plant fragments, especially along shorelines, removes both the fragments of plants such as Eurasian water milfoil which are capable of rerooting and regrowth in new areas of a lake as well as the organic material that can contribute to the build-up of "muck" on the lake bottom.[10] If done correctly and carefully, harvesting has been shown to be of benefit in ultimately reducing the re-growth of nuisance plants.

One disadvantage of mechanical harvesting is that the fragmentation of plants and, thus, contributing unintentionally to the spread of those plants that utilize fragmentation as a means of propagation, as is the case with Eurasian water milfoil. Harvesting may also disturb bottom sediments in shallower areas where such sediments are only loosely consolidated, thereby increasing turbidity and resulting in deleterious effects, including the smothering of fish breeding habitat and nesting sites. Disrupting the bottom sediments also could increase the risk

---

[6]*See SEWRPC Memorandum Report No. 143,* An Aquatic Plant Management Plan for the Lauderdale Lakes, Walworth County, Wisconsin*, August 2001.*

[7]*See SEWRPC Memorandum Report No. 143, 2nd Edition,* An Aquatic Plan Management Plan for the Lauderdale Lakes, Walworth County, Wisconsin*, July 2010, Appendix D, "Eurasian Water Milfoil Management in Mill Lake: 2002."*

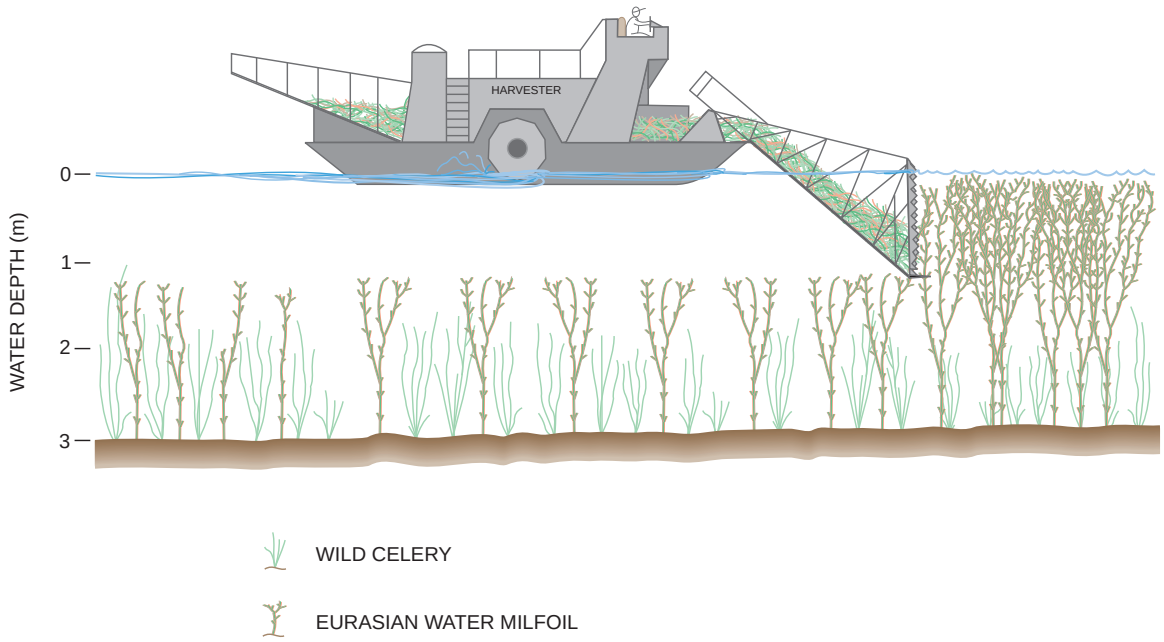
[8]*In the case of the Lauderdale Lakes, documented in SEWRPC Memorandum Report No. 143, 2nd Edition,* op. cit.*, the aquatic plant community of Sterlingworth Bay went from a virtual monoculture of Eurasian water milfoil to a mixed community comprised of pondweeds, Chara, eel-grass, Elodea, and coontail. Cutting of the Eurasian water milfoil canopy was required at three-week intervals to sustain the resurgence of native aquatic plants.*

[9]*Community Assistance Planning Report No. 58, 2nd Edition,* A Lake Management Plan for Pewaukee Lake, Waukesha County, Wisconsin*, May 2003.*

[10]*This is especially important in the case of nonnative aquatic plants such as Eurasian water milfoil that prefer rooting in organic rich, mucky sediments.*

Figure 3

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.

that an exotic species, such as Eurasian water milfoil, may colonize the disturbed area, since this is a species that tends to thrive under disturbed bottom conditions. To this end, most WDNR-issued permits do not allow harvesting in areas having a water depth of less than three feet.

Manual harvesting is considered to be a viable option for control of aquatic plants in Fowler Lake. Mechanical harvesting continues to be considered to be a viable option for much of Fowler Lake.

Chemical Measures

Chemical measures include the use of herbicides as a short-term method of controlling heavy growths of nuisance aquatic plants. Chemical herbicides are generally applied to the growing plants in either a liquid or granular form. The advantages of using chemical herbicides to control aquatic macrophytes growth are their relatively low-cost and their ease, speed, and convenience of application. The disadvantages associated with chemical control include unknown long-term effects on fish, fish food sources, and humans; a risk of increased algal blooms due to the eradication of macrophyte competitors; an increase in organic matter in the sediments, possibly leading to increased plant growth, as well as anoxic conditions which can cause fish kills; adverse effects on desirable aquatic organisms; loss of desirable fish habitat and food sources; and, finally, a need to repeat the treatment the following summer due to existing seed banks and/or plant fragments. Widespread chemical treatments also can provide an advantage to less desirable, invasive, introduced plant species to the extent that such treatments may produce conditions in which nonnative species can out-compete the more beneficial, native aquatic plant species. Hence, the large-scale use of chemical herbicides is seldom a feasible management option. In the case of Fowler Lake, large-scale or widespread chemical treatment, therefore, is not considered a viable aquatic plant manage-

ment option. Limited chemical control is often a viable technique for the control of the relatively small-scale infestations of aquatic plants, such as Eurasian water milfoil, or shoreland plants, such as purple loosestrife. This is especially true in the vicinity of piers and docks where other methods may be difficult to implement.

To minimize the possible impacts of deoxygenation, loss of desirable plant species, and contribution of organic matter to the sediments, early spring or late fall applications should be considered.[11] Such applications also minimize the concentrations and amounts of chemicals used due to the facts that colder water temperatures enhance the herbicidal effects, while the application of chemical herbicides during the periods when most native aquatic plant species are dormant limits the potential for collateral damage. Use of chemical herbicides in aquatic environments is stringently regulated and requires a WDNR permit and WDNR staff oversight during applications.

Use of early spring chemical controls, especially in those shoreline areas where mechanical harvesting would not be deemed viable, targeting growths of Eurasian water milfoil, and purple loosestrife in and around the Lake, is considered a viable option for Fowler Lake. Measures to control curly-leaf pondweed are not recommended unless the growths of this plant continue into the recreational boating season. In general, spring treatments of chemical herbicides, especially for the control of Eurasian water milfoil, are preferred.

Recommended Management Measures

The most-effective plans for managing aquatic plants rely on a combination of methods and techniques, such as those described above. Therefore, to enhance the recreational uses of Fowler Lake, while maintaining the quality and diversity of the biological communities, the following recommendations are made:

- Mechanical harvesting remains the primary method for the management of aquatic plant communities in Fowler Lake. Based upon the experiences documented in the comprehensive lake management plan and subsequent aquatic plant management plan updates, it is recommended that aquatic plants be harvested at the maximum harvesting depth of the equipment in those areas of the Lake where adequate water depths allow such operation.[12] "Clear cutting" or denuding of the lake bottom of vegetation is to be avoided as the root systems and low growing aquatic plants present in the Lake, which tend to be dominated by native aquatic plants, provide for the stabilization of lake bottom sediments—benefitting water clarity—as well as habitat for fish and other aquatic organisms valued by the Fowler Lake community. At least one foot of vegetative material should be retained above the lake bed, with two feet being preferable in areas where adequate depths allow the longer growths of aquatic plants.

---

[11] *It should be noted that, at the time of writing, late fall herbicide treatments are considered to be experimental in Wisconsin and will not typically be permitted by the Wisconsin Department of Natural Resources at this time, pending further research into the use of such treatments. It also is noted that many aquatic plants become dormant during the late fall and winter, die back, and do not meet the nuisance standards established pursuant to Chapter NR 107 of the* Wisconsin Administrative Code *as the basis for the application of aquatic herbicides. Consequently, late fall applications of herbicides are not recommended.*

[12] *"Top chopping" techniques recommended for the control of Eurasian water milfoil can be effective at depths less than the maximum depth of operation of the harvesting equipment; however, in Fowler Lake, the rates of aquatic plant growth are such that harvesting at less than the maximum depth of cutting do not provide sufficient relief from nuisance conditions to allow for a complete pass of the harvester through the area to be harvested before nuisance conditions recur. Consequently, to provide adequate relief from nuisance conditions as well as efficient conduct of the harvesting program, this change in depth of harvesting is recommended.*

- Manual harvesting around piers and docks is the recommended means of controlling nonnative nuisance species of plants in those areas.[13] In this regard, the City of Oconomowoc or the FLMD could consider purchasing several specialty rakes designed for the removal of vegetation from shoreline property and make these available to riparian owners. This would allow the riparian owners to use the rakes on a trial basis before purchasing their own. Although the rakes do not require a permit for use along a 30-foot width of shoreline, State requirements for manual aquatic plant harvesting mandate that the harvested material be removed from the lake. Where feasible and practicable, hand-pulling of stems, where they occur in isolated stands, is also recommended as an alternative means of controlling Eurasian water milfoil and purple loosestrife. Manual control should target nonnative species.

- It is recommended that the use of chemical herbicides be limited to controlling nuisance growths of exotic species, particularly Eurasian water milfoil and purple loosestrife. Any such chemical applications, if required, must be made by licensed applicators. Early spring applications are recommended, subject to State permitting requirements to maximize their effectiveness on nonnative plant species while minimizing impacts on native plant species. Early spring applications can serve as a preventative measure to minimize the development of nuisance conditions. Use of chemical herbicides should be evaluated annually and the herbicide applied only on an as-needed basis. Only herbicides that selectively control Eurasian water milfoil, such as 2,4-D and endothall, should be used. For the control of purple loosestrife, the use of glyphosate could be considered for application to the cut stems of the plants after the seed heads have been cut and bagged.

- The use of algicides, such as Cutrine Plus, is not recommended because there are few significant, recurring filamentous algal or planktonic algal problems in Fowler Lake and valuable macroscopic algae, such as *Chara* and *Nitella,* are killed by this product. Maintenance of shoreland areas around docks and piers remains the responsibility of individual property owners.

- Through informational programming, riparian owners should be encouraged to monitor their shoreline areas, as well as open-water areas of the Lake, for new growths of nonnative nuisance plants and report such growths immediately to the City of Oconomowoc Department of Public Works so that a timely and effective response can be executed.

- It also is recommended that the City of Oconomowoc and FLMD consider the conduct of in-lake aquatic plant surveys at about three- to five-year intervals, depending upon the observed degree of change in the aquatic plant communities. In addition, information on the aquatic plant control program should be recorded and should include descriptions of major areas of nuisance plant growth and areas chemically treated.

- Additional periodic monitoring of the aquatic plant community is recommended for the early detection and control of future-designated nonnative species that may occur. Such control could be

---

[13] *During May 2013, the City of Oconomowoc conducted a survey of residents riparian to Fowler Lake for the purpose of ascertaining the opinions of these residents regarding two alternative approaches to aquatic plant management with the area of the Lake designated as Angling and General Recreation on Map 18. The two alternatives were (a) to maintain the harvesting of aquatic plants within this area or (b) to provide harvesting of boating access lanes from the deeper water areas of the Lake to individual pierheads, abiding by the same restrictions as to harvesting depth as recommended elsewhere in this plan. Of the 51 respondents, 85 percent indicated their desire that the City maintain the harvesting if the area designated as Angling and General Recreation on Map 18. Of the remainder, 14 percent preferred the individual pierhead cuts and 1 percent expressed no opinion. Based upon this survey, maintenance of the general harvesting of the Angling and General Recreation Area is recommended in this plan.*

effected with the assistance of funds provided under the Chapter NR 198, aquatic invasive species control grant program, and should be undertaken as soon as possible once the presence of a nonnative, invasive species is observed and confirmed, reducing the risk of spread from waters where they are present and restoring native aquatic communities. Control of currently designated invasive species, designated pursuant to Chapters NR 40 and NR 109 of the *Wisconsin Administrative Code*, using appropriate control measures,[14] is recommended throughout the Lake. Such control also could be effected with the assistance of funds provided under the Chapter NR 198, aquatic invasive species control grant program, for the control of established populations of invasive aquatic plant species.

The recommended aquatic plant management plan for Fowler Lake is set forth on Map 16. As recommended, it is proposed that aquatic plant management activities be restricted in certain ecologically valuable areas of the Lake, as shown on Map 17, and specifically target nonnative species, especially Eurasian water milfoil, as shown on Map 18. Aquatic plant management operations should be concentrated in the main basin of the Lake and near the boating access ramp, as well as in the principal boating and fishing areas. No environmentally sensitive areas have been identified by the WDNR in the Lake, pursuant to their Chapter NR 107 authorities.

The upper reaches of the impoundment above the N. Oakwood Avenue bridge have more of a wetland character and will be excluded from aquatic plant management operations, except for provision of access channels along the northern and southern shores and for operations associated with the eradication of purple loosestrife in this area. In addition, harvesting will not take place in waters less than three feet deep to avoid the disturbance of fish spawning and nursery areas and beds of native aquatic plants. Special efforts will be made to avoid disturbing major spawning and habitat areas of sportfish in Fowler Lake during the spring spawning season, May 1st to June 24th.

Within the main lake basin of Fowler Lake, the aquatic plant management treatments, shown on Map 16, will be applied as follows:

Access Channels (tan): By providing access channels, disturbances of native aquatic plants offering habitat for both game and pan fishes will be minimized, while the access channels themselves will benefit game fishes that are primarily visual predators which need to see their prey organisms. Additionally, harvesting access channels will limit the propagation of Eurasian water milfoil which can reproduce from plants fragments by motor boat propellers and other anthropogenic causes.[15] The depth of harvesting in these areas is proposed to be increased to the full depth of harvesting of which the equipment is capable, or to approximately five feet in areas where adequate water depths allow; care should be exercised in leaving about one-foot of plant material on the lake bottom to stabilize lake sediments and maintain aquatic habitat. These channels are proposed to be implemented as follows:

- Narrow access channels, approximately 10 feet wide, will be harvested along a portion of the eastern bay and inlet area to provide boating access to the main body of the Lake; no chemicals will be used in this 0.3-acre area.

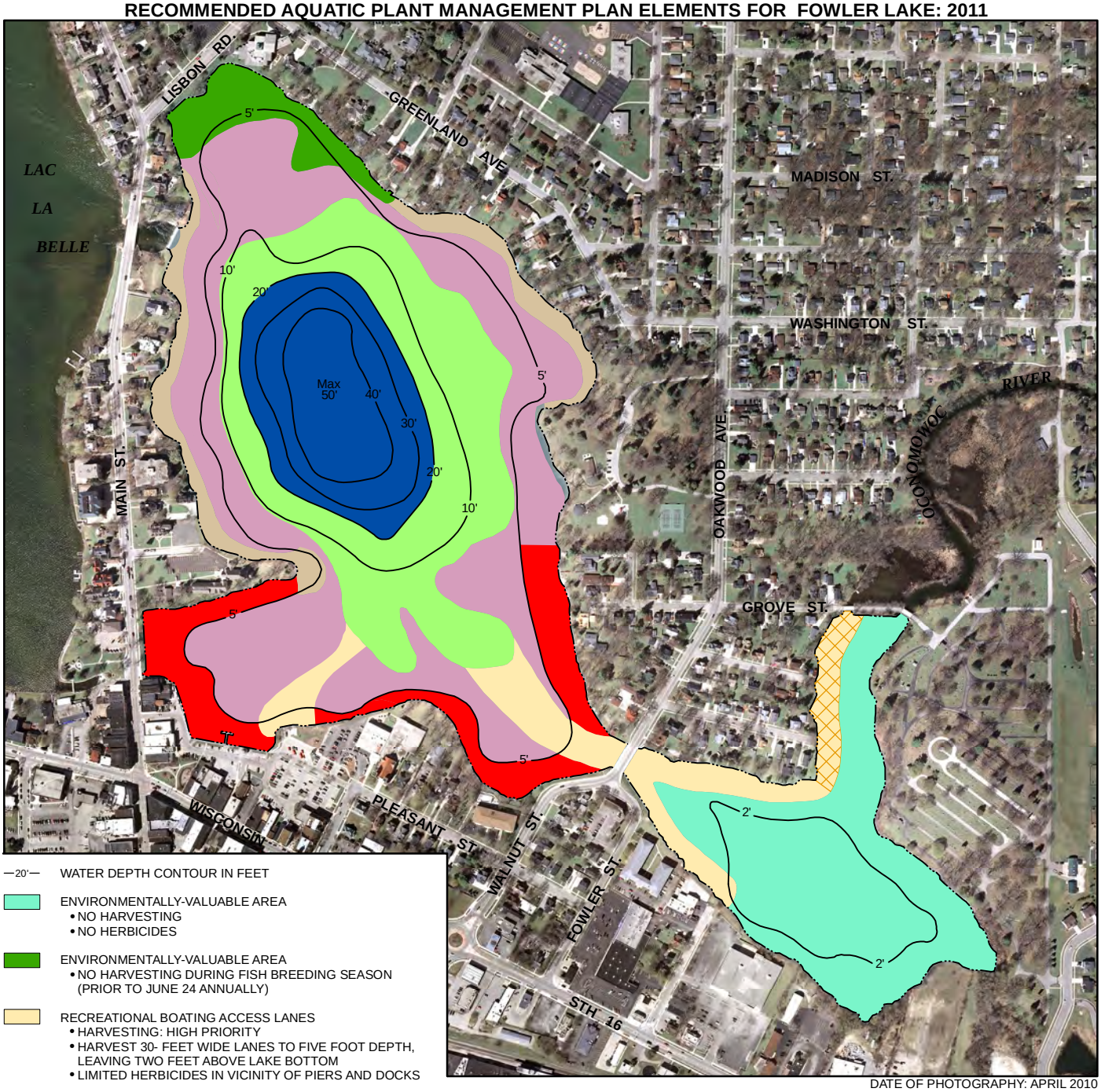
---

[14]*Appropriate control measures include, but are not limited to, any permitted aquatic plant management measure, placement of signage, and use of buoys to isolate affected areas of the Lake. Such measures, as may be appropriate, should be determined in consultation with WDNR staff and conducted in accordance with required permits under Chapters NR 107, NR 109, and NR 198, among others, of the* Wisconsin Administrative Code.

[15]*It should be noted that Eurasian water milfoil naturally reproduces by fragmenting. Such auto-fragmentation is the result of wind wave activity, among other causes, and is beyond the control of the aquatic plant management program; however, control of fragmentation due to boating activity and other human activities can be controlled by recognizing this reproductive strategy of the plant and minimizing the controllable elements.*

Map 16

RECOMMENDED AQUATIC PLANT MANAGEMENT PLAN ELEMENTS FOR FOWLER LAKE: 2011



DATE OF PHOTOGRAPHY: APRIL 2010

—20'— WATER DEPTH CONTOUR IN FEET

ENVIRONMENTALLY-VALUABLE AREA
- NO HARVESTING
- NO HERBICIDES

ENVIRONMENTALLY-VALUABLE AREA
- NO HARVESTING DURING FISH BREEDING SEASON (PRIOR TO JUNE 24 ANNUALLY)

RECREATIONAL BOATING ACCESS LANES
- HARVESTING: HIGH PRIORITY
- HARVEST 30- FEET WIDE LANES TO FIVE FOOT DEPTH, LEAVING TWO FEET ABOVE LAKE BOTTOM
- LIMITED HERBICIDES IN VICINITY OF PIERS AND DOCKS

ANGLING AREA AND GENERAL WATER BASED RECREATION
- HARVESTING: MODERATE PRIORITY; HARVEST TO THREE FEET DEPTH LEAVING TWO FEET ABOVE LAKE BOTTOM

RECREATIONAL BOATING AREA
- HARVESTING: LOW PRIORITY
- MAINTAIN RECREATIONAL WATER SKI AREA AT ABOUT 10-FOOT CONTOUR; HARVEST TO SIX FEET LEAVING ONE FOOT ABOVE LAKE BOTTOM

SHORELINE ZONE: WATER DEPTH LESS THAN THREE FEET
- MANUAL HAVESTING OF 30-FEET SHORELINE CORRIDOR
- PIERHEAD COLLECTION OF FRAGMENTS AND MANUALLY HARVESTED PLANTS
- LIMITED HERBICIDES IN VICINITY OF PIERS AND DOCKS

OPEN WATER AREA
- NO AQUATIC PLANT CONTROLS RECOMMENDED

RECREATIONAL BOATING ACCESS LANES
- HARVESTING LIMITED BY WATER DEPTH: LOW PRIORITY
- HARVEST PERIODICALLY AS WATER DEPTHS ALLOWS
- LIMITED HERBICIDES IN VICINITY OF PIERS AND DOCKS

EURASIAN WATER MILFOIL CONTROL AREA
- HARVESTING RECOMMENDED: HIGH PRIORITY
- MANUAL HARVESTING OF 30-FEET OF SHORELINE CORRIDOR
- LIMITED HERBICIDE APPLICATION TO BE CONSIDERED FOR EURASIAN WATER MILFOIL CONTROL
- PIERHEAD COLLECTION OF FRAGMENTS AND MANUALLY HARVESTED PLANTS

N

0 300 600 Feet

Source: SEWRPC.

Map 17

RECOMMENDED AQUATIC PLANT MANAGEMENT PRACTICES IN ENVIRONMENTALLY VALUABLE AND SHORELINE AREAS OF FOWLER LAKE: 2011

DATE OF PHOTOGRAPHY: APRIL 2010

—20'— WATER DEPTH CONTOUR IN FEET

ENVIRONMENTALLY-VALUABLE AREA
- NO HARVESTING
- NO HERBICIDES

ENVIRONMENTALLY-VALUABLE AREA
- NO HARVESTING DURING FISH BREEDING SEASON (PRIOR TO JUNE 24 ANNUALLY)

RECREATIONAL BOATING ACCESS LANES
- HARVESTING: HIGH PRIORITY
- HARVEST 30- FEET WIDE LANES TO FIVE FOOT DEPTH, LEAVING TWO FEET ABOVE LAKE BOTTOM
- LIMITED HERBICIDES IN VICINITY OF PIERS AND DOCKS

RECREATIONAL BOATING ACCESS LANES
- HARVESTING LIMITED BY WATER DEPTH: LOW PRIORITY
- HARVEST PERIODICALLY AS WATER DEPTHS ALLOWS
- LIMITED HERBICIDES IN VICINITY OF PIERS AND DOCKS

N

0 300 600 Feet

Source: SEWRPC.

Map 18

RECOMMENDED MANAGEMENT OF NONNATIVE INVASIVE SPECIES IN FOWLER LAKE: 2011

DATE OF PHOTOGRAPHY: APRIL 2010

—20'— WATER DEPTH CONTOUR IN FEET

EURASAIN WATER MILFOIL CONTROL AREA
- HARVESTING RECOMMENDED: HIGH PRIORITY
- LIMITED HERBICIDE APPLICATION TO BE CONSIDERED FOR EURASIAN WATER MILFOIL CONTROL
- PIERHEAD COLLECTION OF FRAGMENTS AND MANUALLY HARVESTED PLANTS

N

0 300 600 Feet

Source: SEWRPC.

- The boating channel from the N. Oakwood Avenue bridge into the main lake basin is recommended to be increased to 30 feet in width, linking the access channel from the inlet to the main body of the Lake.

- Narrow access channels, approximately 20 feet wide, will be provided to service the public recreational boating access site providing public access to the main lake basin.

Boating Area (lime green): While much of this area is not subject to extensive aquatic plant growth due to the water depths, the eastern portion of the recreational boating area is utilized by the water ski show during the summer months and consequently is subject to the action of motor boat propellers and similar disturbances. By acknowledging this and by providing harvested boating areas, disturbances of native aquatic plants will be minimized, offering habitat for both game and pan fishes, while benefiting game fishes that are primarily visual predators which need to see their prey organisms. The depth of harvesting in these areas is proposed to be increased to the full depth of harvesting of which the equipment is capable; care should be exercised in leaving about two-feet of plant material on the lake bottom to stabilize lake sediments and maintain aquatic habitat. It should be noted that the perimeter of this open water area, with a width of approximately 50 feet, is recommended to be harvested to a depth equal to the full depth of harvesting of which the equipment is capable to provide a waterskiing circuit to be used by the water ski show. The purpose of this harvesting is to minimize the creation of "floaters" and plant fragments, especially fragments of Eurasian water milfoil which can reroot and increase the nuisance conditions created by that plant.

Angling and General Recreational Areas (rose): In many places, especially along the northern shores of the Lake, eel-grass, although typically considered to be a high-value aquatic plant species, appears to outcompete Eurasian water milfoil in its rate of growth and abundance. Consequently, the application of the "top chopping" technique that has successfully disadvantaged the growth of Eurasian water milfoil in many lakes in southeastern Wisconsin, implemented by harvesting at less than the maximum depth of cutting, does not provide sufficient relief from nuisance conditions to allow for a complete pass of the harvester through the area to be harvested before nuisance conditions recur. In the case of Fowler Lake, much of this nuisance is associated with the abundant growth of eel-grass. The nuisance created by such growths is exacerbated during late summer by the reproductive strategy of the plant, which includes the extension of reproductive structure above the water surface, the sequestration of nutrients into the plant's root system, and the die-off of the above sediment plant biomass during late summer. These factors suggest the need for a more aggressive approach to managing this species in Fowler Lake. Care should be exercised in leaving about two-feet of plant material on the lake bottom to stabilize lake sediments and maintain aquatic habitat. Special efforts should be made to avoid disturbing major spawning and habitat areas of sportfish in Fowler Lake during the spring spawning season, May 1st to June 24th.

Habitat Areas (dark green and turquoise): Areas of the Lake having a predominantly wetland-like character are proposed to be preserved from any intervention, except where necessary to control purple loosestrife infestations along the shorelines and Eurasian water milfoil growths in the Lake. Two such areas have been identified in Fowler Lake:

- The primary environmentally-valuable area in the Lake is comprised of the Inlet, east of the N. Oakwood Avenue bridge (shown in turquoise). This area, especially, has a deep-water marsh-like character that limits access by recreational watercraft. Additional litter collection effort will probably be required in this area to maintain its aesthetic appeal.

- An additional habitat area is recommended to be provided at the northern extreme of the Lake adjacent to Lisbon Road. This area is primarily to be protected to facilitate and protect fish breeding during the reproductive season during spring and early summer, prior to June 24th annually. Additional litter collection effort will probably also be required in this area to maintain its aesthetic appeal.

Shoreline Area (buff): Portions of the littoral zone are proposed for manual harvesting around piers and docks to control nonnative nuisance species of plants in these areas. Permits pursuant to Chapter NR 109 of the *Wisconsin Administrative Code* are not required for harvesting nuisance aquatic plants along a 30-foot width of shoreline, although harvested material must be removed from the lake. Where feasible and practicable, hand-pulling of stems, where they occur in isolated stands, is recommended as an alternative means of controlling Eurasian water milfoil and purple loosestrife within and adjacent to these areas.

Eurasian water milfoil Control Area (red): Eurasian water milfoil, curly-leaf pondweed and purple loosestrife are designated nonnative invasive aquatic plant species pursuant to Chapters NR 40 and NR 198 of the *Wisconsin Administrative Code*. Of these plants, Eurasian water milfoil is the most prevalent in Fowler Lake as is therefore designated for special management efforts in terms of this aquatic plant management plan. Areas adjacent to the boardwalk and shoreline extending from Main Street to Pleasant Street extended to Walnut Street and N. Oakwood Street have been identified as Eurasian water milfoil control areas. Intensive manual harvesting and consideration of using targeted chemical treatments to control this aquatic plant and reduce its competitive advantages in the Lake are recommended. Nevertheless, care should be exercised in leaving about one-foot of plant material on the lake bottom to stabilize lake sediments and maintain aquatic habitat.

Open Water Area (dark blue): Deep-water areas of the Lake would be linked to boating access areas by approximately 30-foot-wide channels in this two-acre, largely plant-free area; no chemicals are recommended to be used in this area.

ANCILLARY PLAN RECOMMENDATIONS

Water Quality Management

Water quality is a descriptor of the overall health of a waterbody. The importance of good water quality can hardly be underestimated, as it impacts nearly every facet of the natural balances and relationships that exist in a lake between the myriad of abiotic and biotic elements present. Water quality is comprised of a number of physical, chemical, and biological components which collectively create the in-lake conditions observed by lake residents and lake users. Because of the importance water quality plays in the functioning of a lake ecosystem, careful monitoring of this lake element represents a fundamental tool in the ongoing practice of lake management. Lake water quality monitoring, whether of a single parameter, such as water clarity, or multiple parameters, such as those included in the Trophic State Index determination—e.g., the concentrations of chlorophyll-*a* and total phosphorus—provide the quantitative basis necessary to identify and address water quality concerns at an early stage, when interventions need not be as drastic or costly, as may be the case if such problems are allowed to fully develop. For this reason, enrolling a volunteer monitor in the University of Wisconsin-Extension (UWEX) Citizen Lake Monitoring Network (CLMN) program is recommended, especially given the possible trend toward worsening water clarity reported herein.

The UWEX CLMN program, formerly the WDNR Self-Help Monitoring Program, trains volunteers enrolled in this program to gather data on water clarity at regular intervals through the use of a Secchi disk. Because poor water quality tends to result in reduced water clarity, Secchi-disk measurements are generally considered to be one of the key parameters in determining the overall quality of lake water and its associated trophic status. Secchi-disk measurement data are added to the WDNR-sponsored Surface Water Information Management System, or SWIMS data base, containing lake water quality information for many lakes in Wisconsin. These data, in turn, are accessible online through the WDNR website.

The UWEX also offers an Expanded Self-Help Monitoring Program (Level II) that involves collecting data on several key physical and chemical parameters in addition to the Secchi-disk measurements. Under this program, samples of lake water are collected by volunteers at regular intervals and analyzed by the State Laboratory of Hygiene. Data collection is more extensive and, consequently, places more of a burden on volunteers.

The basic UWEX CLMN program is available at no charge, but does require volunteers to be committed to taking Secchi-disk measurements at regular intervals—preferably weekly—throughout the spring, summer, and fall. The Expanded Self-Help Program requires additional commitment by volunteers to take a more-extensive array of

measurements and samples for analysis, also on a regular basis. As with any volunteer-collected data, despite the implementation of standardized field protocols, individual variations in levels of expertise due to background and experiential differences, can lead to variations in data and measurements from lake-to-lake and from year-to-year for the same lake, especially when volunteer participation changes.

Shoreline Protection

Shoreline protection measures refer to a group of management measures designed to reduce and minimize shoreline loss due to erosion by waves, ice, or related action of the water. Currently, the shoreline of Fowler Lake is well protected by a variety of protection structures, including riprap, bulkheads (vertical wall), revetments (sloping wall), and natural vegetation. Riprap was the most commonly occurring type of protection structure and revetment was the least common type. Where structural management measures were installed, most of the observed shoreline protection measures were in a good state of repair and no severe erosion-related problems were observed. Monitoring of shoreline vegetation for early detection and control of purple loosestrife and ongoing maintenance of shoreline protection structures is recommended.

Factors affecting the choice of shoreline protection method include: cost; the shoreline bank height, vegetation, stability, and composition; the shoreline geometry and geographic orientation; the lake bottom contour and vegetation immediately adjacent to the stretch of shoreline under consideration; the proximity to boat channels; possible influence of adjacent structures in producing flank erosion; and, the amount of open water (or "fetch") over which wind can act to produce wave action directly into the shoreline under consideration. A worksheet is provided as Table 1 within Section NR 328.08 of the *Wisconsin Administrative Code* in order to assist property owners who wish to install or modify existing shoreline protection structures.

The use of such natural shorescaping techniques is generally required pursuant to Chapter NR 328 of the *Wisconsin Administrative Code*, except in moderate- to high-energy shorelines where more-robust structural approaches, such as placement of rock riprap, may be permitted. Maintenance of a vegetated buffer strip immediately adjacent to a lake is the simplest, least costly, and most natural method of reducing shoreline erosion. The area to be occupied by such vegetated buffer strips is influenced by whether the target shoreline includes developed or undeveloped areas. Along developed areas, this technique employs natural vegetation, rather than maintained lawns, in the first five to 10 feet back from the waterline and the establishment of emergent aquatic vegetation from the waterline out to two to six feet lakeward. Along undeveloped areas, the WDNR recommends shoreland buffers extend from the water's edge onto land at least 35 to 50 feet, contain three layers of flora, herbaceous, shrub, and tree, found in natural Wisconsin lakeshores, and not be mowed except for a viewing access corridor.[16] The use of vegetative buffer strips, as shown in Figure 4, is recommended, especially along privately owned shorelines.

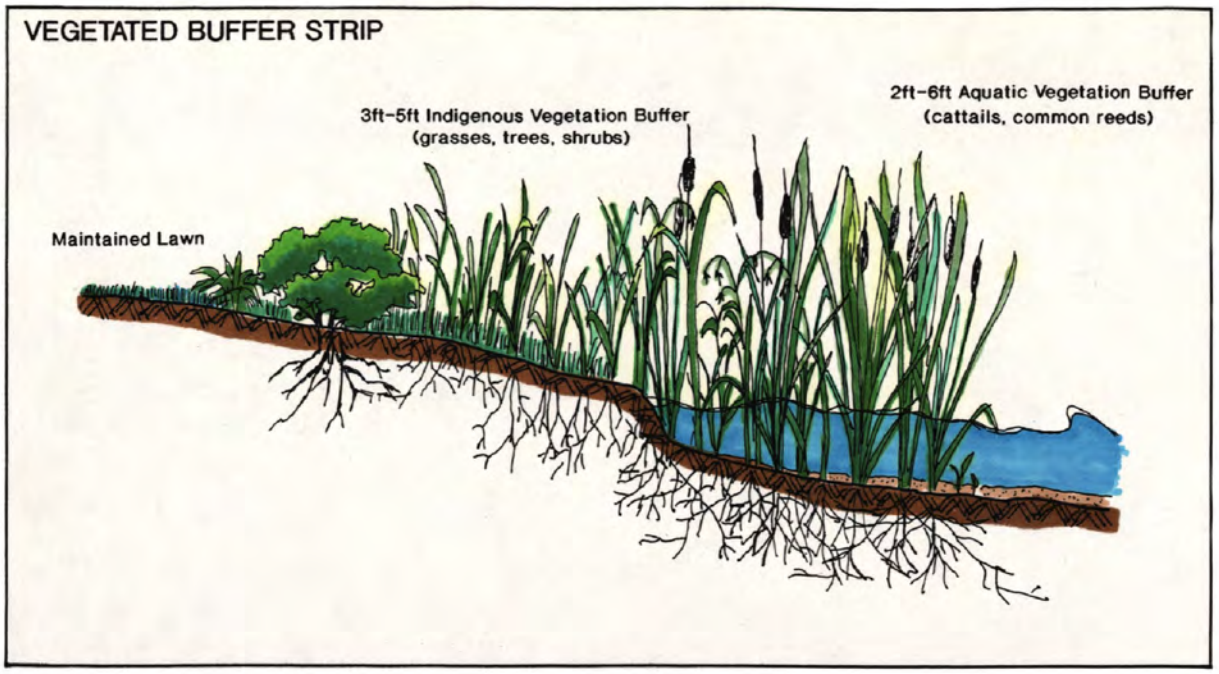
Desirable plant species that may be expected and encouraged to form an effective buffer strip, or which could be planted, include arrowhead (*Sagittaria latifolia*), cattail (*Typha* spp.), water plantain (*Alisma plantago-aquatica*), bur-reed (*Sparganium eurycarpum*), and blue flag (*Iris versicolor*) in the wetter areas; and jewelweed (*Impatiens biflora*), elderberry (*Sambucus canadensis*), giant goldenrod (*Solidago gigantea*), marsh aster (*Aster simplex*), red-stem aster (*Aster puniceus*), and white cedar (*Thuja occidentalis*) in the drier areas. In addition, trees and shrubs, such as silver maple (*Acer saccharinum*), American elm (*Ulmus americana*), black willow (*Salix nigra*), and red-osier dogwood (*Cornus stolonifera*) could become established. These plants will develop a more extensive root system than lawn grass and the above-ground portion of the plants will protect the soil against the erosive forces of rainfall and wave action. A narrow path to the Lake could be maintained as lake access for boating, swimming, fishing, and other activities. A vegetative buffer strip would also serve to trap nutrients and sediments washing into the Lake via direct overland flow. This alternative would involve only minimal cost.

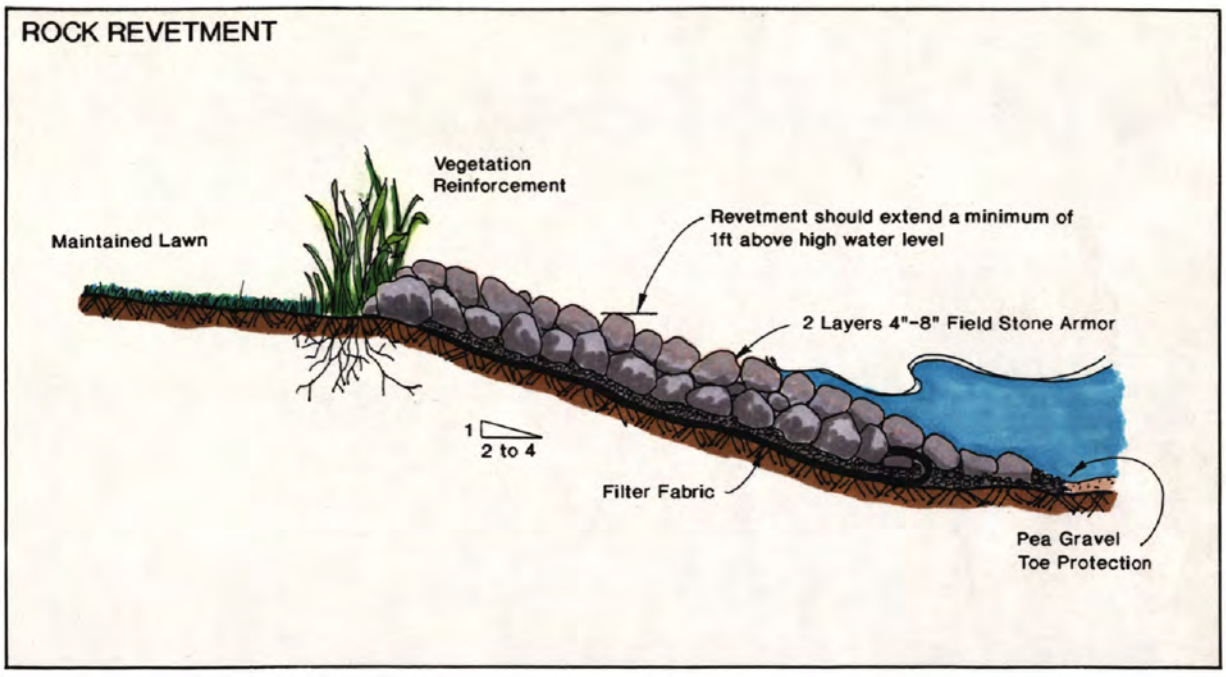
---

[16]*See SEWRPC publication, "Managing the Water's Edge: Making Natural Connections," May 2010; this publication can be accessed through the Internet at:*
http://www.sewrpc.org/SEWRPCFiles/Environment/RecentPublications/ManagingtheWatersEdge-brochure.pdf.

Figure 4

RECOMMENDED ALTERNATIVES FOR SHORELINE EROSION CONTROL





NOTE: Design specifications shown herein are for typical structures. The detailed design of shoreline protection structures must be based upon analysis of local conditions.

Source: SEWRPC.

Recreational Use Management

Current public recreational boating access standards, as set forth in Sections NR 1.91(4) and NR 1.91(5) of the *Wisconsin Administrative Code*, establish minimum and maximum standards, respectively, for public recreational boating access development to qualify waters for resource enhancement services, such as fish stocking, provided by the WDNR. As noted in Chapter II of this report, Fowler Lake is deemed to have adequate public access as defined in Chapter NR 1 of the *Wisconsin Administrative Code*, and recreational boating activities remain a popular pastime on the Lake.

Maintenance of the public recreational boating access opportunities at Fowler Lake is recommended. The WDNR and the City of Oconomowoc, in cooperation with the FLMD, should periodically review the lake access opportunities, especially with regard to the provision of recreational boating access, to ensure ongoing compliance with the State standards. In this regard, ongoing compliance with State recreational boating access standards is a prerequisite for resource enhancement services, including eligibility of the City of Oconomowoc and the FLMD to access State grant funds for lake management planning and lake protection activities, among others.

It is recommended that appropriate signage be provided at the public recreational boating access site in order to alert users of Eurasian water milfoil, zebra mussels, and other nonnative invasive species. Such information also should be included in the FLMD informational programming as an element of the aquatic plant management program set forth in this plan. It is further recommended that the City of Oconomowoc and the FLMD consider participating in the UWEX Clean Boats-Clean Waters Program to enhance awareness of lake users regarding nonnative species and the need to minimize opportunities for such species to be transported between lakes.

Periodic review of boating ordinances governing recreational boating on Fowler Lake is recommended to ensure currency with Chapter 30 of the *Wisconsin Statutes*, and continued applicability to recreational boating activities within the City. Provision for slow-no-wake operation of motorized watercraft during periods of high water in the Lake should be considered; however, any such provision is recommended to be tied to an actual surface elevation relative to the National Geodetic Vertical Datum of 1929 in order to ensure the objective application of any such ordinance.

Public Informational and Educational Programming

As part of the overall citizen informational and educational programming to be conducted in the community, residents and visitors in the vicinity of the Lake should be made aware of the value of the ecologically significant areas in the overall structure and functioning of the ecosystems of the Lake. Specifically, informational programming related to the protection of ecologically valuable areas in and around the Lake is recommended and should focus on the need to minimize the spread of nuisance aquatic invasive species, such as purple loosestrife and Eurasian water milfoil.

With respect to aquatic plants, distribution of posters and pamphlets available from the UWEX and the WDNR 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, is recommended. Inclusion of specific public informational and educational programming within the activities of the City of Oconomowoc and FLMD is recommended. These programs should focus on the value and impacts of these plants on water quality, fish, and wildlife, and on alternative methods for controlling existing nuisance plants, including the positive and negative aspects of each method. These programs can be incorporated into the comprehensive informational and educational programs that also would include information on related topics, such as water quality, recreational use, fisheries, and onsite sewage disposal systems. It would be especially important to alert lakefront property owners and other lake users of the need to remove aquatic vegetation from boats and trailers prior to launch and after recovery, and to the need to use the designated boating and access channels to reach deep water areas of the Lake, so as to minimize the likelihood of fragmenting nuisance aquatic plants, such as Eurasian water milfoil.

Educational and informational brochures and pamphlets of interest to homeowners and supportive of the lake management program are available from the UWEX Waukesha County Office, the WDNR, and many Federal government agencies. These brochures could be provided to homeowners through local media, direct distribution, or targeted library/civic center displays. Many of the ideas contained in these publications can be integrated into ongoing, larger-scale activities, such as anti-littering campaigns, recycling drives, and similar community-oriented pro-environment activities. Other informational programming offered by the WDNR, Waukesha County, and the UWEX Lakes Program, such as the Project WET (Water Education Training) curriculum, can contribute to an informed public, actively involved in the protection of ecologically valuable areas within the area tributary to the Lake. Citizen monitoring and awareness of the positive value of native aquatic plant communities are important opportunities for public informational programming and participation.

Fowler Lake Management District Commissioner Continuing Education

As part of their commitment to the effective managing of Fowler Lake, the FLMD Commissioners, comprised by the City of Oconomowoc City Council, should be encouraged to avail themselves of opportunities to learn about current developments and issues involving lake management. There are numerous publications, writings, newsletters, seminars, and conventions available through governmental, educational, and other organizations and agencies dealing with the subject of lake management. Waukesha County, UWEX, Wisconsin Lakes, the North American Lake Management Society, and WDNR all produce written materials and conduct meetings and seminars dealing with lake management issues. Publications, such as *Lake Tides*, published by the Wisconsin Lakes Partnership and available from UWEX, are also readily available and cover a wide range of lake-related topics. The statewide Lakes Convention, held annually in Green Bay, Wisconsin, provides valuable opportunities to learn about important and timely developments in lake management and learn about lake issues from experts in their fields. Participation in activities that will further understanding of lake management issues is deemed an important part of the lake management experience.

SUMMARY

This plan, requested by the City of Oconomowoc, documents the findings and recommendations of a study of the aquatic plant communities of Fowler Lake. The plan examines existing and anticipated conditions, potential management and protection problems, and recreational use issues on the Lake. The plan sets forth recommended actions and management measures for the resolution of those problems. The recommended plan is summarized in Table 16 and shown on Maps 16 through 18.

The proposed aquatic plant management plan for Fowler Lake is essentially the same as has been set forth in previous aquatic plant management plans developed for this waterbody. However, there are notable differences in the recommended management measures proposed for the control of Eurasian water milfoil and eel grass in the Lake. With regard to the former, the area designated as a Eurasian water milfoil control area has been expanded from the area adjacent to the boardwalk, along the entire shoreline of the Lake west of the N. Oakwood Avenue bridge between Main Street in the west to Fowler Lake Park to the east. This expansion was warranted due to the continued resurgence of the growth of this designated nonnative aquatic plant species within the Lake. With regard to the latter, while control of native species is generally not warranted or recommended in lakes in southeastern Wisconsin, the exceptional rates of growth and the length to which eel grass has been observed to grow in Fowler Lake has led to the inclusion of a recommended boating area surrounding the open water area of the Lake. This boating area includes a water ski lane to be harvested to the maximum depth of harvest possible, with the provision that at least one foot of vegetation be retained above the lakebed. The onset of harvesting was advanced by one week, to June 24th annually.

Table 16

RECOMMENDED LAKE USE PLAN ELEMENTS FOR FOWLER LAKE

Plan Element	Subelement	Management Measures	Management Responsibility
Aquatic Plant Management Measures	Proactive Measures	Conduct periodic in-lake reconnaissance surveys of aquatic plant communities and update aquatic plant management plan every three to five years	FLMD
		Monitor shorelines and open water areas for new growths of nonnative invasive species and immediately report any new growths to the FLMD	FLMD and private landowners
		Additional periodic monitoring of the aquatic plant community for the early detection and control of future-designated nonnative species that may occur	WDNR, FLMD and private landowners
	Management Measures	Manually harvest around piers and docks as necessary[a]	Private landowners
		Where they occur, remove isolated stands of purple loosestrife through bagging, cutting, and herbicide application to the cut stems	WDNR, FLMD and private landowners
		Mechanically harvest nuisance plants in those areas where species locations, depths of water, and types of bottom substrate are supportive in order to maintain boating access, promote public safety, enhance angling opportunities, and encourage native plant growth and biodiversity	WDNR and FLMD
		Consider the use of limited aquatic herbicide applications to control nuisance growths of nonnative aquatic plants where necessary; specifically target Eurasian water milfoil, curly-leaf pondweed, and purple loosestrife as required[b]	
		Encourage growth of native plants in Fowler Lake through use of vegetated buffer strips and control of Eurasian water milfoil and other invasive species	
Ancillary Management Measures	Water Quality Management	Continue participation in UWEX CLMN program; consider participation in WDNR Expanded Self-Help Program and periodic participation in USGS TSI or similar programs	UWEX, WDNR, USGS/WEAL, FLMD
	Shoreline Protection	Revegetate unprotected and unstable shoreline in environmentally valuable areas and maintain existing structures	WDNR and private landowners
	Recreational Use	Periodic review of public recreational access opportunities and public boating access with regard to compliance with State standards; provide signage at access areas regarding invasive species and boating ordinance regulations; participate in Clean Boats Clean Waters program	WDNR and FLMD

Table 16 (continued)

Plan Element	Subelement	Management Measures	Management Responsibility
Ancillary Management Measures (continued)	Public Informational and Educational Programming	Continue to provide informational material and pamphlets on lake-related topics, especially the importance of aquatic plants and the protection of ecologically significant areas; consider offering public informational programming on topics of lake-oriented interest and education	City of Oconomowoc, FLMD, WDNR and UWEX
		Encourage inclusion of lake studies in environmental curricula (e.g., Pontoon Classroom, Project WET, Adopt-A-Lake)	Area school districts, UWEX, WDNR, City of Oconomowoc, FLMD
		Encourage riparian owners to monitor their shoreline areas as well as open-water areas of the Lake for new growths of nonnative plants and report same immediately to FLMD	FLMD and private riparian owners
	Lake District Board Continuing Education	Maintain awareness of current developments in the area of lake management through informative publications, such as *Lake Tides* (available free through the Wisconsin Lakes Partnership) and attendance at lake education conventions, workshops, and seminars	FLMD

NOTE: The following abbreviations have been used:

CLMN = Citizen Lake Monitoring Network
FLMD = Fowler Lake Management District
TSI = Trophic State Index calculated from the phosphorus and chlorophyll-*a* concentrations and Secchi disc transparency value; a measure of the degree to which the Lake may be considered to be impaired.
USGS = U.S. Geological Survey
UWEX = University of Wisconsin-Extension
WDNR = Wisconsin Department of Natural Resources
WEAL = University of Wisconsin-Stevens Point Water and Environmental Analysis Laboratory.

[a]*Manual harvesting beyond a 30-linear-foot width of shoreline is subject to WDNR individual permitting pursuant to Chapter NR 109 of* the Wisconsin Administrative Code.

[b]*Use of aquatic herbicides requires a WDNR permit pursuant to Chapter NR 107 of the* Wisconsin Administrative Code.

Source: SEWRPC.

Fowler Lake was found to be a mesotrophic lake of average water quality. Appropriate land management practices designed to reduce nonpoint source pollutant discharges in stormwater runoff into the Lake are recommended, as set forth in the comprehensive lake management plan for Fowler Lake.[17]

The shoreland protection and aquatic plant management elements of this plan recommend actions be taken that would reduce human impacts on ecologically valuable areas in and adjacent to the Lake, encourage a biologically diverse community of native aquatic plants, and limit the spread of nonnative invasive plant species. The plan recommends the use of mechanical harvesting of nuisance plants in those areas where depth of water and bottom substrate are sufficient to support such activity; manual harvesting aquatic plants around piers and docks, with

[17]*SEWRPC Community Assistance Planning Report No. 187,* A Management Plan for Fowler Lake, Waukesha County, Wisconsin, *March 1994.*

subsequent removal of cut material from the Lake; and monitoring of invasive species populations. Limited use of chemical herbicides, mainly in areas where nuisance levels of nonnative invasive species are present, could be considered. The plan further recommends periodic in-lake aquatic plant surveys every three to five years to monitor changes in the aquatic plant community and assess effectiveness of aquatic plant management techniques.

The plan also recommends regular participation in the expanded UWEX CLMN volunteer water quality monitoring program with consideration of participation in the Expanded Level II CLMN program.

With regard to recreational uses of the Lake, the plan recommends maintaining the public access site in a manner consistent with Chapter NR 1 standards and Chapter NR 7 guidelines, as well as maintaining signage regarding aquatic and other invasive species pursuant to the prohibitions and restrictions on the conveyance of nonnative species set forth in Chapters NR 40 and NR 109 of the *Wisconsin Administrative Code*. Participation in the UWEX Clean Boats, Clean Waters program is suggested.

Finally, the recommended plan includes continuation of an ongoing program of public information and education, focusing on providing riparian residents and lake users with an improved understanding of the lake ecosystem. Additional options regarding household chemical use, lawn and garden care, onsite sewage disposal system operation and maintenance, shoreland protection and maintenance, and recreational use of the Lake should be made available to riparian property owners, thereby providing riparian residents with alternatives to traditional activities. Additionally, FLMD Commissioners, property owners, and electors are encouraged to maintain and broaden their awareness of current developments in the area of lake management through participation in meetings, seminars, conventions, and other lake management-related events and educational opportunities.

Adherence to the recommendations contained in this plan should provide the basis for a set of protection actions that are: aligned with the goals and objectives set forth in Chapter I of this report; reflective of the ongoing commitment by the FLMD to sound planning with respect to the Lake; and sensitive to current needs, as well as those in the immediate future.

(This Page Left Blank Intentionally)

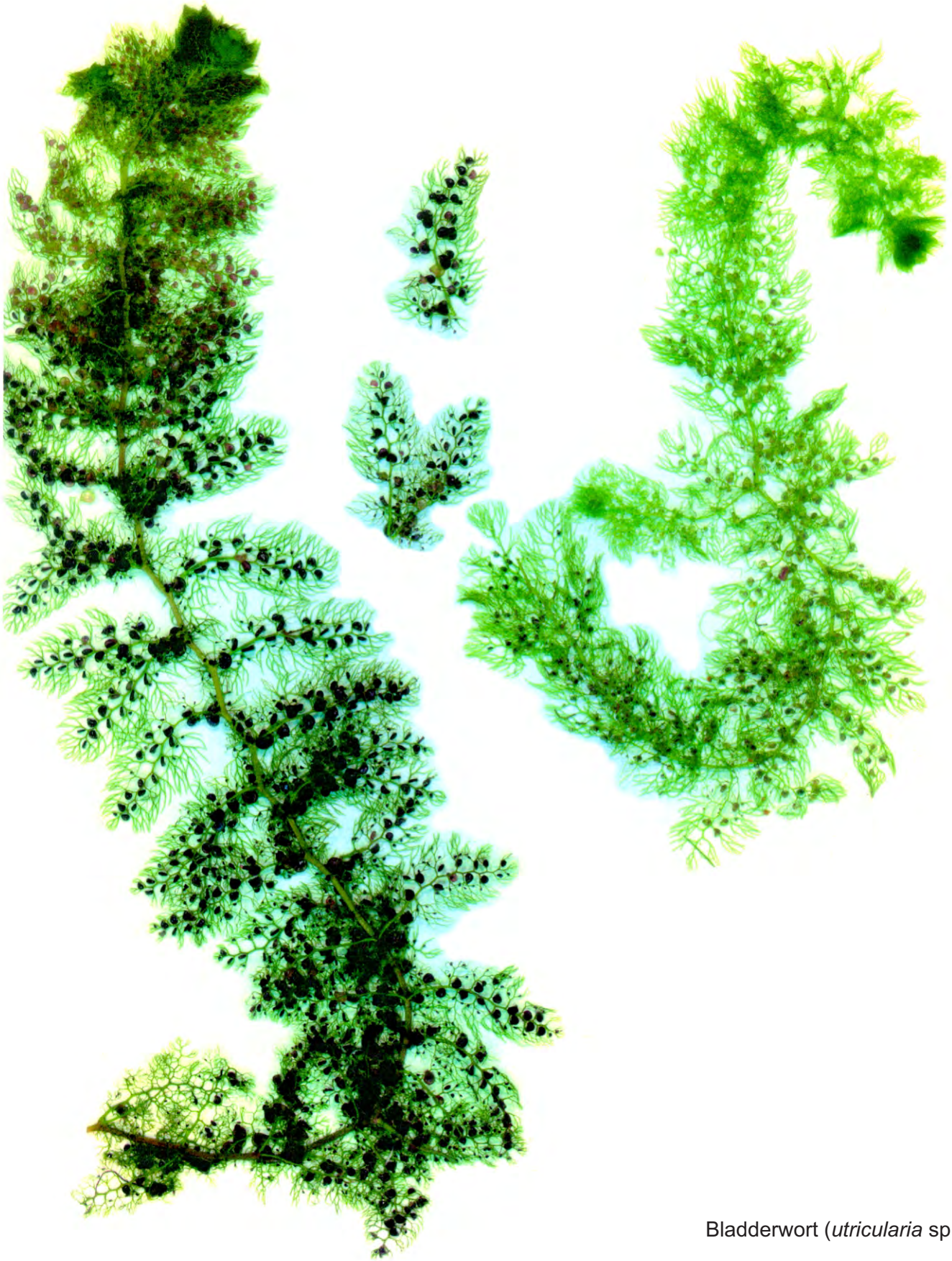
APPENDICES

(This Page Left Blank Intentionally)

Appendix A

ILLUSTRATIONS OF COMMON AQUATIC PLANTS FOUND IN FOWLER LAKE

(This Page Left Blank Intentionally)



Bladderwort (*utricularia* sp.)

Bushy Pondweed (*najas flexilis*)

Clasping-Leaf Pondweed
(*potamogeton richardsonii*)

Coontail (*ceratophyllum demersum*)

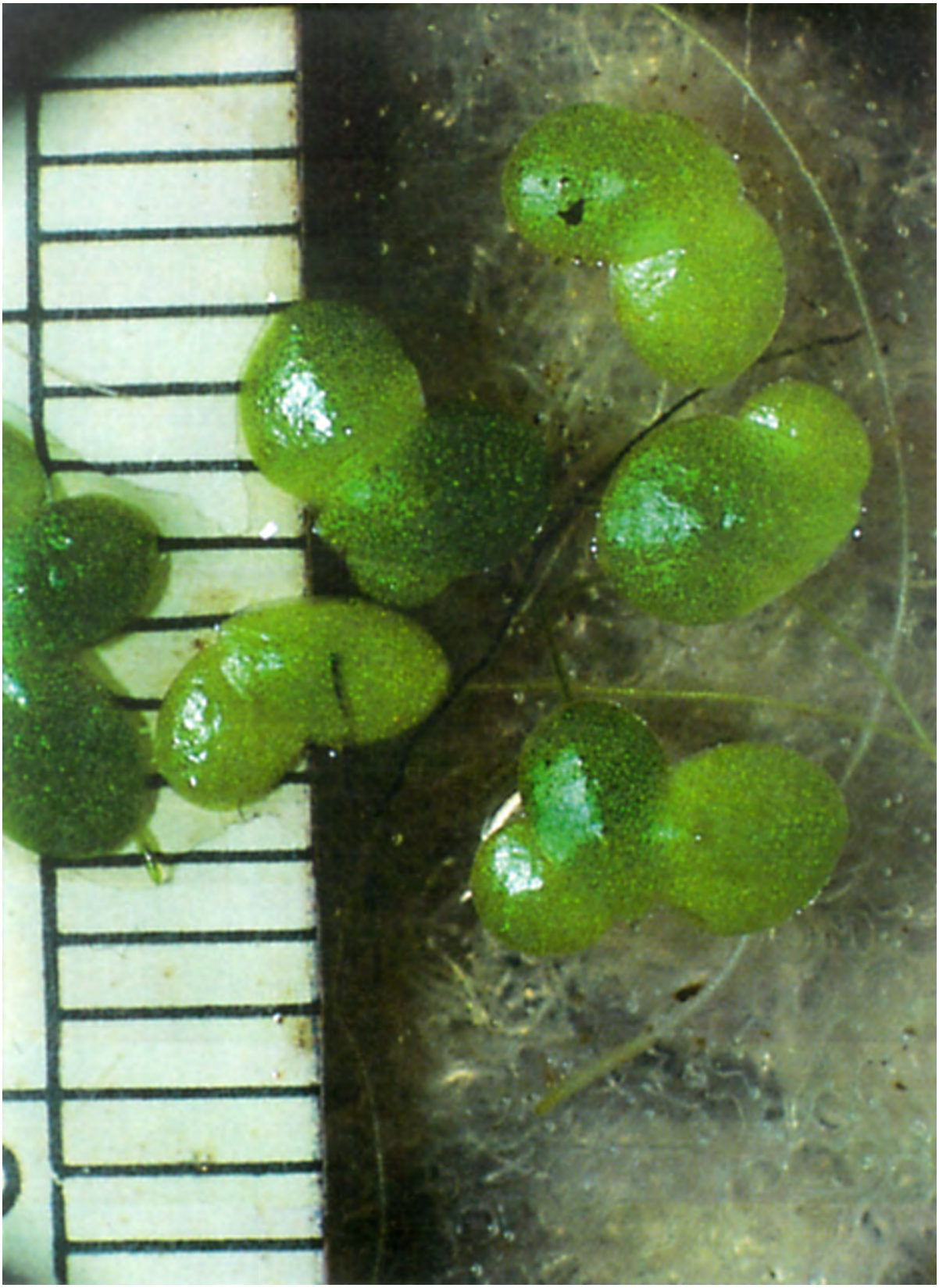
Curly-Leaf Pondweed (*potamogeton crispus*)
Exotic Species (nonnative)

Eurasian Water Milfoil (*myriophyllum spicatum*)
Exotic Species (nonnative)

Flat-Stem Pondweed (*potamogeton zosteriformis*)

Illinois Pondweed (*potamogeton illinoensis*)

Leafy Pondweed (*potamofeton foliosus*)



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*

Muskgrass (*chara vulgaris*)

Native Water Milfoil (*myriophyllum* sp.)

Needle Spike Rush (*ecleocharis acicularis*)

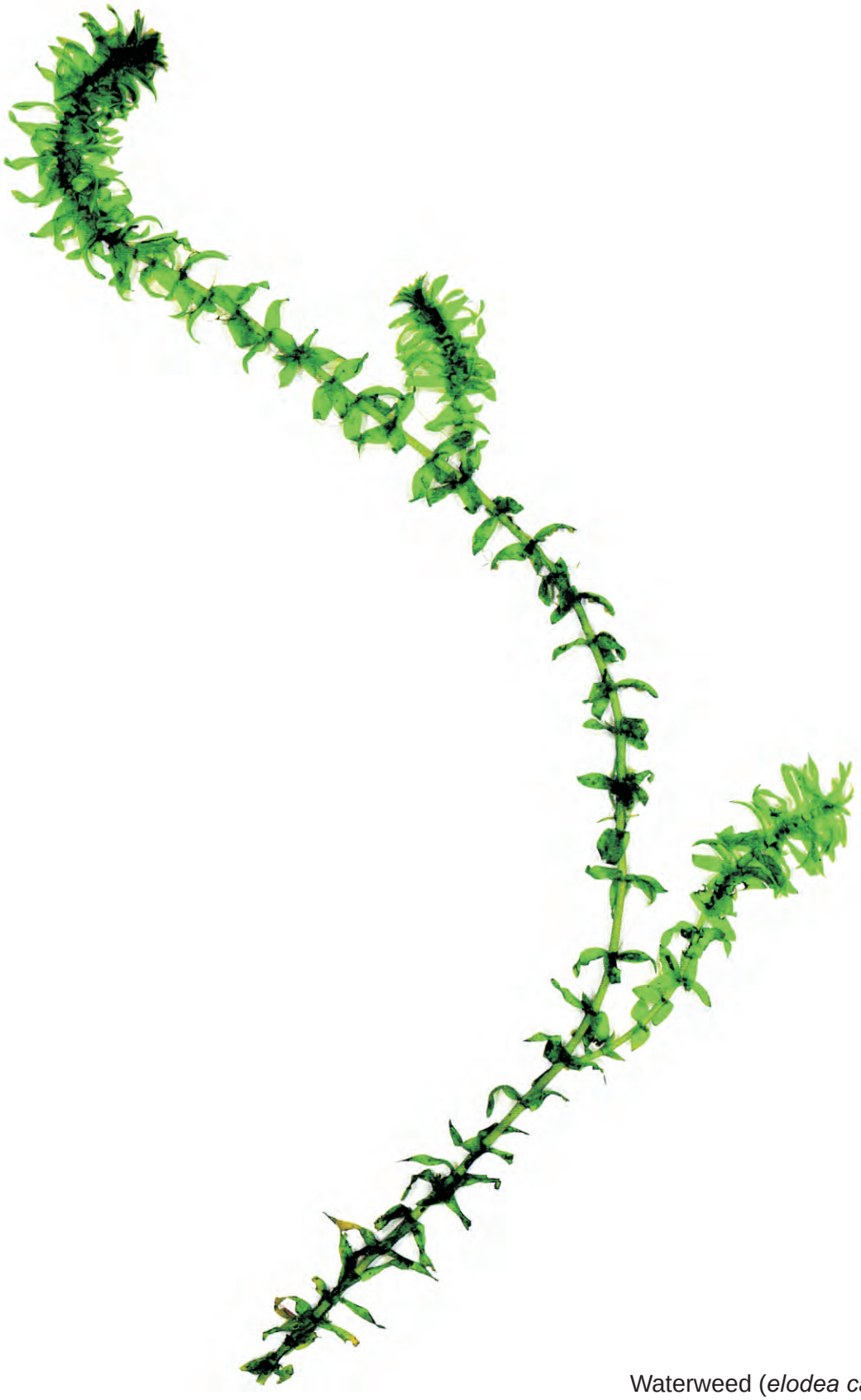
Sago Pondweed (*potamogeton pectinatus*)

Small Pondweed (*potamogeton pusillus*)

Spiny Naiad (*najas marina*)

Variable Pondweed (*potamogeton gramineus*)

Water Stargrass (*zosterella dubia*)



Waterweed (*elodea canadensis*)

White Water Lily (*nymphaea odorata*)

Eel-Grass / Wild Celery (*valisneria americana*)

Yellow Water Lily (*nuphar variegatum*)

Appendix B

DATA ACQUIRED USING GRID-BASED METHODOLOGY

INTRODUCTION

Map 10, set forth in Chapter II of this report, was developed from data acquired using the grid-based, "point-intercept" methodology recently adopted by the Wisconsin Department of Natural Resources (WDNR) for use in conducting aquatic plant surveys.[1] The data acquired using this grid-based methodology are presented in tabular form in this Appendix.

Table B-1 is coded as follows:

"GPS Pt." refers to the waypoint recorded on the Commission's global positioning system (GPS) instrument. This point corresponds to predetermined aquatic plant sampling locations designated by the WDNR for use on Fowler Lake.

"Group" is a numeric designator identifying the aquatic plant community within which specific aquatic plants were found. The Group is also color-coded for ease in identifying the 10 aquatic plant communities identified by the Group number. These color codes are the same as used on Map 10 in Chapter 2, and are as follows:

Group 1 – Lilac
Group 2 – Light blue
Group 3 – Sand/tan
Group 4 – Olive
Group 5 – Green
Group 6 – Red
Group 7 – Salmon/pink
Group 8 – Orange
Group 9 – Yellow
Group 10 – Dark blue

"Eel-Grass" … "Duckweed" are the common names of the aquatic plants observed in Fowler Lake during the 2011 aquatic plant survey. The numbers indicated under the common names of the aquatic plants are subjective estimates of the relative abundance of each plant species observed in each of the samples, using a scale ranging from 1 (sparse) to 5 (abundant). Where the specific aquatic plant species was absent, no number is shown.

---

[1] *Wisconsin Department of Natural Resources, Publication No. PUB-SS-1068 2010*, Recommended Baseline Monitoring of Aquatic Plants in Wisconsin: Sampling Design, Field and Laboratory Procedures, Data Entry and Analysis, and Applications, *2010.*

(This Page Left Blank Intentionally)

Table B-1

DATA ACQUIRED USING GRID-BASED METHODOLOGY

GPS Pt.	Group	Eel-Grass	Chara	Coontail	Sago Pondweed	Bushy Pondweed	Variable Pondweed	Bladderwort	Spiny Naiad	Clasping-Leaf Pondweed	Native Milfoil	Elodea	Small Pondweed	Illinois Pondweed	Needle Spike Rush	Water Stargrass	Leafy Pondweed	Curly-Leaf Pondweed	Flat-Stem Pondweed	Eurasian Milfoil	White Water Lily	Yellow Water Lily	Duckweed
61	1	3	1	1																2			
122	1	3	5	1				2												2			
268	1	3	5	1																1			
282	1	3	5	1		3		2															
212	1	3	5	1																			
62	1	3	1	2		2														3			
54	1	2	5	1				2		2													
44	1	2	5	1																			
82	1	2	5	2				1															
60	1	3	4	1		1														1			
292	1	1	5	1					4											1			
276	1	1	4	4				2															
56	1	4	1	1																			
71	1	4	2	1																3			
303	1	4	2	2																			
241	1	4	2	2								1								2			
28	1	4	2	3								1		2						2			5
141	1	4	3	2		3		3												1			
143	2	4	5	2	3																		
137	2	3	4	1	2			1					1							3			
83	1	4	2	1	1	1	3			1										1			
237	2	3	5	1	1			1												2			
152	2	1	2	3	1			1												1			
298	2	1	5	1	2	2		1	3	1										2			
126	2	2	3	2	2					2										3			
162	2	2	5	1	3			1												1			
145	3	2	1		5															1			
90	3	1	5		1		1	1												3			
119	3	1	5		1																		
277	3	2	5		1						1									1			

Table B-1 (continued)

GPS Pt.	Group	Eel-Grass	Chara	Coontail	Sago Pondweed	Bushy Pondweed	Variable Pondweed	Bladderwort	Spiny Naiad	Clasping-Leaf Pondweed	Native Milfoil	Elodea	Small Pondweed	Illinois Pondweed	Needle Spike Rush	Water Stargrass	Leafy Pondweed	Curly-Leaf Pondweed	Flat-Stem Pondweed	Eurasian Milfoil	White Water Lily	Yellow Water Lily	Duckweed
130	3	2	5		2															1			
150	3	2	5		2					1						2				2		4	
163	3	2	5		2																		
91	3	2	5		3	2	1		3														
307	3	2	5		3				3				2							1			
104	3	2	5		4				4														
305	3	2	5		4																		
238	3	3	3		1															2			
134	3	3	3		2														1	5			
311	3	3	3		2				5											1			
267	3	3	5		1	2														2			
289	3	3	5		2	2	2	2												3			
131	3	3	5		2	3														1			
149	3	3	5		2	2														3			
293	3	3	5		2															1			
105	3	3	5		3															1			
121	3	3	5		4		3													1			
304	4	1	1			1								2						5			
264	4	1	2					1					1					2		5			
174	4	1	4				3													3			
89	4	1	5				1																
308	4	2	5				1																
120	4	2	5				2													2			
300	4	2	5				2		3											1			
58	4	2	5							1													
291	4	2	5																				
199	4	2	5								1									1			
316	4	3	2					1		2				3									
138	4	3	3			2		2									1			3			
239	4	3	5				1																
69	4	3	5																	5			
302	4	3	5								1												

Table B-1 (continued)

GPS Pt.	Group	Eel-Grass	Chara	Coontail	Sago Pondweed	Bushy Pondweed	Variable Pondweed	Bladderwort	Spiny Naiad	Clasping-Leaf Pondweed	Native Milfoil	Elodea	Small Pondweed	Illinois Pondweed	Needle Spike Rush	Water Stargrass	Leafy Pondweed	Curly-Leaf Pondweed	Flat-Stem Pondweed	Eurasian Milfoil	White Water Lily	Yellow Water Lily	Duckweed
310	4	3	5			2				2										3			
70	4	4	1			3		1												2			
140	4	4	2		3	2														1			
227	4	4	2				1																
76	4	4	2			2														2			
128	4	4	2																	3			
312	4	4	3		2				2											4			
101	4	4	3				4													2			
59	4	4	3			1														2			
160	4	4	3																				
151	4	4	3			2																	
139	4	4	4			2	3				3			2						2			
118	4	4	5		2		2																
142	4	4	5		3		3	1					2										
107	4	4	5		3					1							1			2			
313	4	4	5		4			1												1			
254	4	4	5				2																
296	4	4	5	1																1			
55	4	4	5							1				1						1			
146	5	5	1		2	2														3			
94	5	5	1				3													1			
93	5	5	1	2																2			
43	5	5	1	2				1													1	1	
100	5	5	1																				
75	5	5	1									2					1			4			
127	5	5	1			2					2									1			
63	5	5	2				1													4			
112	5	5	2	1																2			
297	5	5	2	1									1							1			
98	5	5	2			1					1												
111	5	5	2																	4			
66	5	5	2									2								3			

Table B-1 (continued)

GPS Pt.	Group	Eel-Grass	Chara	Coontail	Sago Pondweed	Bushy Pondweed	Variable Pondweed	Bladderwort	Spiny Naiad	Clasping-Leaf Pondweed	Native Milfoil	Elodea	Small Pondweed	Illinois Pondweed	Needle Spike Rush	Water Stargrass	Leafy Pondweed	Curly-Leaf Pondweed	Flat-Stem Pondweed	Eurasian Milfoil	White Water Lily	Yellow Water Lily	Duckweed
135	5	5	2			2		1		2										5			
226	5	5	2					1								2							
225	5	5	2					1						1						1			
279	5	5	3				4													1			
108	5	5	4	1													2			3			
148	5	5	4							2	2									1			
278	5	5	4																	1			
110	5	5	5	1																4			
288	6	5		1	1			1					1										
280	6	5		4			1													1			
113	6	5		1							1									4			
72	6	5		1		2														2			
87	6	5		1		2														3	1		
124	6	5		2		2														4			
109	6	5		3										1						4			
52	6	5		3																1			
147	6	5		3		2														3			
125	6	5		4																4			
79	6	4		4	1	1		2			2									2			
144	6	4		1	2	2														3			
96	6	4		1				1								2							
116	6	4		1		2														4			
314	6	4		1						2			1	4									
77	6	2		2								4				1				5			
36	6	2		5							1	2								1	1		5
172	6	3		3											3					3			
159	6	3		4				1												3			
157	6	1		5																5			
173	7	4					2				1									2			
315	7	4				2	3	1		3										2			
95	7	4									2	2								4			
129	7	4				1														3			

Table B-1 (continued)

GPS Pt.	Group	Eel-Grass	Chara	Coontail	Sago Pondweed	Bushy Pondweed	Variable Pondweed	Bladderwort	Spiny Naiad	Clasping-Leaf Pondweed	Native Milfoil	Elodea	Small Pondweed	Illinois Pondweed	Needle Spike Rush	Water Stargrass	Leafy Pondweed	Curly-Leaf Pondweed	Flat-Stem Pondweed	Eurasian Milfoil	White Water Lily	Yellow Water Lily	Duckweed
211	7	4								1										3			
133	7	2			2															5			
65	7	2					2				1									5			
115	7	2				1	2													5			
123	7	2								2			1							5			
85	7	2									2									2			
161	7	2				2														4			
74	7	3				2						2								5			
117	7	1							5														
290	7	5					5	1															
97	7	5						1			2									3			
99	7	5																		2			
114	7	5						1												5			
86	7	5								1	3									1			
84	7	5				1														2			
78	7	5															2	1		2			
73	7	5				3				1				1						3			
67	7	5				1						1								2			
88	7	5																		3			
64	7	5						1												3			
255	7	5				2						3								5			
240	7	5								1				2						4			
29	8		2	2																5			
136	8		3		2	3	2													5			
209	8		3	1	2			1												4			
132	8		3		3	3			1				2							5			
294	8		3										1							1			
301	8		4		2	2											1			2	2		
266	8		4				3																
283	8		5	3	1																		
106	8		5		1															2			
92	8		5	2	2															3			

Table B-1 (continued)

GPS Pt.	Group	Eel-Grass	Chara	Coontail	Sago Pondweed	Bushy Pondweed	Variable Pondweed	Bladderwort	Spiny Naiad	Clasping-Leaf Pondweed	Native Milfoil	Elodea	Small Pondweed	Illinois Pondweed	Needle Spike Rush	Water Stargrass	Leafy Pondweed	Curly-Leaf Pondweed	Flat-Stem Pondweed	Eurasian Milfoil	White Water Lily	Yellow Water Lily	Duckweed
306	8		5		2				3														
102	8		5		3		2		4														
299	8		5		3				4														
253	8		5				2						2										
251	8		5	1									3							2			
236	8		5	2																1			
222	8		5	2				2												1			
187	8		5																	4			
252	8		5															1		3			
295	9			2	1															3			
37	9			3			1					1				1				5			
153	9			4			1																
281	9			1				1										1		3			
198	9			2															4	4			
185	9			2											5					3			
223	9			3				1												5			
156	9			4																1			
210	9			4				1					1							4			
158	9			5				2												1			
287	9			5																			
284	9			5																2			
200	9			5				1										1					
171	9			5		2		1												1			
186	9			5											5					2			
184	9			5																1			
197	9			5																2			
103	10				3		1		5														
57	10																				5	5	
224	10																						
265	10							2										1	2	4			

Source: SEWRPC.

Appendix C

PORTIONS OF CITY OF OCONOMOWOC ORDINANCES PERTAINING TO FOWLER LAKE

(This Page Left Blank Intentionally)

(5) PROHIBITIONS. (Am. #04-O609) In addition to the rules and regulations that will be imposed by the Parks, Recreation and Forestry Department, the following is required of dog owners or custodians before use of dog exercise area(s):

(a) The appropriate user fee must have been paid and a permit issued.

(b) No person using the dog exercise area(s) shall violate any of the then-current rules and regulations established for the control of the dog exercise area(s) by the Parks and Recreation Board of the City of Oconomowoc. A violation of any rule or regulation established by the Board shall be considered a violation of this ordinance.

(c) The dog is licensed and must wear a rabies vaccination tag, an owner identification tag, and a license tag, all as required by the Municipal Code.

(d) The person exercising a dog must remove and dispose of feces before leaving the exercise areas.

(e) Dogs using the exercise areas must have no contagious disease and be parasite-free.

(6) PENALTY. (Am. #04-O609) Any person who violates any of the provisions of this section or the rules and regulations established by the Parks, Recreation and Forestry Department shall, upon conviction of such violation, be subject to penalties as provided in §25.04 of the Municipal Code.

PUBLIC WATERS

21.10 LOCAL REGULATIONS ADOPTED.

Any uniform ordinance adopted pursuant to §§66.30, 30.77 and 30.81, Wis. Stats., to regulate the use of the public waters within the jurisdiction of the City and other municipalities adopting such uniform ordinance and to provide for the cooperative administration and enforcement of such ordinance is adopted by reference and incorporated herein as though set forth in full.

21.11 STATE BOATING AND WATER SAFETY LAWS ADOPTED. (Rep. & recr. #98-0404)

The following statutory provisions describing and defining regulations with respect to water traffic, boats, boating and related water activities in the following enumerated sections of the statutes, exclusive of any provisions therein relating to the penalties to be imposed or the punishment for the violation of such statutes, are hereby adopted and by reference made a part of this section as if fully set forth herein:

21.12 FOWLER LAKE BULKHEAD LINES.

(1) ESTABLISHED. The bulkhead line of that part of the northwesterly shore of Fowler Lake herein described and shown on the plat of survey dated September 10, 1974, and revised September 19, 1974, is established and determined as set forth in the following description:

Commencing at the southwest corner of Lot 170, original plat of Oconomowoc (said point being the intersection of the north line of Wisconsin Ave. and the east line of N. Main St.); thence north along said east line 346 feet to a point 14 feet south of the northwest corner of Lot 174 in said plat; thence east at right angles 140 feet to the point of beginning of the proposed bulkhead line; thence north 51-49-06 west on the proposed bulkhead line 65.52 feet; thence west 88.50 feet to the east line of Main St. and the end of proposed bulkhead line (said point being 26.50 feet north of the southwest corner of Lot 175).

(2) COPY TO BE ON FILE. Upon the approval of the map described in subsection (1) by the Department of Natural Resources, copies of such map shall be filed as follows: one with the Department of Natural Resources, one in the office of the City Clerk and one in the office of the County Register of Deeds.

21.125 FOWLER LAKE SPEED LIMITS. (Rep. & recr. #05-O636)

(1) SLOW-NO-WAKE SPEED LIMITS ON FOWLER LAKE. In addition to slow-no-wake speed limits set forth in §§30.50 through 30.71, Wis. Stats., which sections have been adopted by reference herein, the following slow-no-wake limits are hereby established for Fowler Lake:

(a) Purpose. The purpose of this section is to protect the public health, safety and welfare.

(b) Jurisdiction. Section 21.125 shall apply to Fowler Lake which is located totally within the City limits of the City of Oconomowoc.

(2) EMERGENCY SLOW-NO-WAKE SPEED AT TIMES OF HIGH OR LOW WATER.

(a) Definitions.

1. *High water* means when the waters of Fowler Lake exceed an elevation of 860.23 feet as based upon the USGS benchmark or 9.30 feet on the staff gage (scale) at the Fowler Lake boat launch and/or when the Mayor of the City determines conditions warrant declaring that an emergency exists requiring reduced boat speed. When the high water elevation has been reached, the Mayor shall make the high water declaration.

2. *Low water* means when the waters of Fowler Lake have receded to a point, either by reason of natural or man-made causes, where boating at speeds greater than "slow-no-wake" would be unsafe, or would cause potential undermining of shorelines by way of extraordinary wave action, or when the Mayor of the City determines conditions warrant declaring that an emergency exists requiring reduced boat speed.
3. *Slow-no-wake* has the meaning specified in §30.50(12), Wis. Stats.
4. *Motor boat* has the meaning specified in §30.50(6), Wis. Stats.

(b) Slow-No-Wake Speed Required. No person shall operate a motor boat at a speed in excess of slow-no-wake on Fowler Lake for a period commencing 2 hours after a high or low water condition has been declared until the declaration of a high or low water condition is repealed.

(c) Notice. Notice of a high or low water condition shall be posted at the public launch site and by publication of a notice in both the "Oconomowoc Enterprise" and the "Focus" and by public service announcements on radio and television. Posted notice shall state the time of the declaration of a high or low water condition.

(3) SPECIAL SLOW-NO-WAKE SPEED LIMITS IMPOSED. No person shall operate a motor boat at a speed in excess of slow-no-wake in the following designated areas:

(a) North of the slow-no-wake buoy approximately centrally located between the banks of the Oconomowoc River as the river enters Fowler Lake.

(b) Westerly of the slow-no-wake buoy located approximately 135 feet easterly of the Oakwood Avenue bridge.

(4) [SLOW-NO-WAKE SPEED LIMIT BUOYS.] The Parks, Recreation and Forestry Department is hereby directed to make application to the Wisconsin Department of Natural Resources for a permit to locate slow-no-wake speed limit buoys at the aforementioned 2 locations.

21.13 ISLANDALE CAUSEWAY BULKHEAD LINE. (Cr. #80-066)

A new bulkhead line along a part of the shore of Lac LaBelle, Waukesha County, is established. The bulkhead line shall be along both sides of the Islandale Causeway which commences approximately 803.43 feet north of the centerline of STH 16, extending from said point northerly to the town boundary, all in Sections 29 and 32, City and town, as shown by the map attached to Ordinance #80-066.

statutes incorporated herein are intended to be made a part of this section in order to secure uniform state-wide regulation and enforcement of the boating ordinance violations. Further, the Town of Summit and the City of Oconomowoc specifically elect to use the citation method of enforcement.

(b) Nonexclusivity.

1. *Other Ordinances.* Adoption of this section does not preclude the Town Board or City Council from adopting any other ordinance or providing for the enforcement of any other law or ordinance relating to the same or other matter.

2. *Other Remedies.* The issuance of a citation hereunder shall not preclude the Town Board or City Council or any authorized office from proceedings under any other ordinance or law or by any other enforcement method to enforce any ordinance, regulation or order.

21.17 WINTER REGULATIONS FOR FOWLER LAKE. (Cr. #99-0455)

(1) INTENT. It is the intent of these regulations to provide the basic guidelines and parameters for the safe and healthful use of and conduct of activities on Fowler Lake during periods when the lake is frozen pursuant to the grant of authority under §30.81, Wis. Stats.

(2) COMPLIANCE WITH STATE LAWS. Except as otherwise specifically provided in this section, the current and future statutory provisions of §23.33 and Chs. 350 and 939 through 947, Wis. Stats., described and defining regulations generally with respect to vehicles and traffic conduct, snowmobiles and all-terrain vehicles, exclusive of any provisions therein relating to penalties to be imposed and exclusive of any regulations for which the statutory penalty is a term of imprisonment, are adopted and by reference made a part of this Code as if fully set forth herein. Any act required to be performed or prohibited by any current or future statute incorporated herein by reference is required or prohibited by this section. Any future additions, amendments, revisions or modifications of the current or future statutes incorporated herein are intended to be made part of this Code in order to secure uniform statewide regulation.

(3) DEFINITION OF SELECTED WORDS AND TERMS.

(a) ATV. All-terrain vehicle means any engine-driven device as defined in §340.01(2g), Wis. Stats., which provides: "All-terrain vehicle means an engine-driven device which has a net weight of 650 pounds or less, which has a width of 48 inches or less, which is equipped with a seat designed to be straddled by the operator and which is designed to

travel on 3 or more low-pressure tires. A low-pressure tire is a tire which has a minimum width of 6 inches, which is designed to be mounted on a rim with a maximum diameter of 12 inches and which is designed to be inflated with an operating pressure not to exceed 6 pounds per square inch as recommended by the manufacturer."

(b) Snowmobile. Means any engine-driven vehicle as defined in §340.01(58a), Wis. Stats.

(c) Automobile. Means any motor vehicle as defined by §340.01(4), Wis. Stats., and including mini-vans.

(d) Motor Truck. Means any motor vehicle as defined by §340.01(34), Wis. Stats.

(e) Motor Vehicle. Means any motor vehicle as defined by §340.01(35), Wis. Stats.

(f) Motorcycle. Means any motorized vehicle as defined by §340.01(32), Wis. Stats.

(4) REGULATIONS.

(a) No person shall operate any vehicle defined in subsection (3) at speeds in excess of the following:

1. *Snowmobiles.* 25 mph in daylight and 10 mph at night.
2. *ATVs.* 25 mph in daylight and 10 mph at night.
3. All other vehicles including, but not limited to, automobiles, motor trucks, RVs and motorcycles, 10 mph.

(b) No person shall operate any vehicle defined in subsection (3) above at a speed greater than is reasonable and prudent under the conditions and having regard for the actual and potential hazards then existing.

(c) No vehicle may be operated on Fowler Lake in excess of 10 mph within 200 feet of an ice shanty, parked vehicle or person.

(d) No person shall operate any motorized vehicle in an erratic, free-wheeling manner and all maneuvers including, but not limited to, "wheelies," "doughnuts," "skating" the vehicle, "spinning out" and "wheel-spinning" are specifically prohibited on Fowler Lake.

(e) No person shall operate any internal combustion-powered vehicle not properly equipped with a muffler and, even if equipped with a muffler, no person shall operate such a vehicle in a manner so as to create an excessive noise.

(f) No person shall operate any motorized vehicle during the period beginning one-half hour after sunset and ending at dawn unless equipped with and using adequate, operating headlights and tail-lights.

(g) No person shall operate any motorized vehicle in the bay lying north of the Fowler Lake boardwalk and south of the Zion Episcopal Church peninsula on Fowler Lake on Sunday mornings between the hours of 8:00 a.m. and 12:00 noon.

21.18 ICE FISHING REGULATED. (Cr. #06-O672)

(1) INTENT. It is the intent of these regulations to provide for the public health and safety for those participating in the winter recreational activity of ice skating on skating rinks prepared and maintained by the City of Oconomowoc Department of Parks, Recreation and Forestry.

(2) AUTHORITY. This ordinance is adopted pursuant to the authority granted in §29.038(3), Wis. Stats.

(3) ICE FISHING PROHIBITED. No person shall fish through the ice on ice skating rinks prepared and maintained by the Department of Parks, Recreation and Forestry. This prohibition commences annually when the department begins its rink maintenance.

(4) LOCATION. The Department of Parks, Recreation and Forestry is hereby authorized to prepare and maintain ice skating rinks on Lac LaBelle in the City Beach bay, in the south channel between the Community Center building and the island immediately north thereof, and on Fowler Lake in the vicinity of the boardwalk. The ice skating rink shall be of a size adequate to provide the public with the winter recreational activity of ice skating.

(5) NOTICE. Upon establishing the location of the ice skating rinks, the Department of Parks, Recreation and Forestry shall place appropriate signs notifying the public of this prohibition.

(6) PENALTY. Any person who violates any of the provisions of this section or the rules and regulations established by the Department of Parks, Recreation and Forestry shall, upon conviction of such violation, be subject to penalties as provided in §25.04 of the Municipal Code.

PENALTIES AND ENFORCEMENT

21.30 ENFORCEMENT.

Any cooperative agreement entered into by the City and any other municipalities adopting the uniform ordinance specified in §21.10 for the cooperative enforcement of the provisions of this subchapter, including the mutual financing of the same under equitable terms and arrangements, shall apply.

21.31 PENALTIES AND DEPOSITS.

(1) PENALTY. Any person who violates any provision of this chapter shall upon conviction thereof forfeit not less than $1.00 nor more than $100.00 together with the costs of prosecution and in default of payment thereof shall be imprisoned in the county jail until full payment is made, but not to exceed 60 days.

(2) MONEY DEPOSITS. Any officer arresting a person for violation of a provision of this chapter who is unable to bring the person arrested before a court of appropriate jurisdiction without unnecessary delay shall permit such person to make a money deposit as provided in §30.76, Wis. Stats. Such deposit shall be made to the Chief of Police.

(3) Any person violating §30.681 or 30.684(5), Wis. Stats., shall forfeit not less than $150.00 nor more than $300.00 and in default of such forfeitures shall be imprisoned in the county jail until full payment thereof is made, but not to exceed 60 days. In addition to any penalty, the court shall enter the orders required by §30.80(6)(d) and (e), Wis. Stats. (Cr. #88-0197)