MEMORANDUM REPORT NO. 135

A LAKE PROTECTION PLAN FOR THE KELLY LAKES

MILWAUKEE AND WAUKESHA COUNTIES WISCONSIN

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MEMORANDUM REPORT
NUMBER 135

A LAKE PROTECTION PLAN FOR THE KELLY LAKES MILWAUKEE AND WAUKESHA COUNTIES, WISCONSIN

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

October 2000

Inside Region $10.00
Outside Region $20.00

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Chapter I

INTRODUCTION

Upper and Lower Kelly Lakes, located in the City of New Berlin, Waukesha County, Wisconsin, and the Village of Hales Corners, Milwaukee County, Wisconsin are a valuable resource offering a unique urban residential setting providing a variety of recreational and aesthetic opportunities to the resident community and its visitors. The Lakes are an integral part of the community. However, the recreational and visual value of the Lakes is perceived to be adversely affected by changing land use conditions in the drainage area tributary to the Upper and Lower Kelly Lakes. Seeking to improve the usability and to prevent deterioration of the natural assets and recreational potential of the Kelly Lakes, the riparian residents formed the Kelly Lakes Association that has undertaken a lake-oriented program of community involvement, education, and management. The Association participates in the Wisconsin Department of Natural Resources Self-Help Monitoring Program.

This report sets forth a lake protection plan for the Kelly Lakes, and represents part of the ongoing commitment of the Kelly Lakes Association, the City of New Berlin, and the Village of Hales Corners to sound planning with respect to the Lakes. This plan was prepared over the period 1997-1999 by the Southeastern Wisconsin Regional Planning Commission, in cooperation with the Kelly Lakes Association and includes the results of field surveys conducted by the Commission in 1997 and 1998. The planning program was funded, in part, by a Wisconsin Department of Natural Resources Lake Management Planning Grant awarded to the Kelly Lakes Association under the Chapter NR 190 Lake Management Planning Grant program.

This plan is intended to form an integral part of any future comprehensive lake management plan for the Upper and Lower Kelly Lakes. The scope of this report is limited to a consideration of those management measures which can be determined to be effective in the protection of lake water quality and lake use based upon the available data. The preparation of a comprehensive lake management plan for the Kelly Lakes will require additional water quality and biological data collection and analysis.

The lake protection and recreational use plan goals and objectives for the Kelly Lakes were developed in consultation with the City of New Berlin, the Village of Hales Corners, and the Kelly Lakes Association. The goals and objectives are:

1. To protect and maintain public health, and to promote public comfort, convenience, necessity, and welfare, through the environmentally sound management of the vegetation, fishery, and wildlife populations in and around the Kelly Lakes;

2. To provide for high-quality, water-oriented urban residential setting with recreational and aesthetic opportunities for residents and visitors to the Kelly Lakes, and to manage the Lakes in an environmentally sound manner; and,

3. To effectively maintain the water quality of the Kelly Lakes so as 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 waterbodies.

This plan, which conforms to the requirements and standards set forth in the relevant *Wisconsin Administrative Codes*,[1] should serve as an initial guide to achieving these objectives over time.

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[1]*This plan has been prepared pursuant to the standards and requirements set forth in Administrative Codes Administrative Code NR 1,* Public Access Policy for Waterways*; NR 103,* Water Quality Standards for Wetlands*; and, NR 107,* Aquatic Plant Management.

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Chapter II

INVENTORY FINDINGS

INTRODUCTION

The Kelly Lakes are located in the southeastern portion of the City of New Berlin, Waukesha County, and in the western portion of the Village of Hales Corners, Milwaukee County, as shown on Map 1. Lower Kelly Lake is a spring-fed lake, having an outlet to the north to Upper Kelly Lake through a wetland area and culvert. Upper Kelly Lake is a drainage lake, with a clearly defined, perennial inlet located on the southwestern shore and an intermittent inlet on the southern shore draining from Lower Kelly Lake. This hydrologic connection is clearly shown on the 1873 plat map, as shown on Map 2. Upper Kelly Lake has a well-defined outlet that flows to the east forming the headwaters of the Whitnall Park Creek, a tributary to the North Branch of the Root River.

The total drainage area tributary to the Kelly Lakes, located within the City of New Berlin in Waukesha County, and the Village of Hales Corners in Milwaukee County, is approximately 983 acres in areal extent. More specifically, the drainage area tributary to Lower Kelly Lake is about 25 acres, while the remainder of the drainage area, approximately 958 acres in areal extent, drains to Upper Kelly Lake. The land uses in this area are primarily urban, with some open land including wetlands, woodlands, other natural areas, and some agricultural lands. Urban-residential lands are the principal urban feature of the Kelly Lakes tributary drainage area.

WATERBODY CHARACTERISTICS

Lower Kelly Lake is a three-acre drained waterbody, which is primarily spring-fed with some contribution of water from localized surface runoff. It drains to the north to Upper Kelly Lake. Lower Kelly Lake is roughly circular in shape and has one large basin. The Lake has a maximum depth of 36 feet, a mean depth of 11.6 feet, and a volume of 35 acre-feet.

Upper Kelly Lake is a 12-acre drainage waterbody, which receives most of its water from surface runoff and some groundwater inflows. Upper Kelly Lake drains to the southeast to become the headwaters of the Whitnall Park Creek. The Lake is elongate in shape and has one large basin. Upper Kelly Lake has a maximum depth of 31 feet, a mean depth of 17 feet, and a volume of 211 acre-feet.

The hydrographical characteristics and the bathymetry of the two Lakes are shown in Table 1 and on Map 3, respectively.

LAND USE AND SHORELINE DEVELOPMENT

Population

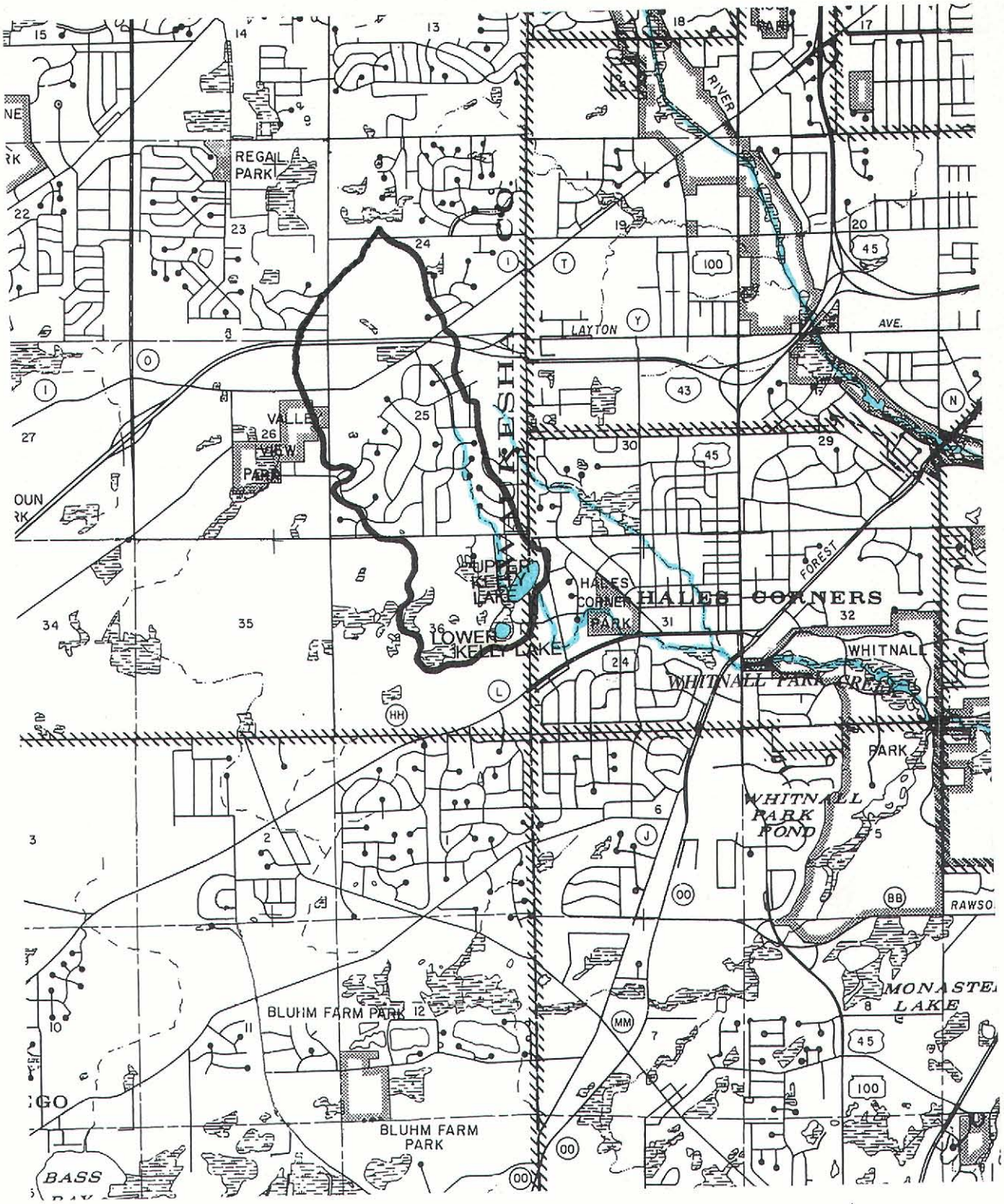
As of 1990, there were approximately 2,500 persons residing within the drainage area tributary to the Kelly Lakes. There were approximately 850 housing units located within the drainage area tributary to the Kelly Lakes. Urban development in the drainage area tributary to the Kelly Lakes consists primarily of residential development that has largely occurred between 1950 and 1963, as shown on Map 4.

Land Use

Residential land uses occupy almost all of the upland portions of the shorelands of the Kelly Lakes, as shown on Map 5. With the exception of the wetland areas located on the southern and western shorelines of Upper Kelly

Map 1

LOCATION OF UPPER AND LOWER KELLY LAKES



LEGEND

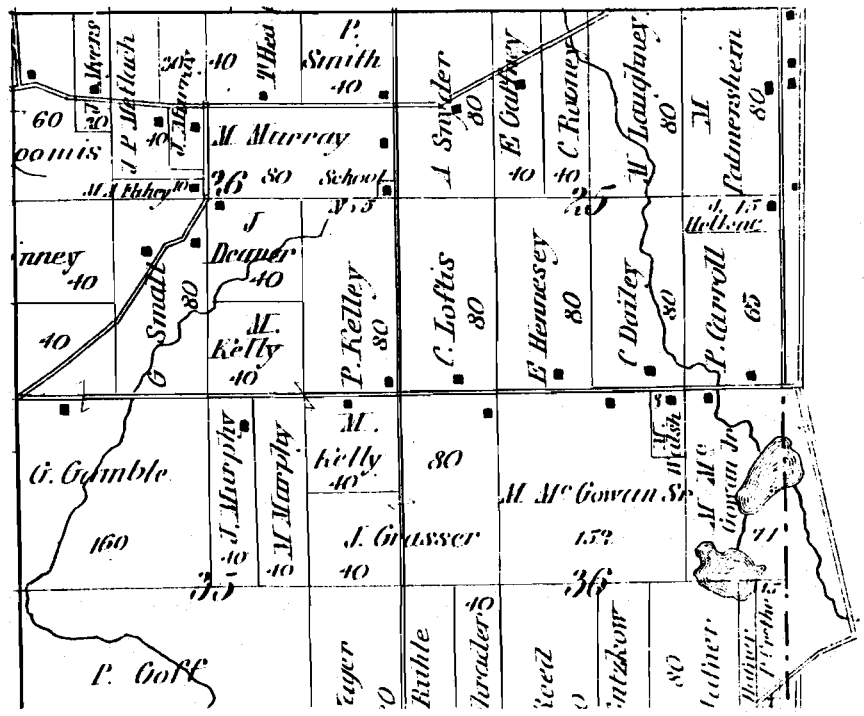
DRAINAGE AREA TRIBUTARY TO UPPER AND LOWER KELLY LAKES

GRAPHIC SCALE
0 2000 4000 FEET

Source: SEWRPC.

Map 2

HISTORIC PLAT MAP FOR THE KELLY LAKES AREA: 1873



Source: 1873 Atlas of Waukesha County, Wisconsin.

Lake and the small dairy farm on the northwestern shoreline of the Lake, residential land uses occupy the major portion of the shoreland of Upper Kelly Lake. Lower Kelly Lake is completely surrounded by wetland, with limited urban residential development located adjacent to the wetlands to the east and west of the Lake. Additional subdivision development, outside of the subwatershed draining to the Kelly Lakes, is occurring to the south and west of the two Lakes.

Public access to the Lakes is provided by a walk-in access at the City of New Berlin park site located at the southern end of Upper Kelly Lake, and a public recreational boating launch site located on the northeastern side of the Lake in the Village of Hales Corners. Parking facilities are not provided at this launch site.

The existing 1990 land use pattern in the drainage area tributary to the Kelly Lakes is shown in Map 5 and is quantified in Table 2. About 576 acres, or about 59 percent of the tributary drainage area, were devoted to urban uses. The dominant urban land use was residential, encompassing 509 acres, or about 88 percent of the area in urban use. About 407 acres, or about 41 percent of the Kelly Lakes drainage area, were still devoted to rural land uses. Approximately 268 acres, or about 66 percent of the rural area, were in agricultural and open land uses. Woodlands, wetlands, and surface waters, including the surface area of the Kelly Lakes, as shown on Map 6, accounted for approximately 139 acres, or about 34 percent of the rural land uses.

Under buildout conditions, conversion of the majority of the remaining rural lands, excepting wetlands and woodlands comprising the secondary environmental corridor lands and isolated natural resource area and the

Table 1

HYDROGRAPHIC CHARACTERISTICS OF THE KELLY LAKES

Parameter	Upper Kelly Lake	Lower Kelly Lake
Surface Area	12 acres	3 acres
Volume	211 acre-feet	35 acre-feet
Maximum Depth	31 feet	36 feet
Mean Depth	17.0 feet	11.6 feet
Drainage Area	958 acres	25 acres

Source: SEWRPC.

portion of the Valley View Park, within the drainage area tributary to the Kelly Lakes to urban land uses is envisioned in the adopted regional land use plan and Waukesha County development plan, as shown on Map 7.[1]

Infilling of existing platted lots and additional low-density, single-family residential development within the tributary drainage area of the Lakes is expected to occur.

WATER QUALITY

Based on Secchi-disk transparency measurements obtained by the IPS Environmental and Analytical Services, Inc., during 1995 and 1996,[2] and by Commission staff during 1997, the Upper and Lower Kelly Lakes have poor to good, and fair to very good water quality, respectively. Based on total phosphorus data, Upper Kelly Lake has a Wisconsin Trophic State Index (WTSI) value of 60 indicating that this lake is an eutrophic waterbody, while Lower Kelly Lake has a WTSI value of 53 indicating that it is a meso-eutrophic waterbody.[3] Eutrophic lakes are fertile lakes that support abundant aquatic plant growths and may support productive fisheries. Nuisance growths of algae and plants are common in eutrophic lakes, and may occur in meso-eutrophic lakes. Many of the lakes in Southeastern Wisconsin are classified as eutrophic or meso-eutrophic.[4]

The annual average surface water total phosphorus concentration of Upper Kelly Lake, reported by IPS Environmental and Analytical Services, Inc., for 1995-96, was approximately 58 micrograms per liter (µg/l), with an annual average chlorophyll-a concentration of 22 µg/l. In Lower Kelly Lake, the average surface water total phosphorus concentration was about 24 µg/l, and the average chlorophyll-a concentration was 6.5 µg/l, as shown

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[1] *SEWRPC Planning Report No. 40,* A Regional Land Use Plan for Southeastern Wisconsin—2010, *January 1992; SEWRPC Community Assistance Planning Report No. 209,* A Development Plan for Waukesha County, Wisconsin, *August 1996.*

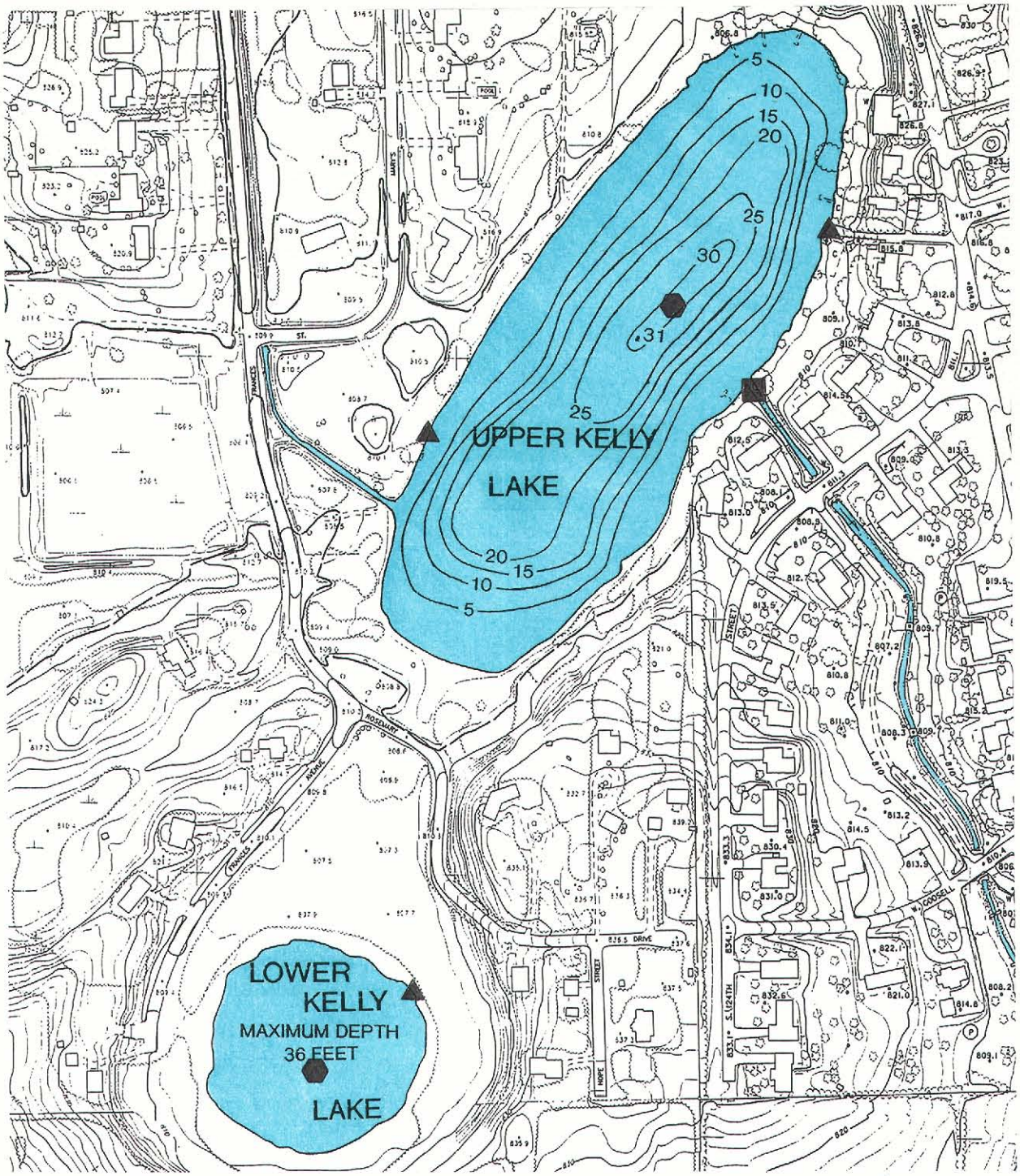
[2] *IPS Environmental and Analytical Services, Inc.,* Phase I Lake Management Plan, Upper and Lower Kelly Lakes, Waukesha and Milwaukee Counties, Wisconsin, *March 1997.*

[3] *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.*

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

Map 3

BATHYMETRIC MAP OF UPPER AND LOWER KELLY LAKES



LEGEND

- 20 — WATER DEPTH CONTOUR IN FEET
- ▲ PUBLIC BOAT ACCESS
- ■ DAM SITE
- ⬢ SAMPLING SITE LOCATION

N

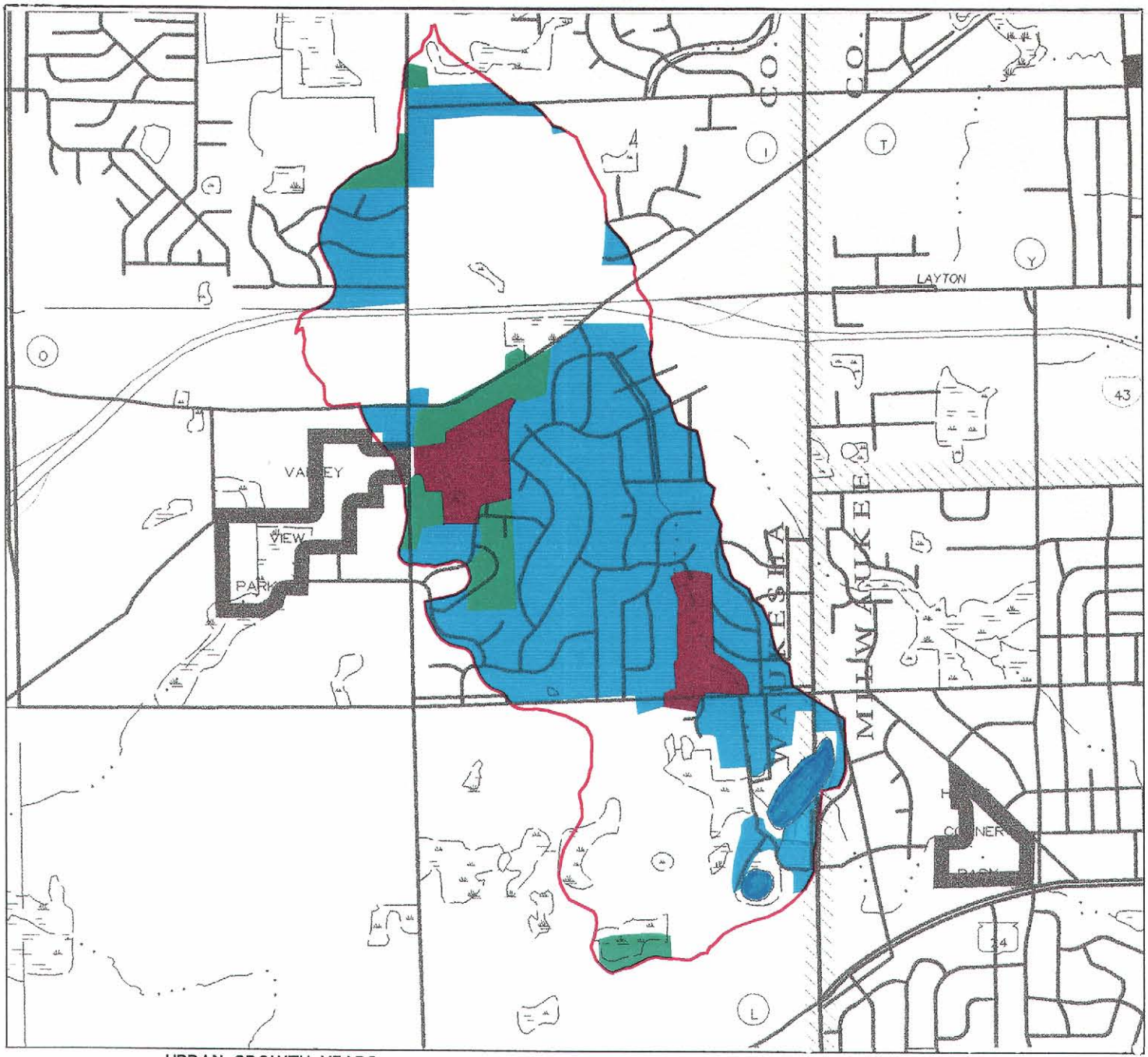
GRAPHIC SCALE

0 150 300 FEET

Source: SEWRPC.

Map 4

HISTORIC URBAN GROWTH WITHIN THE TOTAL TRIBUTARY DRAINAGE AREA TO THE KELLY LAKES: 1850-1990



URBAN GROWTH YEARS

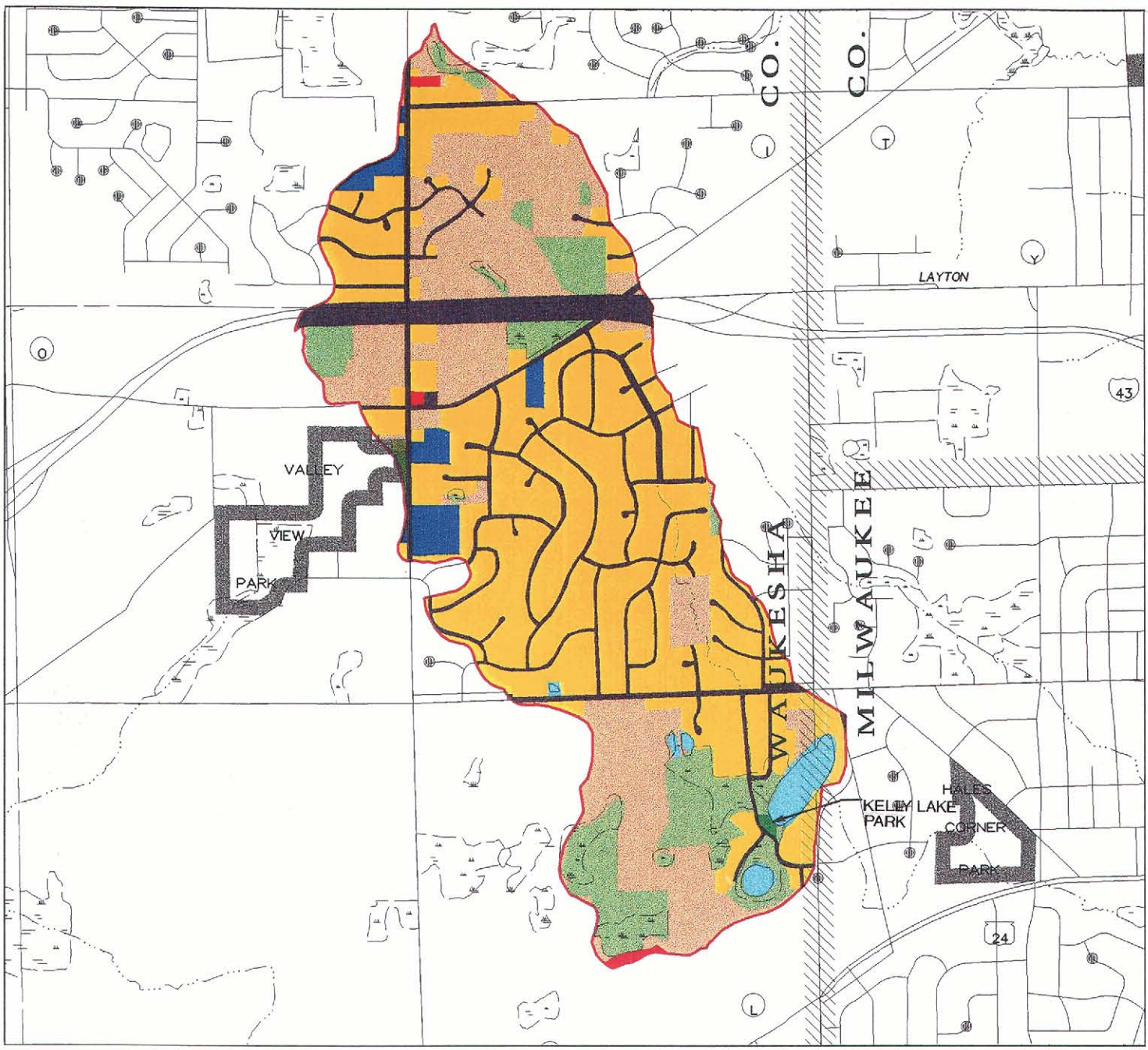
1850	1963
1880	1970
1900	1975
1920	1980
1940	1985
1950	1990

0 2000
Scale in feet

Source: SEWRPC.

Map 5

GENERALIZED LAND USE WITHIN THE TOTAL TRIBUTARY DRAINAGE AREA TO THE KELLY LAKES: 1990



LAND USE CATEGORIES

- Single–family residential
- Multi–family residential
- Commercial
- Industrial
- Transportation, communications, and utilities
- Governmental and institutional
- Recreation
- Surface water
- Wetlands and woodlands
- Agricultural, unused, and other open lands
- Extractive and landfill

Source: SEWRPC.

Table 2

EXISTING AND RECOMMENDED LAND USE WITHIN THE TOTAL TRIBUTARY DRAINAGE AREA TO THE KELLY LAKES

Land Use Categories	1990		Buildout	
	Acres	Percent of Drainage Area	Acres	Percent of Drainage Area
Urban				
Residential	509	51.8	782	79.6
Commercial	6	0.6	6	0.6
Industrial	--	--	--	--
Governmental	24	2.4	24	2.4
Transportation and Utilities	35	3.6	35	3.6
Recreational	2	0.2	11	1.1
Subtotal	576	58.6	858	87.3
Rural				
Agricultural	155	15.8	--	--
Wetlands	58	5.9	58	5.9
Woodlands	62	6.3	38	3.9
Water	19	1.9	19	1.9
Other Open Land	113	11.5	10	1.0
Subtotal	407	41.4	125	12.7
Total	983	100.0	983	100.0

Source: SEWRPC.

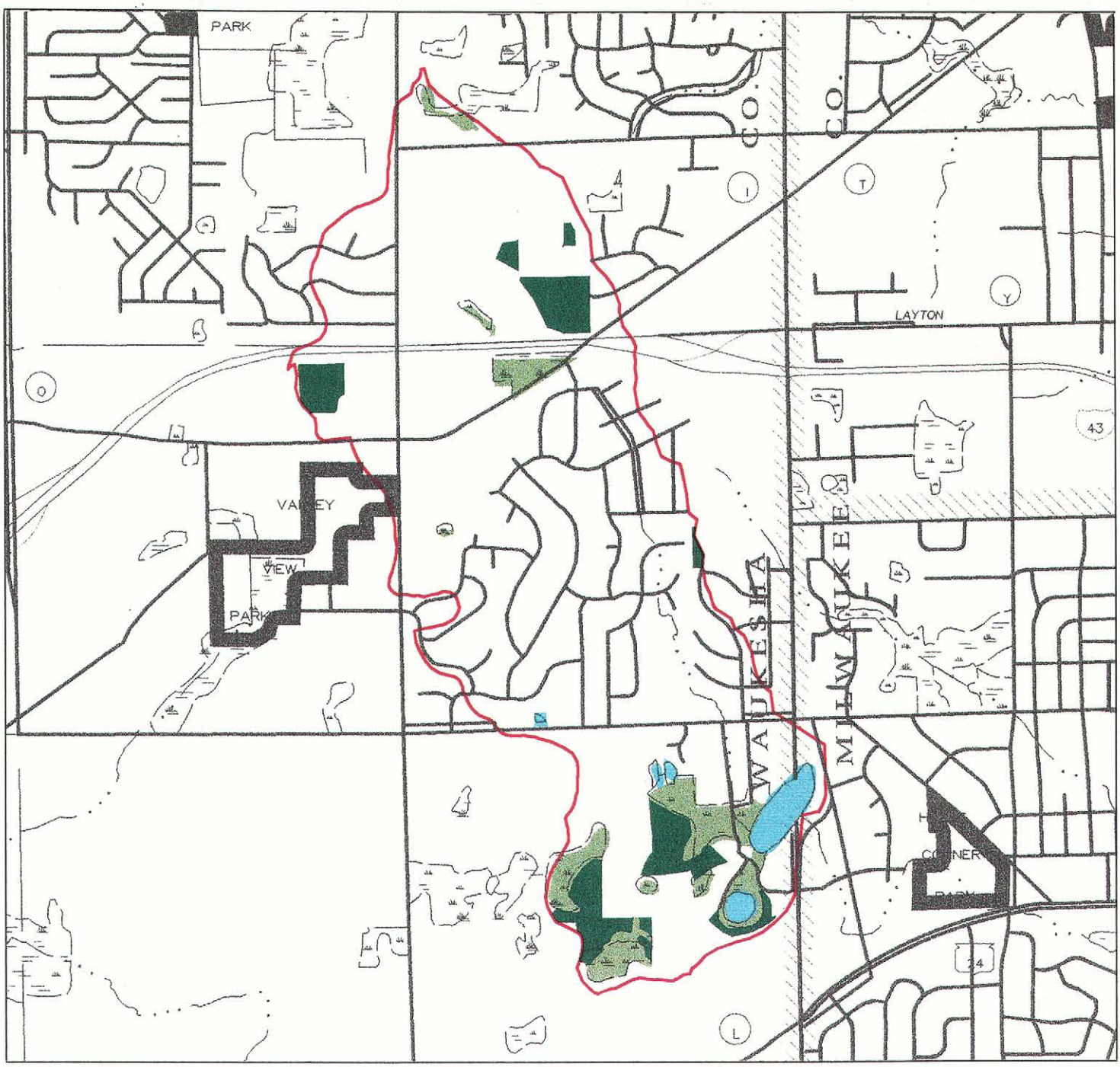
in Table 3. The sampling locations used by IPS Environmental and Analytical Services, Inc., during 1995 and the Wisconsin Department of Natural Resources during 1996 are shown on Map 3. The data reported by IPS Environmental and Analytical Services, Inc., are similar to those obtained during 1997 by Commission staff. Surface water phosphorus concentrations measured during 1997 were 58 µg/l and 25 µg/l, in the Upper and Lower Lakes respectively, with corresponding chlorophyll-a concentrations of 18 µg/l and 9.0 µg/l. The observed chlorophyll-a and total phosphorus concentrations are indicative of some water quality problems, especially in Upper Kelly Lake where chlorophyll-a concentrations exceeded the 10 µg/l concentration generally considered as the lowest concentration at which lake water will appear greenish in color. The spring surface water total phosphorus concentrations in both lakes were in excess of the standard of 20 µg/l recommended by the Regional Planning Commission as the value below which few water quality problems are likely to occur.

Data obtained by IPS Environmental and Analytical Services, Inc., during 1995 and the Wisconsin Department of Natural Resources during 1996 indicated that the Kelly Lakes stratify during the summer months, exhibiting both thermal and dissolved oxygen concentration stratification with depth for the months of June through September. Winter stratification is also suggested by the data for February 1995 and March 1996. These data are typical of dimictic lakes in the temperate zone, with depletion of hypolimnetic or lake bottom water oxygen being common in mesotrophic and eutrophic waterbodies.[5] The increased conductivity in the hypolimnion, or bottom waters, of the Kelly Lakes, indicates a degree of internal loading occurring in the Lakes, the impact of which is related to the rate at which the Lakes mixes from top to bottom during the spring and fall overturn events. In spring and fall, differential warming and cooling of the lake surface waters, respectively, alters the density of lake waters in such a manner as to promote mixing of lake water. When the mixing process is relatively slow, on the order of days to

[5]*R.G. Wetzel,* Limnology, *Saunders, Philadelphia, 1975.*

Map 6

WOODLANDS AND WETLANDS WITHIN THE TOTAL TRIBUTARY DRAINAGE AREA TO THE KELLY LAKES: 1990



LAND AREAS

Woodland

Wetland

Surface water

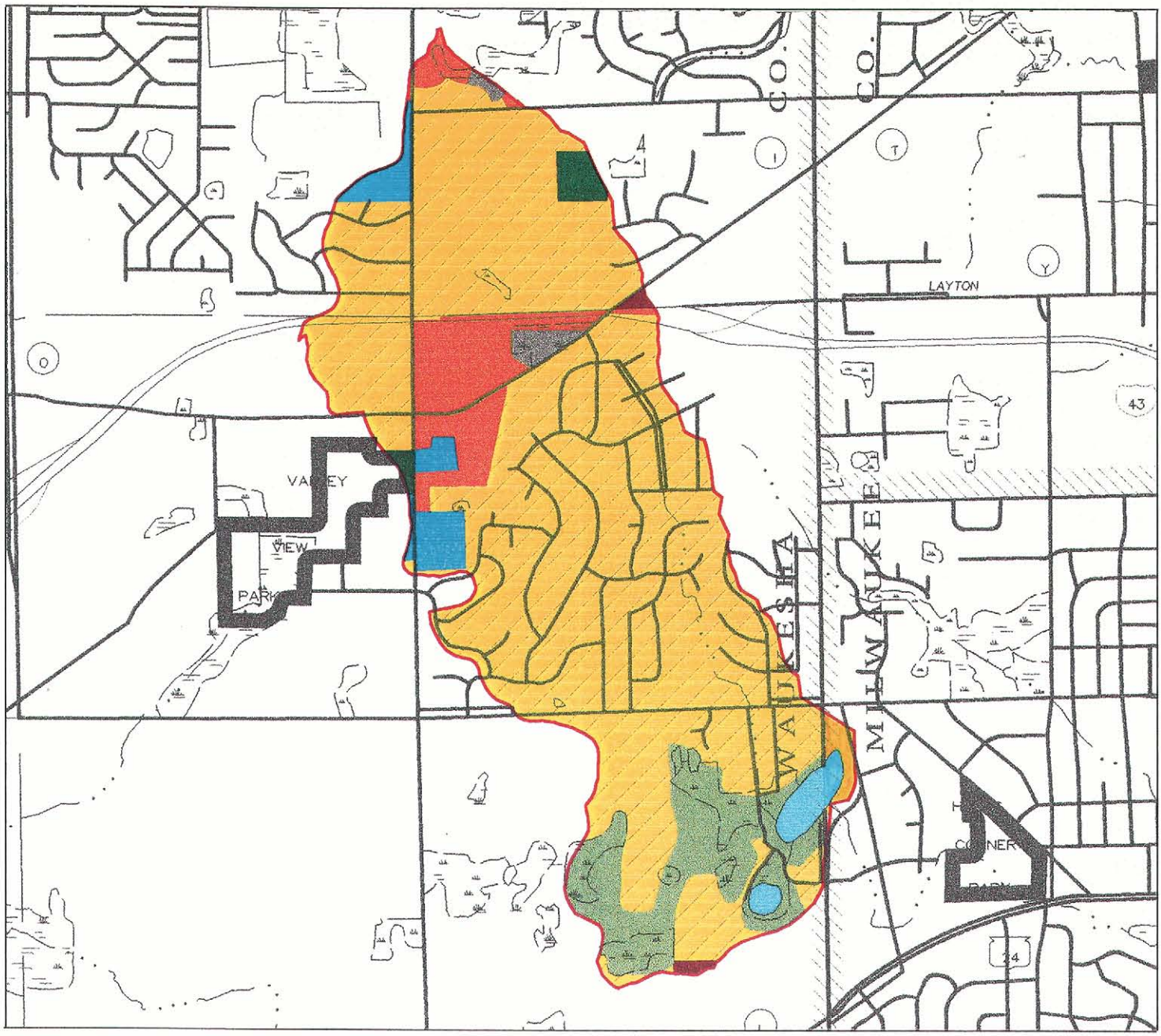
0 2000

Scale in feet

Source: SEWRPC.

Map 7

RECOMMENDED LAND USE PLAN FOR THE TOTAL TRIBUTARY DRAINAGE AREA TO THE KELLY LAKES



RECOMMENDED LAND USES

- High-density residential (less than 6,000 square feet of lot area per dwelling unit)
- Medium-density residential (6,000–19,999 square feet of lot area per dwelling unit)
- Low-density residential (20,000 square feet to 1.49 acres of lot area per dwelling unit)
- Suburban I-density residential (1.5 to 2.9 acres of lot area per dwelling unit)
- Suburban II-density residential (3.0 to 4.9 acres of lot area per dwelling unit)
- Rural-density residential and other agricultural lands
- Commercial
- Industrial
- Government and Institutional
- Recreational
- Transportation, Communication, and Utilities
- Extractive
- Landfill
- Primary environmental corridor
- Secondary environmental corridor
- Isolated natural resource area
- Other open lands to be preser
- Prime agricultural land
- Surface water

0 2000
Scale in feet

12 *Source: SEWRPC.*

Table 3

WATER QUALITY DATA FOR UPPER AND LOWER KELLY LAKES: 1995-1997

Upper Kelly Lake						
Parameter	Winter 1995	Summer 1995	Winter 1996	Summer 1996	Winter 1997	Summer 1997
Water Temperature (°F)	--	46-79	34-37	43-73	45-77	--
Secchi-Disk (feet)	--	7.8	3.6	3.6-7.5	3.6	--
Total Nitrogen (mg/l)	--	1.058-1.078	--	--	--	--
Total Phosphorus (mg/l)	0.071-0.173	0.032-1.13	0.076-0.258	0.031-0.565	0.035-1.095	0.058
Orthophosphorus (mg/l)	0.025-0.143	0.004-1.020	--	--	--	--
Chlorophyll-a (mg/l)	24.3	1.1-39.6	41.3	9.6-28.7	10.9	19.6

Lower Kelly Lake						
Parameter	Winter 1995	Summer 1995	Winter 1996	Summer 1996	Winter 1997	Summer 1997
Water Temperature (°F)	--	43-80	34 - 40	40-80	--	--
Secchi-Disk (feet)	--	8.5	4.3	11.1-14.7	--	--
Total Nitrogen (mg/l)	0.9-2.8	--	--	--	--	--
Total Phosphorus (mg/l)	0.035-0.435	0.016-0.600	0.035-0.388	0.013-0.686	--	0.019-0.030
Orthophosphorus (mg/l)	0.001-0.236	0.002-0.324	--	--	--	--
Chlorophyll-a (mg/l)	15.6	0.5-3.5	19.3	1.3-2.7	--	1.1-16.1

Source: IPS Environmental and Analytical Services, Inc. and SEWRPC.

weeks, minerals and nutrients released from the lake sediments into the hypolimnion of the lake tend to recombine with the multivalent cations, such as iron, calcium, and aluminum, present in the lake sediments and precipitate out of the water column. Conversely, if the mixing process is relatively rapid, on the order of hours or days as may occur due to the passage of an intense storm, the minerals and nutrients may be mixed upward into the epilimnion or surface waters where they are available for plant growth. Given the location of the Kelly Lakes within a wind-sheltered depression, it could be suggested that internal loading is likely to be minimal. This hypothesis is supported by the good agreement between predicted and observed total phosphorus concentrations in the Lakes.[6]

Notwithstanding, observations by Commission staff during July 1998, revealed calcium carbonate, or marl, deposition on aquatic plants in Upper Kelly Lake, which would indicate some degree of groundwater inflow to this lake. Marl deposition occurs as a result of pH changes between the groundwater and lake water which results in the precipitation of dissolved calcium carbonate carried into Upper Kelly Lake by the groundwater inflows.[7]

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[6]*Estimates of the long-term annual average total phosphorus concentration in Kelly Lakes were derived from the WILMS model, described in Wisconsin Department of Natural Resources Publication No. PUBL-WR-363-96 REV,* Wisconsin Lake Model Spreadsheet, Version 2.00, User's Manual, *June 1994.*

[7]*W. Stumm, and J.J. Morgan,* Aquatic Chemistry: An Introduction Emphasizing Chemical Equilibria in Natural Waters, *Wiley-Interscience, New York, 1970.*

POLLUTANT LOADINGS

Pollutant loads to a lake are generated by various natural processes and human activities that take place in the drainage area tributary to a lake. These loads are transported to the 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 the lake as dry fallout and direct precipitation. Pollutants transported across the land surface enter the lake as direct runoff and, indirectly, as groundwater inflows. Pollutants transported by streams enter a lake as surface water inflows. In drained lakes, like Lower Kelly Lake, pollutants are transported across the land surface directly tributary to the lake, and in the absence of point source discharges from industries or wastewater treatment facilities, comprise the principal route by which contaminants enter a waterbody.[8] Similarly, in drainage lakes, like Upper Kelly Lake, pollutants enter the waterbody in runoff from across the land surface directly tributary to the lake and from runoff collected by tributary streams from within a larger tributary watershed. There are no known point sources of water pollutants within the Kelly Lakes total tributary drainage area.[9] All residential lands within the total tributary drainage area are served by public sanitary sewers. For this reason, the discussion that follows is based upon nonpoint source pollutant loadings to the Kelly Lakes.

The nonpoint source pollutant loads to the Kelly Lakes were estimated on the basis of land use inventory data and unit area load coefficients determined for Southeastern Wisconsin. Annual contaminant loads entering the Kelly Lakes were calculated to be approximately 201 tons of sediment; 222 pounds of phosphorus; and 39 pounds and 195 pounds of copper and zinc, respectively, as shown in Table 4. Copper and zinc were used in this analysis as surrogates for metals and other pollutants that are contributed primarily from urban sources.

To validate the estimated contaminant loads to the Kelly Lakes, Commission staff applied the estimated phosphorus load of 222 pounds in the Vollenweider-type OECD phosphorus budget model to estimate an in-lake total phosphorus concentration. This calculation resulted in an estimated annual average phosphorus concentration of about 53 µg/l, which value corresponds reasonably well to the observed in-lake phosphorus concentration of about 58 µg/l. This agreement would suggest that the estimated contaminant loads are a reasonable representation of the loads entering the Kelly Lakes, and that other pollutant sources, including internal loading, to the Kelly Lakes, are relatively small compared to the loading from external sources.

Table 4 shows the relative percentage contributions of the various land uses to the pollutant loads to the Kelly Lakes. The data indicate that, based on 1990 land use conditions in the drainage area tributary to the Kelly Lakes, 39 percent of the phosphorus load to Upper Kelly Lake is contributed from agricultural and open lands within the tributary drainage area; about 4 percent from wetlands, woodlands, and surface waters; and about 58 percent from residential areas, while, for Lower Kelly Lake, almost all of the phosphorus load is contributed from residential areas. About 67 percent of the sediment load to Upper Kelly Lake is generated from urban sources; 32 percent from agricultural and open lands; and about 1 percent from woodlands, wetlands, and surface water sources, as set forth in Table 4. For Lower Kelly Lake, almost all of the sediment load is contributed from urban sources.

Of the controllable pollutant sources, the most significant sources under existing land use condition are urban lands, which generate the largest percentage of sediment, nutrient, and metals loadings. Control of contaminants from these various sources can be effected through a variety of measures as set forth in Chapter IV.

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[8] *S.-O. Ryding and W. Rast,* The Control of Eutrophication of Lakes and Reservoirs, *Unesco Man and the Biosphere Series, Volume 1, Parthenon Press, Carnforth, 1989.*

[9] *SEWRPC Memorandum Report No. 93,* A Regional Water Quality Management Plan for Southeastern Wisconsin: An Update and Status Report, *March 1995.*

Table 4

FORECAST ANNUAL POLLUTANT LOADINGS TO UPPER AND LOWER KELLY LAKES BY LAND USE CATEGORY: 1990

Land Use Category	Pollutant Loads			
	Sediment (tons)	Phosphorus (pounds)	Copper (pounds)	Zinc (pounds)
Urban Land				
Residential	54.9	113.5	10.2	71.3
Commercial	2.9	1.3	1.3	8.9
Transportation	17.1	7.3	26.2	95.2
Institutional	5.4	4.9	1.7	19.2
Park and Open Space	0.4	6.9	--	--
Subtotal	80.7	133.9	39.4	194.6
Rural Land				
Agricultural	120.4	86.6	--	--
Atmosphere	--	1.5	--	--
Total	201.1	222.0	39.4	194.6

Source: SEWRPC.

GROUNDWATER RESOURCES

Groundwater resources constitute an extremely valuable element of the natural resource base related to the Kelly Lakes, both as a source of water, especially to Lower Kelly Lake, and as a component of the surface water system. Groundwater in the vicinity of the Kelly Lakes is available from three aquifers.[10] From the land surface downward, they are the sand and gravel aquifer, of approximately 100 feet in thickness in the vicinity of the Kelly Lakes; the dolomite aquifer, of approximately 300 feet in thickness; and, the sandstone aquifer, of approximately 1,600 feet in thickness, comprising the deep artesian system. The sand and gravel aquifer, consisting of water-bearing sand and gravel, and the dolomite aquifer, are underlain by the Maquoketa shale layer of approximately 200 feet in thickness and the deep sandstone aquifer. The shallow sand and gravel aquifer is the most significant in terms of its relationship with the Kelly Lakes and its tributary surface waters and adjacent wetlands. The groundwater in that aquifer flows from northwest to southeast across the Lakes, as shown on Map 8,[11] and has a direct affect on water quality and lake levels.

SOIL TYPES AND CONDITIONS

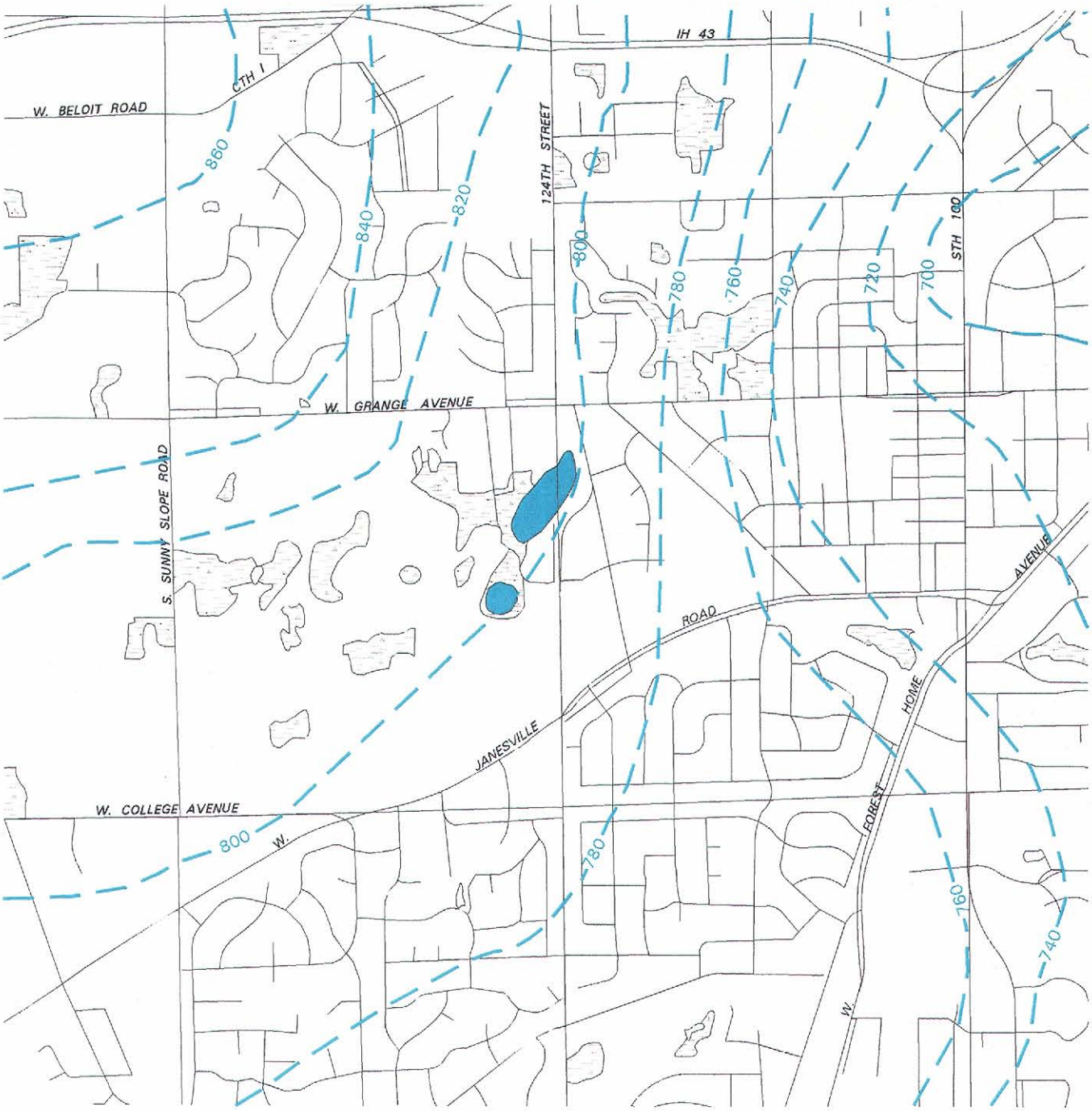
Soil type, land slope, and land use and management practices are among the more important factors determining lake water quality conditions. Soil type, land slope, and vegetative cover are also important factors affecting the rate, amount, and quality of stormwater runoff. The soil texture and soil particle structure influence the

[10] *An aquifer is a water-bearing stratum of rock, sand or gravel.*

[11] *J.B. Gonthier, U.S. Geological Survey Water-Resources Investigations Open-File Report No. 79-43,* Water-Table Map of Waukesha County, Wisconsin, *May 1979; M.G. Sherrill, J.J. Schiller, and J.R. Erickson, U.S. Geological Survey Water-Resources Investigations Open-File Report No. 79-40,* Water-Table Map of Milwaukee County, Wisconsin, *May 1979.*

Map 8

WATER TABLE CONTOURS IN THE VICINITY OF KELLY LAKES



LEGEND

– – WATER TABLE CONTOURS IN FEET

N

GRAPHIC SCALE
0 1000 2000 FEET

Source: U.S. Geological Survey and SEWRPC.

permeability, infiltration rate, and erodibility of soils. Land slopes are also important determinants of stormwater runoff rates and of susceptibility to erosion.

The U.S. Natural Resources Conservation Service, under contract to the Southeastern Wisconsin Regional Planning Commission, completed a detailed soil survey of the Kelly Lakes area in 1966.[12] Using the regional soil survey, an assessment was made of the hydrologic characteristics of the soils in the drainage area tributary to the Kelly Lakes. Soils within the drainage area tributary to the Kelly Lakes were categorized into four main hydrologic soil groups, as well as an "other" category which included disturbed and filled lands, as shown on Map 9. Approximately 3 percent of the total tributary drainage area is covered by moderately drained soils, about 81 percent of the tributary drainage area by poorly drained soils, and about 13 percent is covered with very poorly drained soils, with the remaining areas of the watershed being surface water as shown on Map 9.

AQUATIC PLANTS, DISTRIBUTION, AND MANAGEMENT AREAS

A survey of aquatic plants within the Kelly Lakes was conducted by Commission staff during June 1997. The results of these surveys are tabulated in Tables 5 and 6, and a tabulation of the ecological significance of the plants determined to be present in each of the Lakes is presented in Table 7. The results of the surveys also are graphically depicted on Map 10. Illustrations of the common aquatic plants found in Upper and Lower Kelly Lakes are included in Appendix A.

The flora of the Upper and Lower Kelly Lake basins was relatively impoverished compared with that of the wetlands adjacent to the southwest corner of the Upper Kelly, and the wetlands connecting Upper Kelly and Lower Kelly Lakes. Ten submergent and two floating-leaved aquatic plant species were recorded within the Upper Kelly Lake basin. The Lake was dominated by coontail, *Ceratophyllum demersum*, which can pose recreational use problems when it is abundant, especially if it grows to the water surface. Several of the pondweeds, which are a pollution tolerant species normally dominant or subdominant in disturbed ecosystems,[13] including *Potamogeton crispus*, *P. pectinatus*, and *P. zosterformis,* as well as white and yellow water lilies, were common to abundant throughout the Lake. Filamentous algae were present in the northeastern corner of the Lake. Eurasian water milfoil, *Myriophyllum spicatum*, also was present and widespread in Upper Kelly, and was especially dense in the shallower areas near the public-access site. Eurasian water milfoil, one of the eight milfoil species found in Wisconsin, is an exotic, or nonnative species, known to have an incredible ability to regenerate. This exotic species often outcompetes the native aquatic vegetation of lakes in Southeastern Wisconsin, reducing the biodiversity of the lakes, and degrading the quality of fish and wildlife habitats.[14] It has also been known to cause severe recreational use problems in lakes in the Southeastern Wisconsin Region. All of these plants are indicative of a disturbed lake ecosystem. This is supported by the urbanized surroundings of the Kelly Lakes, and the results of wetland surveys conducted by Commission staff in the areas surrounding the Kelly Lakes. These terrestrial systems also showed significant levels of previous disturbance.

Lower Kelly Lake exhibited increased floral diversity, with 11 submergent, two floating-leaved, and one emergent aquatic plant species present. Coontail was the dominant species, along with water lilies, that surrounded the shoreline. Eurasian water milfoil was present throughout the Lake, but was not dense. Water buttercups, flat-stem pondweed *(Potamogeton zosterformis)*, sago pondweed *(Potamogeton pectinatus)*, and native milfoils *(Myriophyllum* spp.*)* were also common to abundant.

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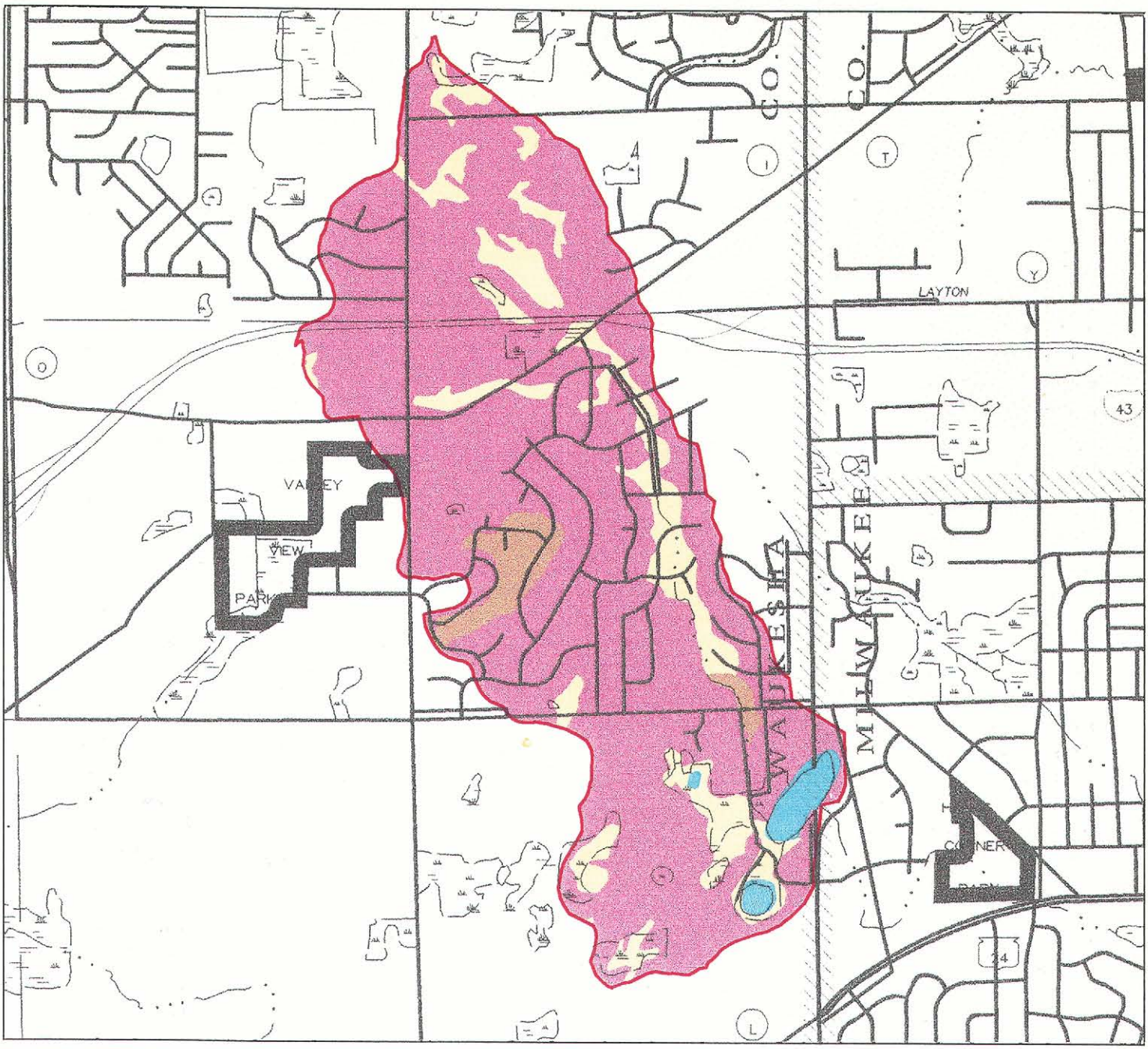
[12] *SEWRPC Planning Report No. 8,* The Soils of Southeastern Wisconsin, *June 1966.*

[13] *G.J. Davis and M.M. Brinson,* Responses of Submersed Vascular Plant Communities to Environmental Change, *Fish and Wildlife Service Publication No. OBS-80/42, August 1980.*

[14] *Wisconsin Department of Natural Resources,* Eurasian Water Milfoil in Wisconsin: A Report to the Legislature, *1993.*

Map 9

HYDROLOGIC SOIL GROUPS WITHIN THE TOTAL TRIBUTARY DRAINAGE AREA TO THE KELLY LAKES



HYDROLOGIC SOIL GROUPS

- GROUP A: Well–drained
- GROUP A/B: Well–drained soil/Moderately drained [1]
- GROUP A/D: Well–drained soil/Very poorly drained soil [2]
- GROUP B: Moderately drained soil
- GROUP B/D: Moderately–drained soil/Very poorly drained soil [3]
- GROUP C: Poorly drained soil
- GROUP C/D: Poorly–drained soil/Very poorly drained soil [4]
- GROUP D: Very poorly drained soil
- Surface Water
- Hydrologic soil group not determined

1 Well–drained soil if water table is lowered through provision of a drainage system. Moderately drained soil if water table is not lowered.

2 Well–drained soil if water table is lowered through provision of a drainage system. Very poorly drained soil if water table is not lowered.

3 Moderately drained soil if water table is lowered through provision of a drainage system. Very poorly drained soil if water table is not lowered.

4 Poorly drained soil if water table is lowered through a provision of a drainage system. Very poorly drained soil if water table is not lowered.

0 2000
Scale in feet

Source: SEWRPC.

Table 5

FREQUENCY OF OCCURRENCE AND DENSITY RATINGS OF SUBMERGENT PLANT SPECIES IN LOWER KELLY LAKE: JUNE 1997

Plant Species	Sites Found	Frequency of Occurrence (percent)	Density at Sites Found	Density in Whole Lake
Ceratophyllum demersum (coontail)	24	100.00	3.92	3.92
Chara vulgaris (muskgrass)	5	20.83	2.00	0.42
Lemna spp. (lesser duckweed)	3	12.50	1.00	0.13
Myriophyllum spp. (native milfoil)	13	54.17	1.77	0.96
Myriophyllum spicatum (Eurasian water milfoil)	6	25.00	1.67	0.42
Potamogeton spp. (pondweed)	2	8.33	1.00	0.83
Potamogeton amplifolius (large-leaf pondweed)	1	4.17	1.00	0.04
Potamogeton pectinatus (sago pondweed)	6	25.00	1.50	0.38
Potamogeton zosterformis (flat-stemmed pondweed)	13	54.17	2.23	0.73
Ranunculus sp. (water buttercup)	9	37.50	1.33	0.50
Vallisneria americana (water celery)	1	2.50	1.00	0.03

NOTE: There were 24 sampling points.

Source: SEWRPC.

The aquatic flora of both Upper and Lower Kelly Lakes is representative of eutrophic lakes which exhibit high aquatic plant growth and are usually dominated by few, often nuisance, species. This condition in the Kelly Lakes may be maintained or accelerated due to the phosphorus loadings discussed above.

During 1989 and 1990, Commission staff conducted surveys of the wetlands located west of Upper Kelly Lake in the northeast one-quarter of U.S. Public Land Survey Section 36, Township 6 North, Range 20 East, City of New Berlin, Waukesha County, near and around the Woodfield Park Subdivision. The wetland plant species identified during these vegetation surveys are set forth in Appendix B. Commission staff concluded that all the areas surveyed had been subject to prior disturbances, including ditching, clear-cutting, filling, vegetation removal, agricultural activities, and dumping; the high number of exotic species present—30 percent—indicated that the wetlands were moderately to heavily disturbed in the past. The wetland area between Upper and Lower Kelly Lakes, though not surveyed, appears to have been also heavily disturbed, not in the least by the construction of Frances Avenue and Rosemary Drive which run through it (see Map 2), which shows the historic hydrologic connection between Lower and Upper Kelly Lakes. The surveyed wetland parcels contained a high diversity of wetland types, but only moderate vegetation diversity and heavy infestations of exotic species. No Federal or State designated rare, threatened, or endangered species were present. All of the wetlands in the vicinity of the Kelly Lakes appear to have the potential to be restored to an higher level of ecosystem function through management interventions.

The invasive wetland plant, purple loosestrife, was not reported in the vicinity of Kelly Lakes during the survey, nor was it observed in a subsequent reconnaissance conducted during June 1998. However, the plant is known to be present within Waukesha County and is rapidly spreading eastward.

Table 6

FREQUENCY OF OCCURRENCE AND DENSITY RATINGS OF SUBMERGENT PLANT SPECIES IN UPPER KELLY LAKE: JUNE 1997

Plant Species	Sites Found	Frequency of Occurrence (percent)	Density at Sites Found	Density in Whole Lake
Ceratophyllum demersum (coontail)	39	97.5	3.56	3.48
Chara vulgaris (muskgrass)	5	12.5	1.80	0.23
Elodea canadensis (waterweed)	2	5.0	1.00	0.05
Myriophyllum spp. (native milfoil)	1	2.5	2.00	0.05
Myriophyllum spicatum (Eurasian water milfoil)	20	50.0	2.10	1.05
Potamogeton crispus (curly-leaf pondweed)	14	35.0	2.36	0.83
Potamogeton pectinatus (sago pondweed)	9	22.5	1.78	0.40
Potamogeton zosterformis (flat-stemmed pondweed)	6	15.0	2.50	0.38
Vallisneria americana (water celery)	1	2.5	1.00	0.03
Vallisneria sp.(water celery)	3	7.5	1.67	0.13

NOTE: There were 40 sampling points.

Source: SEWRPC.

FISHERIES

The most recent electrofishing survey,[15] conducted by Wisconsin Department of Natural Resources staff on Upper Kelly Lake during 1993, supported 1969 observations that panfish appeared to be relatively few in number and slow growing, and that carp were present in the Lake.[16] The 1993 survey results indicated that panfish remained small, but were more numerous than during the 1969 survey. Likewise, carp continued to be present and large, but did not appear to be over-abundant. Largemouth bass, the only gamefish species known to be present in Upper Kelly Lake, were small and scarce. However, lake chubsuckers, an important forage fish and a Wisconsin threatened species, appeared in good numbers during both surveys. Other species present in order of dominance included: bluegill, pumpkinseed, black crappie, yellow perch, warmouth, green sunfish, golden shiner, yellow bullhead, grass pickerel, and white sucker.

As a result of these surveys, the Wisconsin Department of Natural Resources recommended promoting a voluntary program of catch and release bass fishing. It was further noted that the adoption of special regulations, including a total closure of the bass harvest to keep panfish growth rates up and carp numbers down, could be considered in the future.

No fish surveys have been conducted on Lower Kelly Lake.

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[15]*E.R. Schumacher and S. Beyler, DNR Memorandum No. 3600,* Single-run Electrofishing Survey on Upper Kelly Lake, *May 1993.*

[16]*D. Fago, Wisconsin Department of Natural Resources Report No. 148,* Retrieval and Analysis Used in Wisconsin's Statewide Fish Distribution Survey, *Second Edition, December 1988.*

Table 7

POSITIVE ECOLOGICAL SIGNIFICANCE OF AQUATIC PLANT SPECIES PRESENT IN UPPER AND LOWER KELLY LAKES

Aquatic Plant Species Present	Relative Abundance[a]	Ecological Significance[b]
Ceratophyllum demersum (coontail)	Abundant	Provides good shelter for young fish and supports insects valuable as food for fish and ducklings
Chara vulgaris (muskgrass)	Common	Excellent producer of fish food, especially for young trout, bluegill, and small and largemouth bass; stabilizes bottom sediments; and has softening effect on the water by removing lime and carbon dioxide
Elodea canadensis (waterweed)	Scarce	Provides shelter and support for insects valuable as fish food
Lemna minor (lesser duckweed)	Scarce	Provides important food for wildfowl and attracts small aquatic animals
Myriophyllum spp. (native milfoil)	Common	Provides valuable food and shelter for fish; fruits eaten by many wildfowl
Myriophyllum spicatum (Eurasian water milfoil)	Common	None known
Nuphar sp. (yellow water lily)	- -[c]	Leaves, stems, and flowers are eaten by deer; roots eaten by beaver and porcupine; seeds eaten by wildfowl; leaves provide harbor to insects, in addition to shade and shelter for fish
Nymphaea tuberosa (white water lily)	- -[c]	Provides shade and shelter for fish; seeds eaten by wildfowl; rootstocks and stalks eaten by muskrat; roots eaten by beaver, deer, moose, and porcupine
Potamogeton spp.(pondweeds)	Scarce	Provides food, shelter and shade for some fish and food for wildfowl
Potamogeton amplifolius (large-leaf pondweed)	Scarce	Provides cover for panfish, largemouth bass, muskellunge, and northern pike; nesting grounds for bluegill; supports insects valuable as food for fish and ducklings
Potamogeton crispus (curly-leaf pondweed)	Common	Provides food, shelter and shade for some fish and food for wildfowl
Potamogeton pectinatus (sago pondweed)	Scarce	This plant is the most important pondweed for ducks, in addition to providing food and shelter for young fish
Potamogeton praelongus (white-stemmed pondweed)	Scarce	Provides feeding grounds for muskellunge; also good food producers for trout; good food producer for ducks
Potamogeton zosterformis (flat-stemmed pondweed)	Common	Provides some cover for bluegills, perch, northern pike, and muskellunge; food for waterfowl; supports insects valuable as food for fish and ducklings
Ranunculus sp. (water buttercup)	- -[c]	Provides food for trout, upland game birds and wildfowl
Typha augustafolia (cattail)	- -[c]	Supports insects; stalks and roots important food for muskrat and beaver; attracts marsh birds, wildfowl, and songbirds, in addition to being used as spawning grounds by sunfish and shelter for young fish
Vallisneria sp. (water celery)	Scarce	Provides good shade and shelter, supports insects, and is valuable fish food
Vallisneria americana (water celery)	Scarce	Provides good shade and shelter, supports insects, and is valuable fish food

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

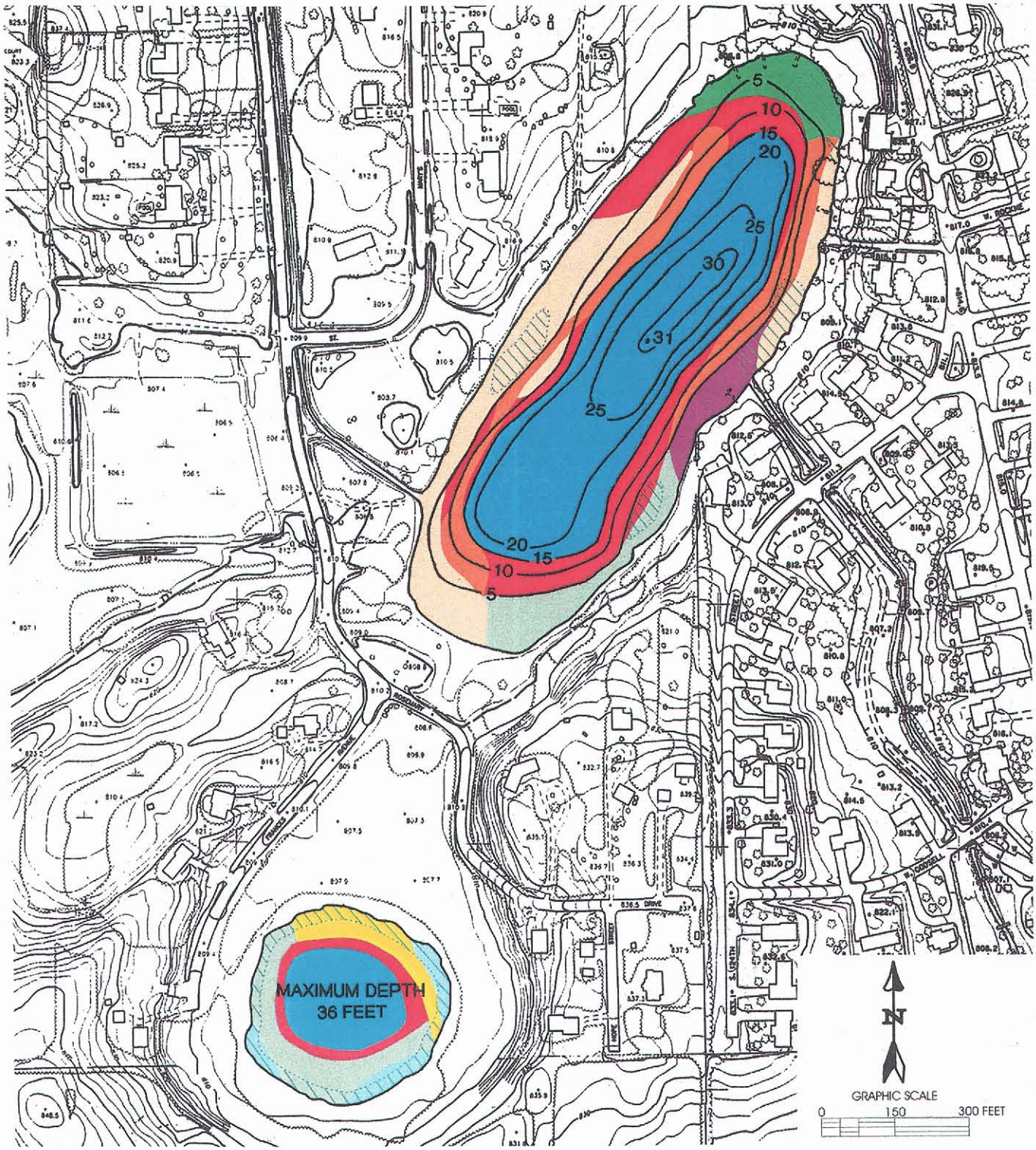
[b]Information obtained from A Manual of Aquatic Plants by Norman C. Fassett and Guide to Wisconsin Aquatic Plants, Wisconsin Department of Natural Resources.

[c]Not measurable using the Jesson and Lound Survey Technique for Submerged Aquatic Plants.

Source: SEWRPC.

Map 10

AQUATIC PLANT COMMUNITY DISTRIBUTION IN UPPER AND LOWER KELLY LAKES: 1997



LEGEND

- WATER LILIES
- COONTAIL
- COONTAIL, MUSKGRASS, EURASIAN WATER MILFOIL, SAGO, PONDWEED, FLAT-STEMMED PONDWEED, AND NATIVE MILFOIL
- COONTAIL, SAGO PONDWEED, FLAT-STEMMED PONDWEED, NATIVE MILFOIL, DUCKWEED, AND POTAMOGETON SPP.
- COONTAIL, MUSKGRASS, EURASIAN WATER MILFOIL, FLAT-STEMMED PONDWEED, NATIVE MILFOIL, WILD CELERY, DUCKWEED, AND POTAMOGETON SPP.
- COONTAIL, EURASIAN WATER MILFOIL, SAGO PONDWEED, CURLY-LEAF PONDWEED, AND WATERWEED
- COONTAIL, MUSKGRASS, EURASIAN WATER MILFOIL, SAGO PONDWEED, FLAT-STEMMED PONDWEED, CURLY-LEAF PONDWEED, AND WILD CELERY
- COONTAIL, EURASIAN WATER MILFOIL, AND CURLY-LEAF PONDWEED
- COONTAIL, MUSKGRASS, EURASIAN WATER MILFOIL, CURLY-LEAF PONDWEED, WILD CELERY
- DEPTH GREATER THAN 20 FEET

Source: SEWRPC.

WILDLIFE AND WATERFOWL

Given the single-family residential nature of the immediate shorelands of the Kelly Lakes and its highly urban location, it is likely that the wildlife community is comprised of small upland game animals, such as rabbit and squirrel; predators, such as fox and raccoon; marsh furbearers, such as muskrat; migratory and resident song birds; marsh birds, such as redwing blackbird and great blue heron; raptors, such as great horned owl and red-tailed hawk; and waterfowl. White-tailed deer have been reported in the area. The character of wildlife species, along with the nature of the habitat present in the planning area has undergone significant change since the time of European settlement and the subsequent clearing of forests, plowing of the prairie, and draining of wetlands for agricultural purposes. Modern practices that adversely affect wildlife and wildlife habitat include: the excessive use of fertilizers and pesticides, road salting, heavy traffic, the introduction of domestic animals, and the fragmentation and isolation of remaining habitat areas for urban and agricultural uses.

As shown on Map 11, wildlife habitat areas in the Kelly Lakes tributary drainage area generally occur in association with existing surface water, wetland, and woodland resources located along the Kelly Lakes. Such areas covered about 210 acres, or 21 percent of the study area. Of this total habitat acreage, about 23 acres, or 2 percent, were rated as Class I habitat; about 89 acres, or 9 percent, were rated as Class II habitat; and about 98 acres, or 10 percent, were rated as Class III habitat. The habitat areas shown on Map 11 are largely coincident with Commission-delineated environmental corridors in this watershed, and are shown on Map 12.

ENVIRONMENTAL CORRIDORS

There is no primary environmental corridor in the watershed. Secondary environmental corridors covered about 136 acres, or 14 percent of the Kelly Lakes tributary drainage area. Isolated natural resource features covered about 33 acres, or about 3 percent of the tributary drainage area. The Commission recommends that to the extent practicable, remaining secondary corridor lands, shown on Map 12, be considered for preservation as the process of development proceeds within the Region, particularly where the opportunity is presented to incorporate such secondary corridors into urban stormwater retention basins, associated drainageways, and neighborhood parks.[17]

RECREATIONAL USES AND FACILITIES

The Kelly Lakes are multi-purpose recreational use waterbodies serving many forms of recreation, including boating, swimming, and fishing during the summer months, and cross-country skiing, snowmobiling, ice fishing, ice skating, and, occasionally, "polar bear" swimming during the winter months. The Lakes are used year round as visual amenities—walking, bird-watching, and picnicking being popular passive recreational uses of the waterbody.

Recreational boating access to Upper Kelly Lake is limited at present to one boat launch site on the northeast corner of the Lake, off of Kurtz Road, as shown on Map 3. There is no public parking currently provided at this site. Walk-in access to Upper Kelly Lake is available at a City park in New Berlin, as shown on Map 3. Lower Kelly Lake has a walk-in public access on its northeast shore at Albert Avenue, as shown on Map 3. A boat survey conducted by Commission staff during June 1998 indicated that 16 boats were either moored in the water or stored on land adjacent to Upper and Lower Kelly Lakes. The types of boats included paddleboats, rowboats, canoes, and sailboats.

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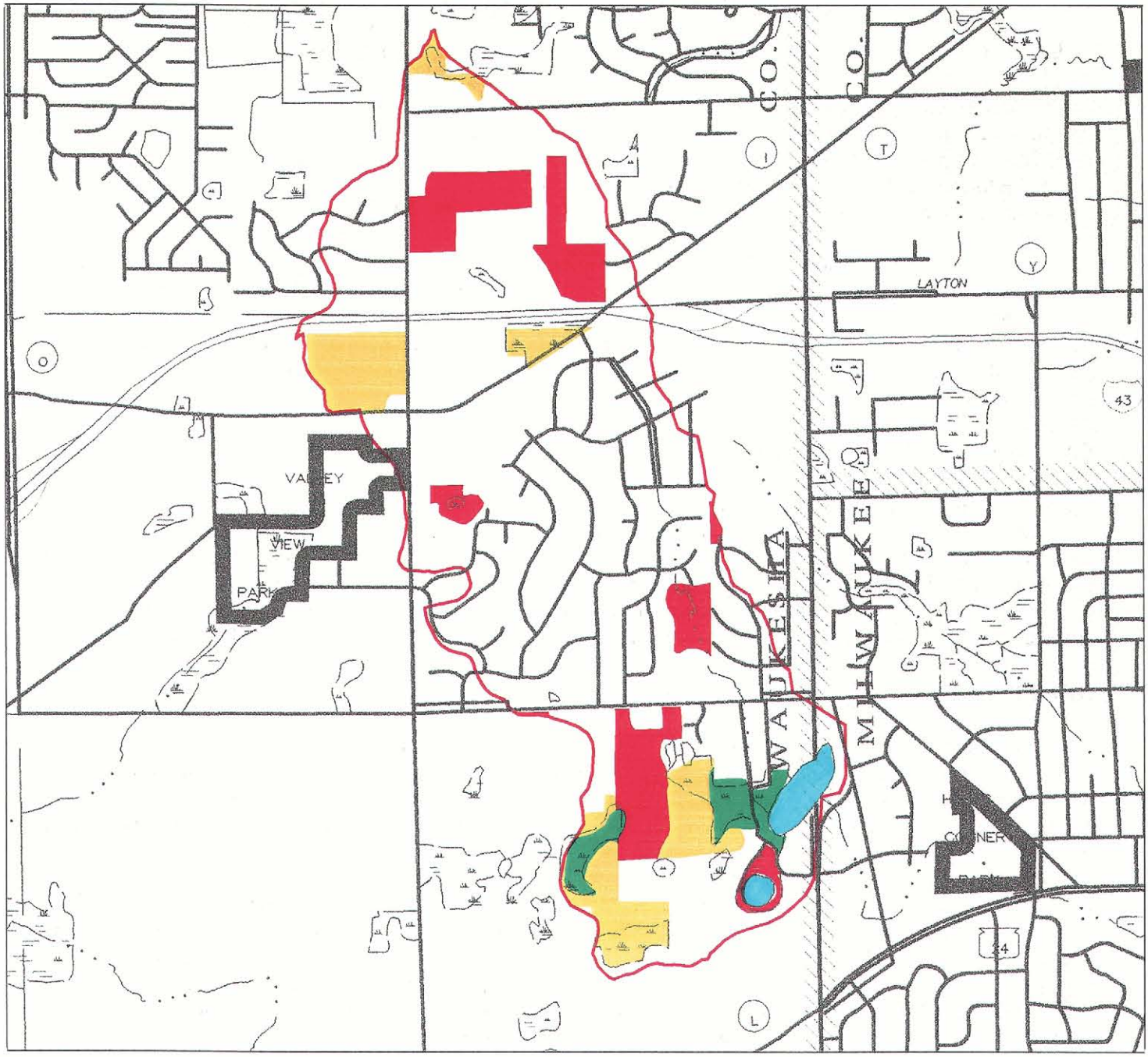
[17] *SEWRPC Planning Report No. 40,* A Regional Land Use Plan for Southeastern Wisconsin—2010, *January 1992.*

Map 11

WILDLIFE HABITAT AREAS WITHIN THE TOTAL TRIBUTARY DRAINAGE AREA TO THE KELLY LAKES: 1985



HABITAT CATEGORIES

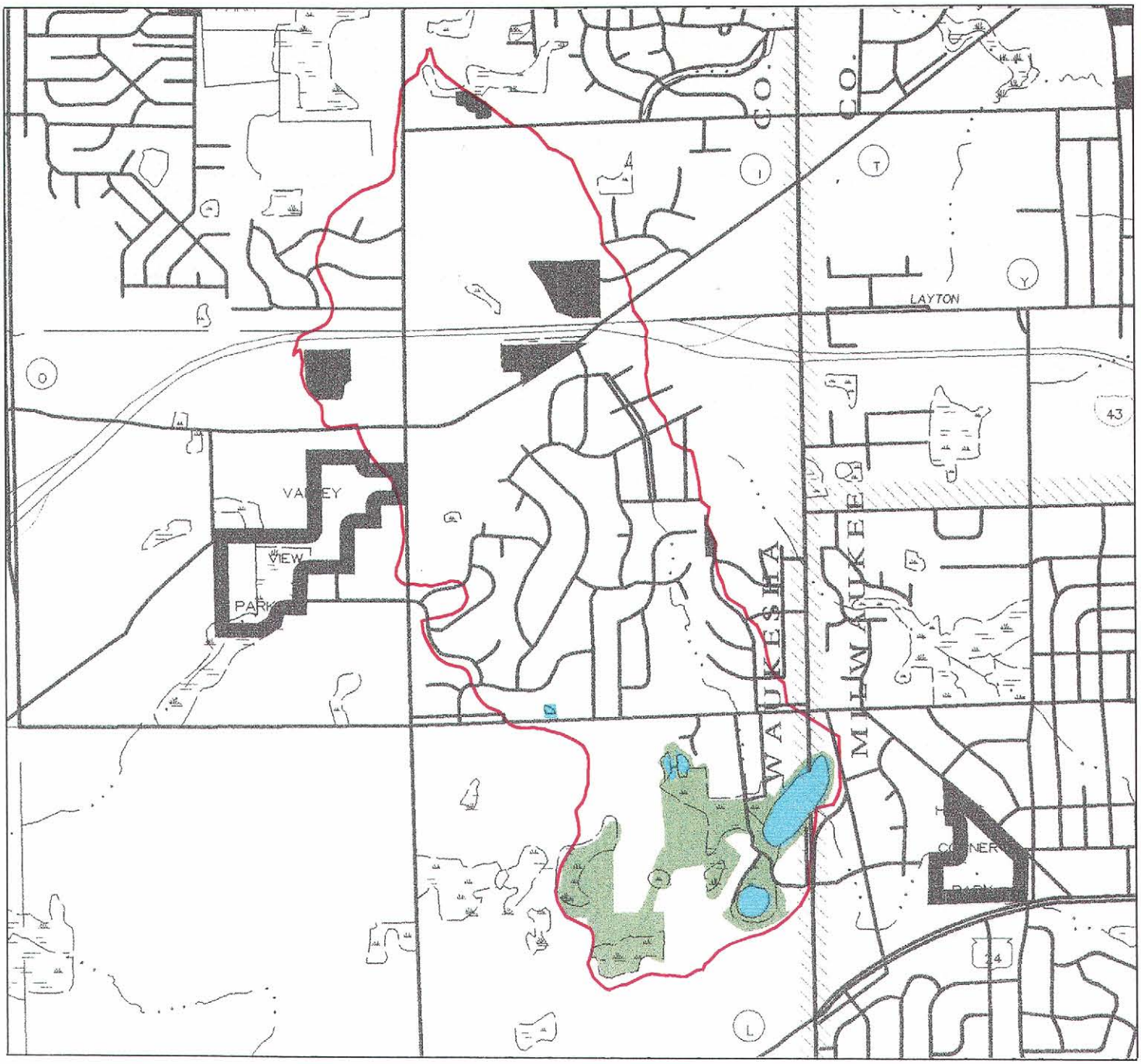
- Class I, high-value habitat
- Class II, medium-value habitat
- Class III, good-value habitat

Source: SEWRPC.

0 2000
Scale in feet

Map 12

ENVIRONMENTAL CORRIDORS AND NATURAL AREAS WITHIN THE TOTAL TRIBUTARY DRAINAGE AREA TO THE KELLY LAKES: 1990



ENVIRONMENTAL AREAS

- Primary environmental corridor
- Secondary environmental corridor
- Isolated natural resource area
- Surface water
- Natural area of statewide significance (NA–1)
- Natural area of countywide significance (NA–2)
- Natural area of local significance (NA–3)

0 2000
Scale in feet

Source: SEWRPC.

Shoreline Protection Structures
Erosion of shorelines results in the loss of land, damage to shoreland infrastructure, and interference with lake access and use. Such erosion is usually caused by wind-wave erosion, ice movement, and motorized boat traffic.

Motorized boat traffic is not an issue of concern on the Kelly Lakes due to their small size.[18] A survey of the Kelly Lakes shoreline, conducted by Commission staff during June 1997, indicated that a majority of the Upper Kelly Lake shoreline remains in a natural condition without shoreline protection structures. However, small sections of the shoreline of the Lake were protected with riprap, as shown on Map 13. The Lower Kelly Lake shoreline is completely natural, as the Lake is ringed by wetlands. Shoreline erosion is not considered a problem on the Kelly Lakes.

Local Ordinances
Based upon the constraints imposed by the limited open water acreage of Upper Kelly Lake, motorized vessels operated on that waterbody are not permitted to exceed no-wake speeds.[19] No motorized vessels are allowed to be operated on Lower Kelly Lake.[20] Neither the Village of Hales Corners nor the City of New Berlin have boating ordinances. Boating traffic on both Lakes is governed by state law as set forth in Chapter 30, *Wisconsin Statutes*.

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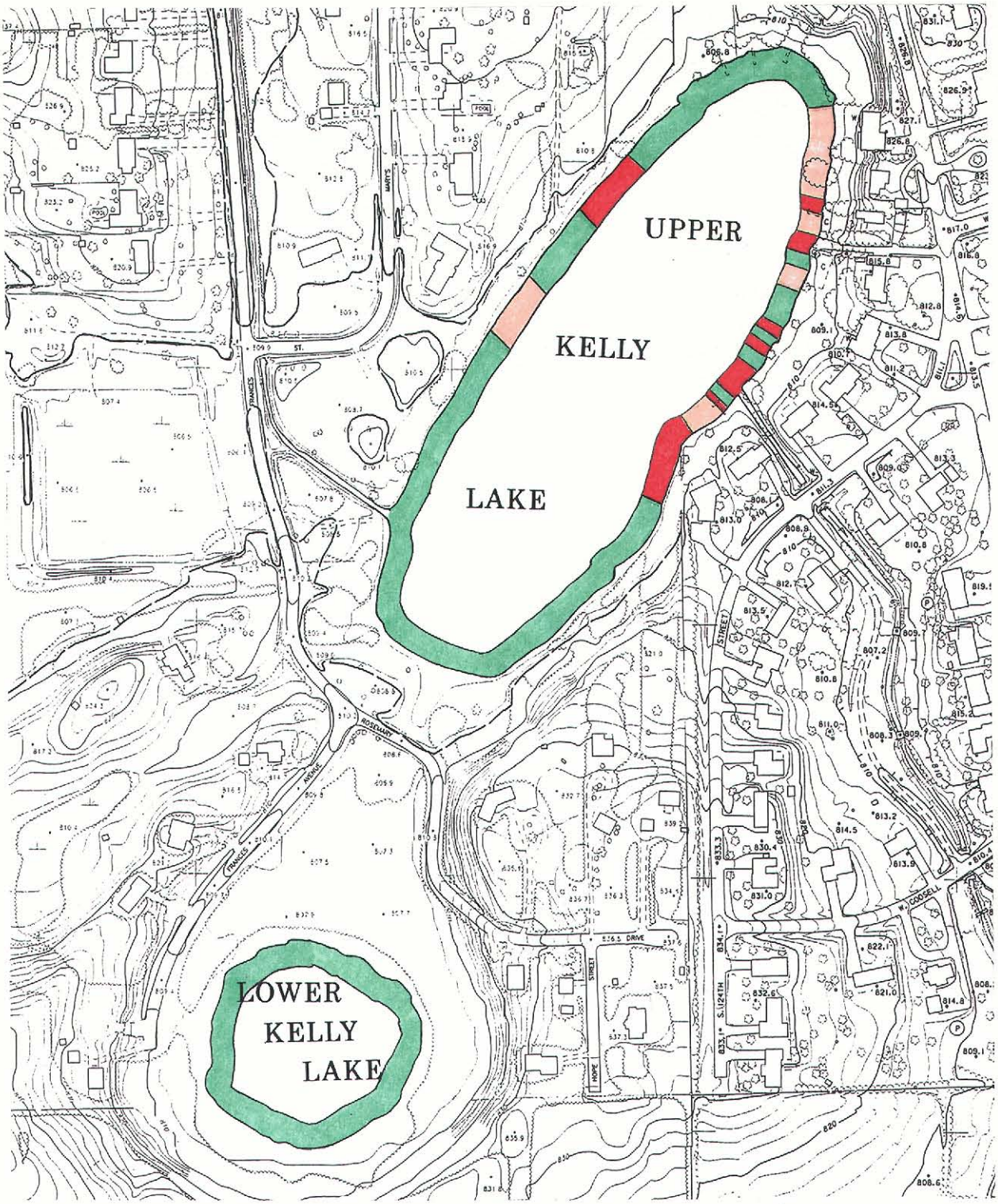
[18]*Section 30.635,* Wisconsin Statutes, *generally prohibits operation of motorboats in excess of slow-no-wake speed on lakes of 50 acres or less in areal extent having public access. The provisions of this Section are applicable on the Kelly Lakes.*

[19]Ibid.

[20]Ibid.

Map 13

SHORELINE PROTECTION CONDITIONS ON UPPER AND LOWER KELLY LAKES: 1997



Source: SEWRPC.

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Chapter III

LAKE USE PROBLEMS AND ISSUES

INTRODUCTION

Although the Kelly Lakes are in relatively good condition and are capable of supporting a variety of water uses, there are a number of existing and potential future problems and issues that should be addressed in this lake protection plan. These problems, or issues of concern, include ecologically valuable areas and aquatic plants, fisheries, construction site erosion and nonpoint source pollution, stormwater and lake water quality, public recreational use and boating access to the Lakes, and institutional development within the community to support lake management initiatives.

ECOLOGICALLY VALUABLE AREAS AND AQUATIC PLANTS

The ecologically valuable areas within the tributary drainage area of the Kelly Lakes, as documented in Chapter II, include wetlands, woodlands, and wildlife habitat. Most of these areas are included in the lands designated as secondary environmental corridor. Critical sites within the Lakes include the fish spawning habitat, macrophyte beds—especially those containing a diverse flora—and the shoreline areas supporting productive aquatic habitat identified in the Phase I lake management planning studies carried out by IPS Environmental and Analytical Services, Inc.[1] Protection of these areas is an important issue that should be considered.

The presence of Eurasian water milfoil in Upper and Lower Kelly Lake represents another important issue. Eurasian water milfoil often outcompetes native aquatic plants and dominates the plant communities in the lakes of Southeastern Wisconsin, to the detriment of fish and wildlife populations, and native plant species. The dominance of Eurasian water milfoil in aquatic ecosystems in Southeastern Wisconsin degrades the natural resource base and commonly interferes with human recreational and aesthetic use of the natural resources. As discussed in Chapter II, this aquatic plant is widespread in Upper Kelly Lake and, therefore, its monitoring and management is an issue that should be considered.

Excessive plant growth in the Kelly Lakes can impede boating traffic and in-lake uses, such as swimming. At various sites around Upper Kelly Lake, growths of Eurasian water milfoil, coontail, muskgrass, curly-leaf pondweed, and sago pondweed equaled or exceeded a density rating of three, indicating moderate densities with quantities of plants ranging from common to abundant, as shown in Table 5. Though muskgrass is a low-growing plant, rarely impeding recreational uses, the other plants can grow to the surface of the water, restricting boating, angling, and swimming. The abundance of plants can also adversely affect riparian property values[2] and the

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[1] *IPS Environmental and Analytical Services, Inc.*, Phase I Lake Management Plan: Upper and Lower Kelly Lakes, Waukesha and Milwaukee Counties, Wisconsin, *March 1997.*

[2] *H.J. Michael, K.J. Boyle, and R. Bouchard,* Water Quality Affects Property Prices: A Case Study of Selected Maine Lakes, *Maine Agricultural and Forest Experiment Station Miscellaneous Report 398, University of Maine, Orono, 1996.*

aesthetic enjoyment of the residents, and can have a significant impact on the aesthetic enjoyment of visitors to the Lakes.[3]

Currently, the Kelly Lakes Association has acquired and is operating an Aquamarine HS-5 aquatic plant harvester on Upper Kelly Lake. The management of this harvester and the aquatic plant harvesting program on Upper Kelly Lake should be carefully monitored in order to prevent the further spread of nuisance plants through drift and/or fragmentation. Periodic aquatic plant surveys should be considered as a means of monitoring the distribution of nuisance species. Hence, aquatic plant management on Upper Kelly Lake is an issue that should be considered.

As discussed in Chapter II, the wetland communities to the southwest of Upper Kelly Lake were surveyed by Commission staff during 1989 and 1990. These areas contained a moderately diverse plant community. There are substantial wetland areas surrounding the Kelly Lakes, particularly around Lower Kelly Lake. These areas provide important habitat for wildlife in addition to contributing to the scenic vistas that characterize the Kelly Lakes. Shoreland wetlands also help to absorb flood waters, and, by retaining sediments and nonpoint source pollutants, can help to protect the Lakes from degradation. Though the wetlands in the Kelly Lakes vicinity have historically been heavily disturbed, there are potentially some benefits that can be achieved by restoring them. These benefits include: providing a nutrient filter and a buffer that protects the Lakes from urban runoff; providing wildlife habitat; and maintaining the ecological structure and function of the wetland ecosystems which provides a broad range of benefits for the natural resources base and ambience of Southeastern Wisconsin.[4]

The secondary environmental corridor in the Kelly Lakes tributary drainage area, together with the isolated natural resource features, contains almost all of the best remaining woodlands, wetlands, and wildlife habitat in the area. The protection of these resources from additional intrusion by incompatible land uses which degrade and destroy the environmental values of these sites, and the preservation of the corridor, is an important issue that should be considered.

FISHERIES

Based upon the fisheries surveys conducted by the Wisconsin Department of Natural Resources, and set forth in summary form in Chapter II, it would appear that the fishery in Upper Kelly Lake is limited by the small size of the panfish harvested. Further, as the most recent fish survey carried out on Upper Kelly Lake was conducted during 1993, and given that no surveys have been reported for Lower Kelly Lake, acquisition of recent data is indicated. Such data would also confirm that the carp population of Upper Kelly Lake remains within acceptable bounds. As angling is a popular recreational activity on both Lakes, identification of the current state of the fishery on the Lakes is an important issue that should be considered.

CONSTRUCTION SITE EROSION AND NONPOINT SOURCE POLLUTION

Erosion during construction and nonpoint source pollutants associated with new urban development in the drainage area tributary to the Kelly Lakes represents a potentially significant threat to both of the Lakes' water quality. Based upon recommendations set forth in the aforereferenced regional land use and Waukesha County development plans, future development of open lands within the drainage area tributary to the Kelly Lakes is expected to

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[3]*J.A. Thornton, "Perceptions of Public Waters: Water Quality and Water Usage in Wisconsin," In: T. van Valey, S.R. Krull and L. Walker,* The Small City and Regional Community: Volume 10, Proceedings of the 1992 Conference, Western Michigan University, *Foundation Press, Stevens Point, pp. 469-478, 1993.*

[4]*The range of benefits to be derived from a sound natural resources bases within Southeastern Wisconsin is summarized in SEWRPC Planning Report No. 42,* A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin, *September 1997.*

occur. Additionally, unplanned development could occur and impacts on lake water quality could potentially result. Hence, control of construction site erosion and stormwater nonpoint source pollution remains an important issue to be considered. Recognition of this has resulted in the proposed development of a stormwater management plan for the City of New Berlin. Development of this plan is currently underway.

SURFACE WATER QUALITY

Given the concerns expressed by some citizens within the Kelly Lakes community, the Kelly Lakes Association has undertaken a program of investigation and planning to identify and propose mitigation of the causes of degradation of water quality in the watershed of the Lakes. As of 1997, surface water quality within the Kelly Lakes was reported to range from very poor to fair, with Lower Kelly Lake being of somewhat better quality than Upper Kelly Lake, based upon observations made during 1995 by IPS Environmental and Analytical Services, Inc., during 1996 by the Wisconsin Department of Natural Resources and during 1997 by the Southeastern Wisconsin Regional Planning Commission. As both Lakes have been determined to be within the eutrophic range, indicating that some water quality problems are likely to exist, surface water quality is an issue to be considered.

PUBLIC RECREATIONAL USE AND BOATING ACCESS

Overcrowding and excessive recreational boating use create problems in many lakes in the Southeastern Wisconsin Region, especially those offering high-quality recreational opportunities within a one- to two-hour drive of the Chicago-Milwaukee metropolitan area. Given the small surface area of the Kelly Lakes and limited parking at, and nature of, the access sites, the potential for the occurrence of problems due to increased or inappropriate boating pressure is considered to be slight. Nevertheless, local use of the Lakes for water-based recreation could result in potentially significant boating pressure should the locations of these Lakes become better known.

Notwithstanding, current public recreational boating 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 for public boating access development, respectively, to qualify waters for resource enhancement services provided by the Wisconsin Department of Natural Resources. Based upon these standards, both Lakes would be required to each have one carry-in access site with parking for five vehicles—for lakes of less than 50 open water acres, the minimum and maximum standards are the same—plus one handicapped accessible unit.

As noted in Chapter II, there is currently one public boating access site on the northeastern shore of Upper Kelly Lake, and one carry-in access site on the eastern shore of Lower Kelly Lake. Neither site has provision for parking. Thus, although both Lakes meet the standards with regard to the numbers of access points, neither Lake currently has adequate parking within the vicinities of the launch sites, and, hence, both fail to conform to current State standards. Thus, provision of adequate public recreational boating access to the Kelly Lakes is an issue to be considered.

In addition to public recreational boating access, there is currently a public park that is located on a filled wetland at the southern end of Upper Kelly Lake within the City of New Berlin. The City has expressed an interest in enhancing this area for recreational lake activities in cooperation with the Kelly Lakes community and the Kelly Lakes Association. Consequently, the Association has proposed the creation of an ecological corridor along the southwestern shoreline of Upper Kelly Lake, combining recreational opportunities provided at the existing park site with wetland restoration and habitat creation within the secondary environmental corridor adjacent to the Lake and within the Woodfield Park Subdivision. This proposal is based, in part, upon Phase I planning studies carried out by IPS Environmental and Analytical Services, Inc., and is designed to facilitate implementation of lake protection measures and public recreational opportunities. Therefore, wetland restoration and recreational usage are important issues to be considered.

INSTITUTIONAL DEVELOPMENT

As the Kelly Lakes community seeks a more active role in the management of the Kelly Lakes, it is essential that an adequate institutional base to support such activities be developed. Currently, the community-based lake management activities are being carried out by the Kelly Lakes Association, Inc., a Chapter 181, *Wisconsin Statutes*, nonstock corporation. The Association is a qualified lake association as defined in Chapter NR 190, *Wisconsin Administrative Code*. In addition to the provision of public information relating to lake use and management, the Association maintains an active aquatic plant management program as previously noted. Nevertheless, the Association's Board of Directors and members have expressed concern regarding the long-term viability of the lake management programs of the Association given its voluntary nature and reliance on informal financing measures. As a result, the development of an adequate institutional structure is an issue of concern.

Chapter IV

ALTERNATIVE AND RECOMMENDED LAKE PROTECTION MEASURES

INTRODUCTION

Chapter III described six issues of concern to be considered as part of this lake protection and recreational use plan. These issues are related to: 1) ecologically valuable areas and aquatic plants; 2) fisheries; 3) construction site erosion and nonpoint source pollution; 4) surface water quality; 5) public recreational use and boating access; and 6) institutional development for lake management. Following a brief summary of the ongoing lake management program activities, alternatives and recommended measures to address each of these issues and concerns are described in this chapter.

PAST AND PRESENT LAKE MANAGEMENT ACTIONS

The residents of the Kelly Lakes, in conjunction with the City of New Berlin and the Village of Hales Corners, have long recognized the importance of informed and timely action in the management of the Kelly Lakes. The initial action in this regard was the formation of the Kelly Lakes Association, Inc., a Chapter 181 nonstock, not-for-profit Wisconsin corporation which provides the forum for many of the lake management activities of the Lakes' residents. The Association is currently enrolled in the water quality monitoring program conducted under the auspices of the Wisconsin Department of Natural Resources Self-Help Monitoring Program. The Kelly Lakes Association has also undertaken a Phase I Planning Grant Program to identify issues of concern relating to the Kelly Lakes. An earlier study, prepared for Kelly Lakes Association by IPS Environmental and Analytical Services, Inc., identified six issues of concern to be addressed by the Kelly Lakes community, including programming in the following areas: public information and education, water quality assessment, watershed boundary delineation, aquatic plant management, phosphorus load estimation, and subdivision design and impact minimization.[1] That report led to the development and conduct of this Phase II, Chapter NR 190 Lake Management Planning Grant Program project, involving a more detailed investigation of aquatic plant, and stormwater and lake water quality, management issues of concern.

Presently, the Kelly Lakes Association is actively pursuing public participation opportunities relating to land use and stormwater management in the vicinity of the Kelly Lakes. The Kelly Lakes Association Board of Directors members regularly attend City of New Berlin Plan Commission and Public Works Committee meetings regarding the development of the plans and lands within the drainage area tributary to the Kelly Lakes. The Association was an active participant in the planning process with respect to the establishment of the Kelly Pointe Subdivision and associated environmental corridor southwest of Upper Kelly Lake within the City of New Berlin. In this regard, the Association also worked in a cooperative effort with the City of New Berlin and the developer of a major residential development located south and southwest of Lower Kelly Lake in developing plans to ensure that nonpoint source pollutants and construction impacts from that development would not negatively impact the

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[1] *IPS Environmental and Analytical Services, Inc.,* Phase I Lake Management Plan: Upper and Lower Kelly Lakes, Waukesha and Milwaukee Counties, Wisconsin, *March 1997.*

Kelly Lakes. In like manner, the Association is currently an active participant in the public process relating to the preparation of a stormwater management plan and adoption of a stormwater management ordinance for the City of New Berlin.

The Kelly Lakes Association also maintains an active public information program and in-lake aquatic plant management program. The Association initiated aquatic plant harvesting operations on Upper Kelly Lake during the summer of 1997. In addition, the Association holds an annual membership meeting, open to all Kelly Lakes community residents and interested parties, to answer questions and provide information to persons interested in the Kelly Lakes. An occasional newsletter is also published and distributed by the Association. The Association is a participant in the Wisconsin Department of Natural Resources Self-Help Monitoring Program. Reports of water clarity trends within the Lakes are a regular feature of the annual membership meetings.

ECOLOGICALLY VALUABLE AREAS AND AQUATIC PLANTS

The Kelly Lakes and its tributary drainage area contain ecologically valuable areas, including diverse aquatic and wetland vegetation and substrates suitable for fish spawning, located within and immediately adjacent to the Lakes. As described in Chapter III, the potential problems associated with ecologically valuable areas in and near the Kelly Lakes include the potential loss of wetlands and other important ecologically valuable areas due to urbanization or other encroachments; and the degradation of wetlands and aquatic habitat due to the presence of invasive species, including Eurasian water milfoil and purple loosestrife.

Array of Protection Measures

Three measures to protect and maintain the biodiversity of the Kelly Lakes and their direct tributary drainage area have been identified as potentially viable: 1) land management measures, 2) in-lake management measures, and 3) citizen informational and educational measures.

Land Management Measures

The recommended future land use plan for the drainage area tributary to the Kelly Lakes is set forth in the adopted regional land use plan and, for those portions of the drainage area located within Waukesha County, in the county development plan.[2] Those plans recommend the preservation of environmental corridor lands in essentially natural, open uses. Within the drainage area tributary to the Kelly Lakes, these lands consist of secondary environmental corridors that were delineated by the Regional Planning Commission in 1997, in response to submissions made by the citizens of the Kelly Lakes community in cooperation with the City of New Berlin, and isolated natural resource features.

In addition to the recommendations set forth in the adopted regional land use plan, the Waukesha County development plan specifically recommends that, with respect to secondary environmental corridor lands and isolated natural resource features such as those that occur within the drainage area tributary to the Kelly Lakes, protections be afforded through placement of these lands in appropriate zoning districts, depending on the type and character of the natural resource to be preserved and protected. The County development plan further recommends incorporation of secondary environmental corridor lands into the urban stormwater management systems, including associated detention basins and drainageways, and neighborhood parks where possible and feasible.

Currently, most of the wetlands and other ecologically valuable lands adjacent to the Kelly Lakes and within the tributary drainage area are included in secondary environmental corridors and isolated natural resource features.

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[2]*SEWRPC Planning Report No. 40,* A Regional Land Use Plan for Southeastern Wisconsin—2010, January 1992; *and SEWRPC Community Assistance Planning Report No. 209,* A Development Plan for Waukesha County, Wisconsin, *August 1996.*

Many of the wetlands, however, have a history of prior or current disturbance that, to varying extents, could affect the structure and functioning of these valuable areas.

The existing zoning of the lands within the total tributary drainage area to the Kelly Lakes is generally consistent with the recommended future land use plan set forth in the regional land use and county development plans. However, two upland areas within the middle to upper portions of the drainage area north of IH 43, recommended for preservation as recreational land and as an isolated natural resource feature under the County development plan, have not been zoned in a manner consistent with such preservation, being included within a residentially zoned area. Rezoning, and possible purchase or preservation by site development planning for these areas, are two potential means that could be considered in this regard.

In-Lake Management Measures

The presence of nonnative and nuisance aquatic plant species within the Lake basins and along their shorelines is indicative of a further loss of ecosystem integrity and function, affecting submergent and emergent lacustrine vegetation. Various in-lake management actions may be considered to mitigate and manage the consequences of aquatic habitat degradation in the Kelly Lakes. Generally, aquatic plant management measures, designed to minimize the environmental and recreational impacts of degraded habitat, are classed into four groups: physical measures which include lake bottom coverings and water level management; mechanical measures which include harvesting and manual removal; chemical measures which include the use of aquatic herbicides; and biological control measures which include the use of various organisms, including insects. Of these, chemical control and biological controls are regulated and require a State permit. Costs range from minimal for manual removal of plants using rakes and hand-pulling to upwards of $50,000 for the purchase of a mechanical plant harvester, for which the operational costs can approach $2,500 to $5,000 per year depending on staffing and operating policies. Harvesting is probably the measure best suited to large areas of open water, while chemical controls may be best suited for use in confined areas and for the initial control of invasive plants. Controlling Eurasian water milfoil by planting native plant species or by introducing the milfoil weevil, *Eurhychiopsis lecontei*, is largely experimental and currently subject to State permitting, while the use of other biological controls, such as grass carp, is prohibited in Wisconsin.

Aquatic Herbicides

Chemical treatment with aquatic herbicides is a short-term method of controlling heavy growths of aquatic macrophytes and algae. Chemicals are applied to the growing plants in either liquid or granular form. The advantages of using chemical herbicides to control aquatic macrophyte growth are the relatively low cost and the ease, speed, and convenience of application. However, 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. To minimize the collateral 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. Such applications also minimize the concentration and amount of chemicals used due to the colder water temperatures that enhance the herbicidal effects. Use of chemical herbicides in aquatic environments is subject to State permitting requirements. Because the Kelly Lakes do not have significant growths of nuisance plant species, chemical treatment is not recommended as a means of controlling aquatic plant growth.

Aquatic Plant Harvesting

Aquatic macrophytes may be mechanically harvested with specialized equipment consisting of a cutting apparatus, which cuts up to five feet below the water surface, and a conveyor system that picks up the cut plants and hauls them to shore. Mechanical harvesting appears to be a practical and efficient means of controlling plant growth as it removes the plant biomass and nutrients from a lake. Limited aquatic plant harvesting is currently carried out on Upper Kelly Lake. Because some plant fragments are lost during the harvesting process due to the

hydrodynamic design of the harvester, the addition of a shoreline cleanup program to remove the plant fragments from the Lake should be considered.

The advantages of aquatic plant harvesting are that the harvester typically leaves enough plant material in the lake to provide shelter for fish and other aquatic organisms, and to stabilize the lake bottom sediments. The disadvantages of mechanical harvesting are that the harvesting operation may cause fragmentation and facilitate the spread of some plants, including Eurasian water milfoil, and may disturb loosely consolidated bottom sediments increasing turbidity and smothering fish breeding habitat and nesting sites. Disrupting the bottom sediments by plant removal also could increase the risk that an exotic species, such as Eurasian water milfoil, may colonize the disturbed area. Nevertheless, if done correctly and carefully, harvesting has been shown to be of benefit in ultimately reducing the regrowth of nuisance plants. There is currently no State permitting requirement for aquatic plant harvesting operations provided the harvested material is removed from the lake.

Operation of an harvester requires managerial oversight and a secure financial basis.[3] The formation of a public inland lake protection and rehabilitation district around the Kelly Lakes could be considered as one means of providing such an organizational basis.

Mechanical harvesting is considered a viable management option to continue as a control of aquatic plants in Upper Kelly Lake. An aquatic plant management plan is set forth in Appendix C.

Manual Harvesting

Mechanical harvesting requires a minimum depth of water in which to operate the harvesting equipment. When the water depth is inadequate depth, as in shoreline areas, manual harvesting provides a reasonable alternative technique. Manual harvesting involves the use of specially designed rakes to remove aquatic plants. The advantage of the rakes is that they are relatively inexpensive, easy and quick to use, and immediately remove the plant material from the lake, without a waiting period. Removal of the plants from the lake avoids the accumulation of organic matter on the lake bottom, which adds to the nutrient pool that favors further plant growth. There is currently no State permitting requirement for manual aquatic plant harvesting provided the harvested material is removed from the lake.

Manual harvesting is recommended for use in small areas of Upper Kelly Lake, but is not recommended for use on Lower Kelly Lake unless nearshore aquatic plants around piers are perceived as a severe nuisance.

Biological Controls

An alternative approach to controlling nuisance plants, particularly Eurasian water milfoil, is biological control. Classical biological control techniques have been successfully used to control both nuisance plants and herbivorous insects.[4] Recent studies have shown that *Eurhychiopsis lecontei*, an aquatic weevil, has potential as a biological control agent for Eurasian water milfoil.[5] Based upon a reconnaissance conducted by the Wisconsin Department of Natural Resources during June 1997, this weevil appears to be naturally occurring in the Kelly Lakes. However, as very few studies have been completed using *Eurhychiopsis lecontei* as a means of aquatic plant management control, it is not recommended that it be added to the Lakes at this time.

Grass carp, *Ctenopharyngodon idella*, another potential biological control, are not permitted for use in Wisconsin.

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[3]*Wisconsin Lakes Partnership Publication No. FH-205-97,* Your Aquatic Plant Harvesting Program: A How-to Field Manual, *1997.*

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

[5]*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.*

Lake Bottom Covering

Lake bottom covers and screens provide limited control of rooted plants by creating a physical barrier which reduces or eliminates the amount sunlight available to the plants. Placement of bottom covers on the beds of inland lakes is subject to State permitting requirements. Due to the steeply sloping bathymetry of the Kelly Lakes, lake bottom coverings are not considered a viable plant management option.

Citizen Information and Education

In addition to these in-lake management measures, an ongoing campaign of community information will support the aquatic plant management program by encouraging the use of shoreland buffer strips, responsible use of household and garden chemicals, and adoption of environmentally friendly household and garden practices to minimize the input of nutrients from these riparian areas. Aquatic plant management usually centers on the eradication of nuisance aquatic plants for the improvement of recreational lake use. The majority of the public views all aquatic plants as "weeds" and residents often spend considerable time and money removing desirable plant species from a lake without considering the environmental impacts. Thus, public information is an important component of an aquatic plant management program. Posters and pamphlets are available from the University of Wisconsin-Extension and Wisconsin Department of Natural Resources that provide information about and illustrations of aquatic plants, detailing their importance in providing habitat and food resources aquatic environments, and explaining the need to control the spread of undesirable and nuisance plant species.

Recommended Protection Measures

The following actions are recommended for the management of ecologically valuable areas and aquatic plants:

1. The Kelly Lakes Association should support the preservation and rehabilitation of the secondary environmental corridor lands and isolated natural resource features in the Kelly Lakes tributary drainage area. These lands, and especially their associated wetland areas, are recommended to be protected and preserved to the extent practicable through their incorporation into the stormwater management system and related drainageways, or inclusion in site plans as local parks, recreational trails, or open spaces; and restoration to reestablish their natural structure and function within the landscape.[6] Such preservation and rehabilitation should be promoted through the existing regulations and programs intended to protect such natural resources.

2. The Kelly Lakes Association, in cooperation with the City of New Berlin and the Wisconsin Department of Natural Resources, should consider the acquisition of the wetlands adjacent to the southwest portion of Upper Kelly Lake and the restoration of their structure and functioning for purposes of protecting lake water quality in Upper Kelly Lake. Such an action would enhance the ecological value of the Commission-delineated secondary environmental corridor within which the wetland system is located. Outright purchase, or the purchase of conservation easements, are possible options.[7] A description of the proposed acquisitions is set forth in Appendix D in the format required

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[6] *SEWRPC Community Assistance Planning Report No. 209,* op. cit.

[7] *Public acquisition including outright purchase or purchase of conservation easements may meet the criteria for cost-shared acquisition under the Chapter NR 191 Lake Protection Grant Program administered by the Wisconsin Department of Natural Resources. Monies granted under the auspices of this program provide up to 75 percent of the purchase price, or the cost of acquisition of a conservancy easement, subject to a cap of $200,000 on State share per parcel. For purposes of urban park development or the relocation of the City of New Berlin park to upland areas adjacent to the wetland site on Upper Kelly Lake, the urban parks fund of the Chapter NR 50/51 Stewardship Program could be considered. For purposes of relocation of the public recreational boating access site and development of parking facilities, the Chapter NR 7 Recreational Boating Facilities Grant Program could be considered.*

for submission of the proposed acquisitions for funding in part through the Chapter NR 191 Lake Protection Grant Program administered by the Wisconsin Department of Natural Resources.

3. The Kelly Lakes Association should continue its limited harvesting operations, in accordance with the aquatic plant management plan set forth in Appendix C. Monitoring of the Lakes and surrounding wetlands for the presence or spread of nuisance plant species such as Eurasian water milfoil and purple loosestrife should continue, with careful attention being paid to the presence of the *Eurhychiopsis lecontei*, an aquatic weevil species believed to control Eurasian water milfoil and naturally occurring in the Kelly Lakes. In areas that are inaccessible to the harvester in Upper Kelly Lake, manual harvesting of plants around piers and docks is the recommended means of controlling milfoil and other nuisance species of plants in those areas given the small size of the Lake. In this regard, the Association 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. The rakes cost approximately $90 each, and do not require a permit for use. However, should milfoil be determined to reach nuisance proportions, the use of chemical herbicides could be considered, but should be limited to small areas. Early spring or late fall treatments to control the growth of Eurasian water milfoil have proven effective in other lakes in Southeastern Wisconsin and are recommended. Early spring herbicide treatments reduce the biomass subject to decomposition and limit the accumulation of organic materials on the Lake bottom. It is recommended that an aquatic plant survey be conducted every three to five years in order to track the success of the current aquatic plant management program, as well as any other changes in the tributary drainage area that may affect the Kelly Lakes.

4. The Kelly Lakes Association, through an educational and informational program, should promote awareness of Lake residents, visitors, and watershed residents of good urban housekeeping practices, and the invasive nature of such exotic, nonnative species as Eurasian water milfoil and purple loosestrife. Participation in citizen-based control programs coordinated by the Wisconsin Department of Natural Resources and University of Wisconsin-Extension should be encouraged.

FISHERIES

Few data on the fisheries of the Upper Kelly Lake are available. Notwithstanding, as has been noted in Chapter III, fishing is a popular pastime on the Kelly Lakes. Because those data that are available suggest that the fishery in the Lakes may be unbalanced, the conduct of a fisheries inventory is considered to be an issue of concern. Given the conclusion set forth by the Wisconsin Department of Natural Resources as a consequence of their 1993 fisheries survey on Upper Kelly Lake, additional measures for managing the fishery of the Kelly Lakes may be required to maintain the bass fishery.

Recommended Management Measures

It is recommended that the Wisconsin Department of Natural Resources conduct a follow-up fisheries survey to determine if more restrictive regulatory measures are required. It is further recommended that a fisheries survey be conducted in Lower Kelly Lake to establish a fisheries baseline for that waterbody. Implementation of regulatory or remedial measures, such as modified size limits for catches and stocking, in both Lakes should be based upon the findings set forth in the recommended surveys.

NONPOINT SOURCE POLLUTION CONTROLS AND SURFACE WATER QUALITY

The Kelly Lakes are eutrophic waterbodies. As such, they may be considered, by definition, to be in need of protection and rehabilitation if they are to maintain and enhance their current aesthetic and recreational uses. The anticipated urbanization of the watershed under buildout conditions, as set forth in the aforenoted regional land use and County development plans and when viewed in light of the recent U.S. Geological Survey findings regarding the potential impacts of suburban lawn care practices on stormwater runoff in urbanized watersheds in

Wisconsin,[8] has heightened concern among lakeshore residents that the water quality of the Lakes may deteriorate further. Thus, consideration is given in this section to those actions that will protect lake water quality and reduce contaminant loads to the Lakes.

As described in Chapter II, the primary sources of pollutant loadings to the Kelly Lakes are nonpoint sources generated in the drainage area tributary to the Lakes. The regional land use plan and Waukesha County development plan envisions a significant increase in the area of urban residential lands in the drainage area tributary to the Kelly Lakes. Such development has the potential to result in increased loadings of some pollutants associated with urban development and construction sites.

The adopted regional water quality management plan nonpoint source pollution abatement plan element for the Root River watershed generally recommends urban nonpoint source pollution control practices designed to reduce the pollutant loadings from nonpoint sources by about 50 percent, plus additional controls in the downstream portions of the drainage basin.[9] The initial regional plan also recommended that local agencies charged with responsibility for nonpoint source pollution control prepare refined and detailed local-level nonpoint source pollution control plans. The preparation of a stormwater management plan by the City of New Berlin during 1998[10] is a consistent with this recommendation.

Watershed management measures may be used to reduce nonpoint source pollutant loadings from such rural sources as runoff from cropland and pastureland; from such urban sources as runoff from residential, commercial, transportation, and recreational land uses; and from construction activities. The alternative, nonpoint source pollution control measures considered in this report are based upon the recommendations set forth in the regional water quality management plan,[11] the Waukesha County soil erosion control plan,[12] and information presented by the U.S. Environmental Protection Agency.[13]

Array of Control Measures

To control nonpoint source pollution to the Kelly Lakes and its tributary drainage area, both urban nonpoint source controls, and rural nonpoint source controls, are considered viable options. In addition, specific wetland restoration and storage options are discussed.

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[8]*U.S. Geological Survey Water-Resources Investigations Report,* Sources of Phosphorus in Stormwater from Two Residential Urban Basins in Madison, Wisconsin: 1994-95, *in press.*

[9]*SEWRPC Planning Report No. 30,* A Regional Water Quality Management Plan for Southeastern Wisconsin: 2000, *Volume One,* Inventory Findings, *September 1978; Volume Two,* Alternative Plans, *February 1979; and Volume Three,* Recommended Plan, *June 1979.*

[10]*Camp Dresser & McKee, Inc.,* (Draft) Storm Water Master Plan for the City of New Berlin, *December 1998.*

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

[12]*SEWRPC Community Assistance Planning Report No. 159,* Waukesha County Agricultural Soil Erosion Control Plan, *June 1988.*

[13]*U.S. Environmental Protection Agency, Report No. EPA-440/4-90-006,* The Lake and Reservoir Restoration Guidance Manual, *2nd Edition, August 1990; and its technical supplement, U.S. Environmental Protection Agency, Report No. EPA-841/ R-93-002,* Fish and Fisheries Management in Lakes and Reservoirs: Technical Supplement to the Lake and Reservoirs Restoration Guidance Manual, *May 1993.*

Urban Nonpoint Source Controls

Potentially applicable urban nonpoint source control measures include wet detention basins, grassed swales, and good urban housekeeping practices. Generally, the application of low-cost urban housekeeping practices may be expected to reduce nonpoint source loadings from urban lands by about 25 percent. Public informational programs can be developed to encourage such good urban housekeeping practices, to promote the selection of building and construction materials which reduce the runoff contribution of metals and other toxic pollutants, and to promote the acceptance and understanding of the proposed pollution abatement measures and the importance of lake water quality protection. Urban housekeeping practices and source controls include restricted use of fertilizers and pesticides; improved pet waste and litter control; the substitution of plastic for galvanized steel and copper roofing materials and gutters; proper disposal of motor vehicle fluids; increased leaf collection; and reduced use of street deicing salt.

Proper design and application of urban nonpoint source control measures such as grassed swales and detention basins requires the preparation of a detailed stormwater management system plan that addresses stormwater drainage problems and controls nonpoint sources of pollution. Such a detailed plan is currently being prepared for the City of New Berlin.[14] In addition, the City of New Berlin is developing a stormwater management ordinance to implement the stormwater management plan recommendations. That ordinance will constitute Chapter 20 of the Municipal Code of the City of New Berlin. This ordinance establishes standards and permitting requirements for the control post-construction stormwater runoff. The draft ordinance provisions would affect residential land development activities of five acres or greater in areal extent as well as non-residential land development activities of five acres or greater in areal extent or that create impervious surfaces of one-half acre or greater in areal extent. In addition, all land development activities, regardless of area, considered by the City Engineer to be likely to result in runoff that exceeds the safe capacity of existing drainage facilities, causes undue channel erosion, increases water pollution by scouring or transportation of particulates, or endangers property or public safety, are proposed to be subject to the provisions of the ordinance.

Notwithstanding, based upon a preliminary evaluation, it is estimated that the practices which could be effective in the existing urban areas within the drainage area tributary to the Kelly Lakes revolve around implementation of adequate urban housekeeping practices, maintenance of grassed swales, and provision for stormwater detention. Implementation of the latter practice could be accomplished through, and would be compatible with, the restoration of the structure and function of the wetland ecosystems immediately upstream of Upper Kelly Lakes pursuant to recommendation set forth above for the protection of ecologically valuable areas. Further, based upon the aforereferenced preliminary evaluation, installation of an approximately three-acre wetland basin within a restored deep-water marsh ecosystem at the headwaters of Upper Kelly Lake could potentially reduce phosphorus levels entering Upper Kelly Lake by up to 50 percent.

Developing areas can generate significantly higher pollutant loadings than established areas of similar size. These areas include a wide array of activities, including individual site development within the existing urban area, and new land subdivision development. As previously noted, additional residential development is presently occurring and/or planned within the drainage area tributary to the Kelly Lakes. These construction sites may be expected to produce suspended solids and phosphorus loadings at rates several times higher than established urban lands, and control of sediment loss from construction sites is recommended.

In the City of New Berlin, construction site erosion controls are currently provided for by measures set forth in Section 14.00, Building Code, City of New Berlin Zoning Ordinances. The City of New Berlin construction site erosion control ordinance is sub-sections 14.72 and 14.73, Erosion Control, of the Code. This Code is administered and enforced by the City in both the shoreland and nonshoreland areas of the drainage area within the City of New Berlin tributary to the Kelly Lakes. The provisions of this ordinance apply to all land disturbing activities in the City that occur on platted lots within a subdivision plat, lots developed under a certified survey

[14] *Camp Dresser & McKee, Inc.*, op. cit.

map, areas of 4,000 square feet or greater, works where fill and/or excavation volumes exceed 400 cubic yards, public streets, roads, or highways, watercourses, and utilities.

In the Village of Hales Corners, such controls are currently provided by measures set forth in Section Comm 21.125, Erosion Control Procedures of Uniform Dwellings, Chapters 20-25 of the *Wisconsin Administrative Code*. These controls include temporary measures taken to reduce pollutant loadings from construction sites during stormwater runoff events, in a manner consistent with the provisions set forth in the construction site management handbook developed by the Wisconsin Department of Natural Resources in cooperation with the Wisconsin League of Municipalities.[15]

Construction erosion controls may be expected to reduce pollutant loadings from construction sites by about 75 percent. However, such practices are expected to have only a minimal impact on the total pollutant loading to the Kelly Lakes due to the relatively small amount of land being developed at any given time. Nevertheless, such controls are important pollution control measures that can abate localized short-term loadings of phosphorus and sediment from the drainage area and the upstream tributary area, and minimize the cumulative impacts of such loadings. The control measures include such revegetation practices as temporary seeding, mulching, and sodding; such runoff control measures as placement of filter fabric fences, straw bale barriers, storm sewer inlet protection devices, diversion swales, sediment traps, and sedimentation basins; and such site management practices as placement of tracking pads to limit the movement of soils from work sites.

Rural Nonpoint Source Controls

Upland erosion from agricultural and other rural lands is a minor contributor of sediment within the tributary drainage area to the Kelly Lakes, and is expected to diminish substantially under buildout conditions. Estimated phosphorus and sediment loadings from croplands, woodlots, pastures, and grasslands in the drainage area tributary to the Kelly Lakes were presented in Chapter II. These loadings are recommended to be reduced to the target level of agricultural erosion control of three tons per acre per year identified in the Waukesha County agricultural soil erosion control plan as the tolerable levels that can be sustained without impairing productivity. Since agriculture is a minor and diminishing land use within the drainage area, implementation of these recommendations is considered to be a secondary water quality management measure for the Kelly Lakes. However, until such time as they are converted from agricultural usage, existing farming operations should continue to implement and maintain nonpoint source pollution control measures to reduce current sediment, nutrient, and agri-chemical loading rates to the extent practicable.

Wetland Restoration for Water Quality Protection

As noted above, significant areas of wetland exist within the drainage area tributary to the Kelly Lakes. Many of these systems have been subjected to prior disturbances that may have reduced their effectiveness as areas providing natural stormwater storage and water quality improvement. While these wetlands have now been largely protected through local zoning. However, additional actions may be required to restore the natural functioning of such prior-disturbed systems. In this regard, specific actions should be considered to mitigate the changes in wetland flooding regime imposed by the construction of Frances Avenue, St. Mary's Drive, and Rosemary Drive in the City of New Berlin, and to enhance the water quality protection that such wetland flooding regimes provide along the unnamed tributary discharging to Upper Kelly Lake. Diversion of the inflow to Upper Kelly Lake through a restored wetland located immediate west of the intersection of Frances Avenue and St. Mary's Drive is an option that could be considered to increase the degree of water quality protection for Upper Kelly Lake.[16] The wetland would be similar in size to the prior-disturbed wetland at that location, as shown on

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[15] *Wisconsin League of Municipalities and Wisconsin Department of Natural Resources,* Wisconsin Construction Site Best Management Practices Handbook, *November 1993.*

[16] *Camp Dresser & McKee, Inc.,* op. cit.

Map 14. A wetlands alternatives analysis for this area, pursuant to Chapter NR 103 of the *Wisconsin Administrative Code*, is set forth in Appendix E.

As a consequence of the current lot layout in the wetland area, acquisition of these lands will result in the acquisition of additional lands that could also facilitate creation of an ecological corridor along the southwestern shoreline of Upper Kelly Lake. Potentially, this ecological corridor could be integrated with the City of New Berlin public park currently located on a filled wetland site between Lower and Upper Kelly Lakes, as shown conceptually on Map 14. This proposal would increase the potential for passive recreational use of Upper Kelly Lake, maintain existing levels of public access to the Lake, and enhance the aesthetic and habitat value of the existing secondary environmental corridor delineated in this area.

Public Informational Programming

In addition to actions designed to restore the natural structure and function of wetland systems upstream of Upper Kelly Lakes as a means of protecting water quality within the Kelly Lakes system—and the downstream Root River—additional actions can be undertaken to minimize nutrient loadings from source areas within the drainage area tributary to the Kelly Lakes. Based upon the aforereferenced findings of the U.S. Geological Survey, residential lawns form a major source of phosphorus to watercourses in urban areas. In some cases, this phosphorus source is enhanced as a consequence of the lawn care practices employed by householders within the drainage area. For this reason, informational programming directed at alternative and appropriate lawn care practices should be provided within this rapidly urbanizing drainage area. Such programming should be predicated upon the soil chemistry and soil nutrient requirements for urban residential lawns and gardens that can be determined through relatively simple soil testing conducted by the University of Wisconsin-Extension. Soil test results allow householders to apply appropriate levels of fertilization to their gardens, generally saving the householder some level of expense and effort, while providing additional protections to the Lakes. In addition, distribution of lawn care pamphlets within the drainage area, providing information on composting, yard care, and maintenance of the grassed swale stormwater system, would apprise householders of alternative means of maintaining their properties.[17]

In addition, programming should be developed to keep the householders in the Kelly Lakes community informed of the current state of their Lakes' water quality. To this end, continued participation in the Wisconsin Department of Natural Resources Self-Help Program is recommended as a means of assessing the health of the Kelly Lakes on a regular basis. Such programs can provide an early warning of undesirable changes in lake water quality and aquatic species composition and initiate appropriate responses in a timely manner. In addition, data gathered through these programs can supplement and be coordinated with data gathered by the Wisconsin Department of Natural Resources under the current surface water monitoring strategy developed to conduct monitoring activities and to perform basic assessments for each watershed in the Region on an approximately five- to seven-year rotating cycle.[18] Regular reports on the results of these studies have been featured at the annual meetings of the Kelly Lakes Association and should be continued as one means of informing residents of the current state of the Lakes.

Recommended Control Measures

The following management actions are recommended for the management of nonpoint source pollution sources and surface water quality:

1. The Kelly Lakes Association, in conjunction with the City of New Berlin, should assume the lead in the development of a public educational and informational program for the residents around the Kelly

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[17]*University of Wisconsin-Extension Publication No. GWQ007,* Practical Tips for Home and Yard, *1993, and related publications in the "Yard Care and the Environment" series.*

[18]*SEWRPC Memorandum Report No. 93,* op. cit.

Map 14

KELLY LAKES PARK CONCEPTUAL DEVELOPMENT PLAN

LEGEND

—10— WATER DEPTH CONTOUR IN FEET

PROPERTY BOUNDARY

PROPOSED ECOLOGICAL CORRIDOR

WETLAND RESTORATION FOR WATER QUALITY PROTECTION

100-YEAR RECURRENCE INTERVAL FLOODWAY LINE UNDER EXISTING CHANNEL CONDITIONS

PARKING AREA

HANDICAPPED ACCESSIBLE FOOTWAYS

HANDICAPPED ACCESSIBLE FISHING PIER

LOW FLOW STORMWATER DIVERSION/ RETURN SYSTEM AND HIGH FLOW BYPASS

PROPOSED CITY OF NEW BERLIN BIKE AND PEDESTRIAN TRAIL AND ROUTE

GRAPHIC SCALE

0 150 300 FEET

Source: SEWRPC.

Lakes and within the drainage area tributary to the Kelly Lakes, which encourages the institution of good urban housekeeping practices including, pesticide and fertilizer use management, improved pet waste and litter control, and yard waste management, as well as other lake management-related topics. The Kelly Lakes Association, in cooperation with service clubs and other nongovernmental organizations within the drainage area tributary to the Kelly Lakes, should acquire and distribute relevant publications in the University of Wisconsin-Extension "Yard Care and the Environment" series to encourage sound yard care practices within the watershed, and encourage their memberships to participate in the soil testing program offered by the University of Wisconsin-Extension. It is recommended that informational programming related to nonpoint source pollution abatement and other lake management topics be included at the annual meetings of the Kelly Lakes Association.

2. The construction site erosion control and water quality protection ordinances adopted by the City of New Berlin and Waukesha County, and the Village of Hales Corners and Milwaukee County should be strictly enforced to reduce sediment and contaminant loadings from the urbanizing areas in the tributary drainage area to the Kelly Lakes, especially in those areas nearest to the Lakes. Likewise, the draft stormwater management ordinance being considered by the City of New Berlin should minimize post-construction water quantity and water quality impacts on the Kelly Lakes.

3. The existing grassed swale drainage system within the Kelly Lakes drainage area should be maintained to minimize the nutrient and sediment loads delivered to the Kelly Lakes, especially Upper Kelly Lake, which is directly affected by the quality of water entering the lake through the tributary stream.

4. The City of New Berlin, as the principal local authority within the drainage area, should give special recognition to the Kelly Lakes as surface water features within its municipal jurisdiction, and incorporate specific actions within their stormwater management plan for the protection of the surface water quality of the Kelly Lakes, including the replacement of undersized culverts at Grange Avenue and at St. Mary's Drive, and the restoration of the wetland upstream of Upper Kelly Lake, as shown in Appendix F. Restoration of the prior converted wetlands adjacent to IH 43 in the vicinity of its intersection with CTH I, within the Sommerset Gardens Subdivision, also should be considered for incorporation into the stormwater management plan for water quality protection purposes.

5. The Kelly Lakes Association, in conjunction with the City of New Berlin and Village of Hales Corners, should jointly develop a detailed local level plan for the acquisition and restoration of the structure and function of the wetland ecosystems adjacent to the Kelly Lakes. This plan would be designed to restore the natural flooding regime within the wetland west of Frances Avenue and the relocate municipal infrastructure to facilitate restoration of the wetland between Lower and Upper Kelly Lakes on Rosemary Drive and provide adequate public recreational boating access to Upper Kelly Lake. Establishment of the restored wetland ecosystem at the headwaters of Upper Kelly Lake should be designed in order to reduce phosphorus and sediment loads delivered to the Lake by up to 50 percent when coupled with other housekeeping and low-cost measures in the tributary drainage area. Restoration of the Frances Avenue wetland complex would include provision for the storage of surface water from within and tributary to Upper Kelly Lake. Wetland restoration activities are subject to State permitting requirements.

6. The Kelly Lakes Association should continue to participate in the Wisconsin Department of Natural Resources Self-Help Monitoring Program as a means of regularly assessing the health of the Lakes and in order to provide an early warning of undesirable changes in lake water quality and aquatic species composition so as to allow the Association, in cooperation with relevant governmental agencies, to initiate appropriate responses in a timely manner. The report of the citizen monitor should continue to be featured at the annual meeting of the Association.

PUBLIC RECREATION AND BOATING ACCESS

The Kelly Lakes provide opportunities for water-based recreation to the residents of the City of New Berlin and the Village of Hales Corners and within the Southeastern Wisconsin Region. As described in Chapter III, potential recreational use problems are related to the current public recreational boating access to Upper Kelly Lake which may not meet the minimum standards set forth in Chapter NR 1 of the *Wisconsin Administrative Code*. Associated with this is the fact that the existing public park on Upper Kelly Lake is situated on filled wetland, a site that has potential for restoration of wetland structure and function.

Access Standards

Determination of the amount of access that should be accommodated at Upper Kelly Lake is dependent on the areal extent of the open water lake surface. Upper Kelly Lake, with a surface area of 12 acres, falls in the one- to 50-acre category for recreational use lakes established in Section NR 1.91 of the *Wisconsin Administrative Code*. Within this category, the minimum and maximum standards are the same. As previously noted, the minimum and maximum number of car-trailer units that could be accommodated at Upper Kelly Lake, in a manner consistent with the Section NR 1.91 guidelines, would be one carry-in access site for five vehicles plus a handicapped accessible unit, for a total of six units. Furthermore, standards set forth in the regional and County park and open space plans indicate that the Lakes lack adequate surface area to support fast or high-speed boating activity; pursuant to state boating laws as set forth in Chapter 30, *Wisconsin Statutes*, the Kelly Lakes are slow-no-wake Lakes. At present, there are approximately 16 nonmotorized watercraft moored at Upper Kelly Lake. Observations by Commission staff, conducted during July 1998, indicated that one watercraft was in operation during a weekday on Upper Kelly Lake.

Array of Options

Two options to provide public recreational boating access and other recreational activities to Upper Kelly Lake have been identified; namely, 1) to provide a level of access fully consistent with the standards set forth in Chapter NR 1 of the *Wisconsin Administrative Code*, and 2) to provide enhanced lakeside educational and recreational opportunities through creation of a lakeside ecological corridor, wetland restoration in the vicinity of the existing park and along the unnamed influent tributary to Upper Kelly Lake, and provision of appropriate signage.

Recommended Boating Access

1. It is recommended that provision of adequate public parking be considered for the existing public recreational boating access site at the S. Kurtz Avenue right-of-way. It is recommended that parking be provided for six vehicles, including one handicapped accessible unit. No parking is currently provided at or near the access site; onstreet parking is currently very limited. The proposed parking facilities should conform to the guidance on accessibility contained in Wisconsin Department of Natural Resources Publication No. CA-003-88, *Handbook for Accessibility...A Reference to Help Develop Outdoor Recreation Areas to Include People with Disabilities*. Such access facilities would provide for greater convenience of the residents of Upper Kelly Lake as well as for the convenience and safety of the public at large by providing an improved public launch site with adequate parking facilities.

2. It is further recommended that consideration be given to integrating existing public recreational opportunities into an enhanced ecological corridor located along the southwestern shoreline of Upper Kelly Lake. This corridor, situated adjacent to and south of the intersection of Frances Avenue and St. Mary's Drive, is proposed to include lands proposed for acquisition to support the restoration of wetland structure and function in the vicinity of the unnamed tributary draining to Upper Kelly Lake, as well as existing park and open space lands previously acquired by the City of New Berlin and outlots of the Woodfield Park Subdivision currently in open space use. Such action would allow the existing City park and adjacent properties, in part, to be restored to their original wetland condition for enhanced wildlife, aesthetic, educational, and hydrologic purposes.

3. It is also recommended that provision be made at this access site on the Lake for the posting of such boating regulations as may be adopted by the municipalities and other notices as necessary.

INSTITUTIONAL DEVELOPMENT

Both public and private organizational options for the management of lakes in the State of Wisconsin exist.[19] Private lake organizations also have the option to be incorporated, generally as nonstock, not-for-profit corporations under Chapter 181, *Wisconsin Statutes*. Public lake organizations are special purpose units of government that are created generally as public inland lake protection and rehabilitation districts under Chapter 33, *Wisconsin Statutes*, although some sanitary districts and utility districts created pursuant to the municipal statutes also engage in lake management activities. The specific type of organizations created is based upon the decision of the community.

Types of Lake Organizations

Private lake organizations are voluntary. Such organizations have the advantage that there are few restrictions imposed upon the types of activities in which they engage, subject to relevant permits and laws. Incorporated associations generally have a somewhat greater number of restrictions imposed upon them, but may be considered qualified associations for purposes of obtained state cost-share grants. Because of their voluntary nature, membership levels, and, therefore, income levels, of associations often fluctuate from year-to-year. Thus, when associations take on specific tasks such as aquatic plant management, for example, the community often elects to create a public inland lake protection and rehabilitation, or lake management, district.

Lake districts are public governmental units formed for the specific purpose of managing and protecting lake water quality. Inclusion in the district, once the district is created, is mandatory; registered voters and persons owning property within the district become the electors of the district for purposes of governance. Lake management districts have the capability of raising public funds subject to majority approval of the district budget at the annual meeting of the district. For this reason, lake management districts can provide a more stable financial base from which to undertake lake management activities. Often, lake associations and lake districts operate in harmony around lakes throughout Wisconsin.

The decision by the Kelly Lakes Association membership in 1995 to acquire and operate an aquatic plant harvester on Upper Kelly Lake has prompted community consideration of alternative means of lake management organization. Currently, while the majority of lakeshore householders express concern about the state of the Kelly Lakes, relatively few comprise the dues paying membership of the Kelly Lakes Association. In contrast, the benefits of the aquatic plant harvesting operation accrue to the entire Kelly Lakes community. Further, the operation and maintenance costs of the harvesting program, while relatively modest at approximately $2,400 per year, are unlikely to fluctuate markedly and may even escalate as operating costs increase and the need for maintenance recurs. Thus, there is some concern that the voluntary association may not be able to reliably fund this operation and attendant insurance costs on an ongoing basis. For this reason, formation of a public inland lake protection and rehabilitation district, pursuant to Chapter 33, *Wisconsin Statutes*, is recommended.

Section 33.25, *Wisconsin Statutes*, provides for the formation of public inland lake protection and rehabilitation districts by petition. In the case of the Kelly Lakes community, such a petition would be most likely to be directed to Waukesha County as the county likely to have the largest portion of the equalized value of the proposed district within its jurisdiction. This petition would have to identify a name for the proposed district, define the boundaries of the district, and contain the signatures 51 percent of the land owners or those of the owners of 51 percent of the land within the proposed district. In addition, the petition should set forth the necessity for the district—the basis upon which a district is being formed and the reason why a district is necessary, and the purpose that the district

[19] *See University of Wisconsin-Extension Publication No. G3216,* The Lake in Your Community, *1986.*

will serve—that the district will promote the public health, convenience, necessity, or public welfare and benefit the lands being included within the district.[20]

In the case of the Kelly Lakes, an additional requirement applicable to the formation of a district, set forth in Section 33.24, *Wisconsin Statutes*, would be that approvals have to be obtained from the City of New Berlin and Village of Hales Corners for inclusion of their territory within the proposed district prior to the petition to form a lake management district being submitted to Waukesha County for consideration.

Other considerations relating to the definition of a lake management district boundary are the extent to which the drainage area tributary to a lake is included in a district, and, in the case of a chain of lakes, the numbers of lakes to be included. It is rarely practical to include a lake's total tributary drainage area within a lake management district. Based upon guidance provided by the University of Wisconsin-Extension, it is recommended that the entire lakeshore, all riparian property, areas directly affecting the lake and/or which are included in planned service areas, and entire parcels be included.[21]

Array of Institutional Measures

Given the small sizes of the Kelly Lakes, and the limited numbers of riparian residents, it would be appropriate to include both Lakes within a single district. Pursuant to the guidance provided by the University of Wisconsin-Extension, riparian properties surrounding the lakes should be included within the proposed district; to wit, properties within a boundary demarcated by W. Grange Avenue between St. Mary's Drive and Kurtz Road, by Kurtz Road between W. Grange Avenue and 124th Street, by 124th Street extended to about Rosemary Drive at Albert Avenue, by Albert Avenue, by Rosemary Drive between Albert Avenue and Frances Avenue, by Frances Avenue and by Frances Avenue between Rosemary Drive and St. Mary's Drive, and by St. Mary's Drive to W. Grange Avenue. This area, shown on Map 15 as Alternative 1, encompasses small tracts and portions of the Kelly Subdivision within the City of New Berlin and Village of Hales Corners.

Alternatively, the proposed district boundary could be drawn to encompass the wetlands areas recommended for restoration. Such a boundary could be defined as the northeast one-quarter and southeast one-quarter of the northeast one-quarter of U.S. Public Land Survey Section 36, Town 6 North, Range 20 East, and the northwest one-quarter and southwest one-quarter of the northwest one-quarter of U.S. Public Land Survey Section 31, Town 6 North, Range 21 East, or an area approximately bounded by W. Grange Avenue on the north, Kurtz Road on the east, Glengary Road extended on the south, and Greentree Drive extended on the west. This alternative, shown on Map 16 as Alternative 2, encompasses small tracts and portions of the Kelly and Wood Field Park Subdivisions within the City of New Berlin and Village of Hales Corners.

A drainage basin-based alternative, Alternative 3, would encompass additional lands to the north and west of the area described above, including small tracts and portions of the Kelly, Wood Field Park, High Grove, Hales Heights, Kelly Brook, Hale Crest, Sunny Slope Heights, Orchard Valley, Sommerset Gardens, Timber Edge, and Rolling Hills Subdivisions within the City of New Berlin and Village of Hales Corners. However, such an alternative is not considered to be feasible as electors within the lands more than three tiers of development removed from the Lakes rarely recognize any substantial connection to the Lakes. Inclusion of potentially large numbers of electors from outside of the first and second tier developments surrounding the Lakes could reduce the ability of the proposed district to conduct lake management activities.

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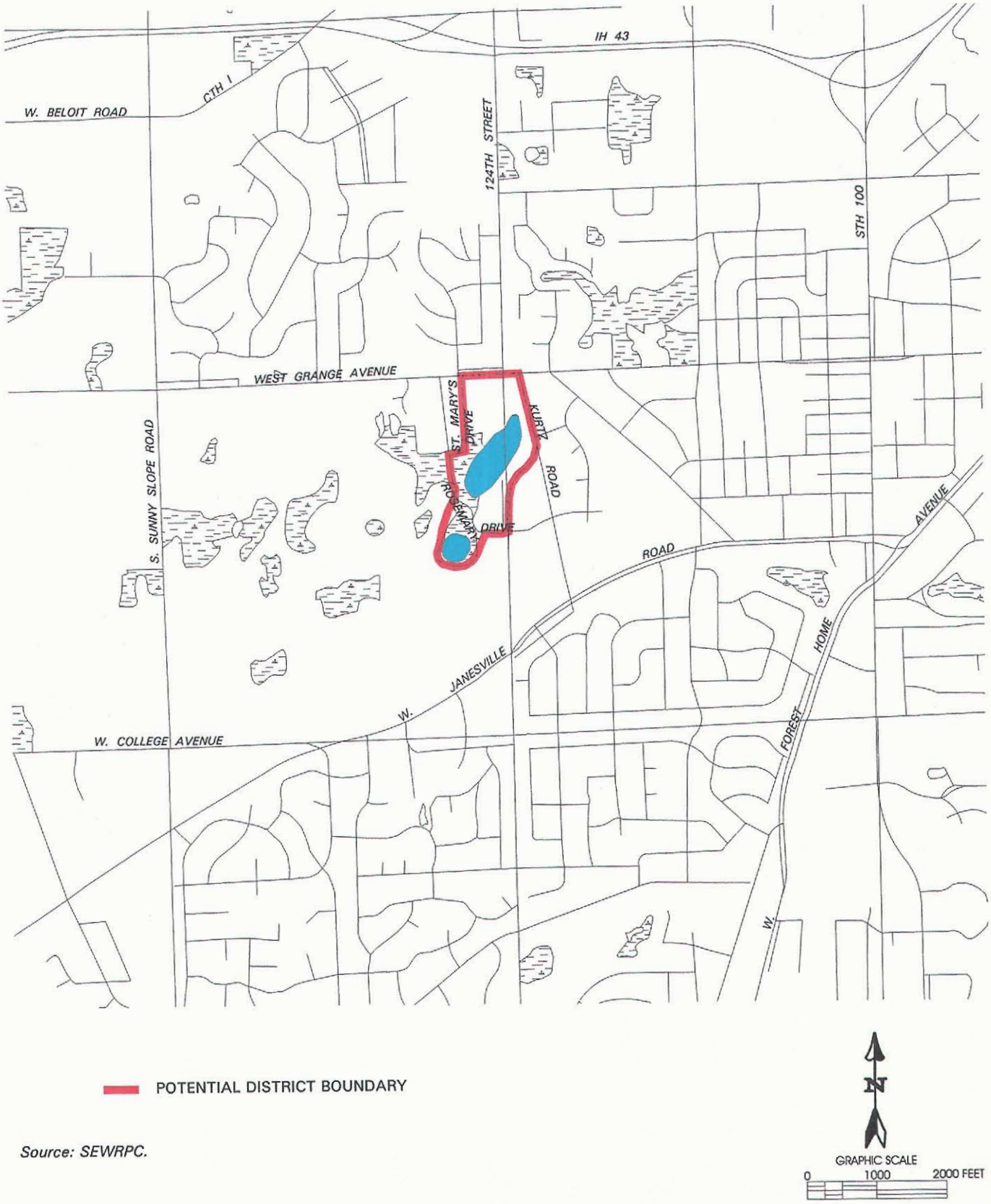
[20] *Benefit has been defined in terms of the benefit to the district of having particular lands included within the district boundaries, rather than the benefit to the individual landowner. See University of Wisconsin-Extension,* Guide to Wisconsin's Lake Management Law, Tenth Edition, *1996.*

[21] *University of Wisconsin-Extension,* Guide to Wisconsin's Lake Management Law, Tenth Edition, *1996.*

Map 15

ALTERNATIVE 1: DISTRICT BOUNDARY FOR UPPER AND LOWER KELLY LAKES MANAGEMENT DISTRICT INCORPORATING RIPARIAN LANDS



POTENTIAL DISTRICT BOUNDARY

Source: SEWRPC.

Map 16

ALTERNATIVE 2: DISTRICT BOUNDARY FOR UPPER AND LOWER KELLY LAKES MANAGEMENT DISTRICT

Source: SEWRPC.

The establishment of the boundaries of a lake protection and rehabilitation district should be undertaken with caution. As noted, guidance provided by the University of Wisconsin-Extension suggests inclusion within a district of the entire lakeshore, of all riparian properties, of lake-related properties, of as much of the lake's watershed as is logistically and politically feasible, of all lands to be included in proposed service areas, of entire parcels, and of all parcels necessary to avoid holes within the district. While there are sound technical and economic reasons for including the Lakes' watershed or direct tributary drainage area in the district, as provided for under Alternative 3, significant political and social difficulties may arise that limit the ability of the district encompassing the entire drainage area to carry out a program of lake protection and rehabilitation activities. Similarly, the inclusion of only riparian owners under Alternative 1 fails to provide adequate geographic scope for the proposed district to exercise management control over the recommended wetland restoration project. While it is not impossible for a district to operate outside of its immediate boundaries, exclusion of the project area from within the district limits access and "community-ownership" of the project. Therefore, should a public inland lake protection and rehabilitation district be formed around the Kelly Lakes, it is recommended that the district boundaries be similar to those set forth under Alternative 2, wherein not only the two Lakes are included within the district but also the proposed wetland restoration project area.

Recommended Institutional Structure

It is recommended that the Kelly Lakes Association consider forming a public inland lake protection and rehabilitation district around the Kelly Lakes, the approximate boundaries of which should be W. Grange Avenue on the north, Kurtz Road on the east, Glengary Road extended on the south, and Greentree Drive extended on the west. This area would encompass the two Lakes and the proposed wetland area to be restored as set forth herein. Creation of a lake management district for the Kelly Lakes would enhance the ability of the Kelly Lakes community to manage the Kelly Lakes on a sustainable basis, and provide a sound fiscal base from which to conduct lake management activities.

SUMMARY

This plan, which documents the findings and recommendations of a study requested by the Kelly Lakes Association, Inc., examines existing and anticipated conditions and potential management problems of the Kelly Lakes and presents a recommended plan for the resolution of these problems.

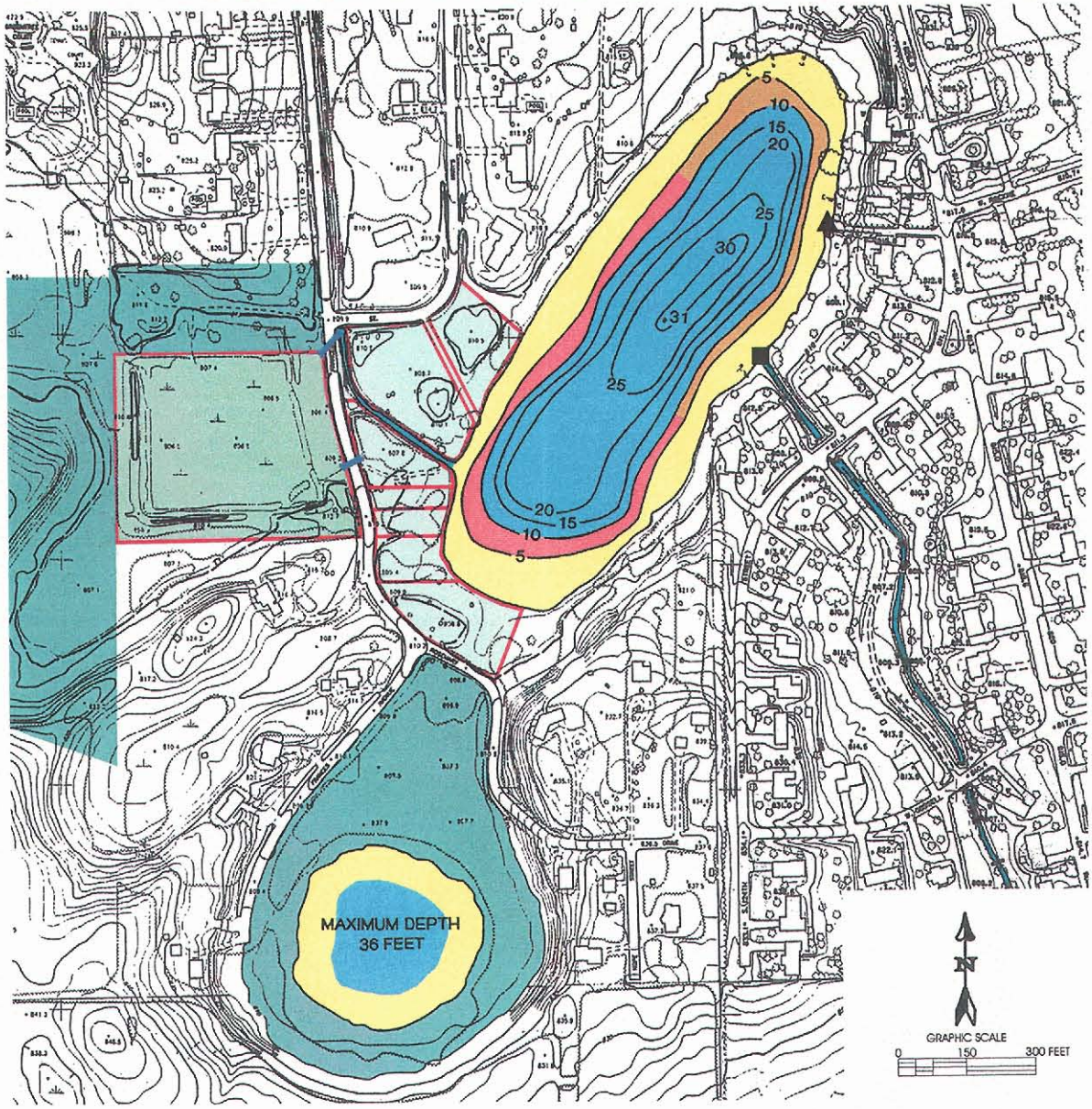
The Kelly Lakes were found to be eutrophic, moderately deep water lakes of average quality located in close proximity to the Milwaukee metropolitan area and adjacent to an increasingly urban part of Waukesha County in which its tributary drainage area is almost entirely located. Surveys indicated that the Lakes and their tributary drainage area contain significant areas of ecological value, including numerous wetlands and high-quality wildlife habitat surrounding the Lakes.

The Kelly Lakes protection and recreational use plan, summarized on Map 17 and in Table 8, recommends actions be taken to limit further human impacts on the in-lake macrophyte beds and reduce human impacts on the ecologically valuable areas adjacent to the Lake and in its watershed. The development of adequate public parking to their access site to serve Upper Kelly Lake is also recommended. The plan recommends only limited aquatic plant management action, including selected manual removal and surveillance activities at this time, mainly in the cases where purple loosestrife and Eurasian water milfoil are present, with the limited use of chemical treatment only to treat such species, if needed. Consideration of public acquisition of, or acquisition of conservation easements over, lands within the primary environmental corridors to ensure the protection and preservation of these ecologically valuable areas is also recommended.

The recommended plan includes continuation of an ongoing program of public information and education providing riparian residents and lake users. For example, additional options regarding household chemical usage, lawn and garden care, shoreland protection and maintenance, and recreational usage of the Lakes should be made available to riparian householders, thereby providing riparian residents with alternatives to traditional alternatives and activities.

Map 17

RECOMMENDED LAKE MANAGEMENT PLAN FOR KELLY LAKES



—15— WATER DEPTH CONTOUR IN FEET

▲ PUBLIC ACCESS SITE

■ WATER LEVEL CONTROL STRUCTURE

PROPERTY BOUNDARY

AQUATIC PLANT MANAGEMENT

EURASIAN WATER MILFOIL CONTROL AREA
HARVESTING: HIGH PRIORITY
CHEMICALS: LIMITED

HARVEST ACCESS LANES
HARVESTING: MODERATE PRIORITY
CHEMICALS: NONE

SHALLOW WATER HABITAT AREA
HARVESTING: NONE
CHEMICALS: NONE

DEEP WATER AREA: NO CONTROL

LAND USE MANAGEMENT

PROTECT ENVIRONMENTALLY VALUABLE AREAS

CREATE AN ECOLOGICAL CORRIDOR BETWEEN LAKES AND ALONG THE SOUTH-WEST SHORE OF UPPER KELLY LAKE:
-PROVIDE PUBLIC FISHING PIER

ACQUIRE EASEMENT FOR PUBLIC USES:
-RESTORE WETLAND FOR LAKE QUALITY PROTECTION

CONSTRUCT LOW FLOW STORMWATER DIVERSION/RETURN SYSTEM AND HIGH FLOW BYPASS

SHORELINE PROTECTION

- MAINTAIN EXISTING STRUCTURES
- PROTECT UNSTABLE AREAS, RESTORE SHORELAND WETLANDS

LAKE MANAGEMENT

- ESTABLISH PUBLIC INLAND LAKE PROTECTION AND REHABILITATION DISTRICT

Source: SEWRPC.

Table 8

RECOMMENDED PROTECTION PLAN ELEMENTS FOR THE KELLY LAKES

Issue	Plan Element	Subelement	Location	Management Measures	Management Responsibility
Ecologically Valuable Areas and Aquatic Plants	Land use management	Land use plan implementation	Entire watershed	Support implementation set forth in the regional land use plan for Milwaukee County and in the development plan for Waukesha County	City of New Berlin and Village of Hales Corners
	Watershed land management	Construction site erosion control	Entire watershed	Continue to enforce existing erosion control and water quality protection ordinances; refine ordinances where necessary	City of New Berlin and Village of Hales Corners
		Urban nonpoint source controls	Entire watershed	Implement and maintain recommended good urban housekeeping practices, maintenance of grassed swales, and provision for stormwater detention (three-acre basin within a restored wetland ecosystem)	Kelly Lakes Association, City of New Berlin City, and Village of Hales Corners
		Rural nonpoint source controls	Entire watershed	Implement and maintain rural land best management practices	City of New Berlin
		Environmentally sensitive lands protection	Entire watershed	Support preservation and rehabilitation of secondary environmental corridor lands Secondary environmental corridor lands be incorporated into the urban stormwater management system	Kelly Lakes Association and City of New Berlin
	Aquatic plant management	Mechanical harvesting	Areas of nuisance growth in Upper Kelly Lake	Harvest nuisance aquatic plants	Kelly Lakes Association
		Manual harvesting	Areas of nuisance growth in Upper Kelly Lake	Harvest nuisance plants, including Eurasian water milfoil, as required around docks and piers	Kelly Lakes Association
		Nuisance species monitoring program	Entire watershed	Monitor lakes and surrounding wetlands for the presence or spread of nuisance species, including Eurasian water milfoil, purple loosestrife, and zebra mussel Monitor lakes for the presence or spread of the aquatic weevil (Eurhychiopsis lecontei)	Kelly Lakes Association
Fisheries	Fisheries management	Fisheries survey	Upper and Lower Kelly Lakes	Conduct fisheries survey of both lakes to determine the current status of the fishery; implement recommendations as necessary	Wisconsin Department of Natural Resources, and Kelly Lakes Association
		Develop a fishery enhancement program based upon survey	Upper and Lower Kelly Lakes	Review survey data and develop fishing regulations and habitat protection measures for improved fisheries as needed	Wisconsin Department of Natural Resources, and Kelly Lakes Association
Nonpoint Source Pollution Controls and Surface Water Quality	Water quality management	Water quality control	Entire lake	Incorporate specific actions within their stormwater management plan for the protection of the surface water quality of the Kelly Lakes	City of New Berlin
		Water quality monitoring	Entire lake	Continue to participate in the DNR Self-Help Monitoring Program	Kelly Lakes Association
		Water quality protection	Entire watershed	Acquisition and restoration of the structure and function of the wetland ecosystems Purchase of conservation easements	Kelly Lakes Association, City of New Berlin, and Village of Hales Corners

Table 8 (continued)

Issue	Plan Element	Subelement	Location	Management Measures	Management Responsibility
Public Recreation and Boating Access	Recreational use management	Public access	Upper Kelly Lake	Provide adequate public access Provide enhanced lakeside recreational activities through the establishment of additional open space lands, wetland restoration in the area of the existing park, and enhanced public recreational boating access	City of New Berlin, Village of Hales Corners, Kelly Lakes Association, and DNR
Institutional Development	Institutional development for lake management	Kelly Lakes Association	W. Grange Avenue on the north, Kurtz Road on the east, Glengary Road extended on the south, and Greentree Drive extended on the West	Consider forming a public inland lake protection and rehabilitation district around the Kelly Lakes	City of New Berlin, Village of Hales Corners, Kelly Lakes Association, and Waukesha County
	Informational program	Public informational programming	Entire watershed	Continue public awareness and information programming Encourage householders to adopt environmentally sustainable land management practices Participate in soil testing program offered by UW-Extension	City of New Berlin, Village of Hales Corners, and Kelly Lakes Association

[a]*Costs to be determined.*

Source: SEWRPC.

The plan recommends reestablishment of the natural structure and function of the wetland system immediately upstream of Upper Kelly Lake to more effectively control nutrient and sediment loading rates into the Lake from the tributary drainage area. Also, the plan recommends enhancement of public recreational boating access opportunities as part of the restoration project. Further, the recommended plan supports the development of a stormwater management ordinance by the City of New Berlin as one mechanism to give effect to the provisions set forth in the stormwater management plan currently being prepared by the City. Restoration of the prior converted wetlands adjacent to IH 43 within the drainage area tributary to the Kelly Lakes, recommended in the stormwater management plan, is endorsed.

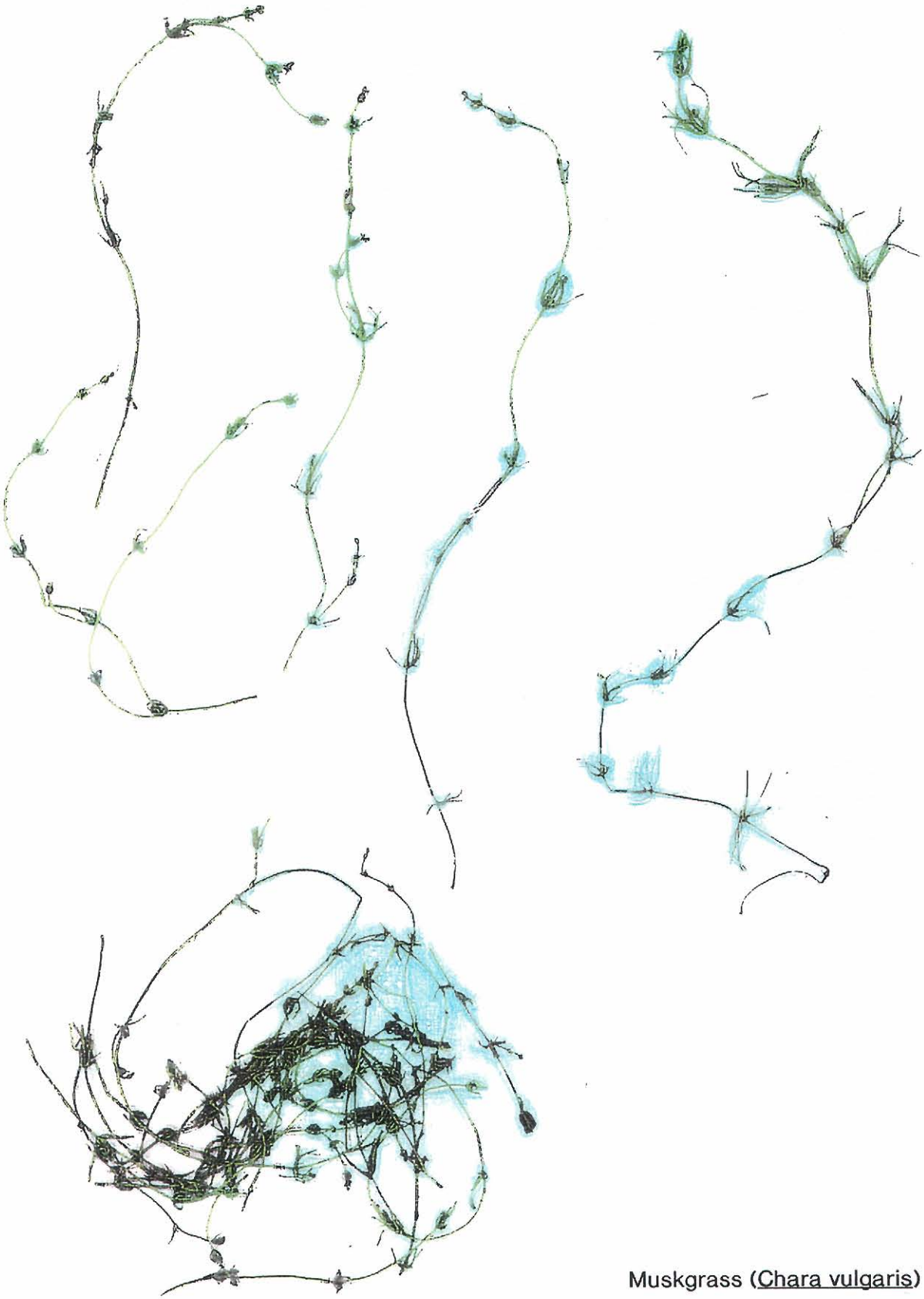
The recommended plan seeks to balance the demand for high-quality residential and recreational opportunities at the Kelly Lakes with the requirements for environmental protection.

APPENDICES

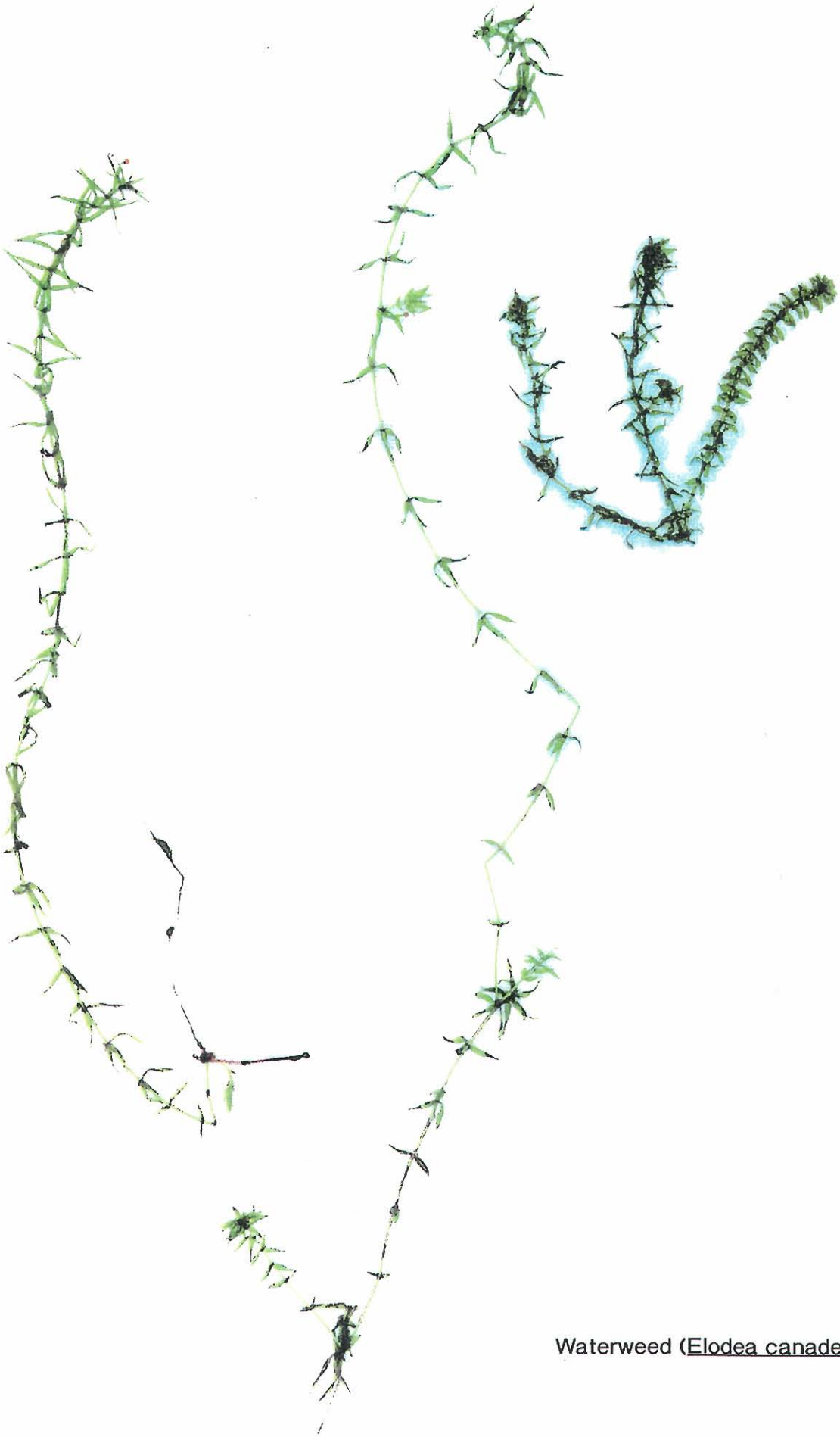
Appendix A

REPRESENTATIVE ILLUSTRATIONS OF AQUATIC PLANTS FOUND IN THE KELLY LAKES

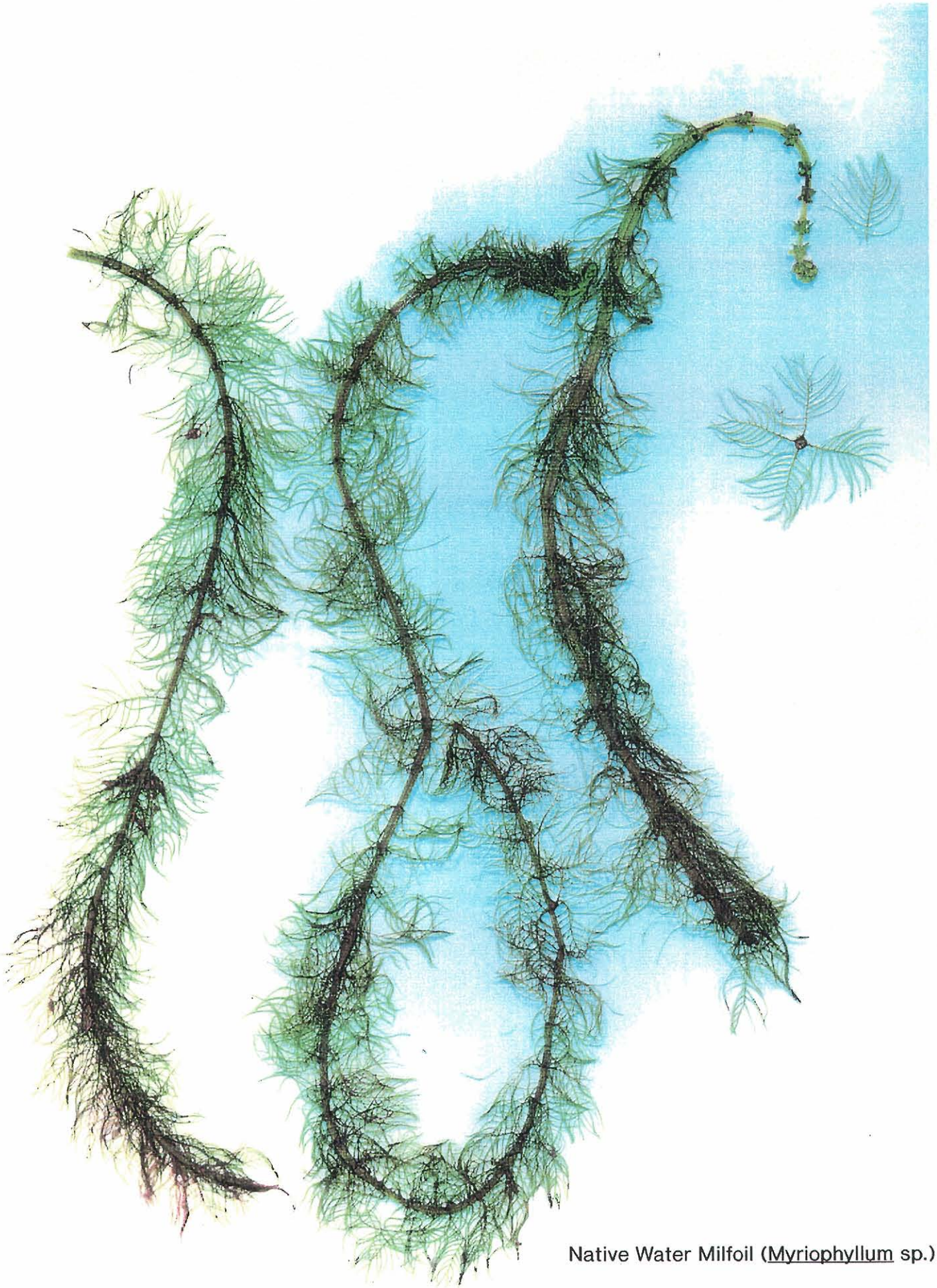
Coontail (Ceratophyllum demersum)



Muskgrass (Chara vulgaris)

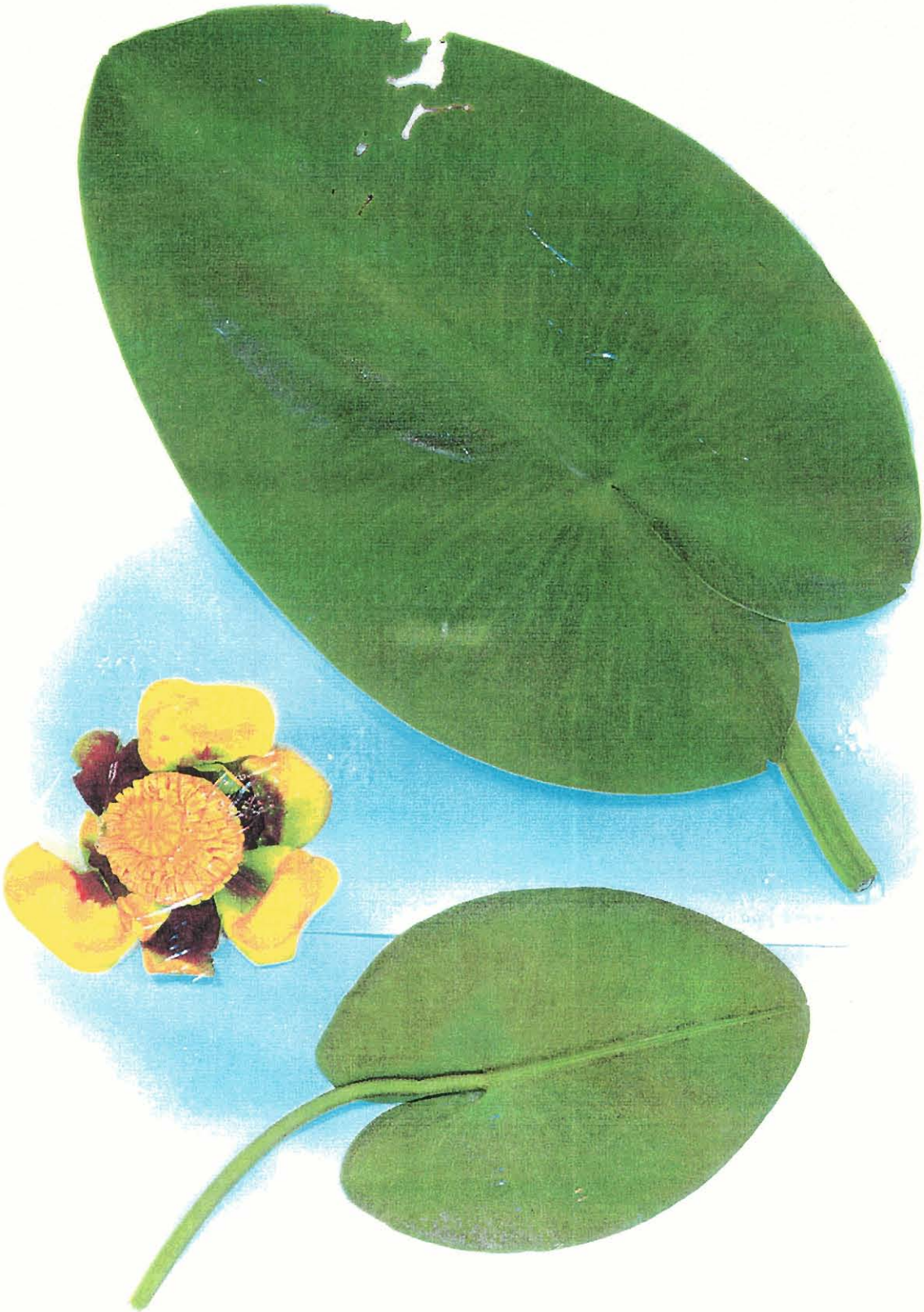


Waterweed (Elodea canadensis)

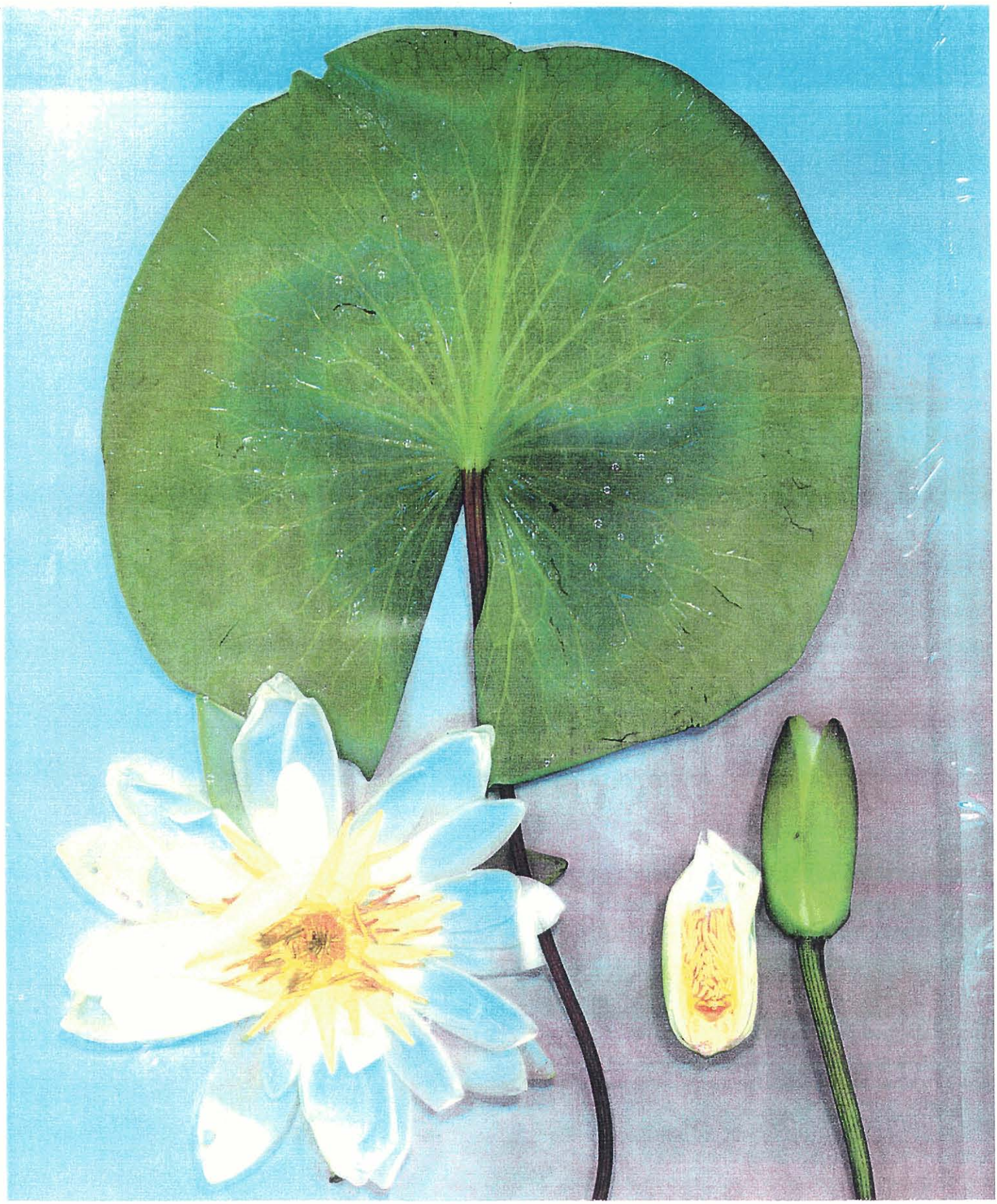


Native Water Milfoil (Myriophyllum sp.)

Eurasian Water Milfoil (Myriophyllum spicatum)

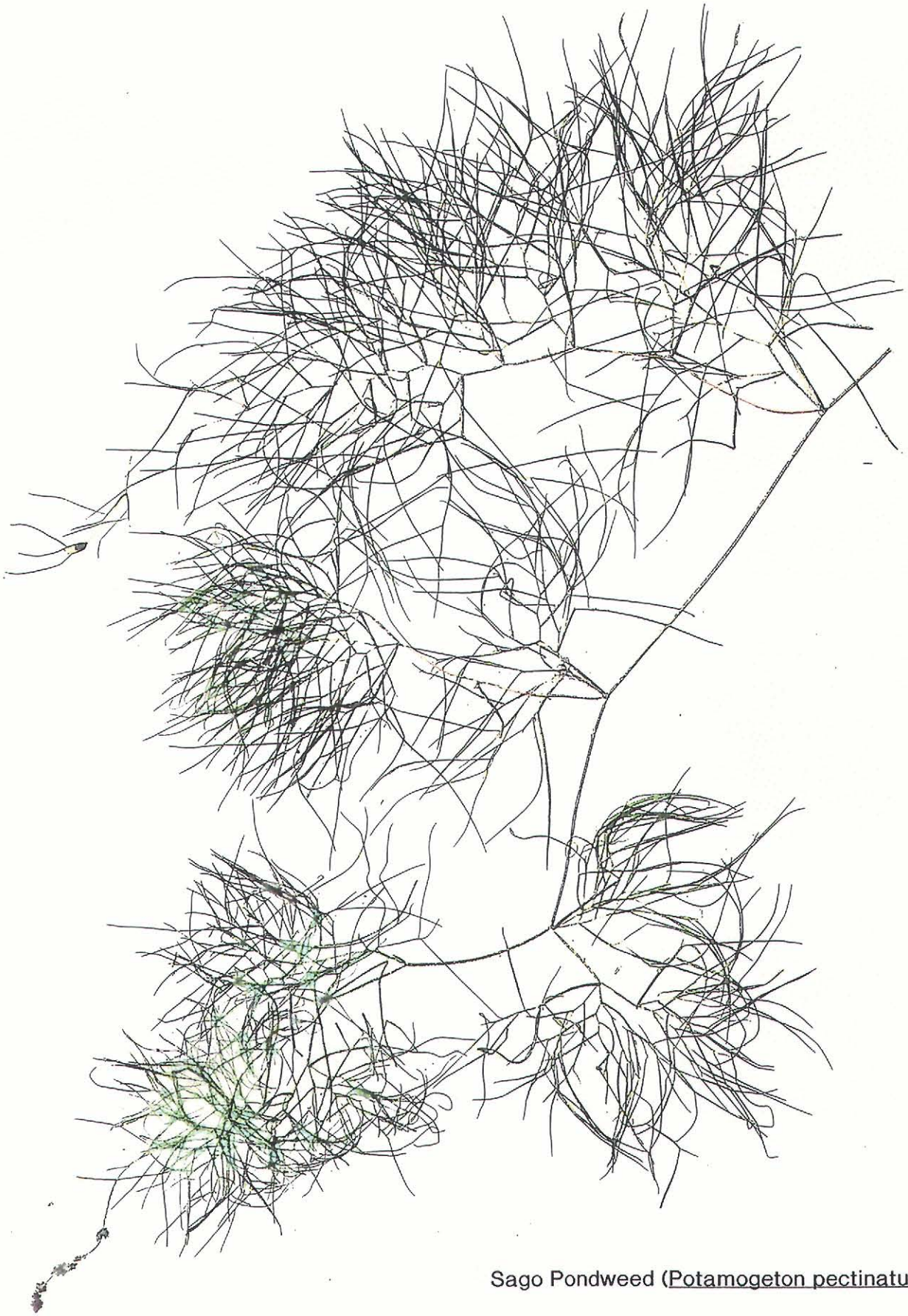


Yellow Water Lilly (Nuphar variegatum)



White Water Lilly (Nymphaea tuberosa)

Curly Leaf Pondweed (Potamogeton crispus)



Sago Pondweed (Potamogeton pectinatus)

Flat-stem Pondweed (Potamogeton zosteriformis)

Cattail (Typha augustifolia)

Eel Grass/ Wild Celery (Vallisneria americana)

Lesser Duckweed (Lemna minor)

NOTE: Plant species in photograph are not to scale.

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

Yellow Water Crowfoot (Ranunculus flabellaris)

NOTE: Plant species in photograph are not to scale.

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

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Appendix B

SEWRPC LETTER REPORTS PRELIMINARY VEGETATION SURVEYS THE KELLY LAKES

PREMLIMINARY VEGETATION SURVEY
J. GORSEGNER PROPERTY-UPPER KELLY LAKE WETLAND

Date: April 3, 1990

Observers: Donald M. Reed, Principal Biologist
Rachel E. Lang, Assistant Biologist
Southeastern Wisconsin Regional Planning Commission

Location: City of New Berlin in the Northeast one-quarter of U.S. Public Land Survey Section 36, Township 6 North, Range 20 East, Town of New Berlin, Waukesha County, Wisconsin.

Species List:

TYPHACEAE
Typha latifolia[1]--Broad-leaved cat-tail

GRAMINEAE
Bromus inermis[2,3]--Smooth brome grass
Poa pratensis--Kentucky bluegrass
Phalaris arundinacea[2]--Reed canary grass

CYPERACEAE
Carex blanda--Wood sedge
Carex sp. --Sedge

IRIDACEAE
Iris versicolor--Blue flag iris

SALICACEAE
Salix nigra--Black willow
Salix interior--Sand-bar willow
Salix discolor--Pussy willow
Salix sp. --Willow

JUGLANDACEAE
Juglans nigra[3]--Black walnut

ULMACEAE
Ulmus americana--American elm

URTICACEAE
Urtica dioica--Stinging nettle

CRUCIFERAE
Alliaria officinalis[2]--Garlic-mustard

SAXIFRAGACEAE
Ribes americanum--Wild black currant

ROSACEAE
Fragaria virginiana--Wild strawberry
Geum canadense--White avens
Rosa palustris--Swamp rose
Crataegus sp.[3]--Hawthorn

ANACARDIACEAE
Rhus glabra[3]--Smooth sumac

ACERACEAE
Acer saccharinum--Silver maple

VITACEAE
Vitis riparia--River-bank grape

UMBELLIFERAE
Daucus carota[2,3]--Queen Anne's lace

CORNACEAE
Cornus stolonifera--Red osier dogwood

OLEACEAE
Fraxinus pennsylvanica--Green ash

LABIATAE
Monarda fistulosa[3]--Wild bergamont

CAPRIFOLIACEAE
Sambucus canadensis--Elderberry
Lonicera X bella[2]--Hybrid honeysuckle

COMPOSITAE
Rudbeckia laciniata--Green-headed coneflower
Ambrosia trifida--Giant ragweed
Solidago gigantea--Giant goldenrod
Solidago altissima x gigantea[3]--Hybrid goldenrod

Total number of plant species: 33
Number of alien, or non-native, plant species: 5 (15 percent)

This approximately 0.25-acre wetland plant community area is part of the Upper Kelly Lake wetland complex and consists of shallow marsh, fresh (wet) meadow, shrub-carr, willow thicket, and scattered southern wet- to wet-mesic lowland hardwoods. Disturbances to this plant community include vegetation removal, side casting of dredge spoil, past wetland filling, and water level changes due to ditching. No federal- or state-designated rare, threatened, or endangered species were observed during the field inspection.

---

[1] Growing along the shoreland edge.

[2] Alien, or non-native, plant species.

[3] Growing along the wetland edge.

COPY

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

916 N. EAST AVENUE • P.O. BOX 1607 • WAUKESHA, WISCONSIN 53187-1607 • TELEPHONE (414) 547-6721

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March 20, 1989

Mr. James B. Carpentier
Assistant Director of Planning
City of New Berlin
3805 S. Casper Drive
New Berlin, Wisconsin 53151-5510

Re: SEWRPC No. CA 724-93

Dear Mr. Carpentier:

This is to acknowledge receipt of your letter of February 1, 1989, requesting the Commission staff to conduct an environmental evaluation of the proposed Woodfield Park Subdivision located in the Northeast one-quarter of U.S. Public Land Survey Section 36, Township 6 North, Range 20 East, City of New Berlin, Waukesha County, Wisconsin. Pursuant to your request, Mr. Donald M. Reed, Principal Biologist of the Commission staff, met with you on February 10, 1989, to conduct a field inspection of the subject development site. The results of the field inspection are attached hereto as Exhibit A and may be summarized as follows:

1. Seven plant community areas were identified on the subject development site. The areal extent of the plant community areas are shown on the 1" = 400' scale 1985 aerial photograph attached hereto as Exhibit B.

2. Plant community area No. 1 is an approximately 6.0-acre wetland complex consisting of shallow marsh, shrub-carr, and southern wet to wet-mesic lowland hardwoods. Disturbances to this wetland plant community include past agricultural activities and past filling due to pond construction.

3. Plant community area No. 2 is an approximately 11.8-acre woodland consisting of second growth southern wet-mesic to mesic hardwoods. Disturbances include past timber cutting and clear cutting for proposed roads.

4. Plant community area No. 3 is an approximately 7.8-acre wetland consisting of shallow marsh and fresh (wet) meadow. Disturbances to this wetland plant community include past agricultural activities, ditching, and past dumping.

5. Plant community area No. 4 is an approximately 1.0-acre wetland consisting of fresh (wet) meadow with shrub-carr along the wetland edge. Disturbances to this wetland plant plant community include past agricultural activities.

6. Plant community area No. 5 is an approximately 14.0-acre plowed corn field. Disturbances to this area include plowing for row crop uses.

7. Plant community area No. 6 is an approximately 25.0-acre old field. Disturbances to this area include past agricultural uses.

8. Plant community area No. 7 is an approximately 1.0-acre wetland complex consisting of shallow marsh, fresh (wet) meadow, and southern wet to wet-mesic lowland hardwoods. Disturbances to this wetland complex includes past agricultural activities.

9. The entire plant community area Nos. 3 and 7 contain Class I wildlife habitat, plant community area No. 2 is a Class II wildlife habitat, and plant community area No. 1 contains both Class II and III wildlife habitat. The areal extent of the wildlife habitat is shown on the 1" = 400' scale 1985 aerial photograph attached hereto as Exhibit C.

10. No federal- or state-designated rare, threatened, or endangered species were observed during the field inspection.

11. The entire area of plant community area Nos. 1, 2, 3, 4, and 7 are located within a Commission-delineated secondary environmental corridor. The areal extent of the secondary environmental corridor is shown on Exhibit B.

In your letter you ask if, based upon the field inspection, any portions of the delineated secondary environmental corridor are particularly valuable and should, therefore, be considered for preservation as the platting of the lands proceeds. In this respect, the Commission staff would suggest that the wetlands identified as plant community area Nos. 1, 3, and 7 not be filled and developed and, that, to the greatest extent practicable given platting considerations, the woodland identified as plant community area No. 2 be preserved and protected. These objectives can be accomplished by requiring the developer to design the plat to place the environmentally sensitive lands either in common open space areas or in the rear yards of lots that are deed restricted against future division, filling, and development.

With respect to your specific question concerning the provision of public sanitary sewer service to the development site, please be advised that this matter was specifically addressed in our letter to you of February 28, 1989.

Finally, with respect to the wetlands identified in plant community area Nos. 1 and 3, because of their association with Upper Kelly Lake, it is likely that the U.S. Army Corps of Engineers will require a federal Section 404 individual permit for any filling activities in these wetlands. Further, that portion of the wetlands lying within the 1,000 foot shoreland zone attendant to Upper Kelly Lake should be maintained within an appropriate shoreland-wetland conservancy district zone as required under Chapter NR 117 of the Wisconsin Administrative Code. Should the landowners propose to drain or fill all or a portion of these wetlands, we suggest they contact:

Mr. Gary L. Nelson
Water Management Coordinator
Wisconsin Department of
Natural Resources
P.O. Box 12436
Milwaukee, WI 53212

District Engineer
Regulatory Functions Branch
St. Paul District
Corps of Engineers
U.S. Dept. of the Army
1421 U.S. Post Office & Customs House
St. Paul, MN 55101-1479

We trust that the foregoing information is responsive to your request. Should you have any questions concerning this matter, please do not hesitate to contact Mr. Reed directly.

Sincerely,

Kurt W. Bauer
Executive Director

KWB/ib
Enclosures

cc: Mr. Gary L. Nelson, DNR
Mr. Ben Wopat, COE

EXHIBIT A

Preliminary Vegetation Survey

PROPOSED WOODFIELD PARK SUBDIVISION SITE

DATE: February 10, 1989

OBSERVER: Donald M. Reed, Principal Biologist
Rachel E. Lang, Assistant Biologist
Southeastern Wisconsin Regional Planning Commission

LOCATION: City of New Berlin in the Northeast one-quarter of U.S. Public Land Survey Section 36, Township 6 North, Range 20 East, Town of New Berlin, Waukesha County, Wisconsin.

SPECIES LIST: Plant Community Area No. 1

Typhaceae

Typha latifolia--Broad-leaved cat-tail

Gramineae

Elymus virginicus--Virginia wild rye

Phalaris arundinacea[1]--Reed canary grass

Cyperaceae

Carex stricta--Tussock sedge

Salicaceae

Salix nigra--Black willow

Salix interior--Sand-bar willow

Ulmaceae

Ulmus americana--American elm

Rosaceae

Rubus occidentalis--Black raspberry

Aceraceae

Acer saccharinum[2]--Silver maple

Onagraceae

Epilobium coloratum--Willow herb

Umbelliferae

Daucus carota[1,2]--Queen Anne's lace

Cornaceae

Cornus stolonifera--Red-osier dogwood

Oleaceae

Fraxinus pennsylvanica--Green ash

Solanaceae

Solanum dulcamara[1]--Deadly nighshade

Caprifoliaceae

Sambucus canadensis--Elderberry

Compositae

Ambrosia trifida--Giant ragweed

Solidago gigantea--Giant goldenrod

Aster simplex--Marsh aster

Arctium minus[1,3]--Common burdock

Total number of plant species: 19
Number of alien, or non-native, plant species: 4 (21%)

This approximately 6.0-acre wetland plant community area consists of shallow marsh, fresh (wet) meadow, shrub-carr, and southern wet to wet-mesic lowland hardwoods. Disturbances to this plant community include past agricultural activities and past filling due to pond construction. No federal- or state-designated rare, threatened, or endangered species were observed during the field inspection.

---

[1]Alien, or non-native, plant species.

[2]Growing along wetland edge.

[3]Growing on fill material.

Plant Community Area No. 2

Pinaceae

Pinus strobus[1]--White pine

Gramineae

Setaria sp.[2]--Foxtail grass

Salicaceae

Populus tremuloides--Quaking aspen

Betulaceae

Ostrya virginiana--Ironwood

Fagaceae

Quercus alba--White oak

Quercus macrocarpa--Bur oak

Quercus borealis[3]--Northern red oak

Ulmaceae

Ulmus americana--American elm

Rosaceae

Geum canadense--White avens

Rosa multiflora[2]--Multiflora rose

Crataegus sp.--Hawthorn

Rhamnaceae

Rhamnus catharticus[2]--Common buckthorn

Rutaceae

Zanthoxylum americanum--Prickly ash

Vitaceae

Vitis sp.--Grape

Tiliaceae

Tilia americana[4]--Basswood

Malvaceae

Abutilon theophrasti[2]--Velvet leaf

Umbelliferae

Daucus carota[2]--Queen Anne's lace

Cornaceae

Cornus rugosa--Round-leaf dogwood

Caprifoliaceae

Viburnum opulus[2]--High-bush cranberry

Viburnum sp.--Viburnum

Lonicera X *bella*[2]--Hybrid honeysuckle

Compositae

Solidago ulmifolia--Elmleaf goldenrod

Aster lateriflorus--Calico aster

Total number of plant species: 23
Number of alien, or non-native, plant species: 7 (30%)

This approximately 11.8-acre plant community area consists of second growth southern wet-mesic to mesic hardwoods. Disturbances to this area include past timber cutting and clear cutting for proposed roads. No federal- or state-designated rare, threatened, or endangered species were observed during the field inspection.

---

[1]Planted tree species.

[2]Alien, or non-native, plant species.

[3]Dominant tree species.

[4]Pole-size trees.

Plant Community Area No. 3

Typhaceae

Typha latifolia[1]--Broad-leaved cat-tail

Typha angustifolia[1]--Narrow-leaved cat-tail

Gramineae

Phalaris arundinacea[1,2]--Reed canary grass

Salicaceae

Populus tremuloides[3]--Quaking aspen

Populus deltoides[3]--Cottonwood

Salix babylonica[2,3]--Weeping willow

Salix nigra--Black willow

Salix interior--Sand-bar willow

Ulmaceae

Ulmus americana[3]--American elm

Urticaceae

Urtica dioica--Stinging nettle

Polygonaceae

Polygonum pensylvanicum--Pinkweed

Aceraceae

Acer saccharinum[3]--Silver maple

Acer negundo[3]--Boxelder

Cornaceae

Cornus amomum--Silky dogwood

Compositae

Solidago gigantea--Giant goldenrod

Aster simplex--Marsh aster

Total number of plant species: 16
Number of alien, or non-native, plant species: 2 (13%)

This approximately 7.8-acre wetland plant community area consists of shallow marsh and fresh (wet) meadow. Disturbances to this plant community include past agricultural activities, ditching, and past dumping. No federal- or state-designated rare, threatened, or endangered species were observed during the field inspection.

---

[1]Co-dominant plant species.

[2]Alien, or non-native, plant species.

[3]Growing along the wetland edge.

Plant Community Area No. 4

Gramineae

Phalaris arundinacea[1,2]--Reed canary grass

Cyperaceae

Scirpus cyperinus--Wool sedge

Salicaceae

Salix interior[3]--Sand-bar willow

Ulmaceae

Ulmus americana--American elm

Polygonaceae

Polygonum pensylvanicum--Pinkweed

Amaranthaceae

Amaranthus retroflexus[2]--Redroot pigweed

Rosaceae

Rosa multiflora[2]--Multiflora rose

Cornaceae

Cornus stolonifera[1,3]--Red-osier dogwood

Oleaceae

Fraxinus pennsylvanica--Green ash

Asclepiadaceae

Asclepias incarnata--Marsh milkweed

Caprifoliaceae

Lonicera X bella[2,3]--Hybrid honeysuckle

Compositae

Solidago gigantea--Giant goldenrod

Aster simplex--Marsh aster

Total number of plant species: 13
Number of alien, or non-native, plant species: 4 (31%)

This approximately 1.0-acre wetland plant community area consists of fresh (wet) meadow with shrub-carr along the wetland edge. Disturbances to this wetland plant community area include past agricultural activities. No federal- or state-designated rare, threatened, or endangered species were observed during the field inspection.

---

[1]Co-dominant plant species.

[2]Alien, or non-native, plant species.

[3]Growing along the wetland edge.

Plant Community Area No. 5

Gramineae

Setaria sp.[1]--Foxtail grass

Zea mays[1,2]--Domestic corn

Amaranthaceae

Amaranthus retroflexus[1]--Redroot pigweed

Malvaceae

Abutilon theophrasti[1]--Velvet-leaf

Total number of plant species: 4
Number of alien, or non-native, plant species: 4(100%)

This approximately 14.0-acre plant community area consists of plowed corn field. Disturbance to this area includes plowing for row crop uses. No federal- or state-designated rare, threatened, or endangered species were observed during the field inspection.

---

[1]Alien, or non-native, plant species.

[2]Planted.

Plant Community Area No. 6

Gramineae

Bromus intermis[1]--Smooth brome grass

Poa pratensis--Kentucky blue grass

Rosaceae

Potentilla simplex--Old field cinquefoil

Rubus occidentalis--Black raspberry

Crataegus sp.--Hawthorn

Aceraceae

Acer negundo--Boxelder

Umbelliferae

Daucus carota[1]--Queen Anne's lace

Oleaceae

Fraxinus pennsylvanica[2]--Green ash

Scrophulariaceae

Linaria vulgaris[1]--Butter-and-Eggs

Caprifoliaceae

Lonicera sp.[1]--Honeysuckle

Compositae

Aster pilosus--Frost aster

Total number of plant species: 11
Number of alien, or non-native, plant species: 4 (36%)

This approximately 25.0-acre plant community area consists of old field. Disturbances to this area include past agricultural uses. No federal- or state-designated rare, threatened, or endangered species were observed during the field inspection.

---

[1]Alien, or non-native, plant species.

[2]Sapling tree.

Plant Community Area No. 7

Typhaceae

Typha latifolia--Broad-leaved cat-tail

Typha angustifolia--Narrow-leave cat-tail

Gramineae

Phalaris arundinacea[1]--Reed canary grass

Salicaceae

Salix interior--Sand-bar willow

Ulmaceae

Ulmus americana--American elm

Cornaceae

Cornus stolonifera--Red-osier dogwood

Oleaceae

Fraxinus pennsylvanica--Green ash

Compositae

Solidago gigantea--Giant goldenrod

Aster simplex--Marsh aster

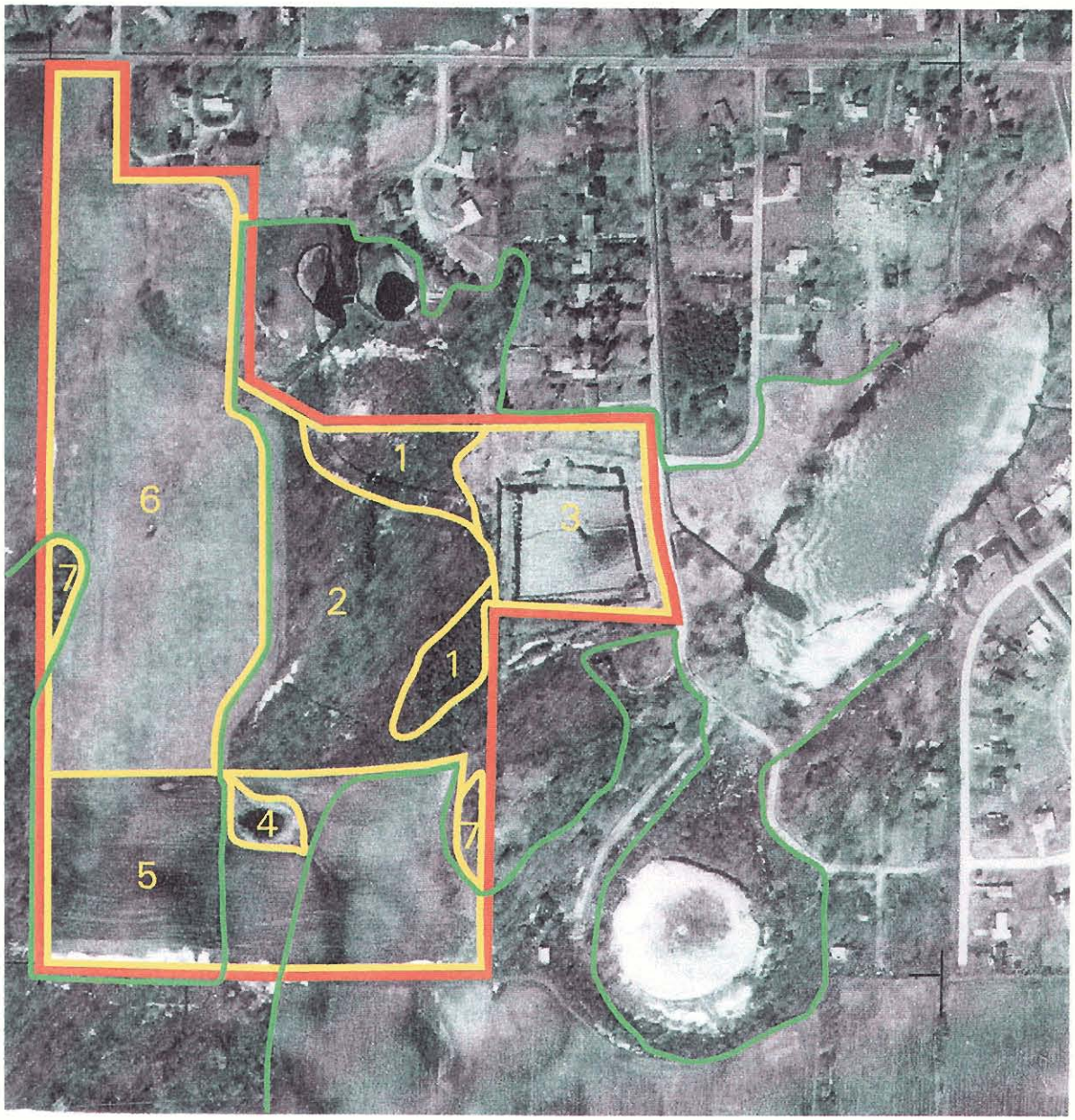
Total number of plant species: 9
Number of alien, or non-native, plant species: 1 (11%)

This approximately 1.0-acre wetland plant community area consists of shallow marsh, fresh (wet) meadow, and southern wet to wet-mesic hardwoods. Disturbance to this wetland plant community area includes past agricultural activities. No federal- or state-designated rare, threatened, or endangered species were observed during the field inspection.

---

[1]Alien, or non-native, plant species.

Exhibit B



LEGEND

PARCEL BOUNDARY

PLANT COMMUNITY AREA AND NUMBER

SECONDARY ENVIRONMENTAL CORRIDOR

N

GRAPHIC SCALE

0 150 300 FEET

Source: SEWRPC.

Exhibit C

Source: SEWRPC.

Appendix C

AN AQUATIC PLANT MANAGEMENT PLAN FOR THE KELLY LAKES, MILWAUKEE AND WAUKESHA COUNTIES, WISCONSIN

INTRODUCTION

The aquatic plant management plan is an integral part of the Kelly Lakes Protection Plan, and represents an important element of the ongoing commitment of the Kelly Lakes Association, City of New Berlin, and Village of Hales Corners to sound environmental management with respect to the Lakes. The aquatic plant management portion of the lake management plan was prepared between 1997 and 1999 by the Regional Planning Commission, and is based on field surveys conducted by Commission staff during 1997 and 1998. This plan follows the format adopted by the Wisconsin Department of Natural Resources for aquatic plant management plans pursuant to Chapters NR 103 and NR 107 of the *Wisconsin Administrative Code*. Its scope is limited to those management measures which can be effective in the control of aquatic plant growth; those measures which can be readily undertaken by the Association in concert with the riparian residents; and those measures which will directly affect the use of Upper Kelly Lake.

This report is comprised of seven main sections:

1. A set of aquatic plant management objectives;
2. A brief description of the Lake and its watershed;
3. A statement of the current use restrictions and the need for aquatic plant management in Upper Kelly Lake;
4. An evaluation of alternative means of aquatic plant management;
5. A description of the recommended plan;
6. A description of the equipment needs for the recommended plan; and
7. A recommended means of monitoring and evaluating the efficacy of the plan and equipment.

STATEMENT OF AQUATIC PLANT MANAGEMENT GOALS AND OBJECTIVES

The goals and objectives of the Kelly Lakes Association, developed in consultation with the City of New Berlin and Village of Hales Corners, are to:

1. Effectively control the quantity and density of aquatic plant growths in portions of the Upper Kelly Lake basin to enhance water-related recreational activities; to improve the aesthetic character of the resource; and to preserve and enhance the overall value of the waterbody;
2. Contribute to overall conservation and wise use of Upper Kelly Lake through the environmentally sound management of vegetation, fish and wildlife populations in and around the Lakes; and,
3. Promote a high-quality, water-oriented urban residential setting with recreational and aesthetic opportunities for residents and visitors of Upper Kelly Lake.

UPPER KELLY LAKE AND ITS WATERSHED CHARACTERISTICS

Upper Kelly Lake is a 12-acre drainage lake located in the southeastern portion of the City of New Berlin in Waukesha County and western portion of the Village of Hales Corners in Milwaukee County as shown on Map C-1. The Whitnall Park Creek forms the principle outflow of Upper Kelly Lake. Upper Kelly Lake has a single basin with a total tributary drainage area of about 983 acres.

Land Use and Shoreline Development

Residential land uses occupy almost all of the upland portions of the shorelands of the Kelly Lakes, as shown on Map C-2. With the exception the wetland areas located on the southern and western shorelines of Upper Kelly Lake and the small dairy farm on the northwestern shoreline of the Lake, residential land uses occupy the major portion of the shoreland of Upper Kelly Lake. Public access to the Lakes is provided by a walk-in access at the City of New Berlin park site located at the southern end of Upper Kelly Lake, and a public recreational boating launch site located on the northeastern side of the Lake in the Village of Hales Corners. Parking facilities are not provided at this launch site. A majority of the Upper Kelly Lake shoreline remains in a natural condition without shoreline protection structures. However, small sections of the shoreline of the Lake were protected with riprap, as shown on Map C-3. Under buildout conditions, conversion of the majority of the remaining rural lands, excepting wetlands and woodlands comprising the secondary environmental corridor lands and isolated natural resource area, and the portion of the Valley View Park, within the drainage area tributary to the Kelly Lakes, to urban land uses is envisioned in the adopted regional land use plan and Waukesha County development plan.[1] Infilling of existing platted lots and additional low-density, single-family residential development within the tributary drainage area of the Lakes is expected to occur.

Aquatic Plants, Distribution and Management Areas

A survey of aquatic plants within the Kelly Lakes was conducted by Commission staff during June 1997. The results of this survey is tabulated in Table C-1, and a tabulation of the ecological significance of the plants determined to be present in each of the Lakes is presented in Table C-2. The results of the surveys also are graphically depicted on Map C-4. Illustrations of the common aquatic plants found in Upper and Lower Kelly Lakes are included in Appendix A.

The flora of the Upper Kelly Lake basin was relatively impoverished compared with that of the wetlands adjacent to the southwest corner of the Upper Kelly, and the wetlands connecting Upper Kelly and Lower Kelly Lakes. Ten submergent and two floating-leaved aquatic plant species were recorded within the Upper Kelly Lake basin. The Lake was dominated by coontail, *Ceratophyllum demersum*, which can pose recreational use problems when it is abundant, especially if it grows to the water surface. Several of the pondweeds, which are a pollution tolerant species normally dominant or subdominant in disturbed ecosystems,[2] including *Potamogeton crispus*, *P. pectinatus*, and *P. zosterformis*, as well as white and yellow water lilies, were common to abundant throughout the Lake. Filamentous algae were present in the northeastern corner of the Lake. Eurasian water milfoil, *Myriophyllum spicatum*, also was present and widespread in Upper Kelly, and was especially dense in the shallower areas near the public access site. Eurasian water milfoil, one of the eight milfoil species found in Wisconsin, is an exotic, or nonnative species, known to have an incredible ability to regenerate. This exotic species often outcompetes the native aquatic vegetation of lakes in Southeastern Wisconsin, reducing the

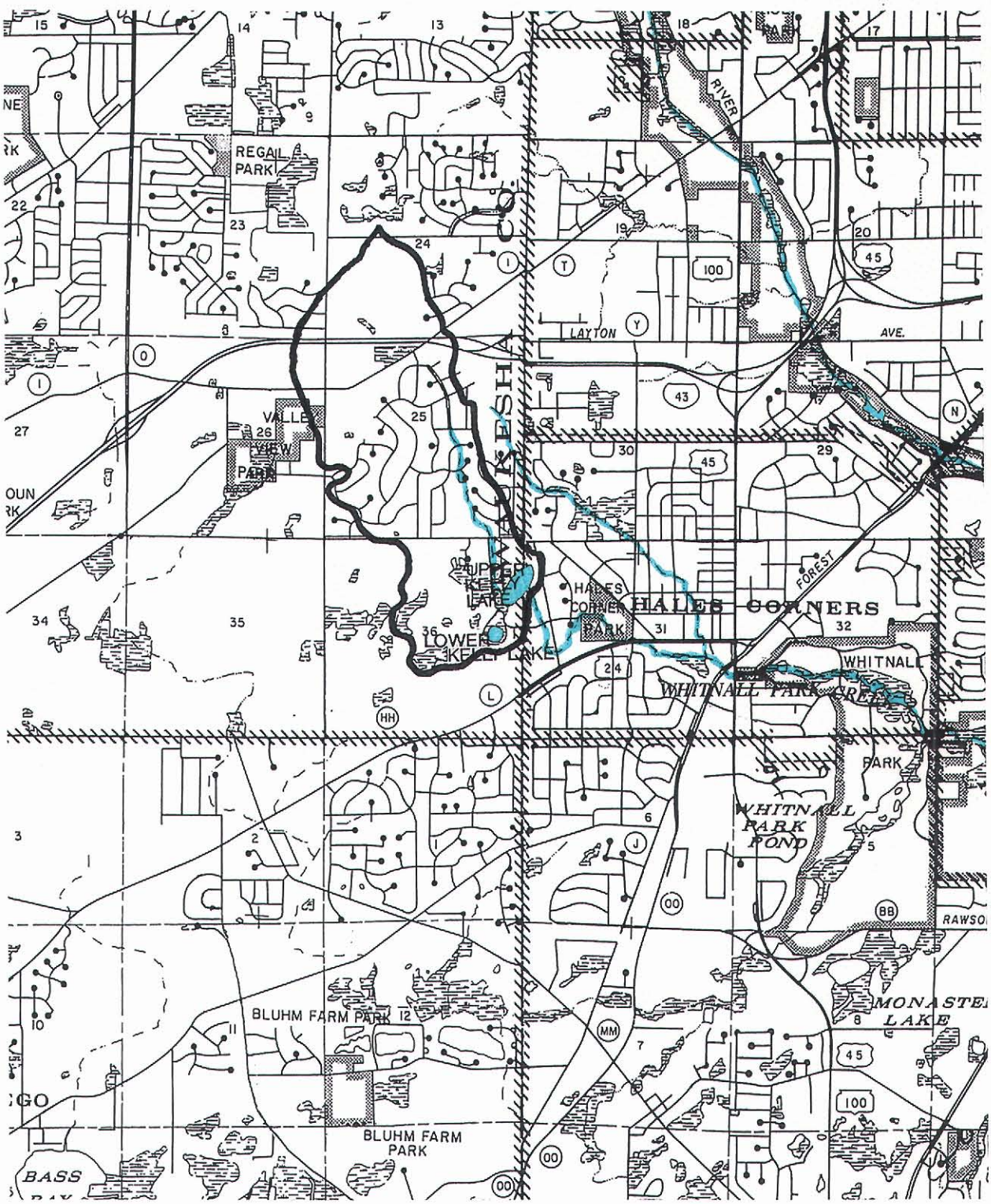
---

[1] *SEWRPC Planning Report No. 40,* A Regional Land Use Plan for Southeastern Wisconsin—2010, *January 1992; and SEWRPC Community Assistance Planning Report No. 209,* A Development Plan for Waukesha County, Wisconsin, *August 1996.*

[2] *G.J. Davis and M.M. Brinson,* Responses of Submersed Vascular Plant Communities to Environmental Change, *Fish and Wildlife Service Publication No. OBS-80/42, August 1980.*

Map C-1

LOCATION OF UPPER AND LOWER KELLY LAKES



LEGEND

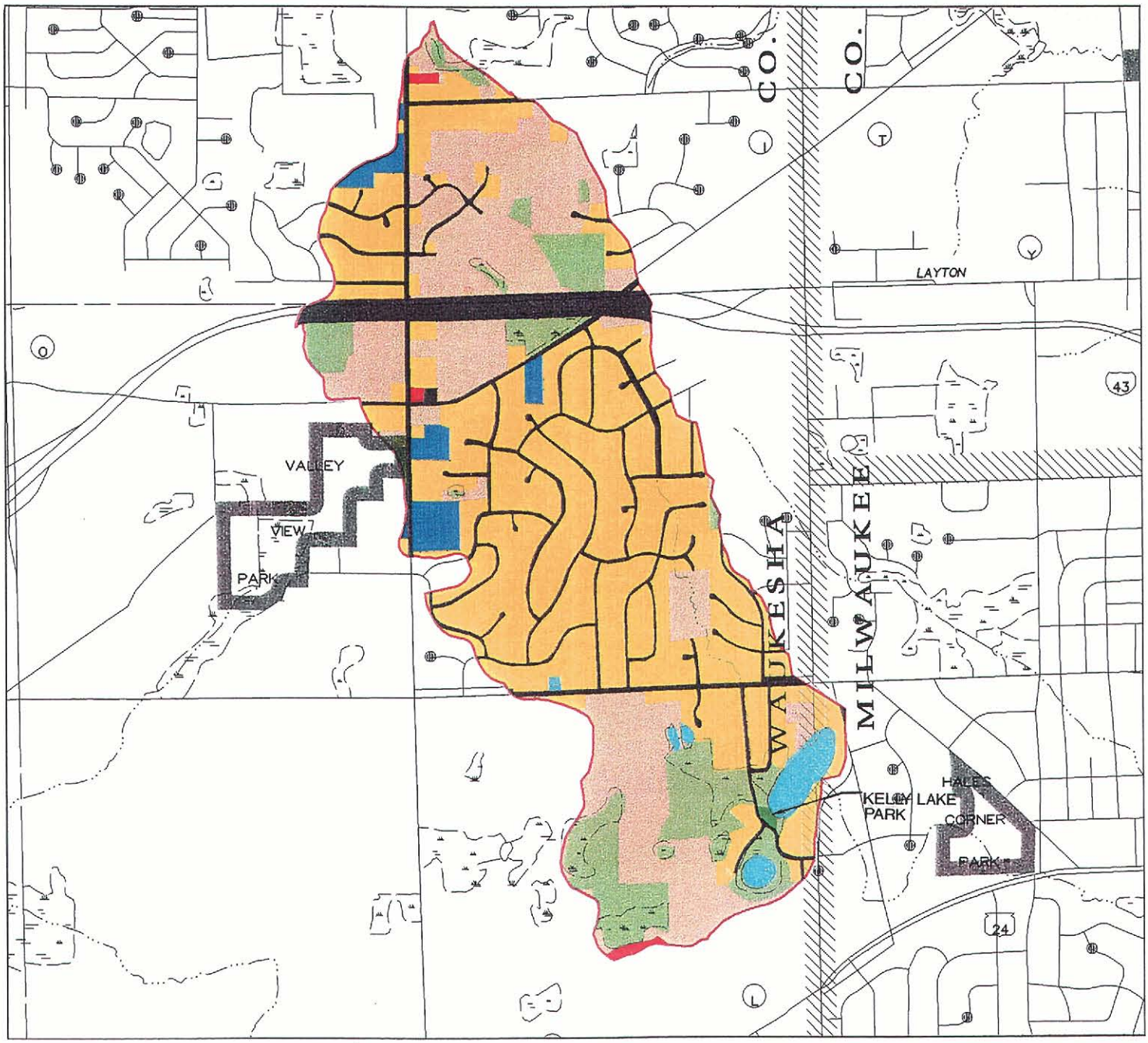
DRAINAGE AREA TRIBUTARY TO UPPER AND LOWER KELLY LAKES

GRAPHIC SCALE
0 2000 4000 FEET

Source: SEWRPC.

Map C-2

GENERALIZED LAND USE WITHIN THE TOTAL TRIBUTARY DRAINAGE AREA TO THE KELLY LAKES: 1990



LAND USE CATEGORIES

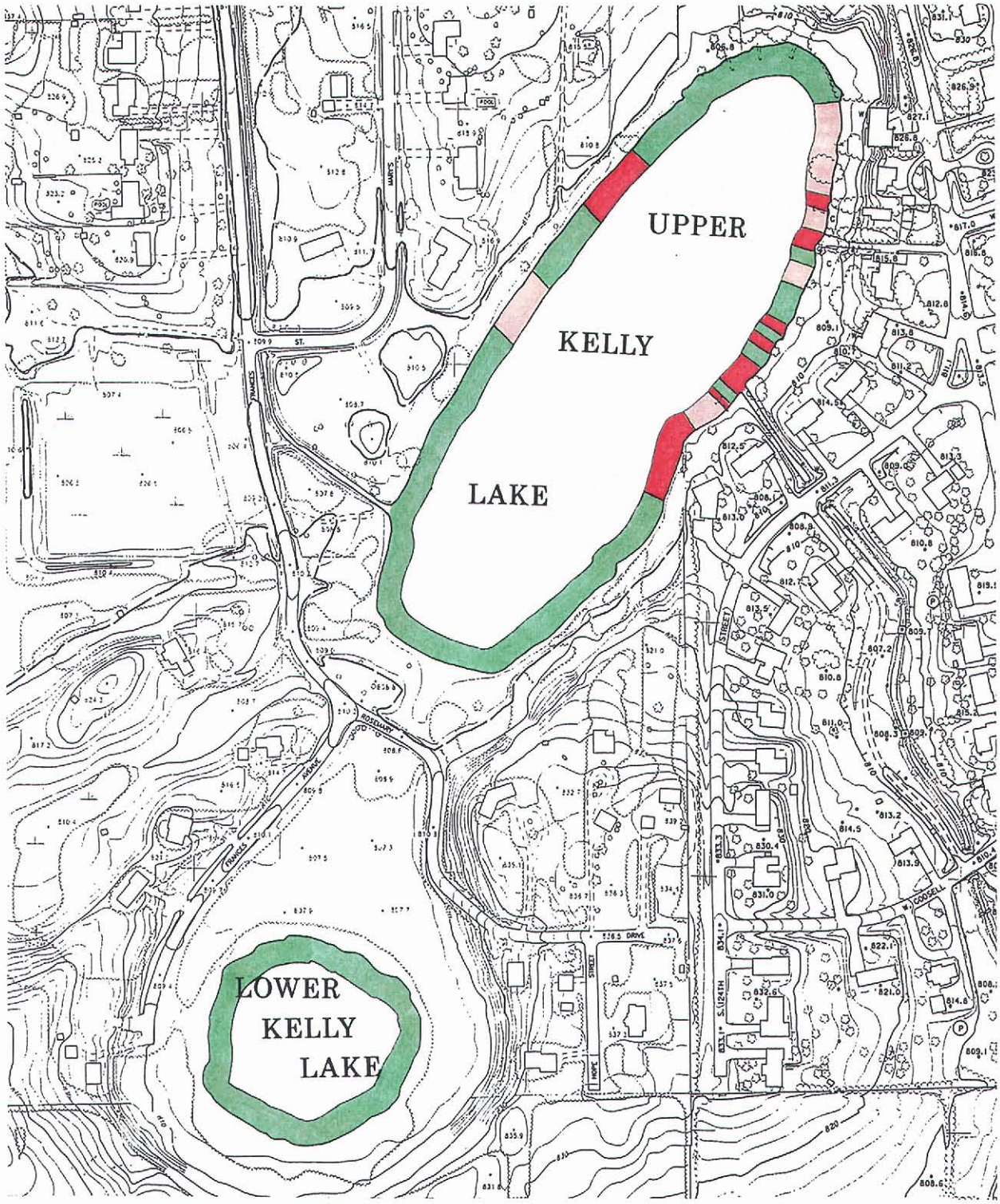
- Single–family residential
- Multi–family residential
- Commercial
- Industrial
- Transportation, communications, and utilities
- Governmental and institutional
- Recreation
- Surface water
- Wetlands and woodlands
- Agricultural, unused, and other open lands
- Extractive and landfill

0 2000
Scale in feet

Source: SEWRPC.

Map C-3

SHORELINE PROTECTION CONDITIONS ON UPPER AND LOWER KELLY LAKES: 1997



Source: SEWRPC.

Table C-1

FREQUENCY OF OCCURRENCE AND DENSITY RATINGS OF SUBMERGENT PLANT SPECIES IN UPPER KELLY LAKE: JUNE 1997

Plant Species	Sites Found	Frequency of Occurrence (percent)	Density at Sites Found	Density in Whole Lake
Ceratophyllum demersum (coontail)	39	97.5	3.56	3.48
Chara vulgaris (muskgrass)	5	12.5	1.80	0.23
Elodea canadensis (waterweed)	2	5.0	1.00	0.05
Myriophyllum spp. (native milfoil)	1	2.5	2.00	0.05
Myriophyllum spicatum (Eurasian water milfoil)	20	50.0	2.10	1.05
Potamogeton crispus (curly-leaf pondweed)	14	35.0	2.36	0.83
Potamogeton pectinatus (sago pondweed)	9	22.5	1.78	0.40
Potamogeton zosterformis (flat-stemmed pondweed)	6	15.0	2.50	0.38
Vallisneria americana (water celery)	1	2.5	1.00	0.03
Vallisneria sp.(water celery)	3	7.5	1.67	0.13

NOTE: There were 40 sampling points.

Source: SEWRPC.

biodiversity of the lakes, and degrading the quality of fish and wildlife habitats.[3] It has also been known to cause severe recreational use problems in lakes in the Southeastern Wisconsin Region. All of these plants are indicative of a disturbed lake ecosystem. This is supported by the urbanized surroundings of the Kelly Lakes, and the results of wetland surveys conducted by Commission staff in the areas surrounding the Kelly Lakes. These terrestrial systems also showed significant levels of previous disturbance.

Fisheries, Wildlife and Waterfowl

The most recent electrofishing survey,[4] conducted by Wisconsin Department of Natural Resources staff on Upper Kelly Lake during 1993, supported 1969 observations that panfish appeared to be relatively few in number and slow growing, and that carp were present in the Lake.[5] The 1993 survey results indicated that panfish remained small but were more numerous than during the 1969 survey. Likewise, carp continued to be present and large, but did not appear to be over-abundant. Largemouth bass, the only gamefish species known to be present in Upper

[3] *Wisconsin Department of Natural Resources,* Eurasian Water Milfoil in Wisconsin: A Report to the Legislature, *1993.*

[4] *E.R. Schumacher and S. Beyler, DNR Memorandum No. 3600,* Single-run Electrofishing Survey on Upper Kelly Lake, *May 1993.*

[5] *D. Fago, Wisconsin Department of Natural Resources Report No. 148,* Retrieval and Analysis Used in Wisconsin's Statewide Fish Distribution Survey, *Second Edition, December 1988.*

Table C-2

POSITIVE ECOLOGICAL SIGNIFICANCE OF AQUATIC PLANT SPECIES PRESENT IN UPPER AND LOWER KELLY LAKES

Aquatic Plant Species Present	Relative Abundance[a]	Ecological Significance[b]
Ceratophyllum demersum (coontail)	Abundant	Provides good shelter for young fish and supports insects valuable as food for fish and ducklings
Chara vulgaris (muskgrass)	Common	Excellent producer of fish food, especially for young trout, bluegill, and small and largemouth bass; stabilizes bottom sediments; and has softening effect on the water by removing lime and carbon dioxide
Elodea canadensis (waterweed)	Scarce	Provides shelter and support for insects valuable as fish food
Lemna minor (lesser duckweed)	Scarce	Provides important food for wildfowl and attracts small aquatic animals
Myriophyllum spp. (native milfoil)	Common	Provides valuable food and shelter for fish; fruits eaten by many wildfowl
Myriophyllum spicatum (Eurasian water milfoil)	Common	None known
Nuphar sp. (yellow water lily)	- -[c]	Leaves, stems, and flowers are eaten by deer; roots eaten by beaver and porcupine; seeds eaten by wildfowl; leaves provide harbor to insects, in addition to shade and shelter for fish
Nymphaea tuberosa (white water lily)	- -[c]	Provides shade and shelter for fish; seeds eaten by wildfowl; rootstocks and stalks eaten by muskrat; roots eaten by beaver, deer, moose, and porcupine
Potamogeton spp.(pondweeds)	Scarce	Provides food, shelter and shade for some fish and food for wildfowl
Potamogeton amplifolius (large-leaf pondweed)	Scarce	Provides cover for panfish, largemouth bass, muskellunge, and northern pike; nesting grounds for bluegill; supports insects valuable as food for fish and ducklings
Potamogeton crispus (curly-leaf pondweed)	Common	Provides food, shelter and shade for some fish and food for wildfowl
Potamogeton pectinatus (sago pondweed)	Scarce	This plant is the most important pondweed for ducks, in addition to providing food and shelter for young fish
Potamogeton praelongus (white-stemmed pondweed)	Scarce	Provides feeding grounds for muskellunge; also good food producers for trout; good food producer for ducks
Potamogeton zosterformis (flat-stemmed pondweed)	Common	Provides some cover for bluegills, perch, northern pike, and muskellunge; food for waterfowl; supports insects valuable as food for fish and ducklings
Ranunculus sp. (water buttercup)	- -[c]	Provides food for trout, upland game birds and wildfowl
Typha augustafolia (cattail)	- -[c]	Supports insects; stalks and roots important food for muskrat and beaver; atracts marsh birds, wildfowl, and songbirds, in addition to being used as spawning grounds by sunfish and shelter for young fish
Vallisneria sp. (water celery)	Scarce	Provides good shade and shelter, supports insects, and is valuable fish food
Vallisneria americana (water celery)	Scarce	Provides good shade and shelter, supports insects, and is valuable fish food

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

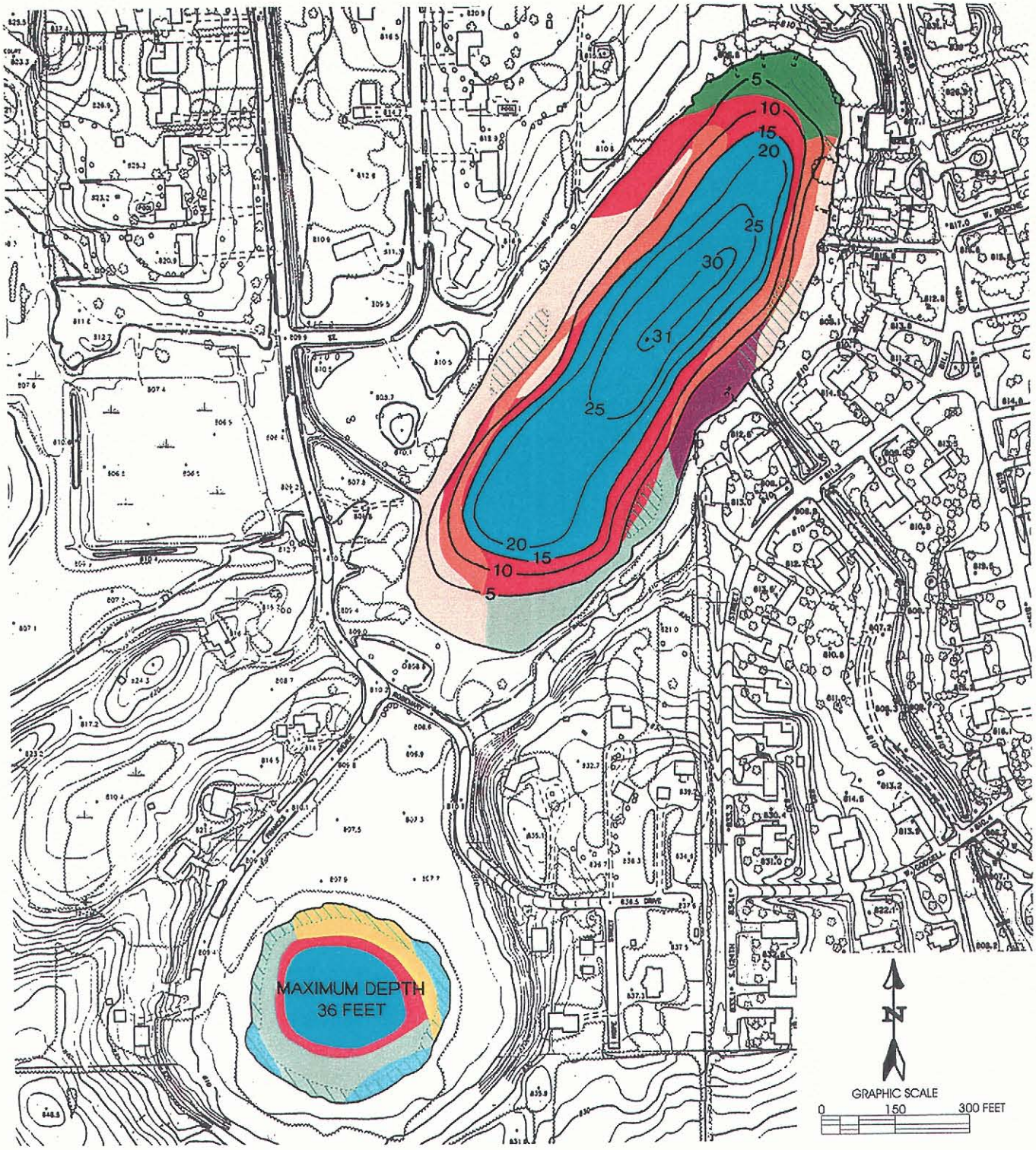
[b]Information obtained from A Manual of Aquatic Plants by Norman C. Fassett and Guide to Wisconsin Aquatic Plants, Wisconsin Department of Natural Resources.

[c]Not measurable using the Jesson and Lound Survey Technique for Submerged Aquatic Plants.

Source: SEWRPC.

Map C-4

AQUATIC PLANT COMMUNITY DISTRIBUTION IN UPPER AND LOWER KELLY LAKES: 1997



LEGEND

- WATER LILIES
- COONTAIL
- COONTAIL, MUSKGRASS, EURASIAN WATER MILFOIL, SAGO, PONDWEED, FLAT-STEMMED PONDWEED, AND NATIVE MILFOIL
- COONTAIL, SAGO PONDWEED, FLAT-STEMMED PONDWEED, NATIVE MILFOIL, DUCKWEED, AND POTAMOGETON SPP.
- COONTAIL, MUSKGRASS, EURASIAN WATER MILFOIL, FLAT-STEMMED PONDWEED, NATIVE MILFOIL, WILD CELERY, DUCKWEED, AND POTAMOGETON SPP.
- COONTAIL, EURASIAN WATER MILFOIL, SAGO PONDWEED, CURLY-LEAF PONDWEED, AND WATERWEED
- COONTAIL, MUSKGRASS, EURASIAN WATER MILFOIL, SAGO PONDWEED, FLAT-STEMMED PONDWEED, CURLY-LEAF PONDWEED, AND WILD CELERY
- COONTAIL, EURASIAN WATER MILFOIL, AND CURLY-LEAF PONDWEED
- COONTAIL, MUSKGRASS, EURASIAN WATER MILFOIL, CURLY-LEAF PONDWEED, WILD CELERY
- DEPTH GREATER THAN 20 FEET

Source: SEWRPC.

Kelly Lake, were small and scarce. However, lake chubsuckers, an important forage fish and a Wisconsin threatened species, appeared in good numbers during both surveys. Other species present in order of dominance included bluegill, pumpkinseed, black crappie, yellow perch, warmouth, green sunfish, golden shiner, yellow bullhead, grass pickerel, and white sucker.

Given the single-family residential nature of the immediate shorelands of the Kelly Lakes and its highly urban location, it is likely that the wildlife community is comprised of small upland game animals, such as rabbit and squirrel; predators, such as fox and raccoon; marsh furbearers, such as muskrat; migratory and resident song birds; marsh birds, such as redwing blackbird and great blue heron; raptors, such as great horned owl and red-tailed hawk; and waterfowl. White-tailed deer have been reported in the area. The character of wildlife species, along with the nature of the habitat present in the planning area has undergone significant change since the time of European settlement and the subsequent clearing of forests, plowing of the prairie, and draining of wetlands for agricultural purposes. Modern practices that adversely affect wildlife and wildlife habitat include: the excessive use of fertilizers and pesticides, road salting, heavy traffic, the introduction of domestic animals, and the fragmentation and isolation of remaining habitat areas for urban and agricultural uses.

Recreation
The Kelly Lakes are multi-purpose recreational use waterbodies serving many forms of recreation, including boating, swimming, and fishing during the summer months, and cross-country skiing, snowmobiling, ice fishing, ice skating and, occasionally, "polar bear" swimming during the winter months. The Lakes are used year round as visual amenities—walking, bird-watching, and picnicking being popular passive recreational uses of the waterbody.

Recreational boating access to Upper Kelly Lake is limited at present to one boat launch site on the northeast corner of the Lake, off of Kurtz Road, as shown on Map C-5. There is no public parking currently provided at this site. Walk-in access to Upper Kelly Lake is available at a City Park in New Berlin, as shown on Map C-5. A boat survey conducted by Commission staff during June 1998 indicated that 16 boats were either moored in the water or stored on land adjacent to Upper Kelly Lake. The types of boats included paddleboats, rowboats, canoes and sailboats.

Local Ordinances
Based upon the constraints imposed by the limited open water acreage of Upper Kelly Lake, motorized vessels operated on that waterbody are not permitted to exceed no-wake speeds. Neither the Village of Hales Corners nor the City of New Berlin have boating ordinances. Boating traffic on both Lakes is governed by state law as set forth in Chapter 30, *Wisconsin Statutes*.

USE RESTRICTIONS IMPOSED BY AQUATIC PLANTS

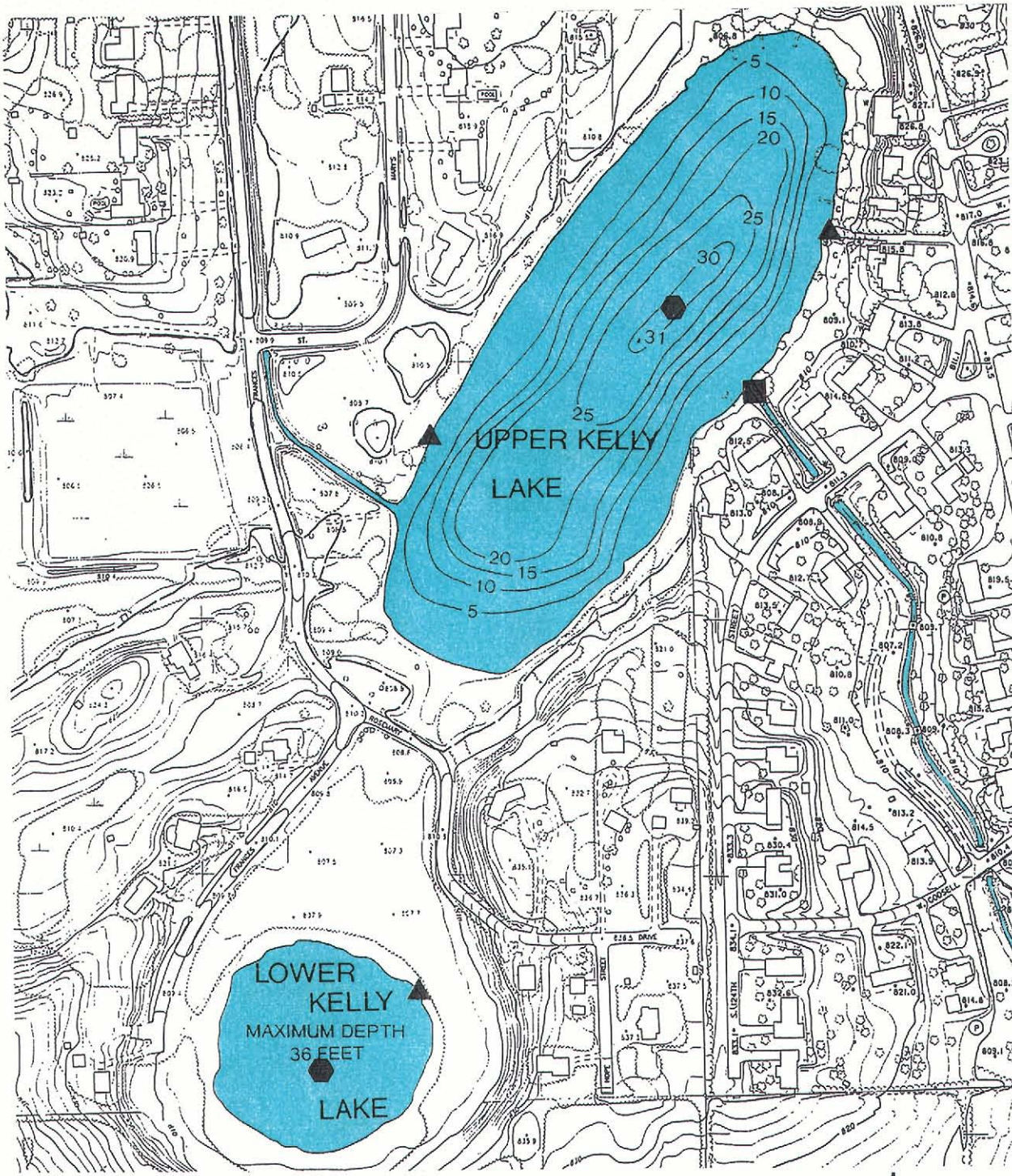
Excessive plant growth in the main basin of Upper Kelly Lake impedes boating traffic. In particular, excessive plant growth in the riparian zone makes access to the open water difficult without some sort of plant control strategy. Plant growth recorded by SEWRPC staff exceeded a density rating of 2.5 (moderate density, at least one species present in quantities rated common to abundant) at most sites sampled along the waterbody, principally those having the heaviest infestations of the plants described above, including *Ceratophyllum demersum*. The results from this survey are shown in Table C-1. Such dense growths also restrict shoreline angling and swimming, and can adversely affect riparian property values and the aesthetic enjoyment of the residents and visitors to the Lake.

PAST AND PRESENT AQUATIC PLANT MANAGEMENT PRACTICES

The residents of the Kelly Lakes, in conjunction with the City of New Berlin and the Village of Hales Corners, have long recognized the importance of informed and timely action in the management of the Kelly Lakes. The initial action in this regard was the formation of the Kelly Lakes Association, which provides the forum for many of the lake management activities of the Lakes' residents. The Association is currently enrolled in the water

Map C-5

BATHYMETRIC MAP OF UPPER AND LOWER KELLY LAKES



Source: SEWRPC.

quality monitoring program conducted under the auspices of the Wisconsin Department of Natural Resources Self-Help Monitoring Program. The Kelly Lakes Association has also undertaken a Phase I Planning Grant Program to identify issues of concern relating to the Kelly Lakes. An earlier study, prepared for Kelly Lakes Association by IPS Environmental and Analytical Services, Inc., identified six issues of concern to be addressed by the Kelly Lakes community, including programming in the following areas: public information and education, water quality assessment, watershed boundary delineation, aquatic plant management, phosphorus load estimation, and subdivision design and impact minimization.[6] That report led to the development and conduct of this Phase II, Chapter NR 190 Lake Management Planning Grant Program project, involving a more detailed investigation of aquatic plant, and stormwater and lake water quality, management issues of concern.

The Kelly Lakes Association also maintains an active public information program and in-lake aquatic plant management program. The Association initiated aquatic plant harvesting operations on Upper Kelly Lake during the summer of 1997. In addition, the Association holds an annual membership meeting, open to all Kelly Lakes community residents and interested parties, to answer questions and provide information to persons interested in the Kelly Lakes. An occasional newsletter is also published and distributed by the Association. The Association is a participant in the Wisconsin Department of Natural Resources Self-Help Monitoring Program. Reports of water clarity trends within the Lakes are a regular feature of the annual membership meetings.

ALTERNATIVE METHODS FOR AQUATIC PLANT CONTROL

Various aquatic plant management techniques—manual, mechanical, physical, and chemical—are potentially viable on Upper Kelly Lake.[7] Consideration has been given to each of these techniques. A number of these methods have been employed with varying success on Upper Kelly Lake in the past.

The presence of nonnative and nuisance aquatic plant species within the Lake basins and along their shorelines is indicative of a further loss of ecosystem integrity and function, affecting submergent and emergent lacustrine vegetation. Various in-lake management actions may be considered to mitigate and manage the consequences of aquatic habitat degradation in the Kelly Lakes. Generally, aquatic plant management measures, designed to minimize the environmental and recreational impacts of degraded habitat, are classed into four groups: physical measures which include lake bottom coverings and water level management; mechanical measures which include harvesting and manual removal; chemical measures which include the use of aquatic herbicides; and biological control measures which include the use of various organisms, including insects. Of these, chemical control and biological controls are regulated and require a State permit. Costs range from minimal for manual removal of plants using rakes and hand-pulling to upwards of $50,000 for the purchase of a mechanical plant harvester, for which the operational costs can approach $2,500 to $5,000 per year depending on staffing and operating policies. Harvesting is probably the measure best suited to large areas of open water, while chemical controls may be best suited for use in confined areas and for the initial control of invasive plants. Controlling Eurasian water milfoil by planting native plant species or by introducing the milfoil weevil, *Eurhychiopsis lecontei*, is largely experimental and currently subject to State permitting, while the use of other biological controls, such as grass carp, is prohibited in Wisconsin.

Aquatic Herbicides

Chemical treatment with aquatic herbicides is a short-term method of controlling heavy growths of aquatic macrophytes and algae. Chemicals are applied to the growing plants in either liquid or granular form. The

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[6] *IPS Environmental and Analytical Services, Inc.,* Phase I Lake Management Plan: Upper and Lower Kelly Lakes, Waukesha and Milwaukee Counties, Wisconsin, *March 1997.*

[7] *The various methods referred to in the text are described in more detail in U.S. Environmental Protection Agency Report No. EPA-440/4-90-006,* The Lake and Reservoir Restoration Guidance Manual, *August 1990.*

advantages of using chemical herbicides to control aquatic macrophyte growth are the relatively low-cost and the ease, speed, and convenience of application. However, 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. To minimize the collateral 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. Such applications also minimize the concentration and amount of chemicals used due to the colder water temperatures that enhance the herbicidal effects. Use of chemical herbicides in aquatic environments is subject to State permitting requirements. Because the Kelly Lakes do not have significant growths of nuisance plant species, chemical treatment is not recommended as a means of controlling aquatic plant growth.

Aquatic Plant Harvesting

Aquatic macrophytes may be mechanically harvested with specialized equipment consisting of a cutting apparatus, which cuts up to five feet below the water surface, and a conveyor system that picks up the cut plants and hauls them to shore. Mechanical harvesting appears to be a practical and efficient means of controlling plant growth as it removes the plant biomass and nutrients from a lake. Limited aquatic plant harvesting is currently carried out on Upper Kelly Lake. Because some plant fragments are lost during the harvesting process due to the hydrodynamic design of the harvester, the addition of a shoreline cleanup program to remove the plant fragments from the Lake should be considered.

The advantages of aquatic plant harvesting are that the harvester typically leaves enough plant material in the lake to provide shelter for fish and other aquatic organisms, and to stabilize the lake bottom sediments. The disadvantages of mechanical harvesting are that the harvesting operation may cause fragmentation and facilitate the spread of some plants, including Eurasian water milfoil, and may disturb loosely consolidated bottom sediments increasing turbidity and smothering fish breeding habitat and nesting sites. Disrupting the bottom sediments by plant removal also could increase the risk that an exotic species, such as Eurasian water milfoil, may colonize the disturbed area. Nevertheless, if done correctly and carefully, harvesting has been shown to be of benefit in ultimately reducing the regrowth of nuisance plants. There is currently no State permitting requirement for aquatic plant harvesting operations provided the harvested material is removed from the lake.

Operation of an harvester requires managerial oversight and a secure financial basis.[8] The formation of a public inland lake protection and rehabilitation district around the Kelly Lakes could be considered as one means of providing such an organizational basis.

Mechanical harvesting is considered a viable management option to continue as a control of aquatic plants in Upper Kelly Lake.

Manual Harvesting

Mechanical harvesting requires a minimum depth of water in which to operate the harvesting equipment. When the water depth is inadequate depth, as in shoreline areas, manual harvesting provides a reasonable alternative technique. Manual harvesting involves the use of specially designed rakes to remove aquatic plants. The advantage of the rakes is that they are relatively inexpensive, easy and quick to use, and immediately remove the plant material from the lake, without a waiting period. Removal of the plants from the lake avoids the accumulation of organic matter on the lake bottom, which adds to the nutrient pool that favors further plant

[8] *Wisconsin Lakes Partnership Publication No. FH-205-97,* Your Aquatic Plant Harvesting Program: A How-to Field Manual, *1997.*

growth. There is currently no State permitting requirement for manual aquatic plant harvesting provided the harvested material is removed from the lake.

Manual harvesting is recommended for use in small areas of Upper Kelly Lake, but is not recommended for use on Lower Kelly Lake unless nearshore aquatic plants around piers are perceived as a severe nuisance.

Biological Controls
An alternative approach to controlling nuisance plants, particularly Eurasian water milfoil, is biological control. Classical biological control techniques have been successfully used to control both nuisance plants and herbivorous insects.[9] Recent studies have shown that *Eurhychiopsis lecontei*, an aquatic weevil, has potential as a biological control agent for Eurasian water milfoil.[10] Based upon a reconnaissance conducted by the Wisconsin Department of Natural Resources during June 1997, this weevil appears to be naturally occurring in the Kelly Lakes. However, as very few studies have been completed using *Eurhychiopsis lecontei* as a means of aquatic plant management control, it is not recommended that it be added to the Lakes at this time.

Grass carp, *Ctenopharyngodon idella*, another potential biological control, are not permitted for use in Wisconsin.

Lake Bottom Covering
Lake bottom covers and screens provide limited control of rooted plants by creating a physical barrier which reduces or eliminates the amount sunlight available to the plants. Placement of bottom covers on the beds of inland lakes is subject to State permitting requirements. Due to the steeply sloping bathymetry of the Kelly Lakes, lake bottom coverings are not considered a viable plant management option.

Citizen Information and Education
In addition to these in-lake management measures, an ongoing campaign of community information will support the aquatic plant management program by encouraging the use of shoreland buffer strips, responsible use of household and garden chemicals, and adoption of environmentally friendly household and garden practices to minimize the input of nutrients from these riparian areas. Aquatic plant management usually centers on the eradication of nuisance aquatic plants for the improvement of recreational lake use. The majority of the public views all aquatic plants as "weeds" and residents often spend considerable time and money removing desirable plant species from a lake without considering the environmental impacts. Thus, public information is an important component of an aquatic plant management program. Posters and pamphlets are available from the University of Wisconsin-Extension and Wisconsin Department of Natural Resources that provide information about and illustrations of aquatic plants, detailing their importance in providing habitat and food resources aquatic environments, and explaining the need to control the spread of undesirable and nuisance plant species.

RECOMMENDED AQUATIC PLANT MANAGEMENT PLAN

Harvesting Plan
The recommended aquatic plant management plan consists of integrated uses of mechanical and manual harvesting design to minimize the negative impacts on the ecologically valuable areas of the Lake, while providing the control needed to achieve the desired recreational and aesthetic uses of the Lake. In order to

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

[10] *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.*

implement the recommended aquatic plant management program the following management actions are recommended:

1. The Kelly Lakes Association should continue its limited harvesting operations.

2. Monitoring of the Lakes and surrounding wetlands for the presence or spread of nuisance plant species such as Eurasian water milfoil and purple loosestrife should continue, with careful attention being paid to the presence of the *Eurhychiopsis lecontei*, an aquatic weevil species believed to control Eurasian water milfoil and naturally occurring in the Kelly Lakes.

3. In areas that are inaccessible to the harvester in Upper Kelly Lake, manual harvesting of plants around piers and docks is the recommended means of controlling milfoil and other nuisance species of plants in those areas given the small size of the Lake. In this regard, the Association 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. The rakes cost approximately $90 each, and do not require a permit for use. However, should milfoil be determined to reach nuisance proportions, the use of chemical herbicides could be considered, but should be limited to small areas. Early spring or late fall treatments to control the growth of Eurasian water milfoil have proven effective in other lakes in Southeastern Wisconsin and are recommended. Early spring herbicide treatments reduce the biomass subject to decomposition and limit the accumulation of organic materials on the Lake bottom.

4. It is recommended that an aquatic plant survey be conducted every three to five years in order to track the success of the current aquatic plant management program, as well as any other changes in the tributary drainage area that may affect the Kelly Lakes.

5. The Kelly Lakes Association, through an educational and informational program, should promote awareness of Lake residents, visitors, and watershed residents of good urban housekeeping practices, and the invasive nature of such exotic, nonnative species as Eurasian water milfoil and purple loosestrife. Participation in citizen-based control programs coordinated by the Wisconsin Department of Natural Resources and University of Wisconsin-Extension should be encouraged.

The recommended aquatic plant harvesting plan is graphically depicted on Map C-6. As indicated on the map, it is proposed that mechanical harvesting activities be restricted to depths greater than five feet for purposes of avoiding fish habitat and spawning areas, though boating access channels can be cut to the piers as long as the harvester leaves a minimum of two feet of vegetation standing. Because coontail (*Ceratophyllum demersum*) is the most abundant aquatic plant in Upper Kelly Lake, it is recommended that the harvester travel slowly in order to cut the plant, as coontail is a light and buoyant plant and will bend over if the harvester moves too quickly.

Depth of Harvesting and Treatment of Fragments

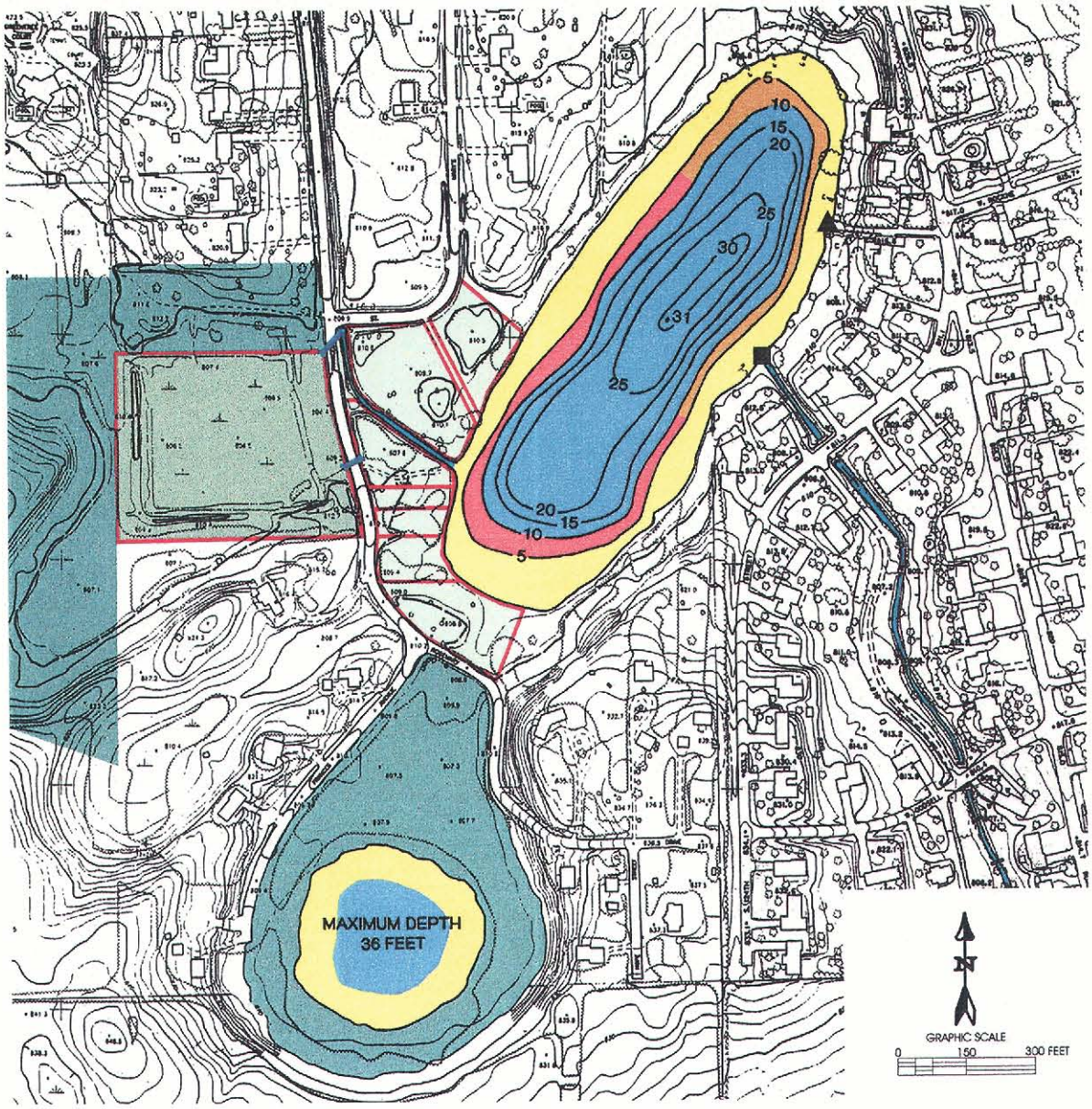
The Aquamarine H-5 aquatic plant harvester has a maximum cutting depth of five feet. It is not the intention of the owners or operators of the equipment to denude the Lake of aquatic plants. Sufficient plant materials will be retained in the Lake to minimize resuspension of lake bottom sediments and to maintain desirable plant communities, such as those dominated by the low-growing muskgrass, *Chara* sp. All plant cuttings and fragments should be collected by means of a program set up by the Kelly Lakes Association. This is extremely important for preventing the spread of Eurasian water milfoil. Fragments can be used by homeowners as garden mulch.

Buoyage

Temporary markers may be used to direct harvesting operations in the lake basin by marking the areas to be cut. However, the size of the Lake generally precludes the need for such buoys. The harvester operators will be provided with a laminated copy of the harvesting plan and made familiar with the plan and local landmarks to the degree necessary to carry out the plan without the use of the buoyage. Harvesting operations should be regularly supervised by Association members.

Map C-6

RECOMMENDED LAKE MANAGEMENT PLAN FOR KELLY LAKES



—15— WATER DEPTH CONTOUR IN FEET

▲ PUBLIC ACCESS SITE

■ WATER LEVEL CONTROL STRUCTURE

PROPERTY BOUNDARY

AQUATIC PLANT MANAGEMENT

EURASIAN WATER MILFOIL CONTROL AREA
HARVESTING: HIGH PRIORITY
CHEMICALS: LIMITED

HARVEST ACCESS LANES
HARVESTING: MODERATE PRIORITY
CHEMICALS: NONE

SHALLOW WATER HABITAT AREA
HARVESTING: NONE
CHEMICALS: NONE

DEEP WATER AREA: NO CONTROL

LAND USE MANAGEMENT

PROTECT ENVIRONMENTALLY VALUABLE AREAS

CREATE AN ECOLOGICAL CORRIDOR BETWEEN LAKES AND ALONG THE SOUTH-WEST SHORE OF UPPER KELLY LAKE:
-PROVIDE PUBLIC FISHING PIER

ACQUIRE EASEMENT FOR PUBLIC USES:
-RESTORE WETLAND FOR LAKE QUALITY PROTECTION

CONSTRUCT LOW FLOW STORMWATER DIVERSION/RETURN SYSTEM AND HIGH FLOW BYPASS

SHORELINE PROTECTION

- MAINTAIN EXISTING STRUCTURES
- PROTECT UNSTABLE AREAS, RESTORE SHORELAND WETLANDS

LAKE MANAGEMENT

- ESTABLISH PUBLIC INLAND LAKE PROTECTION AND REHABILITATION DISTRICT

Source: SEWRPC.

Harvesting Plant Material, Disposal, and Transfer Sites
Plant cuttings and fragments are currently disposed of on the farm owned by Mr. Donald Peffer. Composting remains the recommended method of disposing of aquatic plant cuttings. However, should this site become unavailable as a disposal site, either a new farm or the City of New Berlin compost site will have to be explored as alternative sites. Plant material is collected to avoid the leaching of nutrients back into the Lake and to minimize the visual degradation of the environment near the boat launching site.

Precautions to Protect Wildlife and Ecologically Valuable Areas
Operators will be provided with a laminated copy of the approved harvesting plan map, showing the limits and priorities of harvesting operations. A copy of these items should be kept on the harvester at all times. Operations should not take place in depths less than five feet, other than to cut boat access paths to piers, to prevent disturbance of fish habitat and spawning areas. Harvesting operations should leave at least two feet of vegetation in all areas to be cut, to minimize resuspension of the bottom sediments, and to allow low-growing native plants, such as muskgrass, to retain their competitive advantage over less-desirable invasive species, such as Eurasian water milfoil.

Public Information
It is the policy of the Kelly Lakes Association to maintain an active dialogue with the community. This dialogue is carried out through the medium of the public press, and in public fora through various Association meetings, public meetings, and other scheduled hearings.

EQUIPMENT NEEDS AND OPERATION

The Kelly Lakes Association currently owns and operates one Aquamarine H-5 harvester, with an anticipated 10-year life span. Replacement of this unit when necessary may be expected to cost about $50,000.

Maintenance Schedule, Storage, and Related Costs
Routine maintenance will be performed by the Kelly Lakes Association in accordance with the manufacturer's recommended maintenance schedule. Maintenance costs will be borne by the Kelly Lakes Association. Winter storage will be the responsibility of the Association.

Insurance Coverage
The Kelly Lakes Association currently holds an insurance policy worth $10,000 covering capital equipment and liability. The relevant certificates are held by the Association.

Operators, Training, and Supervision
The harvester will be owned and operated by the Kelly Lakes Association, who will be responsible for the day-to-day operations of the equipment. The Association will provide training as required.

EVALUATION AND MONITORING

Daily Record-Keeping Relating to the Harvesting Operation
Daily harvesting activities will be recorded by the operators of harvesting equipment in an operations log. An annual summary of the harvesting program will be submitted to the Kelly Lakes Association Board of Directors, or designated committee thereof, and made available to the public at that time. The summary will also be published at the annual meeting of the Association.

It is the intention of the Kelly Lakes Association to undertake a periodic, formal review of the harvesting program as set forth in the Protection Plan for the Kelly Lakes, a copy of which has been lodged with the Wisconsin Department of Natural Resources, Southeast Region office.

Daily Record-Keeping Relating to the Harvesters
Daily maintenance and service records showing engine hours, fuel consumed and oil used, will be recorded in an harvester operations log.

Appendix D

PROJECT DESCRIPTION FOR THE PROPOSED CHAPTER NR 191 LAKE PROTECTION GRANT LAND ACQUISITION PROGRAM FOR THE KELLY LAKES, MILWAUKEE AND WAUKESHA COUNTIES

INTRODUCTION

Upper Kelly Lake is a 12-acre lake located partially in the Village of Hales Corners in Milwaukee County and partially in the City of New Berlin in Waukesha County. The Lake is a drainage lake situated at the headwaters of the Root River system. Lower Kelly Lake, a three-acre lake located entirely in the City of New Berlin, is an internally drained seepage lake that drains through a series of wetlands and intermittent streams to Upper Kelly Lake. Both Lakes have been subjected to environmental stresses related to their urban location and urbanizing watershed, which have led to local concerns over water quality conditions. These concerns prompted the formation of a lake association around Upper and Lower Kelly Lakes.

The Kelly Lakes Association, Inc., a Chapter 181, *Wisconsin Statutes*, nonstock corporation has been instrumental since its foundation, and in conjunction with the City of New Berlin and Village of Hales Corners, in jointly requiring an environmental assessment of a proposed subdivision to be located south of Lower Kelly Lake. The Association has also been instrumental in the formulation of planning studies relating to the water quality of the two Lakes. This latter work was supported in part by Phase I and Phase II Chapter NR 190 Lake Management Planning Grants awarded to the Kelly Lakes Association in 1995 and 1997. The Phase I studies were conducted by IPS Environmental & Analytical Services and the Resources Management Group,[1] and the Phase II studies were conducted by the Southeastern Wisconsin Regional Planning Commission.[2] This latter plan recommended the acquisition and restoration of wetland areas, riparian to Upper Kelly Lake, for purposes of water quality protection. This grant application for land acquisition is a direct outcome of that recommendation. This application for Chapter NR 191 Lake Protection Grant funding is the result of that recommendation. The proposed land acquisition, set forth below, follows directly the format of Part E, Project Scope of the Grant application, Wisconsin Department of Natural Resources (WDNR) Form 8700-240 Rev. 10-95, including the required long-term land management plan, and is appended thereto.

SITE DESCRIPTION

The lands proposed to be acquired by the Kelly Lakes Association, Inc., include those lands situated in the riparian zone of Upper Kelly Lake at the point of discharge of the unnamed stream draining to the Lake, and those wetland areas, currently considered to be outlots of the Woodfield Park Subdivision immediate adjacent to the

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[1] *IPS Environmental & Analytical Services, Inc.*, Phase I Lake Management Plan, Upper and Lower Kelly Lakes, Waukesha and Milwaukee Counties, Wisconsin, *March 1997.*

[2] *SEWRPC Memorandum Report No. 135, draft,* A Lake Protection Plan for Upper and Lower Kelly Lakes, Milwaukee and Waukesha Counties, Wisconsin, *April 1999.*

unnamed stream. These lands are located immediately west of the Upper Kelly Lake inlet, along South Francis Avenue, and include a significant proportion of the lands within the 100-year recurrence interval floodway at the point of their debouchement to Upper Kelly Lake. The lands encompass approximately nine acres, or about 75 percent of the lake surface area of Upper Kelly Lake. These lands are situated within a secondary environmental corridor delineated by the Southeastern Wisconsin Regional Planning Commission, and include almost all of the lands riparian to Upper Kelly Lake that have been designated as Class I, high-value wildlife habitat by the Commission. The lands are currently vacant lands zoned as C-2 conservancy by the City of New Berlin. The northernmost three parcels have been considered to be buildable lots, although partially in the floodway of the unnamed stream flowing into Upper Kelly Lake, and the northernmost of these had been offered for sale and development prior to its acquisition by the Kelly Lakes Association. All three of these lots have been considered for development in recent years. Of the shoreline lands, approximately 450 feet of shoreland are included within the area proposed for acquisition. This area lies shoreward and adjacent to an area of the Lake designated as an ecologically valuable area in the lake protection plan. Upper Kelly Lake has adequate public access as defined in Chapter NR 1 of the *Wisconsin Administrative Code*.

RELATIONSHIP TO WATER QUALITY IMPROVEMENTS IN THE KELLY LAKES

The following actions, among others, are recommended in the lake protection plan for the Kelly Lakes and relate directly to the acquisition and protection of the riparian wetlands to Upper Kelly Lake for water quality protection purposes:

1. The Kelly Lakes Association should support the preservation and rehabilitation of the secondary environmental corridor lands in the Kelly Lakes tributary drainage area. These lands, and especially their associated wetland areas, are recommended to be maintained in essentially natural, open spaces uses through their incorporation into the stormwater management system and related drainageways, or inclusion in site plans as local parks, recreational trails, or open spaces; and restoration to reestablish their natural structure and function within the landscape.[3] Such preservation and rehabilitation should be promoted through the existing regulations and programs intended to protect such natural resources.

2. The Kelly Lakes Association, in cooperation with the City of New Berlin and the Wisconsin Department of Natural Resources, should consider the acquisition of the wetlands adjacent to the southwest portion of Upper Kelly Lake and the restoration of their structure and functioning for purposes of protecting lake water quality in Upper Kelly Lake. Such an action would enhance the ecological value of the Commission-delineated secondary environmental corridor within which the wetland system is located. Outright purchase, or the purchase of conservation easements, are possible options.

3. The City of New Berlin, as the principal local authority within the drainage area, should give special recognition to the Kelly Lakes as surface water features within their municipal jurisdiction, and incorporate specific actions within their stormwater management plan for the protection of the surface water quality of the Kelly Lakes.

4. The Kelly Lakes Association, in conjunction with the City of New Berlin and Village of Hales Corners, should jointly develop a detailed local level plan for the acquisition and restoration of the structure and function of the wetland ecosystems adjacent to the Kelly Lakes, including the restoration of the natural flooding regime within the wetland west of Frances Avenue and the relocation of municipal infrastructure to facilitate restoration of the wetland between Lower and

[3]*SEWRPC Community Assistance Planning Report No. 209,* A Development Plan for Waukesha County, Wisconsin, *August 1996.*

Upper Kelly Lakes on Rosemary Drive and the provision of adequate public recreational boating access to Upper Kelly Lake.

5. The City of New Berlin, pursuant to the adopted stormwater management plan, should consider the establishment of an approximately three-acre basin within a restored wetland ecosystem at the headwaters of Upper Kelly Lake to reduce phosphorus and sediment loads delivered to the Lake by up to 50 percent. Restoration of the wetland complex would be subject to State permitting requirements.

RELATIONSHIP TO OTHER LAKE MANAGEMENT EFFORTS

The residents of the Kelly Lakes, in conjunction with the City of New Berlin and the Village of Hales Corners, have long recognized the importance of informed and timely action in the management of the Kelly Lakes. The initial action in this regard was the formation of the Kelly Lakes Association, which provides the forum for many of the lake management activities of the Lakes' residents. The Association is currently enrolled in the water quality monitoring program conducted under the auspices of the Wisconsin Department of Natural Resources Self-Help Monitoring Program. The Kelly Lakes Association has also undertaken a Phase I Planning Grant Program to identify issues of concern relating to the Kelly Lakes. The management plan prepared for Kelly Lakes Association by IPS Environmental and Analytical Services, Inc., as part of the Phase I, Chapter NR 190 Lake Management Planning Grant Program project, identified six issues of concern to be addressed by the Kelly Lakes community, including programming in the following areas: public information and education, water quality assessment, watershed boundary delineation, aquatic plant management, phosphorus load estimation, and subdivision design and impact minimization.[4] That report led to the development and conduct of a Phase II, Chapter NR 190 Lake Management Planning Grant Program project, involving a more detailed investigation of aquatic plant, and stormwater and lake water quality, management issues of concern. The Phase II planning program resulted in the preparation of a lake protection plan for the Kelly Lakes, which documents the findings and recommendations of a study requested by the Kelly Lakes Association, examines existing and anticipated conditions and potential management problems of the Kelly Lakes, and presents a recommended plan for the resolution of these problems. This lake protection plan is consistent with the recommendations set forth in the adopted regional water quality management plan,[5] and with the relevant recommendations set forth in the adopted Root River watershed plan.[6]

The Kelly Lakes were found to be eutrophic, moderately deep water lakes of average quality located in close proximity to the Milwaukee metropolitan area and adjacent to an increasingly urban part of Waukesha County in which its tributary drainage area is almost entirely located. Surveys indicated that the Lakes and their tributary drainage area contain significant areas of ecological value, including numerous wetlands and high-quality wildlife habitat surrounding the Lakes.

The Kelly Lakes protection plan recommended actions be taken to limit further human impacts on the in-lake macrophyte beds and reduce human impacts on the ecologically valuable areas adjacent to the Lake and in its watershed. The development of adequate public parking to their access site to serve Upper Kelly Lake was also recommended. The plan recommended only limited aquatic plant management action, including selected manual removal and surveillance activities at this time, mainly in the cases where purple loosestrife and Eurasian water

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[4]*IPS Environmental and Analytical Services, Inc.,* Phase I Lake Management Plan: Upper and Lower Kelly Lakes, Waukesha and Milwaukee Counties, Wisconsin, *March 1997.*

[5]*SEWRPC Memorandum Report No. 93,* A Regional Water Quality Management Plan for Southeastern Wisconsin: An Update and Status Report, *March 1995.*

[6]*SEWRPC Planning Report No. 9,* A Comprehensive Plan for the Root River Watershed, *July 1966.*

milfoil are present, with the limited use of chemical treatment only to treat such species, if needed. Consideration of public acquisition of, or acquisition of conservation easements over, lands within the primary environmental corridors to ensure the protection and preservation of these ecologically valuable areas was also recommended.

The recommended plan included continuation of an ongoing program of public information and education providing riparian residents and lake users. For example, additional options regarding household chemical usage, lawn and garden care, shoreland protection and maintenance, and recreational usage of the Lakes should be made available to riparian householders, thereby providing riparian residents with alternatives to traditional alternatives and activities.

The plan recommended reestablishment of the natural structure and function of the wetland system immediately upstream of Upper Kelly Lake to more effectively control nutrient and sediment loading rates into the Lake from the tributary drainage area. Also, the plan recommended park relocation and enhancement of public recreational boating access opportunities as part of the restoration project.

While the recommended plan seeks to balance the demand for high-quality residential and recreational opportunities at the Kelly Lakes with the requirements for environmental protection, the Kelly Lakes Association is presently actively pursuing public participation opportunities relating to land use and stormwater management in the vicinity of the Kelly Lakes. Kelly Lakes Association Board of Directors members attend City of New Berlin Plan Commission and Public Works Committee meetings regarding the development of the plans and lands within the drainage area tributary to the Kelly Lakes. The Association was an active participant in the planning process with respect to the establishment of the Woodfield Park Subdivision and associated environmental corridor southwest of Upper Kelly Lake within the City of New Berlin. In like manner, the Association is currently an active participant in the public process relating to the preparation of a stormwater management plan for the City of New Berlin.

The Kelly Lakes Association also maintains an active public information program and in-lake aquatic plant management program. The Association initiated aquatic plant harvesting operations on Upper Kelly Lake during the summer of 1997. In addition, the Association holds an annual membership meeting, open to all Kelly Lakes community residents and interested parties, to answer questions and provide information to persons interested in the Kelly Lakes. An occasional newsletter is also published and distributed by the Association. The Association is a participant in the Wisconsin Department of Natural Resources Self-Help Monitoring Program. Reports of water clarity trends within the Lakes are a regular feature of the annual membership meetings.

PROJECT DESCRIPTION

A. Reason for the Proposed Project

Upper and Lower Kelly Lakes have experienced various water management problems in recent years, including variations in water quality potentially related, to some degree, to land use changes within the Lakes' watershed. A planning program, initiated during 1995 as part of a phased investigation and planning effort to develop a comprehensive lake management plan for the Kelly Lakes, focused on water quality related issues and development of baseline water quality information for Upper and Lower Kelly Lakes. This plan, summarized above, recommended the protection and rehabilitation of wetland areas adjacent to the Kelly Lakes as a primary means of resolving identified current and potential future water quality problems, especially those likely to impact Upper Kelly Lake.

This current project, proposed to be funded, in part, through an NR 191 Lake Protection Grant, is consistent with the recommendations set forth in the lake protection plan for Upper and Lower Kelly Lakes, and with the recently adopted City of New Berlin stormwater management plan.

B. Project Goals

The goals of the proposed planning project include the following:

1. To acquire through fee simple purchase and/or through conservation easements wetlands riparian to the debouchement of the unnamed stream discharging into Upper Kelly Lake.

2. To promote, through such ownership, the essential structure and function of these wetland areas to ensure positive water quality benefit to the downstream Upper Kelly Lake.

3. To facilitate the maintenance of wetland and wildlife habitat within the designated secondary environmental corridor riparian to Upper and Lower Kelly Lakes.

4. To encourage public knowledge and understanding of wetland ecosystems through the development of public informational programming, enhanced in part through public access to the lands proposed to be acquired, focused primarily on youth both within the educational systems of the City of New Berlin and Village of Hales Corners, and through the active participation of nongovernmental organizations such as the Boy Scouts of America and similar youth-oriented organizations. The Kelly Lakes Association, Inc., would catalyze this programming in consultation with relevant institutions and agencies.

Accomplishment of these goals will result in the maintenance of an healthy wetland ecosystem and shoreland area capable of providing the desired water quality benefits to Upper Kelly Lake consistent with the objectives of Chapter NR 191 of the *Wisconsin Administrative Code*. Such benefits are consistent with the ongoing program of lake- and stream-related management actions being undertaken by the Kelly Lakes Association, the City of New Berlin, and the Village of Hales Corners, and with the recommendations set forth in the adopted regional water quality management plan.[7]

C. Proposed Land Acquisition Program

The proposed shoreland wetland acquisition project for Upper and Lower Kelly Lakes is designed as part of the multi-phased program of information gathering, assessment, and response being undertaken by the Kelly Lakes Association, the City of New Berlin, and the Village of Hales Corners. Some portions of the proposed program have been, or are being, undertaken by the Kelly Lakes Association, partly in cooperation with other local and State agencies. Such efforts include the conduct of the Phase I and Phase II planning projects that established baseline conditions in the Kelly Lakes and which set forth the recommended actions proposed herein.

Based upon these previously conducted planning programs, funding is now requested for the acquisition of four or five riparian parcels by outright purchase, and of one or two wetland parcels by conservation easement, pursuant to the recommendations set forth in the lake protection plan for the Kelly Lakes. The five riparian properties include, from north to south along the western shore of Upper Kelly Lakes, the Tetzlaff property (Tax Key NBC 1293-986-001), the Spenser property (Tax Kay NBC 1293-986), the Gorsinger property (Tax Key NBC 1293-985-002), the Konle-Schneider property (Tax Key NBC 1293-985-001), and the Adams property (Tax Keys NBC 1293-009 and NBC 1293-021). The two wetland parcels include the Woodfield Park outlots (Tax Keys NBC 1293-086 and NBC 1293-087) located west of S. Frances Avenue, adjacent to the unnamed stream discharging to Upper Kelly Lake. Currently, pursuant to a letter of retroactivity granted by the Wisconsin Department of Natural Resources under the provisions of Chapter NR 191 of the *Wisconsin Administrative Code*, the Kelly Lakes Association has completed the purchase of the Tetzlaff property. As of April 2000, each of the other property owners has been apprised of the intention of the Kelly Lakes Association to acquire the lands through the Chapter NR 191 Lake Protection Grant Program, and all of the owners have verbally indicated a willingness to negotiate with the Association. As of April 2000, these properties were being appraised pursuant to Chapter NR 191 requirements.

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[7] *SEWRPC Memorandum Report No. 93,* op. cit.

D. Wetland and Upland Management Plan

The principal aspects of the land management practices proposed to be undertaken within the project area are set forth in the lake protection plan, prepared for the Kelly Lakes Association, Inc. and the City of New Berlin, by the Southeastern Wisconsin Regional Planning Commission, and other relevant plans noted above. Both the shoreland and wetland sites will be maintained in a natural state. The actions proposed to be carried out by the Kelly Lakes Association in cooperation with public and private partners, in part identified below, will seek to protect and preserve the environmental corridors and wildlife habitat that comprise the shoreland and wetland lands proposed for acquisition. In this regard, the Association will initially focus attention on the protection and preservation of habitat suitable for the Butler's Garter Snake, a State-designated threatened species reported to occur in the vicinity of the Lakes, while developing detailed landscape designs for restoring the shoreland wetlands proposed to be acquired. In addition, the Kelly Lakes Association will continue to work with the City of New Berlin and other public partners to enhance passive recreational use of the sites for community and educational purposes. The City of New Berlin has successfully applied for a Sportfish Restoration Program grant to construct a public fishing pier at Upper Kelly Lake, an action that complements and is complemented by the proposed acquisition of the shoreland and wetland areas adjacent to the unnamed influent stream by the Kelly Lakes Association.

Management of Shoreland Wetlands

In the short- to medium-term, the Kelly Lakes Association will endeavor to remove the berms and tile drains surrounding the wetland area identified as outlots of the Woodfield Park Subdivision. In so doing, the Kelly Lakes Association will work with the City of New Berlin to reestablish natural patterns of stream flows into the wetland by providing appropriate hydraulic connections between the unnamed stream and the wetland as set forth in the City's adopted stormwater management plan. This is likely to include the provision of additional flow routes under S. Francis Avenue to reestablish the hydraulic connection between the wetland, the stream and Upper Kelly Lake. It is anticipated that this wetland restoration program will be conducted, in part, with funds provided under the Chapter NR 191 Lake Protection Grant Program wetland restoration component. While wetland restoration is scheduled to occur subsequent to the acquisition of the parcels in question, or after a conservation easement is secured on the said properties, it is expected that the request for wetland restoration funds would be made no later than May 1, 2002.

The wetland sites will be planted with native plant materials as appropriate to establish and encourage a native plant community. Community schools and youth groups will be actively engaged in the process of native plant restoration. It is intended that Eagle Scout candidates from Troop 530, Boy Scouts of America (see attached letter of support), and other youth groups as may be identified in the future, assist with this restoration effort, which would use plant materials from local nursery sources to ensure continuity of the regional genetic stocks as recommended in the adopted regional natural areas and critical species habitat protection and management plan.

In the longer-term, the wetland sites will be monitored for evidence of invasive species and appropriate control measures will be undertaken by the Kelly Lakes Association. The Kelly Lakes Association will work with students from Whitnall Park School to develop and carry out an appropriate monitoring program (see attached letter of support). The Kelly Lakes Association will encourage other area schools, namely Eisenhower High School and Elmwood Elementary School, to utilize these lands, possibly through their participation in the Project WET or the Wisconsin Adopt-A-Lake programs. Currently, the wetland sites contain some nonnative species, about 20 to 30 percent of species inventories, and have suffered somewhat from prior agricultural activities that include harvesting of trees, filling, and ditching. No Federal- or State-designated rare, threatened, or endangered plant species were observed during the field inspections that were carried out by Regional Planning Commission staff during 1989 and 1990.

Management of Shoreland Uplands

As part of the short- to medium-term restoration activities on the upland areas to be acquired, the Kelly Lakes Association will work with the City of New Berlin to establish an environmentally sound management policy relating to mowing of the lands included in the project area. As noted above, the Kelly Lakes Association will

encourage the active participation of community schools and youth groups in the process of native plant restoration. Restoration of the upland sites will include use of native prairie plants. It is intended that Eagle Scout candidates from Troop 530, Boy Scouts of America (see attached letter of support), and students from Whitnall School (see attached letter of support) also develop and carry out an appropriate restoration and monitoring program in the upland areas of the site. The Kelly Lakes Association will encourage other area schools, namely Eisenhower High School and Elmwood Elementary School, to utilize these lands, possibly through their participation in the Project WILD program.

The Kelly Lakes Association will encourage public knowledge of, and participation in, the restoration project through informational programming and signage.

In the longer-term, the Kelly Lakes Association will continue to work with the City of New Berlin Parks and Recreational Department to ensure compatibility between the management of public lands and the management of the lands owned by the Kelly Lakes Association. This would include future development of the City pedestrian and bicycle trail proposed in the adopted park and open space plan linking Kelly Lake Park with other City parks and regional trail systems. In addition, the Kelly Lakes Association will continue to liaise with the Village of Hales Corners with respect to the future development of the public recreational boating access site located on the eastern shore of Upper Kelly Lake.

Public Informational Programming

In addition to actions designed to restore the natural structure and function of wetland systems upstream of Upper Kelly Lakes as a means of protecting water quality within the Kelly Lakes system, and the downstream Root River, additional actions can be undertaken to minimize nutrient loadings from source areas within the drainage area tributary to the Kelly Lakes. Based upon the aforereferenced findings of the U.S. Geological Survey, residential lawns form a major source of phosphorus to watercourses in urban areas. In some cases, this phosphorus source is enhanced as a consequence of the lawn care practices employed by householders within the drainage area. For this reason, informational programming directed at alternative and appropriate lawn care practices should be provided within this rapidly urbanizing drainage area. Such programming should be predicated upon the soil chemistry and soil nutrient requirements for urban residential lawns and gardens that can be determined through relatively simple soil testing conducted by the University of Wisconsin-Extension. Soil test results allow householders to apply appropriate levels of fertilization to their gardens, generally saving the householder some level of expense and effort, while providing additional protections to the Lakes. In addition, distribution of lawn care pamphlets within the drainage area, providing information on composting, yard care, and maintenance of the grassed swale stormwater system, would apprise householders of alternative means of maintaining their properties.

In addition, programming should be developed to keep the householders in the Kelly Lakes community informed of the current state of their Lakes' water quality. To this end, continued participation in the Wisconsin Department of Natural Resources Self-Help programs is recommended as a means of assessing the health of the Kelly Lakes on a regular basis. Such programs can provide an early warning of undesirable changes in lake water quality and aquatic species composition and initiate appropriate responses in a timely manner. In addition, data gathered through these programs can supplement and be coordinated with data gathered by the Wisconsin Department of Natural Resources under the current surface water monitoring strategy developed to conduct monitoring activities and to perform basic assessments for each watershed in the Region on an approximately five- to seven-year rotating cycle.[8] Regular reports on the results of these studies have been featured at the annual meetings of the Kelly Lakes Association and should be continued as one means of informing residents of the current state of the Lakes.

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[8]*SEWRPC Memorandum Report No. 93,* op. cit.

E. Project Duration and Status

The proposed acquisition project is subject to letters of retroactivity granted by the WDNR on May 12, 1999 and February 23, 2000. Currently, the Kelly Lakes Association has acquired the northernmost parcel proposed for acquisition. The Kelly Lakes Association is currently negotiating with the owners of the remainder of the parcels proposed for acquisition and for acquisition by easement. All of the parcels are being or have been appraised pursuant to State requirements. It is intended that the acquisition project be carried out over a two-year period from October 1, 2000, through December 31, 2002. Management of the sites would be ongoing.

F. Project Costs

1.	Land acquisitions	$ 219,550
2.	Other Costs (appraisal fees)	$ 2,650
	Other Costs (title insurance)	$ 3,500
	Other Costs (closing costs)	$ 3,500
3.	Miscellaneous (recording fees, legal costs)	$ 5,000
	Total Expense	$ 234,200
	State Share Requested	$ 175,650
	Local Share Provided	$ 58,550

The local share will be provided through contributions of in-kind value by the sellers and through funds raised from the community by the Kelly Lakes Association. In-kind contributions from the youth and other groups utilizing the site for educational purposes may also be considered as part of the local share provided.

G. Official Management Resolution

The Resolution of the Kelly Lakes Association, together with letters of support from the City of New Berlin, Village of Hales Corners, and Waukesha County, is appended hereto. Additional letters of support are appended hereto from Troop 530, Boy Scouts of America, and from Whitnall School.

Appendix E

WETLAND ALTERNATIVES ANALYSIS FOR COMPLIANCE WITH CHAPTER NR 103 OF THE WISCONSIN ADMINISTRATIVE CODE

INTRODUCTION

This appendix documents an analysis of practicable alternatives performed for the wetland restoration measures, called for under the recommended plan, which involve significant disturbance of specific wetlands within the Kelly Lakes drainage area. These wetlands are shown on Map E-1. This alternatives analysis was performed in the context of the system plan presented in this report and is intended to fulfill the necessary requirements set forth in Chapter NR 107 of the *Wisconsin Administrative Code* in order to obtain conceptual approval of the lake management plan from the Wisconsin Department of Natural Resources. This analysis should also expedite the permitting process at such time as the specific features of the recommended plan impacting wetland ecosystems in the Kelly Lakes drainage basin are implemented. It will be necessary for the implementing agency to obtain a State permit prior to implementing the wetland restoration measures recommended under this plan, and additional federal permitting may be required. Application for such permits as may be determined to be necessary will require that additional data, including detailed engineering design details, be provided in support of the proposed project.

WETLAND CONSIDERATIONS IN THE DRAINAGE AREA TRIBUTARY TO THE KELLY LAKES

Site Description

Under the recommended lake protection plan, restoration of an approximately three-acre deepwater marsh is recommended within a portion of the 7.8-acre wetland which extends along the west side of Frances Avenue in the northeast quarter of U.S. Public Land Survey Section 36, Township 6 North, Range 20 East, as shown on Map E-2. The restoration of this deepwater marsh would enhance the wildlife habitat in the area, and provide a biological filter for the Kelly Lakes, reducing, by as much as 50 percent, the suspended sediment and phosphorus loads reaching the Upper Kelly Lake.

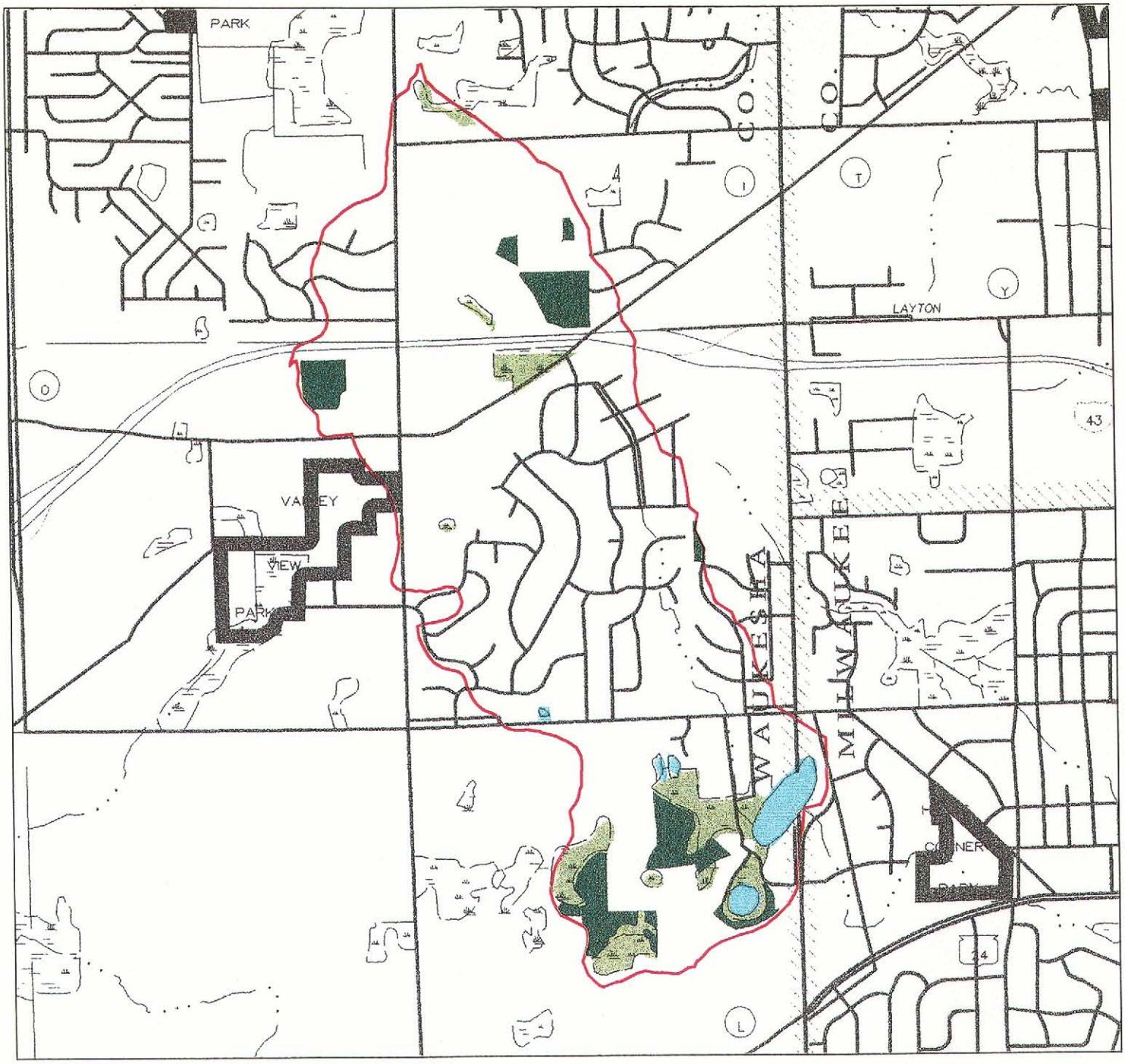
The area draining to the wetland in which the deepwater marsh would be restored totals about 983 acres. The existing land uses tributary to the wetland are almost entirely urban, with medium-density residential land uses being predominant.

The wetland proposed to be affected by the restoration of the deepwater marsh is currently classified as emergent, wet meadow under the State classification system for the Wisconsin wetlands inventory, and as shallow marsh and fresh (wet) meadow under the Commission's inventory as set forth in Appendix B. The existing vegetation on the site is dominated by broad- and narrow-leaved cattails and reed canary grass.

The soils within the wetland site are classified as Wallkill silt loam. Wallkill silt loam is a poorly drained soil associated with a high water table. Wallkill silt loam originally developed as an organic soil. However, as a consequence of settlement and subsequent agricultural activity that led to erosion of topsoil from surrounding fields and deposition of the eroded material in depressional areas within the site, the soil on the site has taken on somewhat different characteristics from the original parent material. Restoration of this wetland would remove the disturbed surface soil, and help to reestablish the original organic soil that characterizes the site.

Map E-1

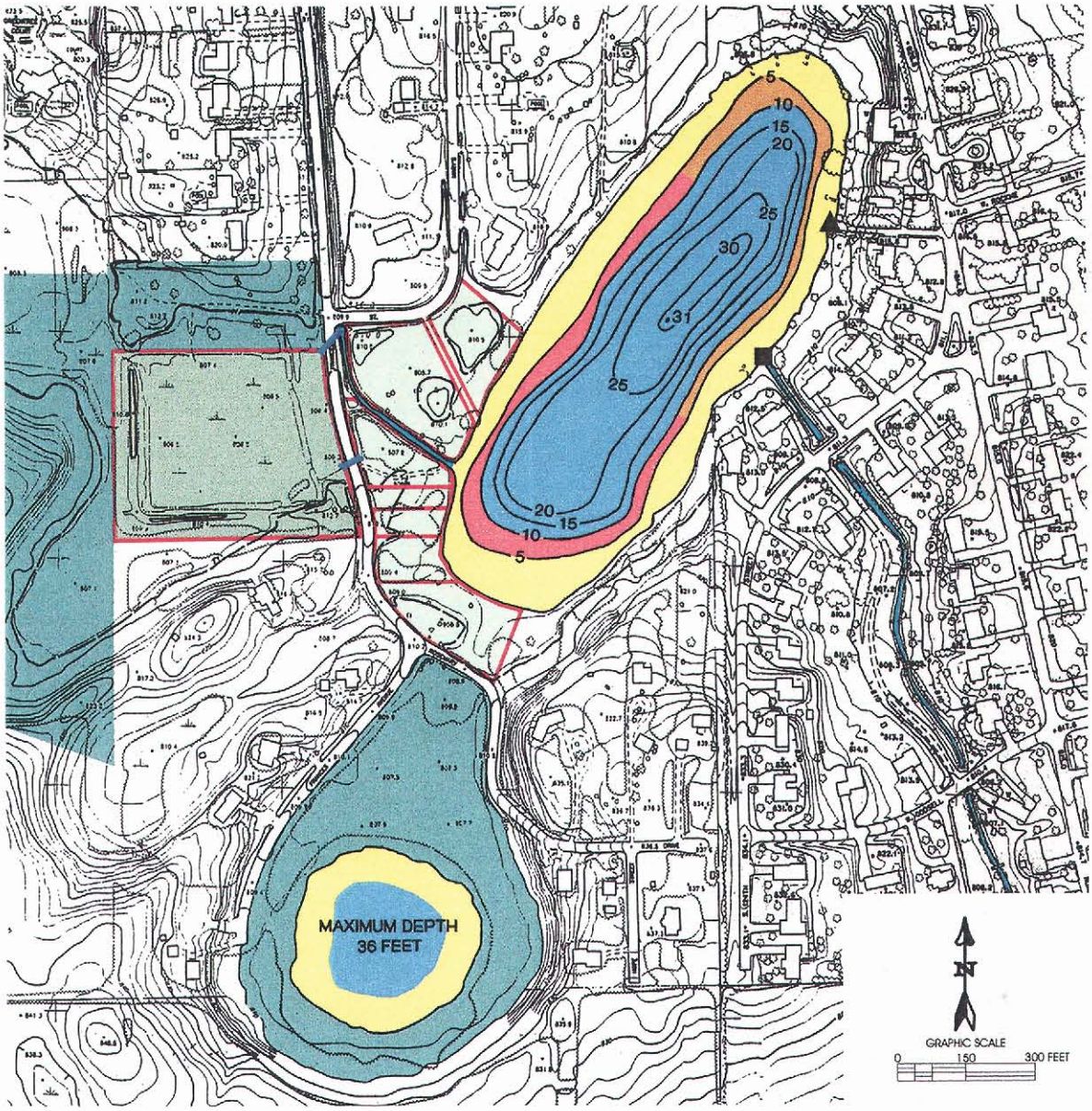
WOODLANDS AND WETLANDS WITHIN THE TOTAL TRIBUTARY DRAINAGE AREA TO THE KELLY LAKES: 1990



Source: SEWRPC.

Map E-2

RECOMMENDED LAKE MANAGEMENT PLAN FOR KELLY LAKES



—15— WATER DEPTH CONTOUR IN FEET

▲ PUBLIC ACCESS SITE

■ WATER LEVEL CONTROL STRUCTURE

PROPERTY BOUNDARY

AQUATIC PLANT MANAGEMENT

EURASIAN WATER MILFOIL CONTROL AREA
HARVESTING: HIGH PRIORITY
CHEMICALS: LIMITED

HARVEST ACCESS LANES
HARVESTING: MODERATE PRIORITY
CHEMICALS: NONE

SHALLOW WATER HABITAT AREA
HARVESTING: NONE
CHEMICALS: NONE

DEEP WATER AREA: NO CONTROL

LAND USE MANAGEMENT

PROTECT ENVIRONMENTALLY VALUABLE AREAS

CREATE AN ECOLOGICAL CORRIDOR BETWEEN LAKES AND ALONG THE SOUTH-WEST SHORE OF UPPER KELLY LAKE:
-PROVIDE PUBLIC FISHING PIER

ACQUIRE EASEMENT FOR PUBLIC USES:
-RESTORE WETLAND FOR LAKE QUALITY PROTECTION

CONSTRUCT LOW FLOW STORMWATER DIVERSION/RETURN SYSTEM AND HIGH FLOW BYPASS

SHORELINE PROTECTION

- MAINTAIN EXISTING STRUCTURES
- PROTECT UNSTABLE AREAS, RESTORE SHORELAND WETLANDS

LAKE MANAGEMENT

- ESTABLISH PUBLIC INLAND LAKE PROTECTION AND REHABILITATION DISTRICT

Source: SEWRPC.

The wetland is in, and adjacent to, areas of special natural resource interest. Wildlife habitat at this site is classified as Class I habitat of high quality. The site is currently included within a wildlife corridor established in the vicinity of the Wood Field Park subdivision by the City of New Berlin, and is in conservancy use.

Degree of Prior Disturbance

As noted above, both the soils and vegetation currently observed on the site reflect a significant degree of prior disturbance. Much of this disturbance has been cased by prior use of the site for agricultural purposes. Creation of berms around the wetland site has not only altered the character of the vegetation on the site, but also has altered the hydrology of the watercourses draining to and through the site. The proposed wetland restoration program set forth below is designed, in part, to restore the natural character of the wetland system estimated to have previously existed on the site, and to restore the structure and function of the wetland ecosystem to the benefit of the Kelly Lakes system.

Wetland Restoration

In order to accomplish restoration of this wetland as a deep water marsh and to restore the water quality benefit provided by such a system upstream of Upper Kelly Lake, several further steps will have to be taken during the detailed design phase of the restoration project. While a detailed plant survey of the area has been completed by Commission staff, as set forth in Appendix B, a determination of appropriate deep water marsh plant species to be introduced during the restoration process would have to be made. Selection of these species should include consideration of their ability to enhance the filtering function of the restored wetland. Additionally, "weed" species likely to exist or occur on the site should be identified, and measures set forth in the site plan to allow determination of proper control and eradication of undesirable species. The berms created around the wetland site during the period in which the land was under agricultural use, and which have disturbed the natural hydrology of the area, would have to be leveled and removed. Grading would then be undertaken to establish an area of open water, and finally, revegetation would have to be undertaken to restore the area disturbed by grading.

WETLAND FUNCTIONAL VALUES

The functional values of wetlands, identified by the State of Wisconsin, are set forth in Sections NR 103.03, NR 115.05(2)(e)4, and NR 117.05(4)(d) of the *Wisconsin Administrative Code*. These functional values include:

1. Storm- and floodwater storage;
2. Maintenance of dry season stream flows, and groundwater recharge;
3. Filtration and storage of sediments, nutrients, and other potential contaminants;
4. Protection of shoreline areas from erosion by dissipating wave energy;
5. Provision of habitat for aquatic organisms in the food web including, but not limited to, fish, crustaceans, mollusks, insects, annelids, planktonic organisms, and the plants and animals upon which these aquatic organisms feed and depend upon for their needs in all life stages;
6. Provision of habitat for resident and transient wildlife species, including mammals, birds, reptiles, and amphibians for breeding, resting, nesting, escape, cover, travel corridors, and food; and,
7. Recreational, cultural, educational, scientific, and natural aesthetic values and uses.

The functional values proposed to be restored as a result of this particular wetland restoration program include:

1. Restoration of storm- and flood-water storage capacity which has been diminished as a consequence of the prior disturbance of the site by the establishment of berms surrounding the property, prior filling, and agricultural use;

2. Restoration of the integrity of the hydrologic, Wallkill silt loam soils necessary to support wetland vegetation, which has been disturbed by the deposition of eroded materials over the surface of the organic soil, and restoration of the hydrologic function of the land by creation of an hydrologic link to Upper Kelly Lake through provision of a culvert underneath Frances Avenue. The wetland is located within the floodplain of the influent stream to Upper Kelly Lake.

3. Restoration of the wetland's capacity to filter and store sediments, nutrients, and other potential contaminants, and thereby reinstate the capacity of this wetland system to protect and enhance water quality in Upper Kelly Lake.

4. Restoration of erosion protection functions by buffering the Lake from flood flows that would currently enter the Lake without first passing through the wetland system.

5. Restoration of habitat for aquatic organisms and other plants and animals which depend upon aquatic organisms, including restoration of the hydraulic linkage between the wetland system and Upper Kelly Lake that will enhance the opportunity for the wetland to provide fish spawning area and juvenile fish habitat. Additionally, restoration of the aquatic habitat could help to control the populations of those insects that use wetland areas during certain stages of their life cycles.

6. Enhancement of habitat for resident and transient wildlife species consistent with the attributes of the area as a Class I wildlife habitat area, providing all of the necessary requirements of food, shelter, and nesting sites.

7. Provision of recreational, cultural, educational, scientific, and natural aesthetic values and uses is limited as the wetland site is situated on private property, although the wetland does, and will continue to, provide open space and aesthetic benefits within an urban environment.

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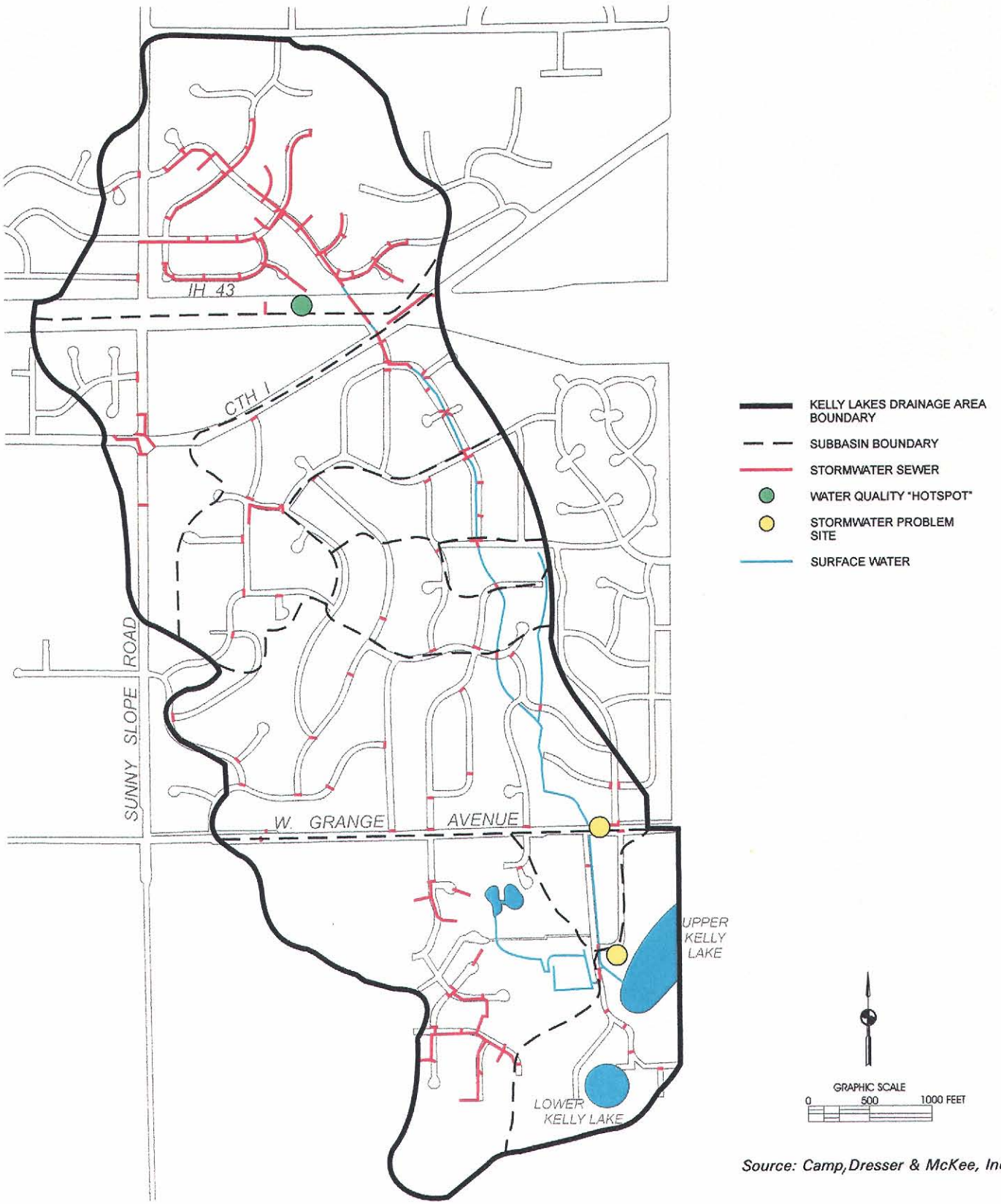
Appendix F

CITY OF NEW BERLIN STORMWATER MANAGEMENT PLAN FOR THE KELLY LAKES DRAINAGE AREA



Source: Camp, Dresser & McKee, Inc.