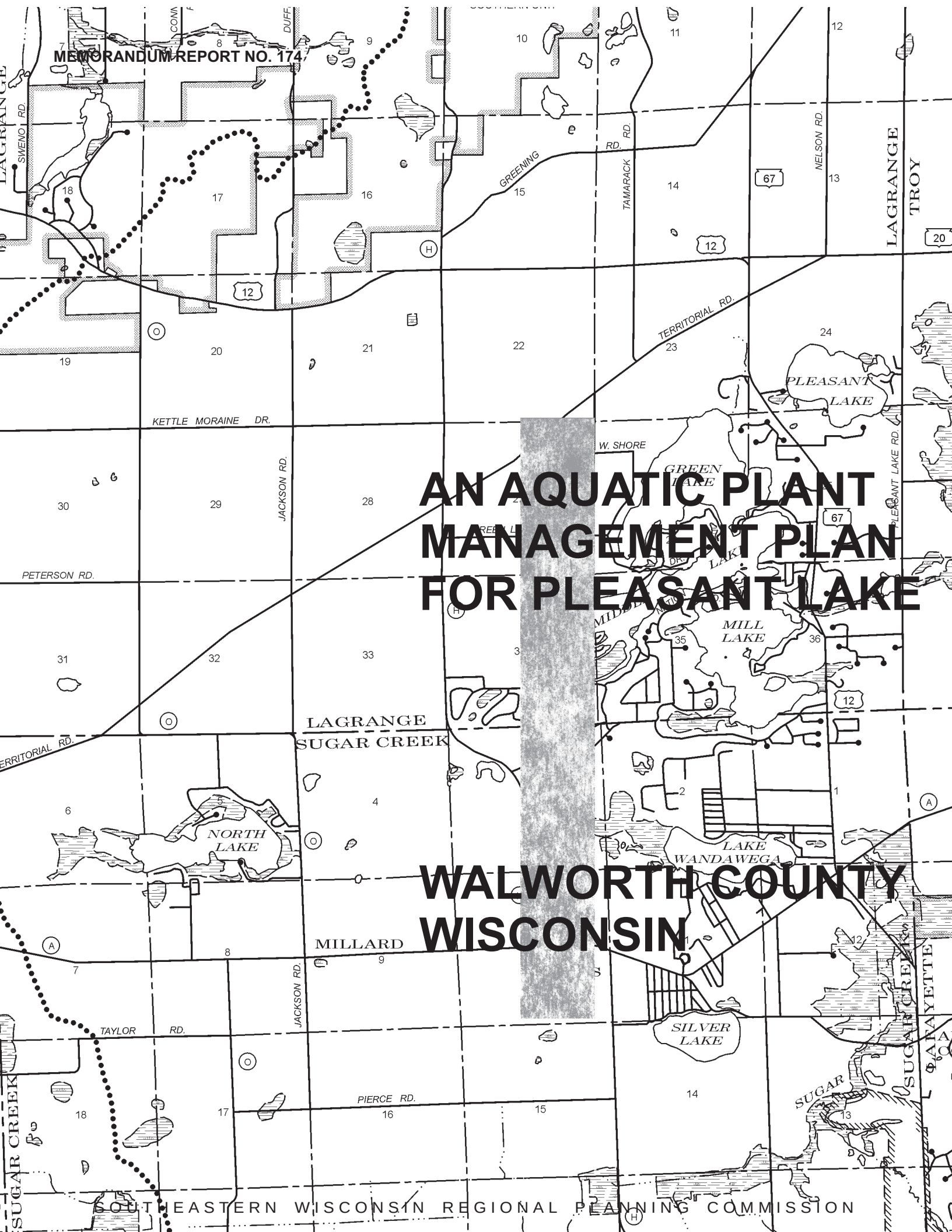
MEMORANDUM REPORT NO. 174



AN AQUATIC PLANT MANAGEMENT PLAN FOR PLEASANT LAKE

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MEMORANDUM REPORT
NUMBER 174

AN AQUATIC PLANT MANAGEMENT PLAN FOR PLEASANT LAKE

WALWORTH COUNTY, WISCONSIN

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Chapter I

INTRODUCTION

Pleasant Lake, located in north-central Walworth County, Wisconsin, is a 155-acre seepage lake and a valuable natural resource, offering a variety of recreational and related opportunities to the resident community and its visitors. The Lake is located entirely within U.S. Public Land Survey Township 4 North, Range 16 East, Sections 24 and 25, Town of LaGrange, in Walworth County. In recent years, the recreational and aesthetic values of Pleasant Lake have been perceived to be adversely affected by excessive aquatic plant growth within portions of the lake basin. Seeking to improve the usability and to prevent the deterioration of its natural assets and recreational potentials, the Pleasant Lake community, through the Pleasant Lake Protection and Rehabilitation District (PLPRD), and in cooperation with the Pleasant Lake Property Owners Association, Inc. (PLPOA) and the Town of LaGrange, continues to undertake annual programs of lake and aquatic plant management in the basin.

Pleasant Lake has been the subject of earlier lake management-related investigations, being included in the Wisconsin Department of Natural Resources (WDNR) Lake Use Report published in 1969[1] and the WDNR Priority Watershed Project that included the Honey Creek tributary to the Illinois Fox River.[2] This report provides information on the condition of the aquatic plant communities in Pleasant Lake during 2007, including relevant tributary area and waterbody data, and provides recommendations for the management of the aquatic plant community within Pleasant Lake.

BACKGROUND

Specifically, this report represents part of the ongoing commitment of the Pleasant Lake community, through the PLPRD, the PLPOA, and the Town of LaGrange, to sound planning with respect to the Lake. The report sets forth inventories of the aquatic plant communities present within Pleasant Lake. The inventories were prepared by the Southeastern Wisconsin Regional Planning Commission (SEWRPC) in cooperation with the PLPRD, and include the results of field surveys conducted by the Commission staff during July and August 2007. The aquatic plant surveys were conducted using the modified Jesson and Lound[3] transect methodology developed by the WDNR.

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[1]*Wisconsin Department of Natural Resources Publication Lake Use Report No. FX-25,* Pleasant Lake, Walworth County, Wisconsin, *1969.*

[2]*Wisconsin Department of Natural Resources Publication No. WT-478-97,* A Nonpoint Source Control Plan for the Sugar/Honey Creek Priority Watershed Project, *February 1997.*

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

The planning program was funded, in part, through a Chapter NR 190 Lake Management Planning Grant awarded to the PLPRD and administered by the WDNR.

The scope of this report is limited to a consideration of the current water quality conditions and the aquatic plant communities present within Pleasant Lake, the documentation of historic changes in the plant communities based upon currently existing data and information, and refinement of those management measures which can be effective in the control of aquatic plant growth within an aquatic plant management plan for Pleasant Lake. Recommendations are made with respect to the potential management actions that could be carried out by the PLPRD, the PLPOA, and the Town of LaGrange, with lesser emphasis on those actions that could be carried out by other entities, both governmental and nongovernmental.

AQUATIC PLANT MANAGEMENT PROGRAM GOALS AND OBJECTIVES

The aquatic plant management and associated lake use goals and objectives for Pleasant Lake were developed in consultation with the PLPRD and PLPOA, and include the following:

1. Protection and maintenance of the public health and promotion of the public comfort, convenience, necessity, and welfare, in concert with the natural resource base, through the environmentally sound management of native vegetation, fishes, and wildlife populations in and around Pleasant Lake;

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

3. Effective maintenance of the water quality of Pleasant Lake to better facilitate the conduct of water-related recreation, improve the aesthetic value of the resource to the community, and enhance the resource value of the waterbody; and,

4. Promotion of a high-quality, water-based experience for residents and visitors to Pleasant Lake consistent with the policies and objectives of the WDNR and articulated in the adopted regional water quality management plan.[4]

This inventory and aquatic plant management plan elements conform to the requirements and standards set forth in the relevant *Wisconsin Administrative Codes.*[5] Implementation of the recommended actions set forth herein should continue to serve as an important step in achieving the stated lake use objectives over time.

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[4]*See SEWRPC Planning Report No. 30,* A Regional Water Quality Management Plan for Southeastern Wisconsin—2000*, Volume Two,* Alternative Plans*, February 1979, adopted by SEWRPC on July 12, 1979. See also SEWRPC Memorandum Report No. 93,* A Regional Water Quality Management Plan for Southeastern Wisconsin: An Update and Status Report*, March 1995.*

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

Chapter II

INVENTORY FINDINGS

INTRODUCTION

Pleasant Lake is located in the Town of LaGrange, Walworth County, Wisconsin, as shown on Map 1. Pleasant Lake is a natural lake comprised of a single, deep basin with an adjacent shallow bay. The Lake is a seepage lake and, as such, depends principally on precipitation falling directly onto the Lake's surface, runoff from the relatively small tributary area directly surrounding the Lake, and groundwater flowing into the Lake for its sources of water. The Lake has no defined outflow, it does have an overflow control structure, shown on Map 2, that serves as a lake outlet during periods of high water. This fixed elevation outflow structure consists of a series of pipes, equipped with a trash rack to minimize the downstream transport of debris and aquatic plant material, which ultimately discharge to Honey Creek, located to the southeast of the main lake basin.[1] Such an overflow condition was observed during June 2008, when the Southeastern Wisconsin Region experienced exceptionally heavy rainfalls. The level of the Lake is largely sustained by local groundwater inputs and precipitation patterns which introduce waters both directly and indirectly to the Lake, while flooding risks are minimized by the overflow structure located on the southeastern shores of the Lake.

WATERBODY CHARACTERISTICS

Pleasant Lake is a 155-acre waterbody, the hydrographical characteristics of which are set forth in Table 1. As aforementioned, the Lake is a seepage lake with a single basin. Pleasant Lake has a maximum depth of approximately 29 feet, a mean depth of 12 feet, and a volume of about 1,910 acre-feet. The bottom contours of the Lake reveal a generally uniform basin devoid of bars or reefs; the general bathymetry of the Lake is shown on Map 2. About 17 percent of the Lake's surface area has a depth of less than three feet and about 25 percent of the Lake has a depth of over 20 feet. The general orientation of Pleasant Lake is northwest-southeast.

Lake bottom sediment types in the nearshore areas of Pleasant Lake consist of sand along 45 percent of the shoreline, especially along the western shore; gravel along 21 percent of the shoreline, especially along the northern shores; and soft sediments along about 34 percent of the shoreline, especially in the shallow bay adjacent to the northeastern corner of the Lake.

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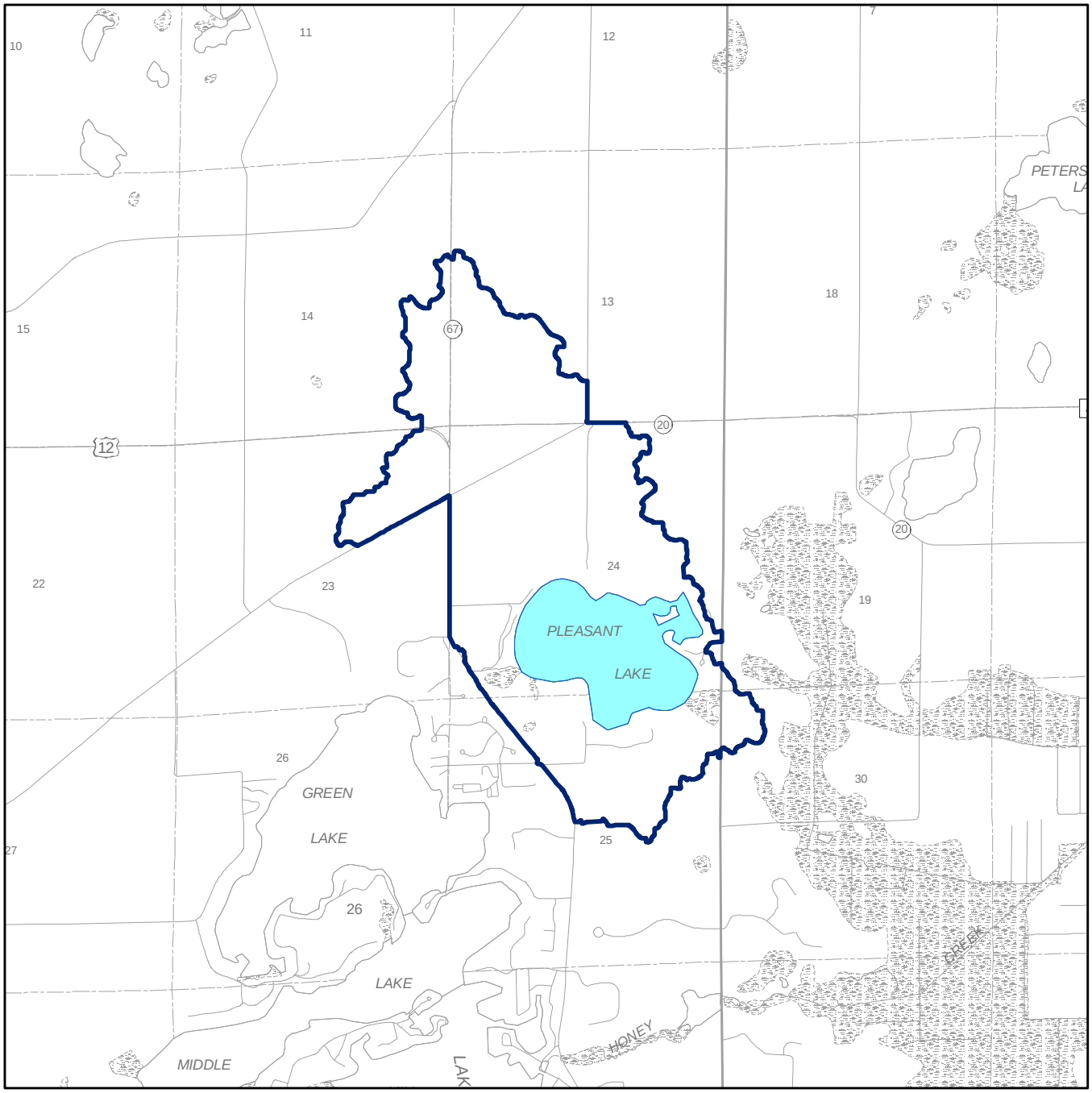
[1] *Wisconsin Department of Natural Resources Publication Lake Use Report No. FX-25*, Pleasant Lake, Walworth County, Wisconsin, *1969.*

Map 1

LOCATION OF PLEASANT LAKE



Total Tributary Area Boundary for Pleasant Lake

Surface Water

Source: SEWRPC.

Map 2

BATHYMETRIC MAP OF PLEASANT LAKE

DATE OF PHOTOGRAPHY: APRIL 2005

—20'— WATER DEPTH CONTOUR IN FEET

MONITORING SITE

WATER LEVEL CONTROL STRUCTURE

Source: U.S. Geological Survey and SEWRPC.

GRAPHIC SCALE
0 350 700 FEET

Table 1

HYDROLOGY AND MORPHOMETRY OF PLEASANT LAKE: 2007

Parameter	Pleasant Lake
Size	
Surface Area of Lake	155 acres
Tributary Area	976 acres
Lake Volume	1,910 acre-feet
Residence Time[a]	2.06 years
Shape	
Length of Lake	0.7 mile
Width of Lake	0.5 mile
Length of Shoreline	2.8 miles
Shoreline Development Factor[b]	1.62
General Lake Orientation	NW-SE
Depth	
Mean Depth	12 feet
Maximum Depth	29 feet
Percentage of Lake Area	
Less than Three Feet	17 percent
Greater than 20 Feet	25 percent

NOTE: The total tributary area for Pleasant Lake has been recorded in earlier reports to be 1,030 acres. The current measurement is based on elevation refinements made possible through Commission digital terrain modeling analysis.

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

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

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

TRIBUTARY AREA AND LAND USE CHARACTERISTICS

The area tributary to Pleasant Lake is situated in the north-central portion of Walworth County. As shown on Map 3, the area which drains directly to Pleasant Lake is approximately 1.5 square miles (976 acres) in areal extent, and includes portions of the Towns of LaGrange and Troy, both in Walworth County.

Population

The resident population and the numbers of housing units within the Pleasant Lake tributary area have generally shown a steady increase since the 1960s, as shown in Table 2. The greatest increase in population occurred between 1990 and 2000, when the number of people increased by nearly 48 percent, from 124 persons to 185 persons. The numbers of housing units also increased the most during this period from 1990 to 2000, when the number increased from 44 housing units to 66 units, an increase of about 50 percent. From 1960 to 1990, the rates of increase in both population and numbers of households remained fairly steady during these decades.

The Lake also has a sizeable transient population, principally during the summer months, when the remaining scout camps are in active use. While the Boy Scouts of America camp formerly situated along the southern shores of the Lake has been converted to residential land use, the Girl Scouts of the USA continue to operate two camps on the Lake; namely, Camp Juniper Knolls operated by the Girl Scouts of Greater Chicago and Northwest Indiana located on the northern shores of the Lake, and Camp Pottawatomie Hills operated by the Girl Scouts of Wisconsin Southeast located on the southeastern shores of the Lake. These camps offer a variety of outdoor experiences not only to the Girl Scouts, but also to the wider community, and contribute to the scenic beauty of the lakeshores.

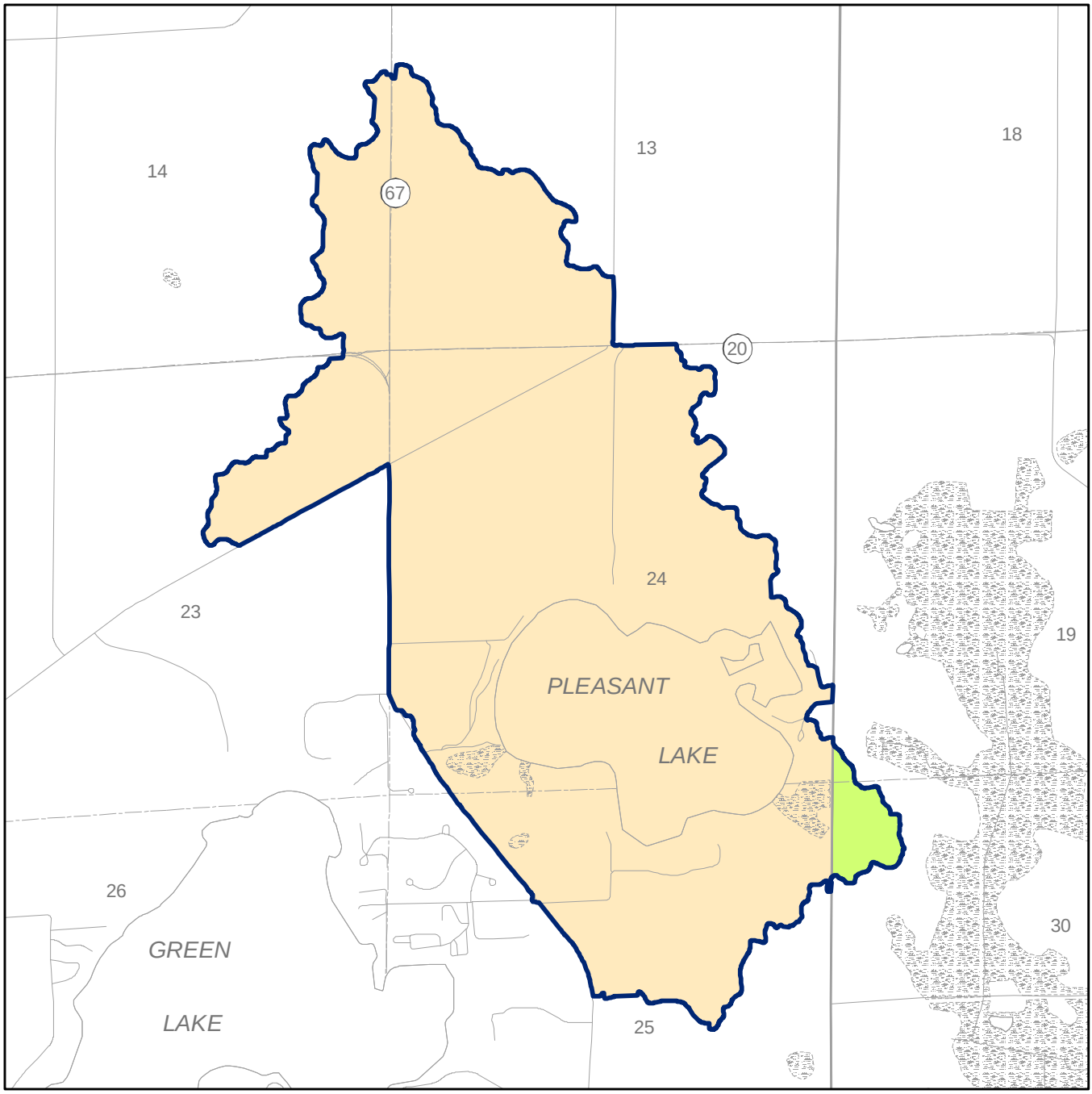
Land Uses

The land uses within the area tributary to Pleasant Lake are primarily rural, with agricultural uses being the dominant rural land use. In contrast, the shoreline of the Lake is mostly developed for residential usage, although significant areas of wetland and woodland areas are located along the northern, northwestern, and southeastern corners of the Lake, and, as noted, there are two Scout camps located on the Lake that have preserved a significant portion of the Lake's viewshed.

Map 4 shows the existing land uses within the area tributary to Pleasant Lake, as of 2000. The areal extent of those land uses is summarized in Table 3. Future changes in land use within the area tributary to the Lake may include limited further urban-density residential development, infilling of already platted lots, and possible redevelopment of existing properties. In this respect, and following the conversion of the former Boy Scouts of America property to residential land uses, there has been considerable concern within the Pleasant Lake community whenever the sale of

Map 3

CIVIL DIVISION BOUNDARIES WITHIN THE PLEASANT LAKE TRIBUTARY AREA



Source: SEWRPC.

Table 2

POPULATION AND HOUSEHOLDS WITHIN THE AREA TRIBUTARY TO PLEASANT LAKE: 1960-2000[a]

Year	Direct Tributary Area	
	Population	Households
1960	54	17
1970	78	25
1980	102	38
1990	124	44
2000	185	66

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

the properties owned by the Girl Scouts of the USA has been mentioned. The Pleasant Lake Protection and Rehabilitation District (PLPRD) and the Pleasant Lake Property Owners Association, Inc. (PLPOA) have had preliminary discussions with representatives of the Girl Scouts with regard to the protection of the viewsheds associated with the Scout properties.

Under proposed year 2035 conditions, as shown on Map 5, urban land uses are expected to increase from about 13 percent of the land coverage during 2000, to about 19 percent of the land coverage under planned year 2035 conditions. Agricultural uses are anticipated to decrease from about 50 percent of the land coverage as of 2000, to about 45 percent of the land coverage under year 2035 conditions. As shown on Map 5, many of these changes are predicted to occur within the southern portion of the tributary area. These land use changes have the potential to modify the nature and delivery of nonpoint source contaminants to the Lake, as discussed below, with concomitant impacts on the aquatic plant communities within the waterbody.

SHORELINE PROTECTION STRUCTURES

Erosion of shorelines results in the loss of land, damage to shoreline infrastructure, and interference with lake access and use. Wind-wave erosion, ice movement, and motorized boat traffic usually cause such erosion. As shown on Map 6, a survey of the shoreline of Pleasant Lake, conducted by Southeastern Wisconsin Regional Planning Commission (SEWRPC) staff during August 2007, indicated that, at that time, about 75 percent of the shoreline was naturally vegetated, about 7 percent was protected with riprap, about 13 percent of the shoreline was protected with some form of bulkhead structure, and about 5 percent was beach. No severe erosion-related problems were noted.

WATER QUALITY

Water quality data on Pleasant Lake have been recorded intermittently since 1960 when data were collected by the Wisconsin Department of Natural Resources (WDNR) as noted in the aforereferenced lake use report.[2] At that time, the Lake was moderately alkaline, with about average fertility, and considered to be clear. Temperature and dissolved oxygen concentration profiles indicated that the Lake stratified during the summer months. Coliform bacterial counts were among the lowest of those reported for the studied lakes in the Fox River watershed.

For purposes of the current study, water quality data, collected under the auspices of the WDNR Self-Help Monitoring Program, now the University of Wisconsin-Extension (UWEX) Citizen Lake Monitoring Network (CLMN), for the period from 1986 through 2006 were used to identify longer-term trends. These data are elaborated below.

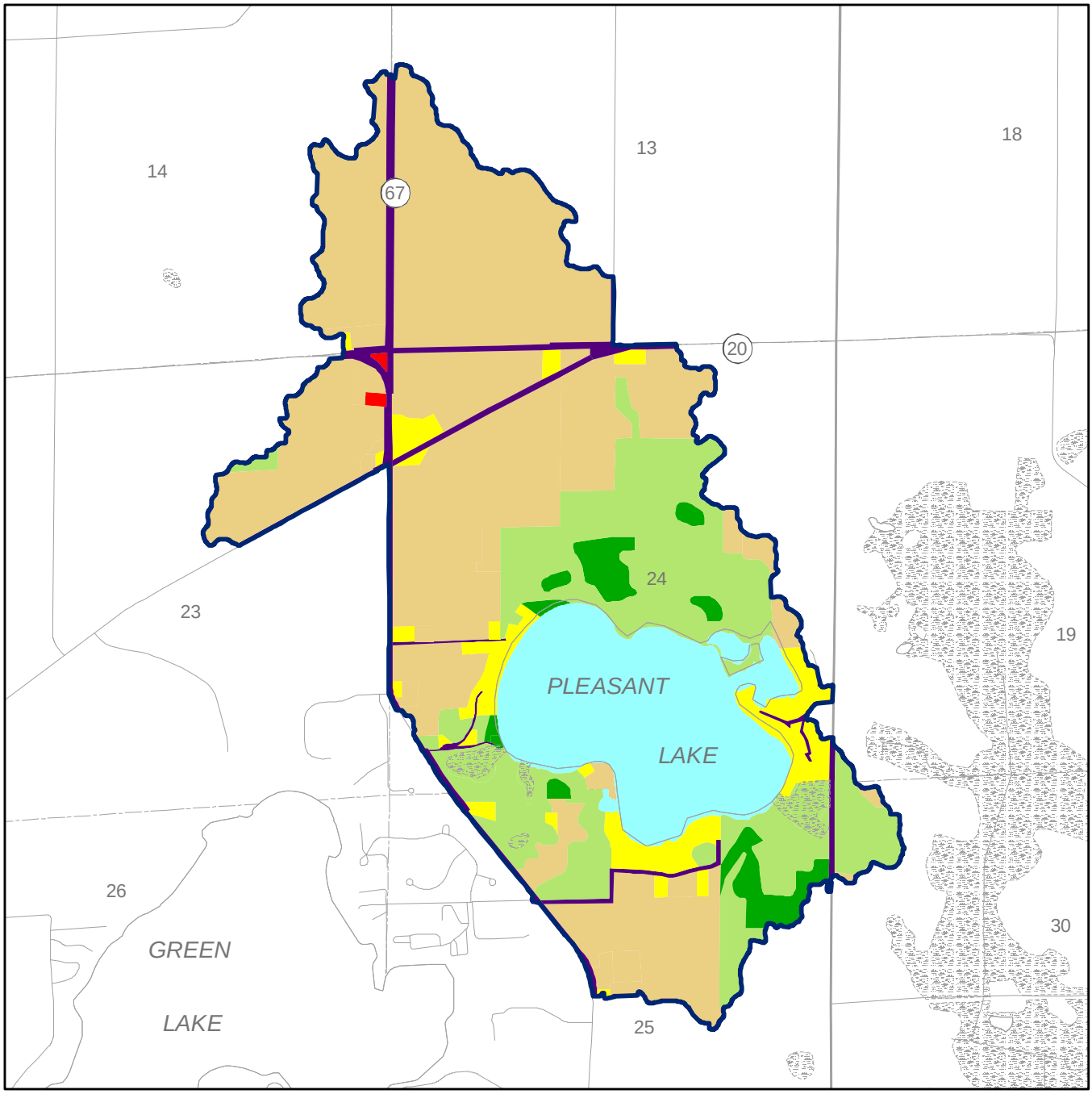
Water Clarity

Water clarity, or transparency, is often used as an indicator of water quality. Transparency can be affected by physical factors, such as water color and suspended particles, and by various biological factors, including seasonal variations in planktonic algal populations and the activities of fish and other aquatic organisms living in the lake.

[2]Ibid.

Map 4

EXISTING LAND USE WITHIN THE PLEASANT LAKE TRIBUTARY AREA: 2000



Source: SEWRPC.

Table 3

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

Land Use Categories[a]	2000		2035	
	Acres	Percent of Tributary Area	Acres	Percent of Tributary Area
Urban				
Residential	56	5.7	63	6.4
Commercial	2	0.2	5	0.5
Industrial	- -	- -	- -	- -
Governmental and Institutional	- -	- -	- -	- -
Transportation, Communication, and Utilities	40	4.1	40	4.1
Recreational	32	3.3	78	8.0
Subtotal	130	13.3	186	19.0
Rural				
Agricultural and Other Open Lands	485	49.7	429	44.0
Wetlands	12	1.2	12	1.2
Woodlands	195	20.0	195	20.0
Surface Water	154	15.8	154	15.8
Extractive	- -	- -	- -	- -
Landfill	- -	- -	- -	- -
Subtotal	846	86.7	790	81.0
Total	976	100.0	976	100.0

[a]*Parking included in associated use.*

Source: SEWRPC.

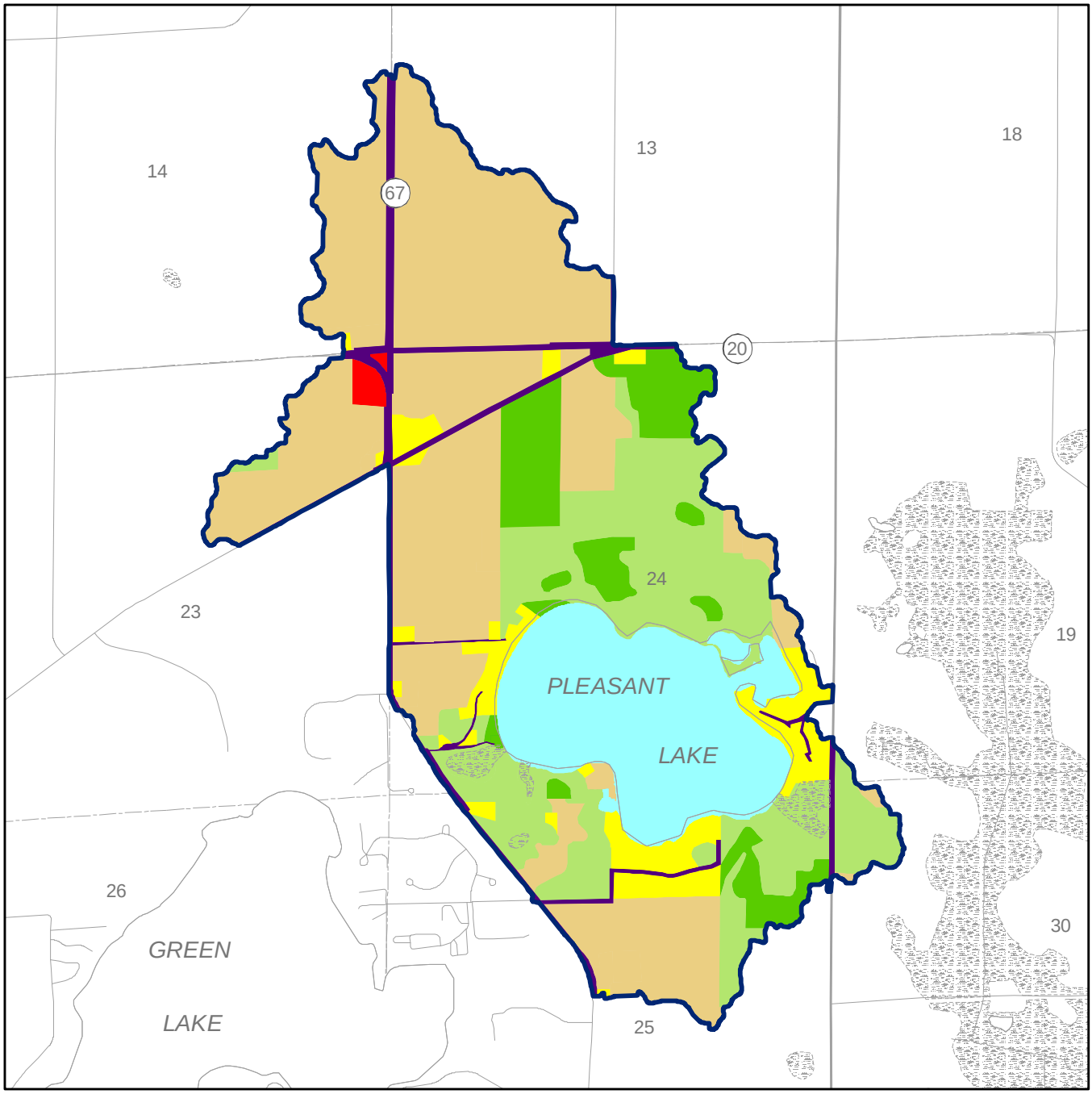
Water clarity is commonly measured with a device known as a Secchi disk, an eight-inch-diameter weighted disk whose surface is divided into quadrants painted alternately black and white. The disk is lowered into the water at the deepest point in the lake on the downwind, shaded side of the boat. The depth at which the disk just disappears from sight is noted; then the disk is raised until it is just visible again, and that depth is noted. The average of these two depths is the Secchi-disk measurement, or Secchi-disk reading. Generally, it is best to take Secchi-disk measurements on calm, sunny days during peak sunlight hours.

From 1986 through 1989, water clarity data for Pleasant Lake were acquired under the auspices of the WDNR Self-Help Monitoring Program.[3] These data indicated summer average Secchi-disk measurements of between 8.0 feet and 9.4 feet. These data suggested a reduction in water clarity, since earlier measurements of approximately 14.0 feet were obtained during the 1960s. During the current study period, from 1986 through 2006, it was reported that Secchi-disk measurements for Pleasant Lake averaged 12.2 feet, ranging from a low of 4.3 feet, to a high of 30 feet, as shown in Figure 1. During the latter half of the 20-year period of record, Secchi-disk readings averaged 13.4 feet, generally suggesting a trend toward improving water quality. This slight improvement in water clarity measurements shifted the indicative water quality condition of the Lake from good to very good.

[3]*These data are reported by the U.S. Geological Survey in the annual publications within the U.S. Geological Survey Water-Data Report Series commencing with data for Water Year 1985 and continuing through Water Year 1989: see U.S. Geological Survey Water Data Report WI-85-1,* Water Resources Data, Wisconsin: Water Year 1985*, August 1986, and subsequent editions through U.S. Geological Survey Water Data Report WI-89-1,* Water Resources Data, Wisconsin: Water Year 1989*, June 1990.*

Map 5

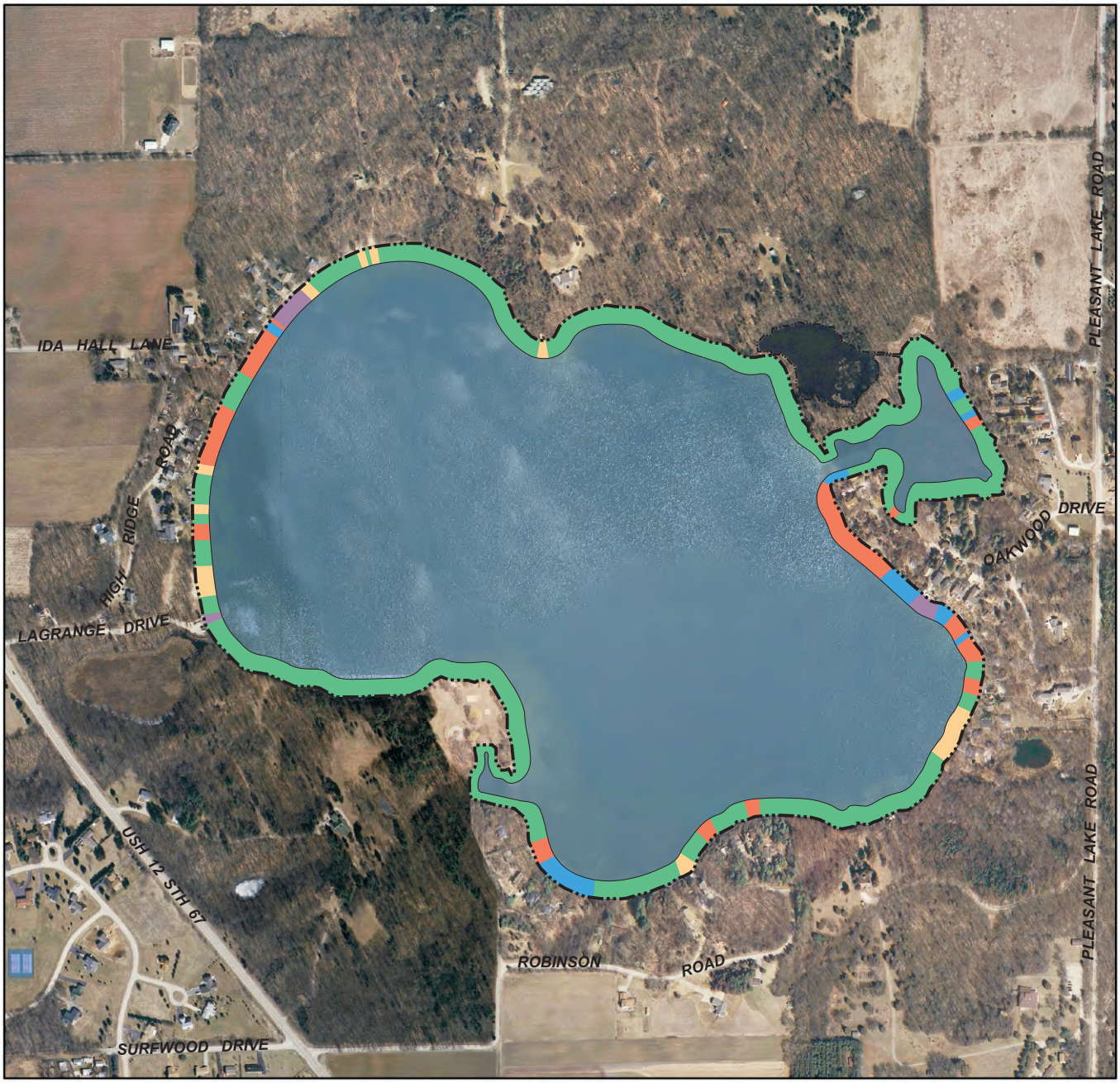
PLANNED LAND USE WITHIN THE PLEASANT LAKE TRIBUTARY AREA: 2035



Source: SEWRPC.

Map 6

SHORELINE PROTECTION STRUCTURES ON PLEASANT LAKE: 2007



DATE OF PHOTOGRAPHY: APRIL 2005

RIPRAP

BEACH

NATURAL

BULKHEAD

REVETMENT

Source: SEWRPC.

GRAPHIC SCALE
0 350 700 FEET

Figure 1

PRIMARY WATER QUALITY INDICATORS FOR PLEASANT LAKE: 1986-2006

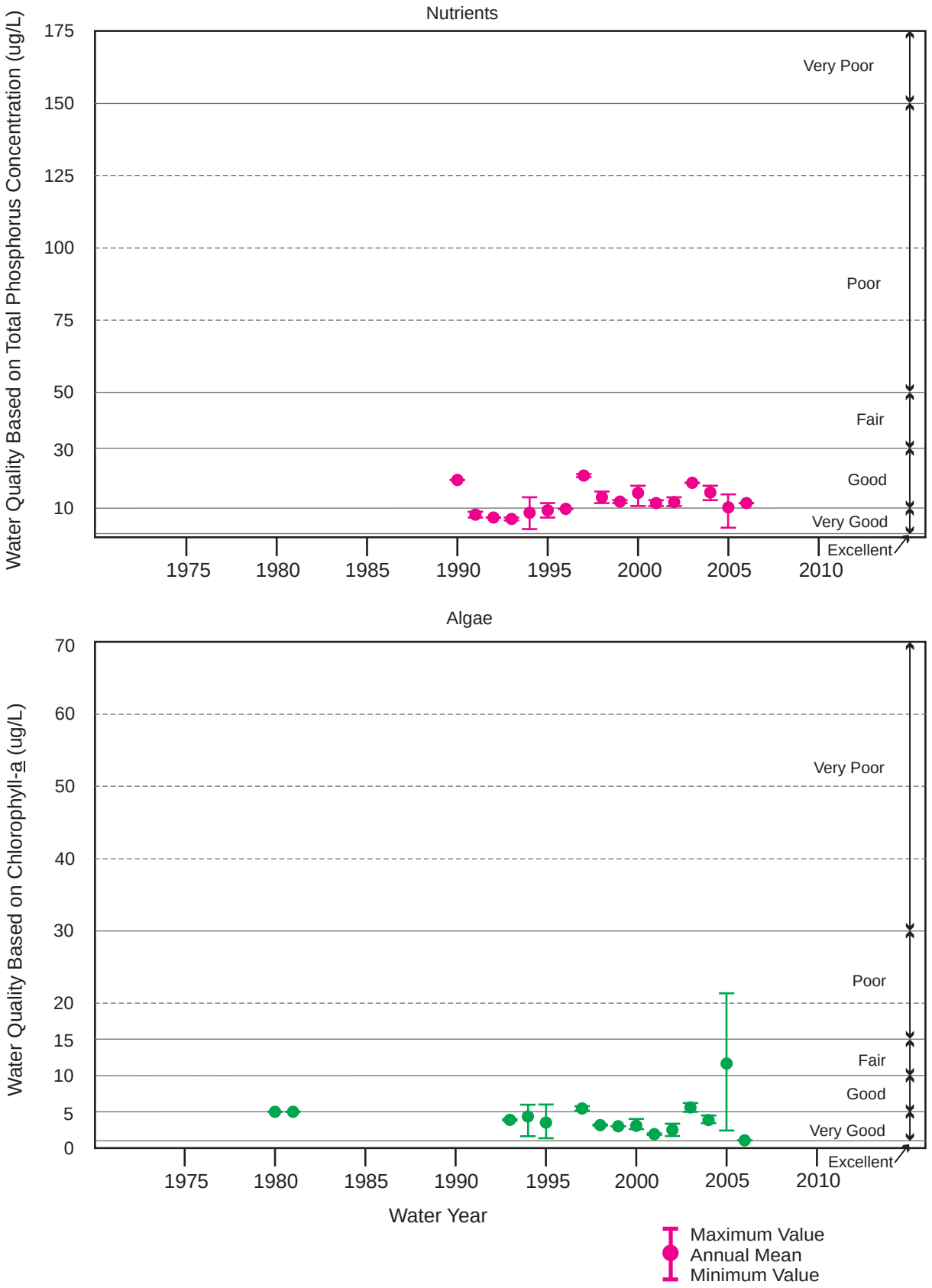
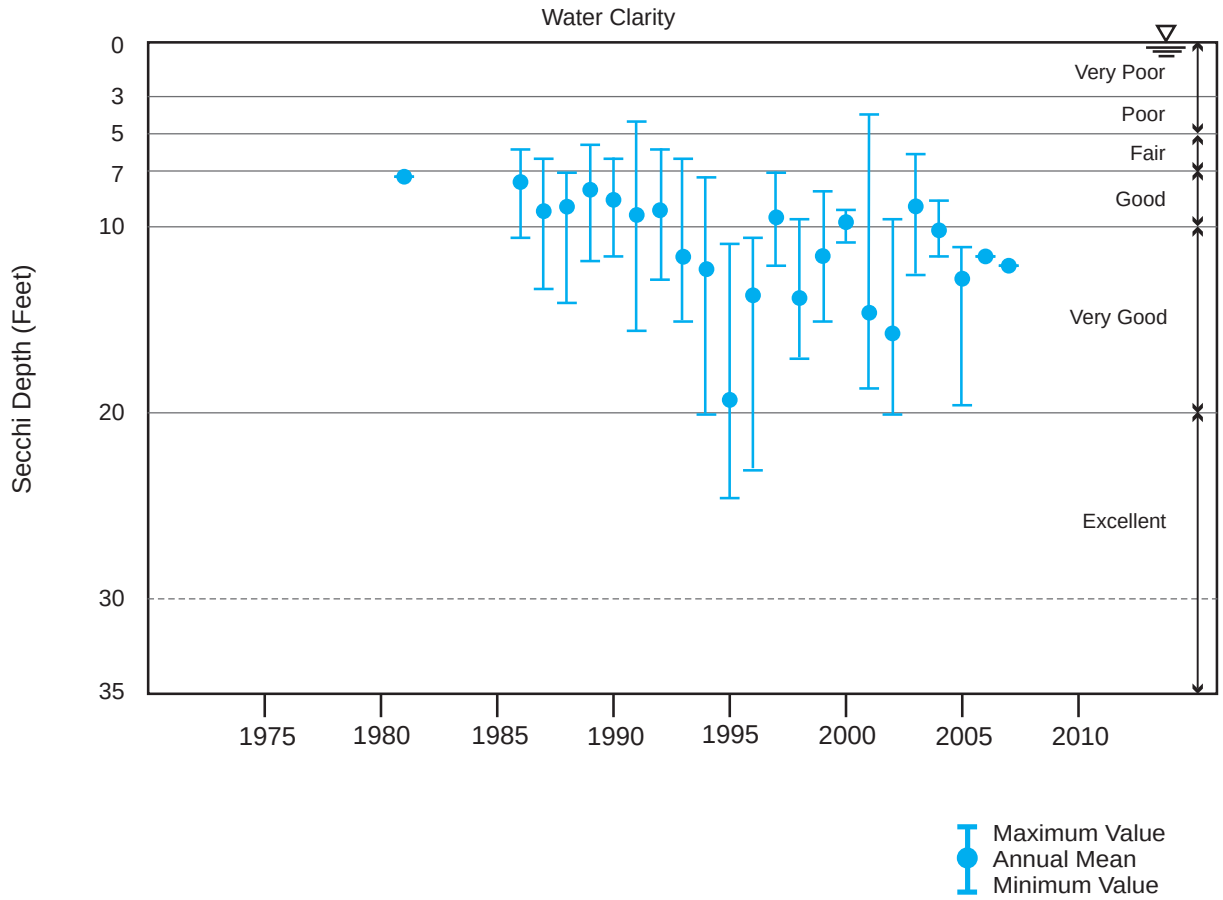


Figure 1 (continued)



Source: Wisconsin Department of Natural Resources and SEWRPC.

In addition to in-lake direct measurements of water clarity using a Secchi disk, the transparency of many Wisconsin lakes has been assessed using remote-sensing technology. The Environmental Remote Sensing Center (ERSC), established in 1970 at the University of Wisconsin-Madison, was one of the first remote-sensing facilities in the United States. Using data gathered by satellite remote-sensing technologies over a three-year period, the ERSC generated a map based on a mosaic of satellite images that presented estimated water clarity values for the largest 8,000 lakes in Wisconsin. The WDNR, through its volunteer Self-Help Monitoring Program, was able to gather simultaneous Secchi-disk readings from about 800 lakes, or about 10 percent of the lakes for which water clarity conditions were estimated. Based upon the fact that the satellite remote-sensing technology utilized by ERSC was able to accurately estimate the water clarity of these sampled lakes, the program had some confidence that it could estimate the water clarity in the remaining 90 percent of the 8,000-lake sample. Measurements reported by ERSC and based upon remote-sensing estimated the average water clarity in Pleasant Lake to be 12.2 feet, a value indicative of generally good to very-good water quality. These data are consistent with the Secchi-disk measurements reported by the WDNR Self-Help Monitoring Program and UWEX CLMN.

Zebra Mussel Impacts

Pleasant Lake is listed by the WDNR as having an established population of zebra mussels (*Dreissena polymorpha*), a nonnative species of shellfish with known negative impacts on native benthic populations. Zebra mussels have been confirmed to be present in the Lake since 2005. Zebra mussels are having varied impacts on

inland lakes in the Upper Midwest. They disrupt the food chain by removing significant amounts of phyto-plankton which serve as food, not only for themselves, but also for larval and juvenile fish and many forms of zooplankton. While many lakes have experience improved water clarity as a result of the filter feeding proclivities of these animals, this improved clarity often has led to increased growths of rooted aquatic plants, including Eurasian water milfoil. Curiously, within the Southeastern Wisconsin Region, zebra mussels have been observed attaching themselves to the stalks of the Eurasian water milfoil plants, dragging these stems out of the zone of light penetration due to the weight of the zebra mussel shells, and negating the competitive strategy of the Eurasian water milfoil plants. This, in turn, has contributed to improved growths of native aquatic plants, in some cases, and to the growths of filamentous algae too large to be ingested by the zebra mussels, in others. Since zebra mussels are established in Pleasant Lake, their populations should be carefully monitored. Regardless of the seeming beneficial impacts of these animals, the overall effect is that, as zebra mussels and other invasive species spread to inland lakes and rivers, so do the environmental, aesthetic, and economic costs to water users.

Dissolved Oxygen

Dissolved oxygen levels are one of the most critical factors affecting the living organisms of a lake ecosystem. As shown in Figure 2, dissolved oxygen levels were generally higher at the surface of Pleasant Lake, where there is an interchange between the water and atmosphere, stirring by wind action, and production of oxygen by plant photosynthesis, and lowest near the bottom of the Lake, where decomposer organisms and chemical oxidation processes utilized oxygen in the decay process. When any lake becomes stratified, that is, when a thermal or chemical gradient of sufficient intensity produces a barrier separating the upper waters, called the epilimnion, from lower waters, known as the hypolimnion, the surface supply of oxygen to the hypolimnion is cut off. Eventually, if there is not enough dissolved oxygen to meet the demands from the bottom dwelling aquatic life and decaying organic material, the dissolved oxygen levels in the bottom waters may be reduced to zero, a condition known as anoxia or anaerobiasis.

As shown in Figure 2, by mid- to late-summer, Pleasant Lake thermally stratifies, albeit somewhat weakly, at depths of between about 15 to 25 feet. In the 1969 WDNR lake use report, anoxic conditions were indicated as having occurred during July of 1966.[4] During the current study period from 1990 through 2006, also shown in Figure 2, anoxic conditions were recorded on only three occasions, indicating that, in general, total oxygen deprivation in bottom waters is likely to be relatively uncommon in Pleasant Lake.

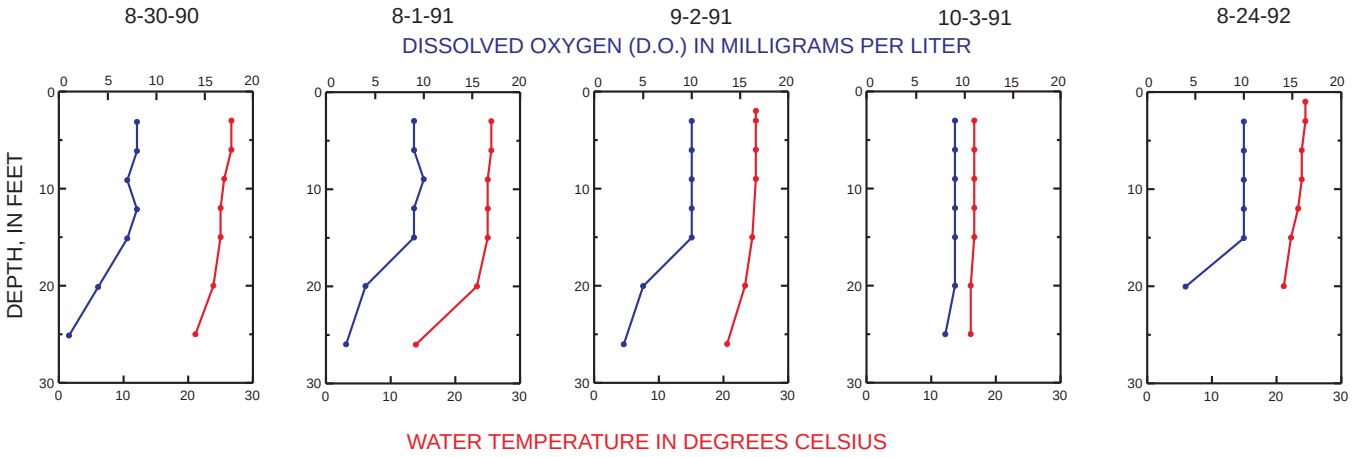
In many of the lakes in southeastern Wisconsin, however, hypolimnetic anoxia is common during summer stratification. The depleted oxygen levels in the hypolimnion cause fish to move upward, nearer to the surface of the stratified lakes, where higher dissolved oxygen concentrations exist. This migration, when combined with the warmer temperatures of the surface waters of the lakes, can select against some fish species that prefer the cooler water temperatures that generally prevail in the lower portions of the lakes. When there is insufficient oxygen at these depths, fishes in the hypolimnion may be susceptible to summer-kills, or, alternatively, are driven into the warmer water portions of the lake where their condition and competitive success may be severely impaired. Similar conditions can occur during winter, when the supply of atmospheric oxygen may be cut off due to the formation of ice cover. Such winter anoxia is exacerbated by heavy snowfalls which may limit the ability of the aquatic plants to photosynthesize under the ice. Under such conditions winterkill can occur. Given the infrequent stratification of Pleasant Lake, it is unlikely that either summerkills or winterkills have occurred at Pleasant Lake.

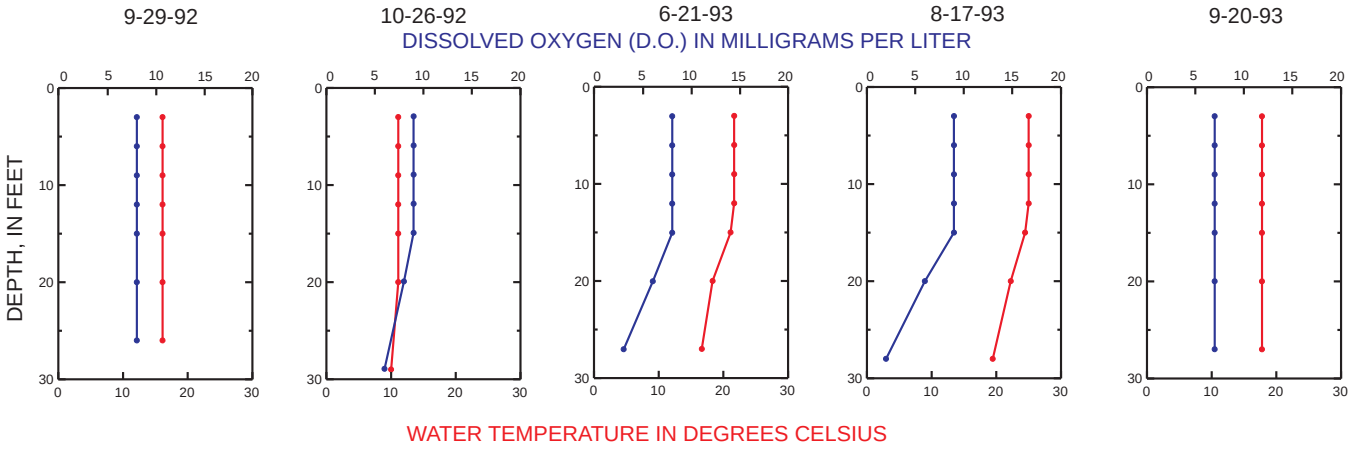
In addition to the aforementioned biological consequences, the lack of dissolved oxygen at depth can enhance the development of chemoclines, or chemical gradients, with an inverse relationship to the dissolved oxygen concentration. For example, the sediment-water exchange of elements, such as phosphorus, iron, and manganese, is increased under anaerobic conditions, resulting in higher hypolimnetic concentrations of these elements. Under anaerobic conditions, iron and manganese change oxidation states enabling the release of phosphorus from the

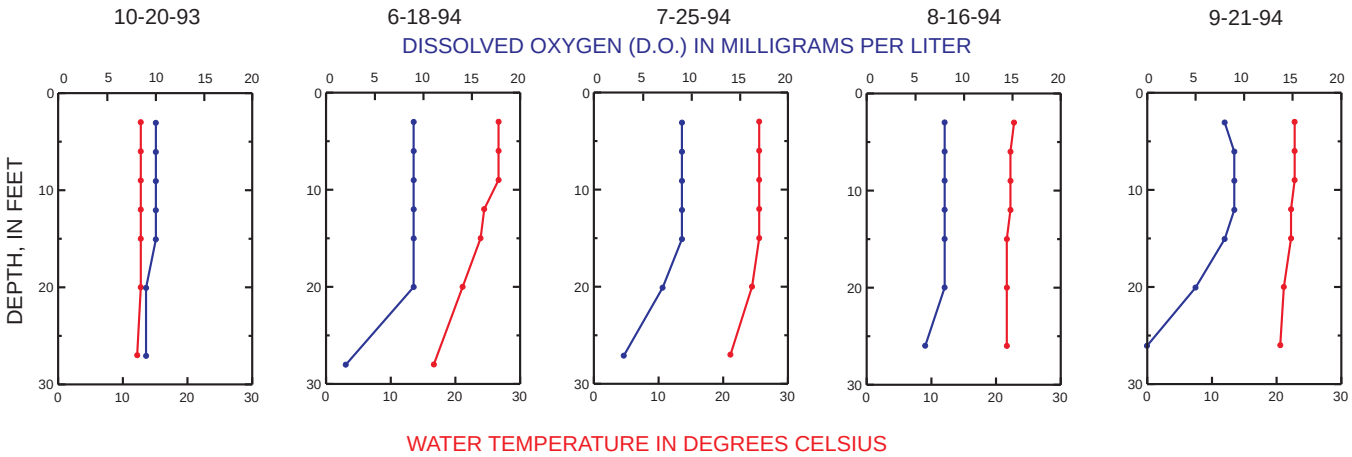
[4]Ibid.

Figure 2

DISSOLVED OXYGEN AND TEMPERATURE PROFILES FOR PLEASANT LAKE: 1990-2006







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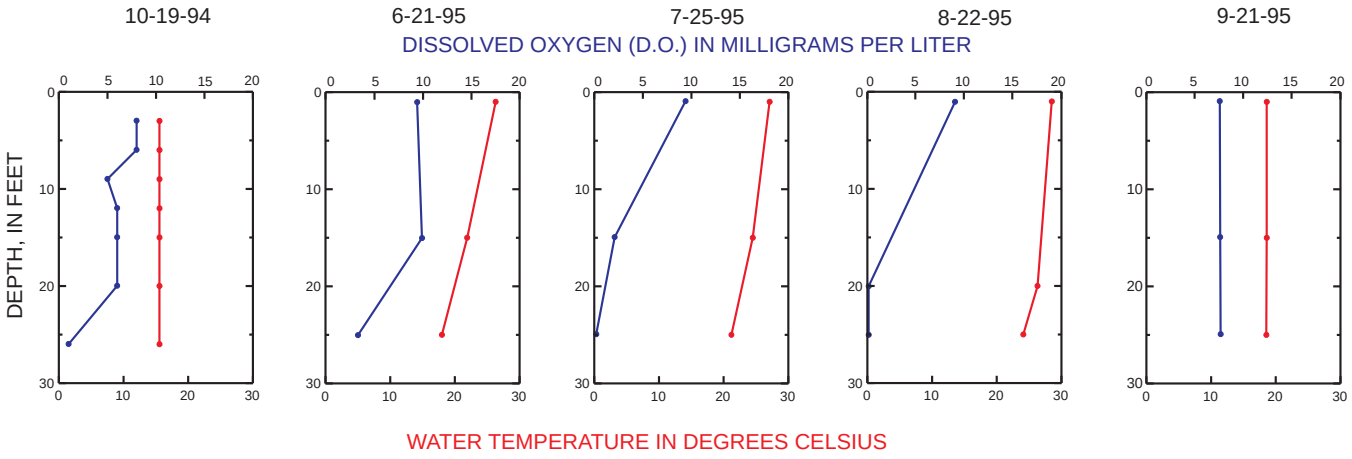

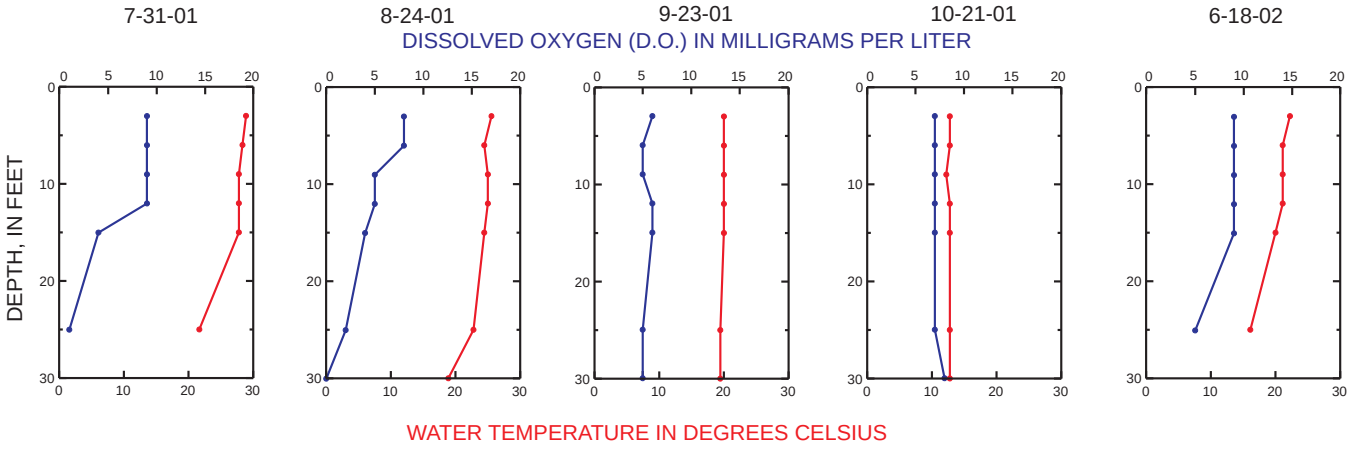

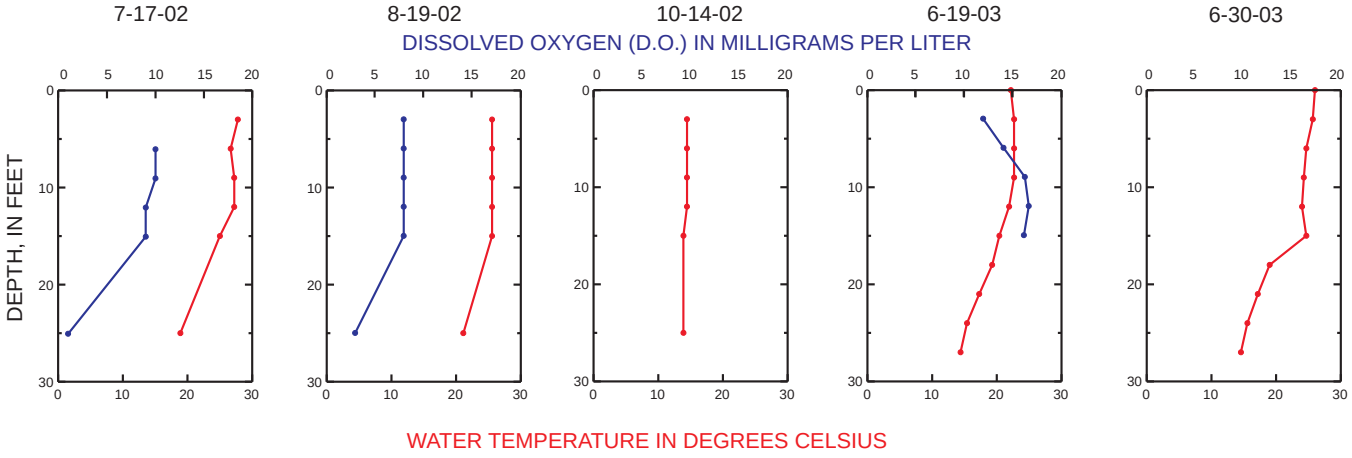

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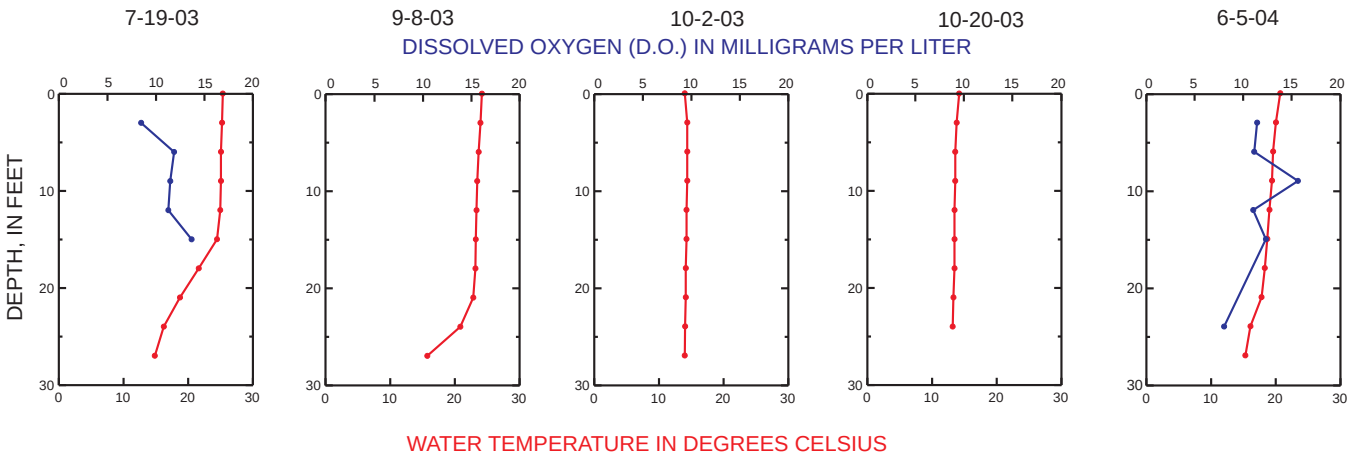

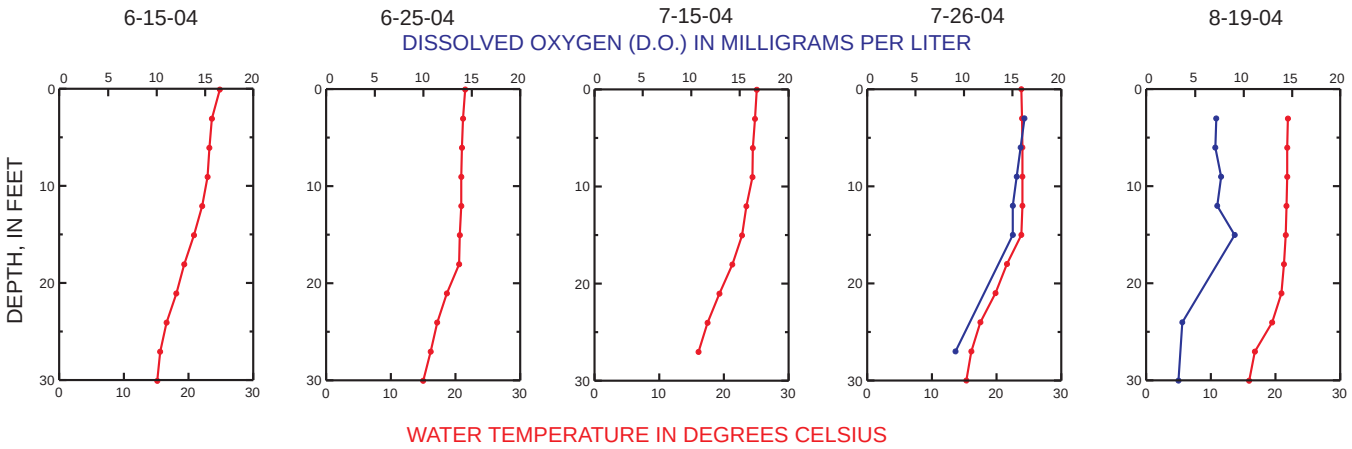

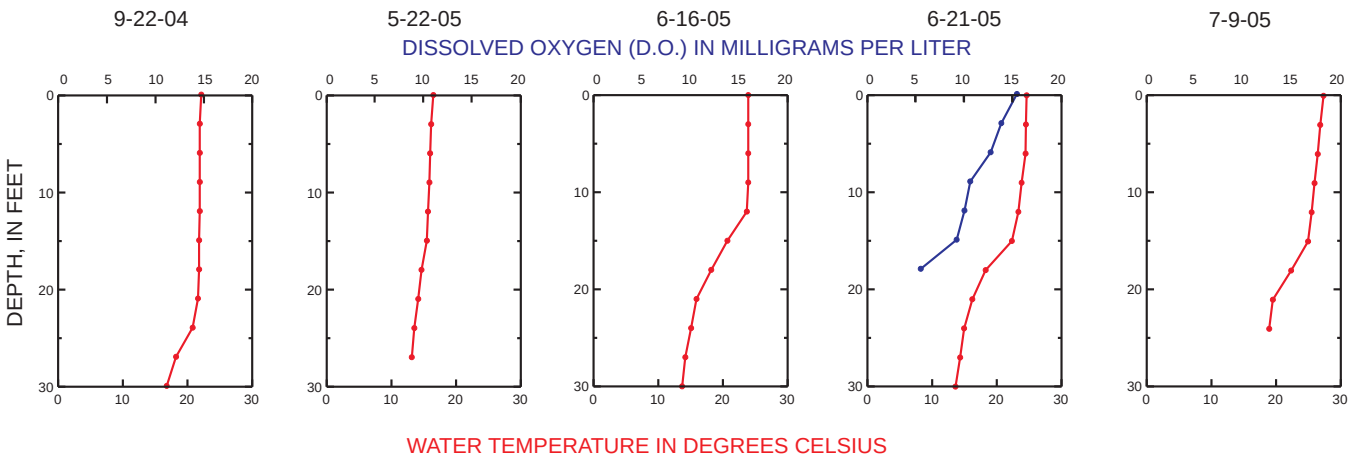

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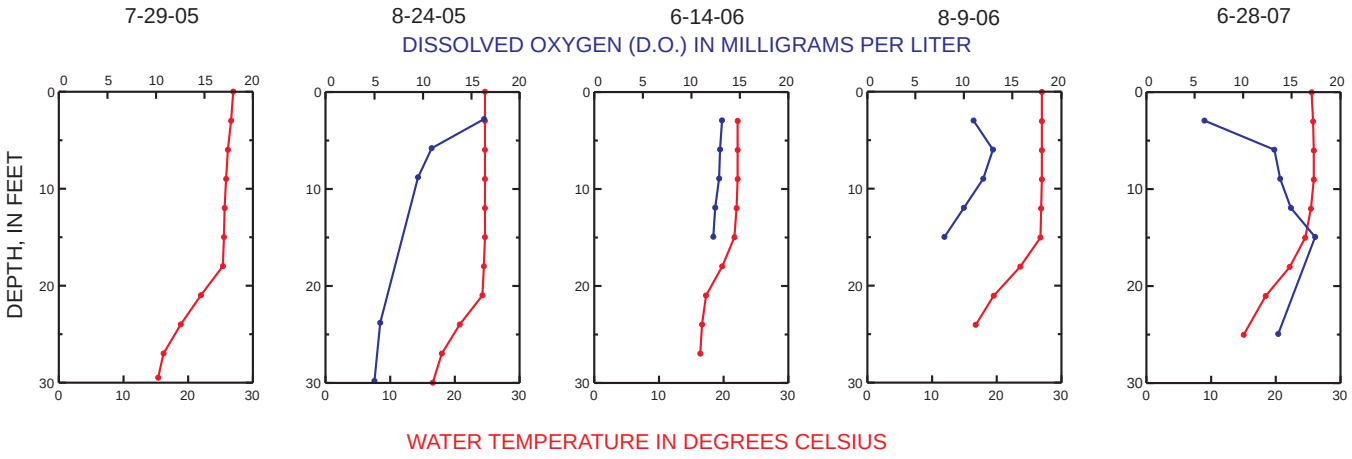

Source: Wisconsin Department of Natural Resources and SEWRPC.

iron and manganese complexes to which they are bound under aerobic conditions. This "internal loading" can affect water quality, especially if these nutrients and salts are mixed into the epilimnion, notably during early summer, when these nutrients can become available for algal and rooted aquatic plant growth. In the afore-referenced WDNR priority watershed project report,[5] it was noted that, based on data from 1995, concentrations of phosphorus in the bottom waters of Pleasant Lake were consistent with tributary area phosphorus loading and that excessive internal loading, therefore, was not indicated.

Chlorophyll-*a*

Chlorophyll-*a* is the major photosynthetic ("green") pigment in algae. The amount of chlorophyll-*a* present in the water, therefore, is an indication of the biomass, or amount of algae, in the water. During the current study period, chlorophyll-*a* concentrations ranged from not detectable to 21.0 micrograms per liter (µg/l), with a mean chlorophyll-*a* concentration of about 4.6 µg/l. Chlorophyll-*a* levels above about 10.0 µg/l result in a green coloration of the water that may be severe enough to impair recreational activities, especially full-body-contact recreational uses, such as swimming or waterskiing.[6] The chlorophyll-*a* values for Pleasant Lake, typically being below the average chlorophyll-*a* concentrations in other lakes in the Region,[7] indicate good to very-good water quality, as shown in Figure 1.

Nutrient Characteristics

Aquatic plants and algae require such nutrients as phosphorus and nitrogen for growth. In hard-water alkaline lakes, most of these nutrients are generally found in concentrations that exceed the needs of the growing plants. However, in lakes where the supply of one or more of these nutrients is limited, plant growth is limited by the

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[5]*Wisconsin Department of Natural Resources Publication No. WT-478-97,* A Nonpoint Source Control Plan for the Sugar/Honey Creek Priority Watershed Project, *February 1997.*

[6]*J.R. Vallentyne, 1969. "The Process of Eutrophication and Criteria for Trophic State Determination" in* Modeling the Eutrophication Process—Proceedings of a Workshop at St. Petersburg, Florida, *November 19-21, 1969, pp. 57-67.*

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

amount of the nutrient that is available in the least quantity relative to all of the others. The ratio (N:P) of total nitrogen (N) to total phosphorus (P) in lake water indicates which of these nutrients is the factor most likely to be limiting aquatic plant growth in a lake.[8] When the N:P ratio is greater than 14:1, phosphorus is most likely to be the limiting nutrient. If the ratio is less than 10:1, nitrogen is most likely to be the limiting nutrient. When there is an addition of the limiting nutrient to the lake water, additional aquatic plant growth is likely to occur at a rate commensurate with the available nutrient.

Samples for nitrogen analysis were obtained from the Lake in 2000 and 2008. These data were used to determine the N:P ratios in the Lake. Based upon an average of these few data points, an average total Kjeldahl nitrogen-to-total phosphorus ratio of about 5.5 was determined. Based on this value, it is likely that aquatic plant growth in Pleasant Lake is nitrogen-limited.

Total phosphorus concentrations were measured in Pleasant Lake during the initial studies of the 1960s, and during the current study period, from 1990 to 2005. Total phosphorus concentrations include the phosphorus contained in plant and animal fragments suspended in the lake water, phosphorus bound to sediment particles, and phosphorus dissolved in the water column. Total phosphorus concentrations, therefore, usually are considered to be a good indicator of the nutrient status of a lake.

In Pleasant Lake, total phosphorus concentrations obtained during the mid-1990s and described in the afore-referenced priority watershed project report,[9] ranged from 10 μg/l to 20 μg/l during spring turnover, with summer surface concentrations ranging from 3.0 μg/l to 14 μg/l. These levels were found to be well below the levels necessary to support nuisance algal blooms. For lakes, the guideline value set forth in the adopted regional water quality management plan is 20 μg/l of total phosphorus during spring turnover, the level above which algal and aquatic plant growths reach levels likely to interfere with recreational uses and a warmwater fishery established pursuant to Chapters NR 102 and NR 104 of the *Wisconsin Administrative Code*. As recommended in the aforereferenced priority watershed plan, actions to reduce the phosphorus loading to Pleasant Lake by 11 percent relative to the conditions pertaining at the time of the priority watershed project were considered to be necessary to achieve best managed conditions in Pleasant Lake.

During the recent study period, total phosphorus concentrations in Pleasant Lake, as shown in Figure 1, generally averaged 10 μg/l for the period between 1990 and 1996. Between 1996 and 1998, average surface total phosphorus concentrations appear to have increased to 15 μg/l, although the total phosphorus concentrations then decreased again between 1998 and 2002. All of these values indicate generally good water quality conditions, as shown in Figure 1.

The seasonal gradients in phosphorus concentrations between the epilimnion and hypolimnion reflect the biogeochemistry of this growth element. When aquatic organisms die, they usually sink to the bottom of a lake, where they are decomposed. Phosphorus from these organisms is then either stored in the bottom sediments or rereleased into the water column. Because phosphorus is not highly soluble in water, it readily forms insoluble precipitates with calcium, iron, and aluminum under aerobic conditions and accumulates, predominantly, in the lake sediments. If the bottom waters become depleted of oxygen during stratification, however, certain chemical changes occur, especially the change in the oxidation state of iron from the insoluble Fe^{3+} state to the more soluble Fe^{2+} state. The effect of these chemical changes is that phosphorus becomes soluble and is more readily released from the sediments. This process also occurs under aerobic conditions, but generally at a slower rate than under anaerobic conditions. As the waters mix, this phosphorus may be widely dispersed throughout the waterbody and become available for algal growth.

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[8] *M.0. Allum, R.E. Gessner, and T.H. Gakstatter, U.S. Environmental Protection Agency Working Paper No. 900,* An Evaluation of the National Eutrophication Data, *1976.*

[9] *Wisconsin Department of Natural Resources Publication No. WT-478-97,* op. cit.

As noted above, data gathered during the priority watershed project indicated that no significant internal loading of phosphorus to Pleasant Lake was likely. This condition is not likely to have changed since the priority watershed project studies. Hence, should any such loading occur, the magnitude of the release and its subsequent effect in contributing to algal growth in the surface waters of the Lake is likely to be minimal. Any such loading also would be moderated by a number of circumstances, including the rates of mixing during the spring and fall overturn events. Rapid mixing generally results in any phosphorus released into the bottom waters of the Lake being reprecipitated and unavailable to aquatic plants.[10]

POLLUTION LOADINGS AND SOURCES

Pollutant loads to a lake are generated by various natural processes and human activities that take place in the area tributary to a lake. These loads are transported to 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, including drainage from onsite wastewater treatment systems. Pollutants transported by streams enter a lake as surface water inflows. In seepage lakes, like Pleasant Lake, pollutant loadings transported across land surfaces tributary to the Lake, in the absence of identifiable or point source discharges from industries or wastewater treatment facilities, and deposited from the atmosphere comprise the principal routes by which contaminants enter a waterbody.[11] Currently, there are no significant point source discharges of pollutants to Pleasant Lake. For this reason, the discussion that follows is based upon nonpoint source pollutant loadings to the Lake.

Nonpoint sources of water pollution include urban sources, such as runoff from residential, commercial, transportation, construction, and recreational activities; rural sources, such as runoff from agricultural lands; and, onsite sewage disposal systems.

For the current study, nonpoint source loadings of suspended solids, phosphorus, and urban-derived metals into Pleasant Lake were estimated using the Wisconsin Lake Model Spreadsheet (WILMS version 3.3),[12] and unit area load-based models developed for use within the Southeastern Wisconsin Region.[13]

Sediment Loadings

For the current study period, the estimated sediment loadings to Pleasant Lake under existing year 2000 land use conditions are shown in Table 4. A total annual sediment load of 126 tons was estimated to be contributed to Pleasant Lake under existing year 2000 conditions, as shown in Table 4. Of the likely annual sediment load, it

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[10]*See, for example, R.D. Robarts, P.J. Ashton, J.A. Thornton, H.J. Taussig, and L.M. Sephton, "Overturn in a hypertrophic, warm, monomictic impoundment (Hartbeespoort Dam, South Africa),"* Hydrobiologia*, Volume 97, 1982, pp. 209-224.*

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

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

[13]*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.*

Table 4

ESTIMATED ANNUAL POLLUTANT LOADINGS TO PLEASANT LAKE BY LAND USE CATEGORY: 2000

Land Use Category	Pollutant Loads			
	Sediment (tons)	Phosphorus (pounds)	Copper (pounds)	Zinc (pounds)
Urban				
Residential[a]	0.5	11.2	0.0	1.6
Commercial	0.8	2.4	0.4	3.0
Industrial	0.0	0.0	0.0	1.5
Governmental	0.0	0.0	0.0	24.8
Transportation	0.2	4.4	0.0	0.0
Recreational	0.4	8.6	0.0	0.0
Subtotal	1.9	26.6	0.4	30.9
Rural				
Agricultural	109.1	417.1	0.0	0.0
Wetlands	0.1	0.5	0.0	0.0
Woodlands	0.4	7.8	0.0	0.0
Surface Water	14.5	20.0	0.0	0.0
Extractive	- -	- -	- -	- -
Subtotal	124.1	445.4	0.0	0.0
Total	126.0	472.0	0.4	30.9

[a]*Includes the contribution from onsite sewage disposal systems. The contribution from onsite sewage disposal systems, based upon the* per capita *phosphorus contribution contained within wastewater estimated within the WILMS model, could range from approximately 2.5 pounds per year to as much as about 65.0 pounds per year, depending upon soil type, system condition, and system locations. For purposes of this analysis, 20.5 pounds per year were used as that value provided the loading that was best correlated to the measured in-lake phosphorus concentration.*

Source: SEWRPC.

was estimated that 124.1 tons per year, or 98 percent, of the total load, were contributed by runoff from rural lands, with 1.9 tons, or 2 percent, being contributed from urban lands. An estimated 14.5 tons, or 11 percent of the total load, are contributed by atmospheric deposition directly onto the lake surface.

Under planned year 2035 conditions, as set forth in the adopted regional land use plan,[14] and shown in Table 5, the annual sediment load to the Lake is anticipated to diminish slightly. The most likely annual sediment load to the Lake under buildout conditions is estimated to be 115.2 tons. In addition, the distribution of the sources of the sediment load to the Lake may be expected to change, with an increased mass of sediment being contributed from urban sources, estimated to be 3.7 tons of sediment per year, and a decreased mass of sediment being contributed from rural sources, estimated to be 111.5 tons of sediment per year. An estimated 14.5 tons of sediment per year are contributed by direct precipitation onto the lake surface.

Phosphorus Loadings

In most lakes in the Southeastern Wisconsin Region, phosphorus is the major factor limiting aquatic plant growth. Thus, excessive levels of phosphorus in a lake are likely to result in conditions that interfere with the desired use of the lake. While it was not possible to determine whether phosphorus was, in fact, the major factor limiting aquatic plant growth in Pleasant Lake, such limitation can be assumed on the basis of the historic data, including the N:P ratio, and the similarities between Pleasant Lake and most other lakes in the Region.

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

Table 5

ESTIMATED ANNUAL POLLUTANT LOADINGS TO PLEASANT LAKE BY LAND USE CATEGORY: 2035

Land Use Category	Pollutant Loads			
	Sediment (tons)	Phosphorus (pounds)	Copper (pounds)	Zinc (pounds)
Urban				
Residential[a]	0.6	12.6	0.0	1.6
Commercial	2.0	6.0	1.1	3.0
Industrial	0.0	0.0	0.0	1.5
Governmental	0.0	0.0	0.0	24.8
Transportation	0.2	4.4	0.0	0.0
Recreational	0.9	21.1	0.0	0.0
Subtotal	3.7	44.1	1.1	30.9
Rural				
Agricultural	96.5	368.9	0.0	0.0
Wetlands	0.1	0.5	0.0	0.0
Woodlands	0.4	7.8	0.0	0.0
Surface Water	14.5	20.0	0.0	0.0
Extractive	- -	- -	- -	- -
Subtotal	111.5	397.2	0.0	0.0
Total	115.2	441.3	1.1	30.9

[a]*Includes the contribution from onsite sewage disposal systems. The contribution from onsite sewage disposal systems, based upon the* per capita *phosphorus contribution contained within wastewater estimated within the WILMS model, could range from approximately 2.5 pounds per year to as much as about 65.0 pounds per year, depending upon soil type, system condition, and system locations. For purposes of this analysis, 20.5 pounds per year were used as that value provided the loading that was best correlated to the measured in-lake phosphorus concentration.*

Source: SEWRPC.

Existing year 2000 phosphorus loads to Pleasant Lake and their sources were identified and quantified using Commission land use inventory data, as shown in Table 4. It was estimated that, under year 2000 conditions, the total phosphorus load to Pleasant Lake was 472 pounds. Of the annual total phosphorus load, it was estimated that 445 pounds per year, or 94 percent of the total loading, were contributed by runoff from rural lands, and 27 pounds per year, or 6 percent, were contributed by runoff from urban lands, inclusive of inputs from onsite sewage disposal systems. About 20 pounds, or 4 percent, were contributed by direct precipitation onto the lake surface. Phosphorus release from the lake bottom sediments, or internal loading, as discussed above, did not appear to be a contributing factor.

Under planned year 2035 conditions, as set forth in the aforereferenced adopted regional land use plan,[15] and as shown in Table 5, the annual total phosphorus load to the Lake is anticipated to continue to diminish slightly as agricultural activities within the area tributary to Pleasant Lake are replaced by urban residential land uses. The most likely annual total phosphorus load to the Lake under buildout conditions is estimated to be 441 pounds. Of this total forecast annual phosphorus load to Pleasant Lake, 397 pounds per year, or 90 percent of the total loading, are estimated to be contributed by runoff from rural lands, and 44 pounds per year, or 10 percent, by runoff from urban lands. About 20 pounds per year, or 4.5 percent, are expected to be contributed by direct precipitation onto the lake surface. Thus, it may be anticipated that the distribution of the sources of the

[15]Ibid.

phosphorus load to the Lake could change, with the amount of phosphorus being contributed from urban sources increasing from 6 percent of the total in 2000 to 10 percent of the total in 2035. The amount of phosphorus contributed from rural sources would decreases commensurately from 94 percent of the total in 2000 to 90 percent of the total in 2035. This trend, however, may be offset by the increased utilization of phosphorus-containing agro-chemicals in urban landscaping.[16] Studies within the Southeastern Wisconsin Region indicate that urban residential lands fertilized with a phosphorus-based fertilizer can contribute up to two times more dissolved phosphorus to a lake than lawns fertilized with a phosphorus-free fertilizer or not fertilized at all.[17] The adoption in June of 2003 by the Town of LaGrange of Ordinance No. 03-007, "An Ordinance to Regulate Fertilizers Near Lakes," limits the application of phosphorus-containing fertilizers to lands within the Lauderdale and Pleasant Lake Management Districts, and should control the additional mass of the phosphorus likely to be delivered to the Lakes from urban sources within the Town. As of April 2009, 2009 Wisconsin Act 9 extended a restriction on the sale and use of fertilizer containing phosphorus and other turf fertilizer to urban areas across the entire State. During November 2009, 2009 Wisconsin Act 63 limited the amount of phosphorus in cleaning agents used within the State. Both Acts will take effect during 2010.

Urban Heavy Metals Loadings

Urbanization brings with it increased use of metals and other materials that contribute pollutants to aquatic systems.[18] The majority of these metals become associated with sediment particles[19] and is likely to be encapsulated into the bottom sediments of a receiving water lake. The estimated loadings of copper and zinc likely to be contributed to Pleasant Lake under existing year 2000 and forecast year 2035 land use conditions are shown in Tables 4 and 5.[20]

Under year 2000 land use conditions, as shown in Table 4, 0.4 pound of copper and 31 pounds of zinc were estimated to be contributed annually to Pleasant Lake from urban lands. Rural lands are considered to contribute negligible amounts of these pollutants and are not considered in the unit area load model utilized to estimate heavy metal loadings to lakes.[21]

Under planned year 2035 conditions, as set forth in the adopted regional land use plan, and shown in Table 5, the annual heavy metal loads to the Lake are anticipated to remain about the same. The most likely annual loads to the Lake under buildout conditions are estimated to be one pound of copper and 31 pounds of zinc, all from urban sources.

TROPHIC STATUS

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

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

[17]Ibid.

[18]*Jeffrey A. Thornton, et al.,* op. cit.

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

[20]*SEWRPC Planning Report No. 48,* op. cit.

[21]*SEWRPC Planning Report No. 30,* op. cit.

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

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

Eutrophic lakes are nutrient-rich lakes. These lakes often exhibit excessive aquatic macrophyte growths and/or experience frequent algae blooms. If the lakes are shallow, fish winterkills may be common. While portions of such lakes are not ideal for swimming and boating, eutrophic lakes may support very productive fisheries. In extreme cases of nutrient enrichment, lakes may become hypertrophic, or extremely enriched, experiencing heavy growths of algae and possible summerkills of fishes as dissolved oxygen is consumed by both plant respiration and decomposition processes.

Several numeric "scales," based on one or more water quality indicator, have been developed to define the trophic condition of a lake. Because trophic state is actually a continuum from very nutrient poor to very nutrient rich, a numeric scale is useful for comparing lakes and for evaluating trends in water quality conditions. Care must be taken, however, that the particular scale used is appropriate for the lake to which it is applies. In this case, two indices appropriate for Wisconsin lakes have been used; namely, the Vollenweider-OECD open-boundary trophic classification system,[22] and the Carlson Trophic State Index (TSI),[23] through a variation known as the Wisconsin Trophic State Index value (WTSI).[24] The WTSI is a refinement of the Carlson TSI designed to account for the greater humic acid content—brown water color—present in Wisconsin lakes, and has been adopted by the WDNR for use in lake management investigations.

TSI readings, calculated during the aforementioned priority watershed project and based on water quality data acquired between 1994 and 1995, indicated that Pleasant Lake was an oligo- to meso-trophic waterbody. Based on Secchi-disk measurements over the period from 1986 through 2006, Pleasant Lake had an average WTSI value of 41, which is consistent with an oligo-mesotrophic condition. Since the time of the priority watershed project, the average WTSI value has been 40. A TSI value of 41 was estimated for Pleasant Lake by the ERSC utilizing their satellite telemetry. A value above 50 is generally considered to be indicative of the enriched conditions associated with eutrophic lakes, while a value of between 40 and 50 is representative of mesotrophic lakes; a value below 40 is indicative of oligotrophic lakes.

AQUATIC PLANTS: DISTRIBUTION AND MANAGEMENT AREAS

A previous survey and inventory of the aquatic plant community in Pleasant Lake was conducted in 1967. At that time, aquatic plants in the main basin of the Lake did not appear to be growing in such densities as to be considered as a nuisance, although the small bay on the eastern side of the Lake was noted as becoming weed-choked during

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[22] *H. Olem and G. Flock, U.S. Environmental Protection Agency Report EPA-440/4-90-006,* The Lake and Reservoir Restoration Guidance Manual, Second Edition*, Walworth, D.C., August 1990.*

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

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

late summer. In the main basin of the Lake, pondweeds were the dominant type of submerged plants, especially American pondweed (*Potamogeton americanus*), curly-leaf pondweed (*Potamogeton crispus*), white-stem pondweed (*Potamogeton praelongus*), and bushy pondweed (*Najas flexilis*). Waterweed (*Elodea* sp.) also was noted as being present in significant quantities.

During the current study period, Commission staff conducted an aquatic plant survey on Pleasant Lake during August of 2007. The results of this survey are presented in Table 6, and shown graphically on Map 7. A species list, compiled from the results of the Commission aquatic plant survey of Pleasant Lake, is set forth in Table 7, along with comments on the ecological significance of each of the submergent aquatic plants observed. Representative illustrations of these aquatic plants can be found in Appendix A.

The dominant species observed during the 2007 study was muskgrass (*Chara vulgaris*), although spiny naiad (*Najas marina*) also was present at nearly an equal number of sites. Also present in significant densities were: Sago pondweed (*Potamogeton pectinatus*), eel-grass (*Valisneria americana*), and bushy pondweed (*Najas flexilis*). Eurasian water milfoil (*Myriophyllum spicatum*), although present, was not observed to be present in significant densities, relative to the other species recorded during the 2007 survey.

Eurasian water milfoil is an invasive plant species capable of "explosive" growth, frequently outcompeting important native aquatic plant species, and potentially leading to significant ecological disruptions in the aquatic plant community of a lake. These disruptions, in turn, can degrade water quality and habitat for fishes, invertebrates, and other wildlife. Eurasian water milfoil and curly-leaf pondweed, both of which have been recorded from Pleasant Lake, are identified as invasive species pursuant to Chapter NR 109 of the *Wisconsin Administrative Code*.

Aquatic plant communities do undergo cyclical and periodic changes, which reflect, in part, changing climatic conditions on the interannual scale, as well as, in part, the evolution of the aquatic plant community in response to changing hydroclimate conditions in the Lake; these latter include factors such as changes in long-term nutrient loading, sedimentation rates, and recreational use patterns. Interannual changes occur over a period of three to seven years and may be temporary, while the aquatic plant community changes occur over a decadal period or longer and are longer-lasting. In the absence of quantitative aquatic plant data for earlier times, it is not possible to determine with certainty the nature of any changes in the aquatic plant community of Pleasant Lake that may be occurring. During 2007, the aquatic plant survey of Pleasant Lake was conducted using the Jesson and Lound transect method as modified by the WDNR for use in Wisconsin lakes. This methodology, when utilized in successive aquatic plant surveys, will allow the statistical evaluation of changes in the aquatic plant community within the Lake.[25]

A critical element in the ability of an ecosystem, such as a lake, to maintain its ecological integrity is through maintenance of its biological diversity. Conserving the biological diversity, or biodiversity, of an ecosystem helps not only to sustain the system, but preserves a spectrum of options for future decisions likely to affect the management of that system. During the 2007 aquatic plant survey of Pleasant Lake, several aquatic plant communities in the Lake showed significant biodiversity, being comprised of at least 11 different species. These highly diverse communities were most prevalent in the nearshore areas at the western end of Pleasant Lake just north of the public boat launch site, in the southeastern corner of the Lake, and in the small bay off the eastern end of the Lake, known locally as "the Bay."

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

Table 6

SUBMERGENT AQUATIC PLANT SPECIES OBSERVED IN PLEASANT LAKE: AUGUST 2007

Aquatic Plant Species	Number of Sites Found	Frequency of Occurrence[a]	Relative Density[b]	Importance Value[c]
Ceratophyllum demersum (coontail)	5	4.3	2.0	8.6
Chara vulgaris (muskgrass)	92	79.3	3.4	267.2
Elodea canadensis (waterweed)	1	0.9	1.0	0.9
Myriophyllum sibiricum (northern water milfoil)	24	20.7	1.7	35.3
Myriophyllum spicatum (Eurasian water milfoil)	10	8.6	1.8	15.5
Najas flexilis (bushy pondweed)	37	31.9	2.4	76.7
Najas marina (spiny naiad)	87	75.0	2.6	196.6
Potamogeton amplifolius (large-leaf pondweed)	11	9.5	1.6	15.5
Potamogeton foliosis (leafy pondweed)	1	0.9	1.0	0.9
Potamogeton gramineus (variable pondweed)	26	22.4	2.2	49.1
Potamogeton illinoensis (Illinois pondweed)	6	5.2	1.7	8.6
Potamogeton natans (floating-leaf pondweed)	3	2.6	1.3	3.5
Potamogeton pectinatus (Sago pondweed)	53	45.7	2.1	94.8
Potamogeton pusillus (small pondweed)	4	3.5	2.0	6.9
Potamogeton zosteriformis (flat-stem pondweed)	11	9.5	1.6	15.5
Ranunculus longirostris (white-water crowfoot)	1	0.9	1.0	0.9
Utricularia sp. (bladderwort)	6	5.2	1.5	7.8
Vallisneria americana (water celery/eel-grass)	43	37.1	2.1	79.3
Zosterella dubia (water stargrass)	8	6.9	1.6	11.2

NOTE: Sampling occurred at 116 sampling sites along 32 transects.

[a]*The percent frequency of occurrence is the number of occurrences of a species divided by the number of samplings with vegetation, expressed as a percentage. It is the percentage of times a particular species occurred when there was aquatic vegetation present, and is analogous to the Jesson and Lound point system.*

[b]*The average density is the sum of density ratings for a species divided by the number of sampling points with vegetation. The maximum density possible of 4.0 is assigned to plants that occur at all four points sampled at a given depth and is an indication of how abundant a particular plant is throughout a lake.*

[c]*The importance value is the product of the relative frequency of occurrence and the average density, expressed as a percentage. This number provides an indication of the dominance of a species within a community.*

Source: SEWRPC.

Aquatic Plant Species of Special Significance

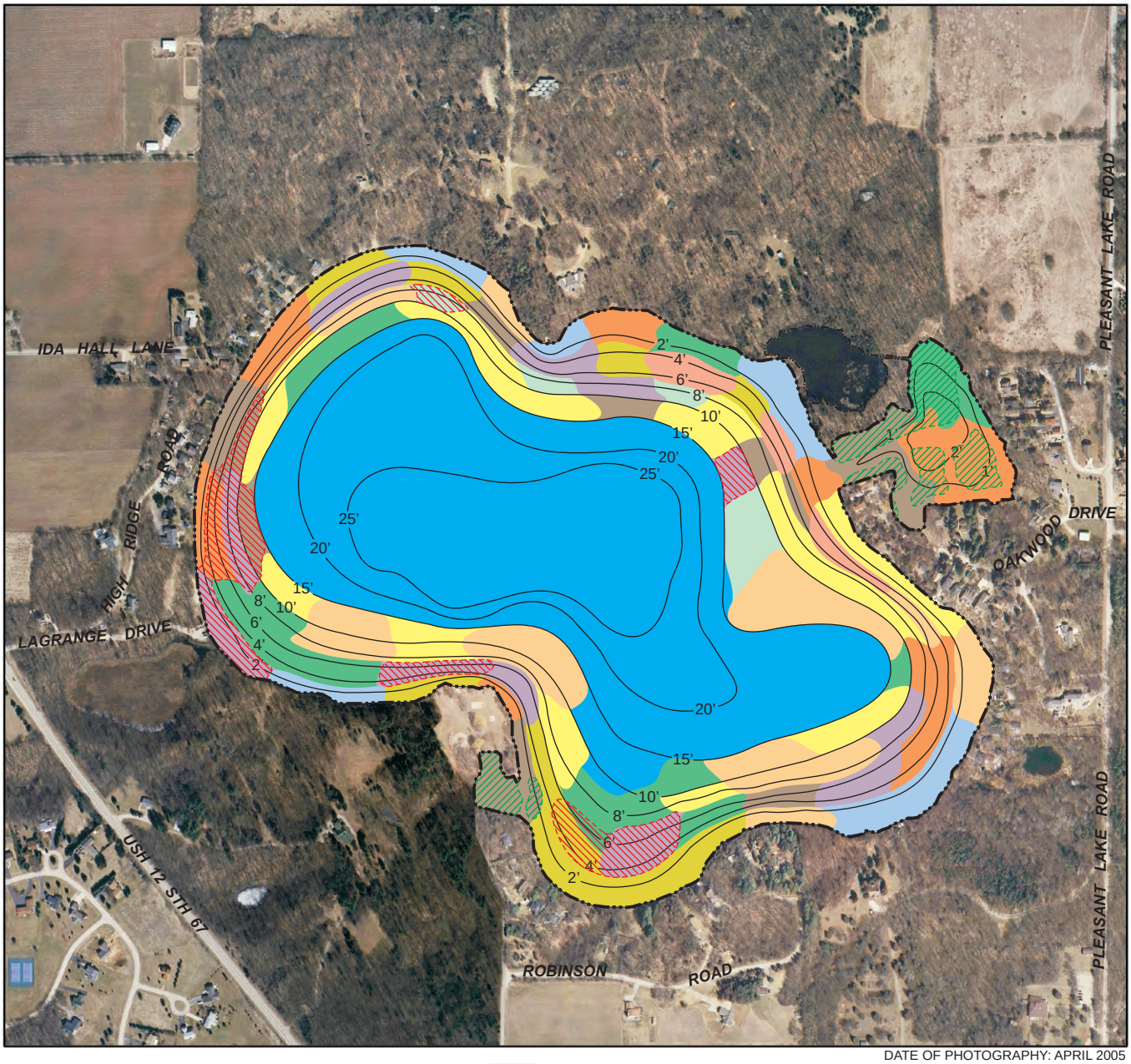
During the 2007 and earlier aquatic plant survey on Pleasant Lake, several species of significance were observed. Two of these species, Eurasian water milfoil and curly-leaf pondweed, are nonnative species and are considered detrimental to the ecological health of the Lake.

Nonnative Invasive Aquatic Plants

Eurasian water milfoil is one of eight milfoil species found in Wisconsin and the only one known to be exotic or nonnative. Because of its nonnative nature, Eurasian water milfoil has few natural enemies that can inhibit its growth which, under suitable conditions, can be rapid. The plant exhibits this characteristic growth pattern in lakes with organic-rich sediments, or where the lake bottom has been disturbed. It frequently has been reported as a colonizing species following dredging, unless its growth is anticipated and controlled. Eurasian water milfoil populations can displace native plant species and interfere with the aesthetic and recreational use of the waterbodies. This plant has been known to cause severe recreational use problems in lakes within the Southeastern Wisconsin Region.

Map 7

AQUATIC PLANT COMMUNITY DISTRIBUTION IN PLEASANT LAKE: 2007



DATE OF PHOTOGRAPHY: APRIL 2005

—20'— WATER DEPTH CONTOUR IN FEET

OPEN WATER

WATER LILIES

EURASIAN WATER MILFOIL

MUSKGRASS

MUSKGRASS AND SPINY NAIAD

MUSKGRASS, SPINY NAIAD, AND SAGO PONDWEED

MUSKGRASS, SPINY NAIAD, SAGO PONDWEED, AND WILD CELERY

MUSKGRASS, SPINY NAIAD, SAGO PONDWEED, AND BUSHY PONDWEED

MUSKGRASS, SPINY NAIAD, SAGO PONDWEED, WILD CELERY, BUSHY PONDWEED, COONTAIL, FLAT-STEM PONDWEED, LEAFY PONDWEED, WATER STAR GRASS, NATIVE WATER MILFOIL, AND VARIABLE PONDWEED

MUSKGRASS, SPINY NAIAD, WILD CELERY, COONTAIL, SAGO PONDWEED, FLAT-STEM PONDWEED, SMALL PONDWEED, NATIVE WATER MILFOIL, WATER STAR GRASS, ILLINOIS PONDWEED, VARIABLE PONDWEED, WATER BULRUSH, AND BLADDERWORT

MUSKGRASS, SPINY NAIAD, SAGO PONDWEED, SMALL PONDWEED, NATIVE WATER MILFOIL, BLADDERWORT, ILLINOIS PONDWEED, VARIABLE PONDWEED, WATER STAR GRASS, FLOATING-LEAF PONDWEED, AND WHITE WATER CROWFOOT

MUSKGRASS, BUSHY PONDWEED, SPINY NAIAD, WILD CELERY, FLAT-STEM PONDWEED, ILLINOIS PONDWEED, LARGE-LEAF PONDWEED, NATIVE WATER MILFOIL, VARIABLE PONDWEED, WATER STAR GRASS, AND BLADDERWORT

MUSKGRASS, SPINY NAIAD, BUSHY PONDWEED, WILD CELERY, SAGO PONDWEED, COONTAIL, FLAT-STEM PONDWEED, LARGE-LEAF PONDWEED, NATIVE WATER MILFOIL, SMALL PONDWEED, ILLINOIS PONDWEED, VARIABLE PONDWEED, WATER BULRUSH, FLOATING-LEAF PONDWEED, WATER STAR GRASS, WATERWEED, AND BLADDERWORT

GRAPHIC SCALE
0 350 700 FEET

Source: SEWRPC.

Table 7

POSITIVE ECOLOGICAL SIGNIFICANCE OF AQUATIC PLANT SPECIES PRESENT IN PLEASANT LAKE AND LITTLE PLEASANT LAKE: 2005

Aquatic Plant Species Present	Ecological Significance
Ceratophyllum demersum (coontail)	Provides good shelter for young fish and supports insects valuable as food for fish and ducklings
Chara vulgaris (muskgrass)	Excellent producer of fish food, especially for young trout, bluegills, small and largemouth bass, stabilizes bottom sediments, and has softening effect on the water by removing lime and carbon dioxide
Elodea canadensis (waterweed)	Provides shelter and support for insects which are valuable as fish food
Myriophyllum sibiricum (northern water milfoil)	Provides food for waterfowl, insect habitat and foraging opportunities for fish
Myriophyllum spicatum (Eurasian water milfoil)	None known
Najas flexilis (bushy pondweed)	Stems, foliage, and seeds important wildfowl food and produces good food and shelter for fish
Najas marina (spiny naiad)	Important food source for ducks
Potamogeton amplifolius (large-leaf pondweed)	Offers shade, shelter and foraging for fish; valuable food for waterfowl
Potamogeton foliosis (leafy pondweed)	Provides food for geese and ducks; food for muskrat, beaver and deer; good surface area for insects and cover for juvenile fish
Potamogeton gramineus (variable pondweed)	Provides habitat for fish and food for waterfowl, muskrat, beaver and deer
Potamogeton illinoensis (Illinois pondweed)	Provides shade and shelter for fish; harbor for insects; seeds are eaten by wildfowl
Potamogeton natans (floating leaf pondweed)	Provides food for waterfowl, muskrat, beaver and deer; good fish habitat
Potamogeton pectinatus (Sago pondweed)	This plant is the most important pondweed for ducks, in addition to providing food and shelter for young fish
Potamogeton pusillus (small pondweed)	Provides food for ducks, geese, muskrat, beaver, and deer, and provides food and shelter for fish
Potamogeton zosteriformis (flat-stem pondweed)	Provides some food for ducks
Ranunculus longirostris (white-water crowfoot)	Provides food for trout, upland game birds, and wildfowl
Utricularia sp. (bladderwort)	Provides cover and foraging for fish
Vallisneria americana (water celery/eel-grass)	Provides good shade and shelter, supports insects, and is valuable fish food
Zosterella dubia (water stargrass)	Provides food and shelter for fish, locally important food for waterfowl

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

Source: SEWRPC.

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

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

Native Aquatic Plants

There were several native plant species observed in the 2007 and earlier survey of the Lake that are of exceptionally high ecological value, namely, muskgrass, large-leaf pondweed, and white-stem pondweed. Muskgrass is a favorite waterfowl food source and, as an effective bottom sediment stabilizer, benefits water quality. Its prevalence in the plant communities of a lake may be a significant contributing factor to establishing and maintaining good water quality of a lake and, subsequently, in establishing water quality conditions that assist native plant species to successfully compete with curly-leaf pondweed, as described above. Large-leaf pondweed, also known as musky weed or bass weed, enjoys a reputation as a highly valuable provider of fish habitat. White-stem pondweed, because of its sensitivity to changes in water quality and intolerance of turbidity, is considered an excellent indicator species; its disappearance from water systems is an indication of declining water quality in disturbed systems. Conversely, its presence in a lake is usually an indicator of very good water quality.

Past and Present Aquatic Plant Management Practices

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

An aquatic plant management program has been carried out on Pleasant Lake in a documented manner since 1958. These aquatic plant management activities in Pleasant Lake can be categorized as primarily chemical control, specifically targeting beds of Eurasian water milfoil. Recorded chemical herbicide treatments that have been applied to Pleasant Lake are summarized in Table 8. As shown in Table 8, between 1950 and 1967, a total of 1,372 pounds of sodium arsenite were applied to Pleasant Lake to control perceived nuisance growths of aquatic plants. When it became apparent that arsenic was accumulating in the sediments of treated lakes and that the accumulations of arsenic were found to present potential health hazards both to humans and aquatic life, the use of sodium arsenite was discontinued in the State in 1969. Applications of a range of other aquatic herbicides have been used at intervals through 2007 and are summarized in Table 8.

Table 8

CHEMICAL CONTROL OF AQUATIC PLANTS IN PLEASANT LAKE: 1950-2007

Year	Total Acres Treated	Algae Control			Macrophyte Control				
		Copper Sulfate (pounds)	Blue Vitriol (pounds)	Cutrine or Cutrine Plus (pounds)	Sodium Arsenite (pounds)	2,4-D (pounds)	Diquat (gallons)	Glyphosate (gallons)	Endothall/ Aquathol (gallons)
1950-1969	- -	- -	- -	- -	1,372	- -	- -	- -	- -
1970-1976	- -	- -	- -	- -	- -	- -	- -	- -	- -
1977	0.10	- -	- -	- -	- -	- -	- -	- -	30.0 lbs.
1978-1984	- -	- -	- -	- -	- -	- -	- -	- -	- -
1985	0.06	- -	- -	- -	- -	- -	- -	- -	20.0 lbs.
1986-1998	- -	- -	- -	- -	- -	- -	- -	- -	- -
1999	1.56	- -	- -	- -	- -	156	- -	- -	- -
2000	0.52	- -	- -	- -	- -	350	- -	- -	- -
2001	3.00	- -	- -	- -	- -	380	- -	- -	- -
2002	1.75	- -	- -	- -	- -	300	- -	- -	- -
2003	- -	- -	- -	- -	- -	- -	- -	- -	- -
2004	N/A	- -	- -	- -	- -	394	- -	- -	- -
2005	- -	- -	- -	- -	- -	- -	- -	- -	- -
2006	N/A	- -	- -	- -	- -	1,189	- -	- -	14.0
2007	N/A	- -	- -	- -	- -	420	- -	- -	- -
2008	N/A	- -	- -	- -	- -	731 (9 gallons)	- -	- -	- -
Total	- -	- -	- -	- -	1,372	3,920 (9 gallons)	- -	- -	64.0

NOTE: N/A = Records or information not available.

Source: Wisconsin Department of Natural Resources and SEWRPC.

FISHERIES AND WILDLIFE

Fisheries and Fisheries Management

The WDNR reports that, in Pleasant Lake, largemouth bass are considered abundant, while other species present include panfish, northern pike, and walleye.[26] Currently the Lake is managed for largemouth bass, northern pike, panfish, and walleye.

As noted in the 1969 WDNR lake use report,[27] at that time, the principal gamefish was the largemouth bass. Other gamefish, namely the walleye and northern pike, were present in the Lake. Natural reproduction was noted to be occurring for all three gamefish species, albeit to a very limited extent in the walleye population. Roughfish populations consisted mainly of carp and the populations were very limited. The panfish community at that time was dominated by bluegill with bullheads, yellow perch, and warmouth, which also were considered to be common.

Currently, the Lake is managed for panfish, largemouth bass, northern pike, and walleye. In 2000, a fisheries survey of Pleasant Lake was conducted by the WDNR.[28] Fish species observed at that time, listed in order of abundance, included: bluegill, largemouth bass, warmouth, pumpkinseed, yellow bullhead, yellow perch, grass

[26]*Wisconsin Department of Natural Resources Publication No. PUB-FH-800 2005,* Wisconsin Lakes, *2005.*

[27]*Wisconsin Department of Natural Resources Publication Lake Use Report No. FX-25,* op. cit.

[28]*E-mail from Douglas E. Welch, WDNR, to Michael Borst, SEWRPC,* October 8, 2007.

pickerel, and brown bullhead. Other species observed included: rock bass, Iowa darter, and Johnny darter. Bluegill numbers were a little higher than average, with their size being noted as somewhat on the small side, which is fairly typical for lakes in Walworth County. Largemouth bass were present in good numbers, but also on the small side. Further surveys are noted as being planned.

As shown in Table 9, WDNR stocking records for Pleasant Lake show a fairly regular stocking of northern pike into the Lake from 1982 through 2001, with walleye being stocked into the Lake in 2006.

Wildlife, Waterfowl, Reptiles, and Amphibians

Given the land uses present around the shorelands of the Lake, only smaller animals and waterfowl can be expected to inhabit the lakeshore. Muskrats, beaver, grey and fox squirrels, and cottontail rabbits are probably the most abundant and widely distributed fur-bearing mammals in the immediate riparian areas. Larger mammals, such as the whitetail deer, are likely confined to the larger wooded areas and the open meadows found in the park and open space lands within the tributary area of the Lake.

The Pleasant Lake tributary areas support a significant population of waterfowl, including mallards, wood duck, and blue-winged teal. During the migration seasons a greater variety of waterfowl may be present and in greater numbers.

Amphibians and reptiles are vital components of the Pleasant Lake ecosystem, and include frogs, toads, and salamanders, and turtles and snakes, respectively. About 14 species of amphibians and 16 species of reptiles would normally be expected to be present in the Pleasant Lake area, including State-designated threatened species, the Blanding's turtle (*Emydoidea blandingii*).

WDNR-Designated Sensitive Areas and Critical Species Habitat

Within or around lakes, the WDNR identifies sites that have special importance biologically, historically, geologically, ecologically, or even archaeologically. Areas are identified as sensitive areas after a comprehensive examination and study is completed by WDNR staff from many different disciplines and fields of study. Currently, nearly all of Pleasant Lake is considered to be a sensitive area, as shown on Map 8. In 2008, a draft report on sensitive areas in Pleasant Lake was developed by the WDNR, pursuant to authorities granted to the Department pursuant to Chapter NR 107 of the *Wisconsin Administrative Code*. A copy of this draft sensitive area delineation is included as Appendix B.

In addition to delineations made by the WDNR pursuant to Chapter NR 107 of the *Wisconsin Administrative Code*, the Regional Planning Commission has identified specific areas within the Pleasant Lake watershed as having local, countywide, regional, State or greater significance as critical species habitat.[29] Natural areas are defined as those areas of land or water so little modified by human activity, or which have sufficiently recovered from the effects of such activity, that they contain intact native plant and animal communities believed to be representative of the pre-European-settlement landscape. Critical species habitat is defined as those tracts of land or water which support Federally or State-listed rare, threatened, and/or endangered plant or animal species as defined by State or Federal agencies. While the tributary area of Pleasant Lake does not contain any specifically designated and delineated natural areas, there are several such areas in the vicinity of Pleasant Lake, including:

1. Adams Lake Fen and Marsh: This 65-acre, privately owned good-quality calcareous fen and spring includes a shallow marsh and tamarack relict. Located east of the Pleasant Lake tributary area, this area has an NA-2 rating, designating it as an area of countywide or regional significance;

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

Table 9

FISH STOCKED INTO PLEASANT LAKE

Year	Species Stocked	Number	Average Fish Length (inches)
1982	Northern pike	310	Yearling
1985	Northern pike	310	8.00
1990	Northern pike	50,000	1.00
1992	Northern pike	310	9.00
1994	Northern pike	310	7.50
1999	Northern pike	310	7.20
2001	Northern pike	500	7.60
2001	Northern pike	2,129,410	0.30
2006	Walleye	5,000	1.40

Source: Wisconsin Department of Natural Resources and SEWRPC.

2. Lein's Road Fen: This 22-acre, privately owned site, located southeast of the Pleasant Lake tributary area, contains a degraded shrub-fen, disturbed by past grazing and ditching. The Fen has been given an NA-3 rating, identifying the area as a site of local significance; and,

3. Honey Creek Fen: This seven-acre, privately owned site, located south of the Pleasant Lake tributary area, is rated as an NA-3 site of local significance. It is a moderate-quality wetland complex bordering Honey Creek consisting of a calcareous fen, sedge meadow, and shallow marsh containing the State-designated threatened plant, the beaked spike-rush (*Eleocharis rostellata*).

Pleasant Lake itself is listed as a Critical Lake of Southeastern Wisconsin due to the presence of the State-designated Special Concern fish species, the lake chubsucker (*Erimyzon sucetta*). Pleasant Lake has been given a designation of AQ-2, identifying it as a lake of countywide or regional significance.

RECREATIONAL USES AND FACILITIES

As set forth in the regional water quality management plan, Pleasant Lake is a multi-purpose waterbody serving a variety of recreational uses.[30] Active recreational uses include boating, waterskiing, swimming, and fishing during the summer months, and cross-country skiing, snowmobiling, and ice-fishing during the winter. Public access to Pleasant Lake is provided by a Town of LaGrange facility located on the western shores of the Lake. This access site is comprised of: a single lane, paved boat launch; a paved parking area; and a boarding dock. Pleasant Lake is considered to have adequate public access, as defined in Chapter NR 1 of the *Wisconsin Administrative Code*. Chapter NR 1 establishes quantitative standards for determining the adequacy of public recreational boating access, setting maximum and minimum standards for available parking facilities, including both car-top and car-trailer units depending upon the boatable surface area of a specific lake. A Town-owned and operated park for Town residents is located adjacent to the launch site and provides picnic facilities, an unpaved parking area, and a swimming beach.

The Lake is used year-round as a visual amenity. Walking, bird watching, and picnicking are popular passive recreational uses of this waterbody. The Lake is heavily utilized during open water periods. During the current study period, a boat census conducted on Pleasant Lake in 2007 indicated that about 197 boats were either moored in the water or stored on land in the shoreland areas around the Lake, as shown in Table 10.

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

Map 8

WISCONSIN DEPARTMENT OF NATURAL RESOURCES-DESIGNATED SENSITIVE AREAS WITHIN PLEASANT LAKE

DATE OF PHOTOGRAPHY: APRIL 2005

—20'— WATER DEPTH CONTOUR IN FEET

ENVIRONMENTAL SENSITIVE AREA

Source: Wisconsin Department of Natural Resources and SEWRPC.

GRAPHIC SCALE
0 350 700 FEET

Pleasant Lake has been designated as a "no-wake" lake by the Town of LaGrange pursuant to a recreational boating ordinance set forth as Appendix C. Nevertheless, recreational boating is a popular active recreational use of the Lake. Of the motorized watercraft observed moored or stored, pontoon boats represented the largest group, with fishing boats and powerboats the next most common categories. Of the nonmotorized watercraft observed, canoes represented the most common type of watercraft, with paddleboats, rowboats, and kayaks also being observed in good numbers. The types of watercraft observed on the Lake are noted in Table 10.

The types of motorized watercraft docked or moored on a lake, as well as the relative proportion of nonmotorized to motorized watercraft, reflect the attitudes of the primary users of the lake, the riparian residents. On Pewaukee Lake in Waukesha County, Wisconsin, for example, nearly 80 percent of all watercraft on the Lake were motorized,[31] compared to about 30 percent of the watercraft on Pleasant Lake. Additionally, of all the watercraft on Pewaukee Lake, powerboats made up the largest proportion, comprising almost 40 percent. On Pleasant Lake, the largest proportion of all watercraft is pontoon boats, which represent about 23 percent of all watercraft on the Lake.

To assess the degree of recreational boating use of a lake, it has been estimated that, in southeastern Wisconsin, the number of watercraft operating at any given time is 2 to 5 percent of the total number of watercraft docked and moored. On Pleasant Lake, this would amount to somewhere between five and 13 boats of all kinds, less than one-third of which would be expected to be motorized. While there is a range of opinions on the issue of what constitutes optimal boating density, or the numbers of acres of open water available in which to operate a boat on a lake, the numbers of watercraft expected to be operating on Pleasant Lake would result in a boating density of between 12 and 31 acres per watercraft. The adopted regional park and open space plan suggested that, in the mid-1970s, an average area of about 16 acres per powerboat or sailboat was, at that time, considered suitable for the safe and enjoyable use of a boat on a lake.[32] Over time, motorized watercraft of all kinds have steadily increased in power and speed. Currently, an area of 40 acres per boat is suggested as the minimum area necessary for safe waterskiing and fast boating. Subsequently, Chapter NR 1 of the *Wisconsin Administrative Code* has established recreational boating standards that suggest densities of between 15 acres and 30 acres per watercraft as being appropriate for lakes with a surface area equal to that of Pleasant Lake. Public recreational boating access opportunities on Pleasant Lake are consistent with these standards.

Another way to assess the degree of recreational boat use on a lake is through direct counts of boats actually in use on a lake at a given time. During 2007, surveys to assess the types of watercraft in use on a typical summer weekday and a typical summer weekend day were conducted by Commission staff. The results of these surveys are shown in Table 11. As shown in Table 11, canoes were the most popular watercraft in use on Pleasant Lake, during weekdays, while fishing boats were the most common watercraft in use on weekends.

Table 12 shows how people were using Pleasant Lake recreationally during a typical summer weekday and a typical summer weekend day in 2007. The most popular weekday recreational activities on Pleasant Lake included going to the park, people were using the beach and picnic area at the Town-owned park on the western side of the Lake, swimming, fishing from boats, and pleasure boating. The most popular weekend recreational activities observed were swimming, canoeing or paddle-boating, and going to the park.

Recreational boating activities on Pleasant Lake are subject to State of Wisconsin boating and water safety laws as set forth in Chapter 30, *Wisconsin Statutes*. Additionally, the Lake is subject to boating ordinances promulgated by the Town of LaGrange included herein as Appendix C.

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

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

Table 10

WATERCRAFT DOCKED OR MOORED ON PLEASANT LAKE: 2007[a]

Type of Watercraft									
Powerboat	Fishing Boat	Pontoon Boat	Personal Watercraft	Canoe	Sailboat	Kayak	Paddleboat	Rowboat	Total
3	9	46	0	43	12	23	33	28	197

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

Source: SEWRPC.

Table 11

WATERCRAFT IN USE ON PLEASANT LAKE: JULY 2007

Date and Time	Powerboat	Pontoon Boat	Fishing Boat	Personal Watercraft	Sailboat	Canoe/ Kayak	Wind Surf Board	Paddleboat	Total
Saturday, July 7									
10:00 a.m. to 11:00 a.m.	- -	1	8	- -	- -	- -	- -	- -	9
2:00 p.m. to 3:00 p.m.	- -	1	6	- -	- -	- -	- -	- -	7
Tuesday, July 10									
10:00 a.m. to 11:00 a.m.	- -	- -	1	- -	1	5	- -	- -	7
2:00 p.m. to 3:00 p.m.	- -	- -	- -	- -	- -	1	- -	- -	1

Source: SEWRPC.

Table 12

RECREATIONAL USE IN/ON PLEASANT LAKE: JULY 2007

	Weekday Participants									
Date and Time	Fishing from Shoreline	Pleasure Boating	Skiing/ Tubing	Sailing	Operating Personal Watercraft	Swimming	Fishing from Boats	Canoeing/ Paddle Boating	Park Goers	Total
Saturday, July 7										
10:00 a.m. to 11:00 a.m.	- -	- -	- -	- -	- -	2	14	- -	3	19
2:00 p.m. to 3:00 p.m.	1	4	- -	- -	- -	13	12	- -	18	48
Total for the Day	1	4	- -	- -	- -	15	26	- -	21	67
Percent	1	6	- -	- -	- -	22	39	- -	32	100

	Weekend Participants									
Date and Time	Fishing from Shoreline	Pleasure Boating	Skiing/ Tubing	Sailing	Operating Personal Watercraft	Swimming	Fishing from Boats	Canoeing/ Paddle Boating	Park Goers	Total
Tuesday, July 10										
10:00 a.m. to 11:00 a.m.	- -	- -	- -	1	- -	- -	2	7	1	11
2:00 p.m. to 3:00 p.m.	2	- -	- -	- -	- -	6	- -	1	10	19
Total for the Day	2	- -	- -	1	- -	6	2	8	11	30
Percent	7	- -	- -	3	- -	20	7	27	36	100

Source: SEWRPC.

Table 13

LAND USE REGULATIONS WITHIN THE AREA TRIBUTARY TO PLEASANT LAKE IN WALWORTH COUNTY BY CIVIL DIVISION: 2001

Community	Type of Ordinance				
	General Zoning	Floodland Zoning	Shoreland or Shoreland-Wetland Zoning	Subdivision Control	Construction Site Erosion Control and Stormwater Management
Walworth County.....	Adopted	Adopted	Adopted and Wisconsin Department of Natural Resources approved	Floodland and shoreland only	Adopted
Town of La Grange…..	County	County ordinance	County ordinance	County	County
Town of Troy……	County	County ordinance	County ordinance	County	County

Source: SEWRPC.

LOCAL ORDINANCES

The Towns of LaGrange and Troy have adopted Walworth County ordinances as they relate to general zoning, subdivision control, floodland zoning, shoreland or shoreland-wetland zoning, and construction site erosion control/stormwater management controls, as shown in Table 13.

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Chapter III

ALTERNATIVE AND RECOMMENDED AQUATIC PLANT MANAGEMENT PRACTICES

INTRODUCTION

There are a number of issues of concern that relate to aquatic plant management in Pleasant Lake that impact the recreational use and protection of the Pleasant Lake ecosystem. These issues were identified in Chapter II and include: continuing urban-density residential development in the area tributary to the Lake, including the need to manage stormwater runoff and onsite sewage disposal;[1] the presence of nuisance growths of Eurasian water milfoil and other nonnative aquatic plants in specific areas of Pleasant Lake, including the potential negative ecological impacts posed by invasive species, such as Eurasian water milfoil, curly-leaf pondweed, zebra mussel, and purple loosestrife identified in Chapters NR 107 and NR 109 of the *Wisconsin Administrative Code*; and, the maintenance of in-lake habitat and water quality to promote the survival of warmwater fishes and other aquatic life consistent with the requirements of Chapters NR 102 and NR 104 of the *Wisconsin Administrative Code*.

In some ways, these issues of concern are interrelated. For example, in those areas of the Lake where Eurasian water milfoil is abundant, certain recreational uses are limited, the aesthetic quality of the Lake is impaired, and in-lake habitat degraded. The plant primarily interferes with recreational boating activities by clogging propellers and cooling water intakes, snagging paddles, and slowing sailboats by wrapping around keels and control surfaces. The plant also causes concern among swimmers who can become entangled within the plant stalks. Thus, without control measures, these areas can become problematic to boat navigation, fishing, and swimming. Native aquatic plants, generally found at slightly deeper depths, pose fewer potential problems for navigation, swimming, and fisheries. In addition, many native aquatic plants provide fish habitat and food resources and offer shelter for juvenile fishes and young-of-the-year.

As of 2007, the Lake generally contains a robust and fairly diverse aquatic plant community capable of supporting a warmwater fishery, albeit some areas of the Lake suffer from the impairment of recreational boating opportunities and other lake-oriented activities due to an overabundance of aquatic macrophytes and algae. Consequently, in this Chapter, alternative and recommended management measures to address the identified issues of concern are presented. The alternatives and recommendations set forth herein focus on those measures which are applicable to the Pleasant Lake Protection and Rehabilitation District (PLPRD) and the Pleasant Lake

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[1]*See SEWRPC Community Assistance Planning Report No. 168,* A Land Use Plan for the Town of LaGrange: 2010, *March 1991.*

Property Owners Association, Inc. (PLPOA), and the Town of LaGrange, with lesser emphasis given to those measures which are applicable to other agencies with jurisdiction within the area tributary to the Lake.

The alternative shoreland and aquatic macrophyte management elements of this plan consider measures consistent with the provisions of Chapters NR 103, NR 107, and NR 109 of the *Wisconsin Administrative Code*. Further, the alternative aquatic plant management measures are consistent with the requirements of Chapter NR 7 of the *Wisconsin Administrative Code*, and with the public recreational boating access requirements set forth in Chapter NR 1 of the *Wisconsin Administrative Code*, relating to the eligibility of the PLPRD to access State cost-share funding through the Chapter NR 190, NR 191, and NR 198 grant programs governing lake management planning, lake protection, and aquatic invasive species management.

AQUATIC PLANT AND SHORELINE PROTECTION MANAGEMENT MEASURES

As stated in Chapter II of this report, aquatic plant management activities in Pleasant Lake can be categorized as primarily based on chemical control agents. From 1950 through 1969, a total of 1,372 pounds of sodium arsenite were applied to Pleasant Lake to manage aquatic plants, and between 1977 and 2007 a variety of other herbicides were used at intervals. Individual householders on Pleasant Lake have been known to engage periodically in manual harvesting in the vicinities of their piers and docks. Ongoing aquatic plant management activities, therefore, are anticipated, as described below.

Array of Management Measures

Aquatic plant management measures are classed into four groups: ***physical measures***, which include lake bottom coverings and water level management; ***mechanical*** and ***manual measures***, which include harvesting; ***chemical measures***, which include the use of aquatic herbicides; and ***biological control measures***, which include the use of various organisms, including insects. All aquatic plant management activities, except for some limited manual harvesting along shorelines, require permits issued by the Wisconsin Department of Natural Resources (WDNR) pursuant to authorities granted the WDNR in Chapters NR 107 and NR 109 of the *Wisconsin Administrative Code*. In this regard, it is noted that all aquatic plant management activities within the WDNR-delineated environmentally sensitive areas, which encompass the majority of the shorelands and nearshore waters of Pleasant Lake as shown on Map 8 in Chapter II, require WDNR permits regardless of the nature of the aquatic plant management measure. Chemical controls are regulated under Chapter NR 107 of the *Wisconsin Administrative Code,* and all other aquatic plant management practices are regulated under Chapter NR 109 of the *Wisconsin Administrative Code*. Placement of bottom covers also requires a Wisconsin Department of Natural Resources (WDNR) permit under Chapter 30 of the *Wisconsin Statutes*. Costs range from minimal for manual removal of plants using rakes and hand-pulling, to upwards of $50,000 for the purchase of a mechanical plant harvester, for which the operational costs can approach $2,500 to $15,000 per year, depending on staffing and operation policies.

Physical Measures

Lake bottom covers and light screens provide limited control of rooted plants by creating a physical barrier which reduces or eliminates the sunlight available to the plants. They have been used to create swimming beaches on muddy shores, to improve the appearance of lakefront property, and to open channels for motorboating. Sand and gravel are usually widely available and relatively inexpensive to use as cover materials, but plants readily recolonize areas so covered in about a year. Synthetic materials, such as polyethylene, polypropylene, fiberglass, and nylon, can provide relief from rooted plants for several years. However, such materials, known as bottom screens or barriers, generally have to be placed and removed annually. Such barriers also are susceptible to disturbance by watercraft propellers or the build-up of gasses from decaying plant biomass trapped under the barriers. In the case of Pleasant Lake, the need to encourage native aquatic plant growth while simultaneously controlling the growth of Eurasian water milfoil, suggests that the placement of lake bottom covers as a method to control aquatic plant growth does not appear to be warranted and is not considered viable.

Biological Measures

Biological controls offer an alternative approach to controlling nuisance plants, particularly purple loosestrife (*Lythrum salicaria*), an invasive shoreland wetland plant, and Eurasian water milfoil. Classical biological control techniques have been successfully used to control both nuisance plants with herbivorous insects.[2] Recent evidence shows that *Galerucella pucilla* and *Galerucella calmariensis*, a beetle species, and *Hylobius transversovittatus* and *Nanophyes brevis*, a weevil species, have potential as biological control agents for purple loosestrife.[3] Extensive field trials conducted by the WDNR in the Southeastern Wisconsin Region since 1999 have indicated that these insects can provide effective management of large infestations of purple loosestrife. In contrast, the few studies of Eurasian water milfoil control utilizing *Eurhychiopsis lecontei*, an aquatic weevil species, have resulted in variable levels of control, with little control being achieved on those lakes having extensive motorized boating traffic. Thus, while the use of insects as a means of shoreland wetland plant management is considered to be viable, the use of *Eurhychiopsis lecontei* as a means of aquatic plant management, is not considered a viable option for use on Pleasant Lake at this time.

The use of grass carp, *Ctenopharyngodon idella*, an alternative biological control used elsewhere in the United States, is not permitted in Wisconsin.

A variation on the theme of biological control is the introduction of aquatic plants into a waterbody as a means of encouraging or stimulating the growth of desirable native aquatic plant species in a lake. While few projects of this nature have been undertaken in the Southeastern Wisconsin Region, the Lac La Belle Management District, in partnership with the WDNR and University of Wisconsin-Milwaukee, did attempt to supplement the aquatic plant community of that Lake by selectively planting pondweeds (*Potamogeton* spp.).[4] Several hundred pondweeds were transplanted into Lac La Belle, and, while there is some evidence that a few of these transplants were successful, the net outcome of the project was disappointing. Few of the introduced plants were observed in subsequent years.[5] Given the extensive and diverse aquatic plant community present in many areas of Pleasant Lake, supplemental plantings are not considered to be a viable aquatic plant management option.

Manual and Mechanical Measures

The physical removal of specific types of vegetation by selective harvesting of plants provides a highly selective means of controlling the growths of nuisance aquatic plant species, including purple loosestrife and Eurasian water milfoil. Pursuant to Chapter NR 109 of the *Wisconsin Administrative Code*, manual harvesting of aquatic plants within a 30-foot-wide corridor along a 100-foot length of shoreline would be allowed without a WDNR permit, provided the plant material is removed from the Lake. Any other manual harvesting would require a State

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

[3]*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.*

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

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

permit, unless employed in the control of designated nonnative invasive species, such as Eurasian water milfoil or curly-leaf pondweed.

Aquatic macrophytes also may be harvested mechanically with specialized equipment consisting of a cutting apparatus, which cuts up to about five feet below the water surface, and a conveyor system that picks up the cut plants. Mechanical harvesting can be a practical and efficient means of controlling plant growth as it removes the plant biomass and nutrients from a lake. Mechanical harvesting is particularly effective as a measure to control large-scale growths of aquatic plants. Narrow channels can be harvested to provide navigational access and "cruising lanes" for predator fish to migrate into the macrophyte beds to feed on smaller fish. The harvesting of water lilies and other emergent native plants should be avoided.

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

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

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

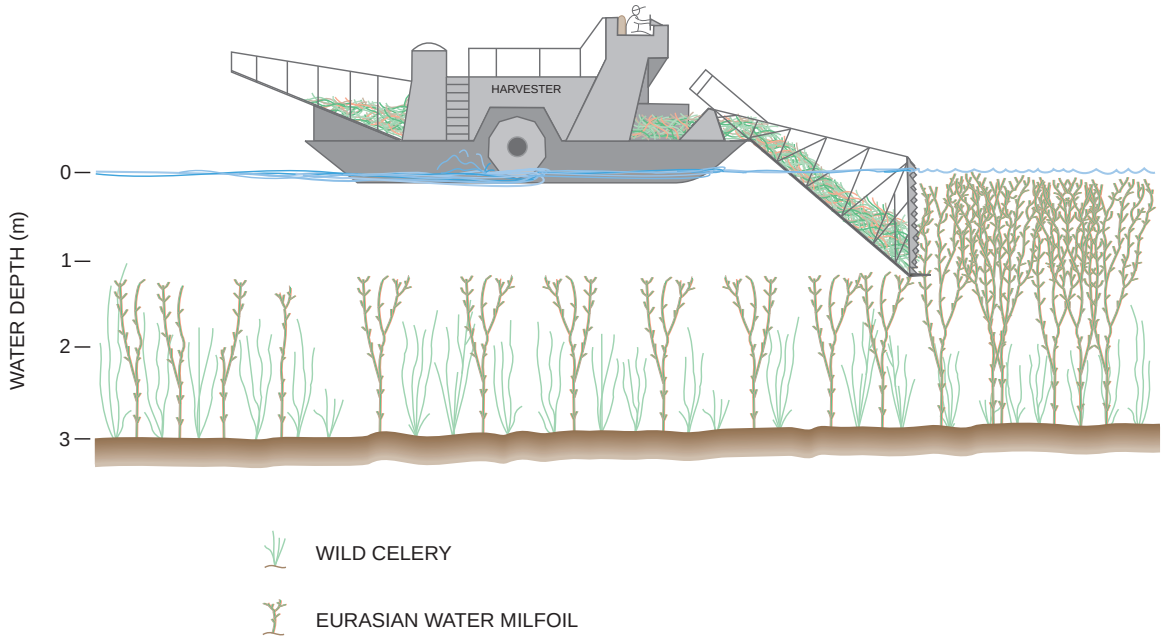
Hand-pulling of stems, where they occur in isolated stands, provides an alternative means of controlling plants, such as Eurasian water milfoil, in the Lake, and purple loosestrife, on the lakeshore. Because this is a more selective measure, the rakes being nonselective in their harvesting, manual removal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

An advantage of mechanical aquatic plant harvesting is 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. Aquatic plant harvesting also has been shown to facilitate the growth of native aquatic plants in harvested areas by allowing light penetration to the lakebed. Many native aquatic plants are low-growing species that are less likely to interfere with human recreational and aesthetic uses of a lake. A disadvantage of mechanical harvesting is that the harvesting operation may cause fragmentation of plants and, thus, unintentionally facilitate the spread of some plants that utilize fragmentation as a means of propagation, namely Eurasian water milfoil. Harvesting may also disturb bottom sediments in shallower areas where such sediments are only loosely consolidated, thereby increasing turbidity and resulting in deleterious effects, including the smothering of fish breeding habitat

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

Figure 3

PLANT CANOPY REMOVAL WITH AN AQUATIC PLANT HARVESTER



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

Source: Wisconsin Department of Natural Resources and SEWRPC.

and nesting sites. Disrupting the bottom sediments also could increase the risk that an exotic species, such as Eurasian water milfoil, may colonize the disturbed area since this is a species that tends to thrive under disturbed bottom conditions. To this end, most WDNR-issued permits do not allow harvesting in areas having a water depth of less than three feet. Nevertheless, if done correctly and carefully, harvesting has been shown to be of benefit in ultimately reducing the regrowth of nuisance plants when used under conditions suitable for this method of control.

Given the loosely consolidated nature of the bottom sediments in the shallow water areas and the species composition with correspondingly dense growths of Eurasian water milfoil in these same areas, and, given the logistical problems likely to be encountered during the off-loading of plant material due to the lack of suitably located public access areas along the mostly privately owned shoreline of Pleasant Lake, mechanical harvesting is not considered a viable option for control of aquatic plants in the Lake.

Chemical Measures

Chemical treatment with herbicides is a short-term method of controlling heavy growths of nuisance aquatic plants. Chemicals are generally applied to the growing plants in either a liquid or granular form. The advantages of using chemical herbicides to control aquatic macrophytes growth are the relatively low-cost and the ease, speed, and convenience of application. The disadvantages associated with chemical control include unknown long-term effects on fish, fish food sources, and humans; a risk of increased algal blooms due to the eradication of macrophyte competitors; an increase in organic matter in the sediments, possibly leading to increased plant growth, as well as anoxic conditions which can cause fish kills; adverse effects on desirable aquatic organisms; loss of desirable fish habitat and food sources; and, finally, a need to repeat the treatment the following summer due to existing seed banks and/or plant fragments. Widespread chemical treatments can also provide an advantage to less desirable, invasive, introduced plant species to the extent that such treatments may produce conditions in

which nonnative species can outcompete the more beneficial, native aquatic plant species. Hence, this is seldom a feasible management option to be used on a large scale. Widespread chemical treatment, therefore, is not considered a viable option for widespread use on Pleasant Lake, although limited chemical control is considered to be a viable technique for the control of the relatively small-scale infestations of aquatic plants, such as Eurasian water milfoil, or shoreland plants, such as purple loosestrife in confined areas such as around piers and docks should manual harvesting not be possible in these areas.

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

Use of early spring or late fall chemical controls,[7] especially in those shoreline areas where mechanical harvesting would not be deemed viable, targeting growths of Eurasian water milfoil and purple loosestrife in and around the Lake, is considered a viable option for Pleasant Lake.

Recommended Management Measures

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

- Manual harvesting around piers and docks is the recommended means of controlling nonnative nuisance species of plants in those areas. Maintenance of shoreland areas around docks and piers remains the responsibility of individual property owners. In this regard, the PLPRD or PLPOA could consider purchasing several specialty rakes designed for the removal of vegetation from shoreline property and make these available to riparian owners. This would allow the riparian owners to use the rakes on a trial basis before purchasing their own. Although the rakes generally do not require a permit for use, State permitting requirements for manual aquatic plant harvesting mandate that the harvested material be removed from the Lake. The rakes do require a permit for use within Chapter NR 107-designated environmentally sensitive areas, which, in the case of Pleasant Lake, encompass the majority of the Lake's shoreline. Where feasible and practicable, hand pulling of stems, where they occur in isolated stands, is also recommended as an alternative means of controlling Eurasian water milfoil and purple loosestrife. Manual control should target nonnative species.

- It is recommended that the use of chemical herbicides be limited to controlling nuisance growth of exotic species, particularly Eurasian water milfoil, purple loosestrife, and curly-leaf pondweed. It is recommended that chemical applications, if required, be made by licensed applicators in early spring subject to State permitting requirements to maximize their effectiveness on nonnative plant species, while minimizing impacts on native plant species and acting as a preventative measure to reduce the development of nuisance conditions. Such use should be evaluated annually and the herbicide applied only on an as-needed basis. Only herbicides that selectively control milfoil, such as 2,4-D and endothall should be used. Maintenance of shoreland areas around docks and piers is the responsibility

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

of individual property owners. It is noted that use of chemical herbicides within WDNR-delineated environmentally sensitive area should be limited, and consistent with the requirements of the WDNR as set forth in the Integrated Sensitive Area Report, appended hereto as Appendix B. In particular, it is recommended that efforts be made to protect the stands of bladderwort within Sensitive Area #2, at the mouth of the embayment locally known as "The Bay."

- Algicides, such as Cutrine Plus, are not recommended because there are few significant, recurring filamentous algal or planktonic algal problems in Pleasant Lake and valuable macroscopic algae, such as *Chara* and *Nitella* are killed by this product. As in the case of rooted aquatic plants, maintenance of shoreland areas around docks and piers is the responsibility of individual property owners.

- Few lakes in southeastern Wisconsin lack aquatic plant growth, and Pleasant Lake is no exception. However, the Lake would benefit from a greater diversity of native aquatic plants. Low-growing plants, such as spiny naiad and muskgrass, which provide food and shelter for fish and waterfowl, do occur in the Lake. However, because of their low-growing height, these species are often outcompeted by the nonnative Eurasian water milfoil. Eurasian water milfoil grows rapidly to the lake surface, capturing the available sunlight and shading out the native species. Thus, control of the Eurasian water milfoil, using manual and chemical means as noted above, is one means of promoting the growth of native plants, and is recommended for Pleasant Lake.

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

- In-lake aquatic plant surveys should be conducted at about five-year intervals, depending upon the observed degree of change in the aquatic plant communities. In addition, information on the aquatic plant control program should be recorded and should include descriptions of major areas of nuisance plant growth and areas chemically treated.

- Additional periodic monitoring of the aquatic plant community is recommended for the early detection and control of future-designated nonnative species that may occur. Such control could be effected with the assistance of funds provided under the Chapter NR 198, aquatic invasive species control grant program, and should be undertaken as soon as possible once the presence of a nonnative, invasive species is observed and confirmed, reducing the risk of spread from waters where they are present and restoring native aquatic communities. Control of currently designated invasive species, identified pursuant to Chapter NR 109 of the *Wisconsin Administrative Code*, using appropriate control measures,[8] is recommended throughout the Lake.

Shoreline Protection Management

Shoreline protection management measures refer to a group of measures designed to reduce and minimize shoreline loss due to erosion by waves, ice, or related action of the water. Currently, much of the shoreline is protected by vegetation, with several small beach areas and a few small isolated sections of riprap or bulkhead. The observed shoreline protection measures were in a good state of repair.

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

Array of Management Measures

Four shoreline erosion control techniques are commonly used: vegetative buffer strips, rock revetments, wooden and concrete bulkheads, and beach. Maintenance of a vegetated buffer strip immediately adjacent to the Lake is the simplest, least costly, and most natural method of reducing shoreline erosion. This technique employs natural vegetation, rather than maintained lawns, within five to 10 feet of the lakeshore and the establishment of emergent aquatic vegetation from two to six feet lakeward of the shoreline. The use of such natural shorescaping techniques is generally required pursuant to Chapter NR 328 of the *Wisconsin Administrative Code*, except in moderate- to high-energy shorelines where more robust structural approaches may be required. A worksheet is provided within Section NR 328.08 Table 1 as a means of assisting property owners who wish to install or modify existing shoreline protection structures.

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

Rock revetments, or riprap, are a highly effective method of shoreline erosion control applicable to many types of erosion problems, especially in areas of low banks and shallow water. This measure involves the shaping of the shoreline slope, the placement of a porous filter material, such as sand, gravel, or pebbles, on the slope and the placement of rocks on top of the filter material to protect the slope against the actions of waves and ice. The advantages of rock revetments are that they are highly flexible and not readily weakened by movements caused by settling or ice expansion, they can be constructed in stages, and they require little or no maintenance. The disadvantages of rock revetments are that they limit some uses of the immediate shoreline. The rough, irregular rock surfaces are unsuitable for walking; require a relatively large amount of filter material and rocks to be transported to the lakeshore; and can cause temporary disruptions and contribute sediment to the lake. If improperly constructed, revetments may fail because of washout of the filter material. A rock revetment is estimated to cost $25 to $35 per linear foot.

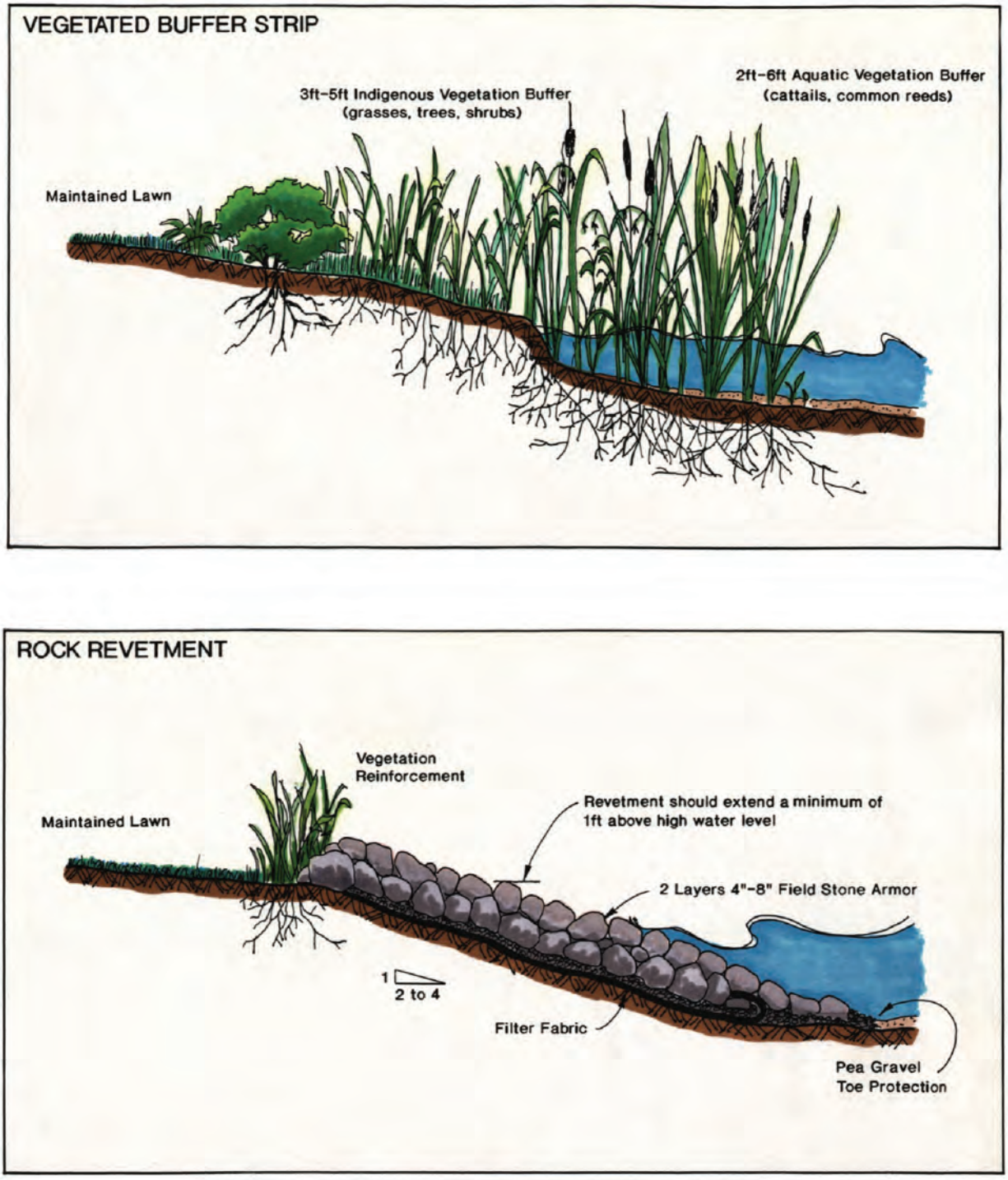
Recommended Management Measures

The use of vegetative buffer strips, as shown in Figure 4, is recommended as the primary shoreline protection measure. Along higher energy areas of the shoreline, or in areas experiencing high levels of motorized recreational boating traffic, the use of riprap could be considered, provided that the specific sites meet the criteria set forth in Chapter NR 328 of the *Wisconsin Administrative Code*. It should be noted that the selection of appropriate shoreland protection structures is subject to the provisions of Chapter NR 328 of the *Wisconsin Administrative Code*, which also governs repair and replacement of structural shoreland protection measures.

The buffer strip and riprap alternatives were selected because they can be constructed, at least partially, by local residents; because most of the construction materials involved are readily available; because the measures would, in most cases, enable the continued use of the immediate shoreline; and because the measures are visually “natural” or “semi-natural” and should not significantly affect the aesthetic qualities of the lake shoreline. In those portions of the Lake subject to direct action of wind waves and ice scour, the use of riprap would provide a more robust means of stabilizing shorelines, while elsewhere along the lakeshore creation of vegetated buffer strips would provide, not only shoreline erosion protection, but also enhanced shoreland habitat for fish and wildlife. Ongoing maintenance of these shoreline protection measures also is recommended.

Figure 4

RECOMMENDED ALTERNATIVES FOR SHORELINE EROSION CONTROL



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

Source: SEWRPC.

ANCILLARY PLAN RECOMMENDATIONS

Water Quality Management

Water quality is one of the key parameters used to determine the overall health of a waterbody. The importance of good water quality can hardly be underestimated, as it impacts nearly every facet of the natural balances and relationships that exist in a lake between the myriad of abiotic and biotic elements present. Because of the importance water quality plays in the functioning of a lake ecosystem, careful monitoring of this lake element represents a fundamental management tool.

Array of Management Measures

The University of Wisconsin-Extension (UWEX) operates the Citizen Lake Monitoring Network (CLMN), formerly the WDNR Self-Help Monitoring Program. Volunteers enrolled in this program gather data at regular intervals on water clarity through the use of a Secchi disk. Because pollution tends to reduce water clarity, Secchi-disk measurements are generally considered one of the key parameters in determining the overall quality of a lake's water as well as a lake's trophic status. Secchi-disk measurement data are added to the WDNR-sponsored data base containing lake water quality information for most of the lakes in Wisconsin and is accessible on-line through the WDNR website. An Expanded Self-Help Monitoring Program involves the collection of data on several key physical and chemical parameters in addition to the Secchi-disk measurements. Under this program, samples of lake water are collected by volunteers at regular intervals and analyzed by the State Laboratory of Hygiene. Similar data gathering opportunities are offered through the University of Wisconsin-Stevens Point (UW-SP) Water and Environmental Analysis Laboratory (WEAL). Data collection is more extensive and, consequently, places more of a burden on volunteers. Currently, members of the PLPRD take part in the CLMN program, collecting water quality data on a regular basis throughout the summer months.

The U.S. Geological Survey (USGS) also offers an extensive water quality monitoring program. USGS field personnel conduct a series of approximately four monthly samplings beginning with the spring turnover. Samples are analyzed for an extensive array of physical and chemical parameters.

The UWEX CLMN is available at no charge, but does require volunteers to be committed to taking Secchi disk measurements at regular intervals throughout the spring, summer, and fall. The Expanded Self-Help Program requires additional commitment by volunteers to take a more extensive array of measurements and samples for analysis, also on a regular basis. As with any volunteer-collected data, despite the implementation of standardized field protocols, individual variations in levels of expertise, due to background and experiential differences, can lead to variations in data and measurements from lake-to-lake and from year-to-year for the same lake, especially when volunteer participation changes. The UW-SP WEAL turnover sampling programs require only a once-a-year sampling, thereby requiring a smaller time commitment by the volunteers, but involves a modest charge for the laboratory analysis. Because sampling is performed by volunteers, the data collection is subject to those variations identified above. Additionally, since samples need to be taken as closely as possible to the actual turnover period, which occurs only during a relatively short window of time, volunteers need to monitor lake conditions as closely as possible to be able to determine when the turnover period is occurring. The USGS program does not require volunteer sampling. All sampling and analysis is provided by USGS personnel using standardized field techniques and protocols. As a result, a more standardized set of data and measurements may be expected. However, the cost of the USGS program is significantly higher than the UW-SP program, even with State cost-share availability.

Recommended Management Measures

The WDNR offers Small Grant cost-share funding within the Chapter NR 190 Lake Management Planning Grant Program that can be applied for to defray the costs of laboratory analysis and sampling equipment. Therefore, it is recommended that the PLPRD continue its participation in the UWEX CLMN program and consider participation in the Expanded Self-Help Program. Data gathered as part of this program should be presented annually by the volunteers at meetings of the PLPRD, where the citizen monitors could be given some recognition for their work. The lake coordinator of the WDNR, Southeast Region, could assist in enlisting more volunteers in this program.

The information gained at first-hand by the public from participation in this program can increase the credibility of the proposed changes in the nature and intensity of use to which the Lake is subjected.

The UW-SP program and the USGS program are also worthy of consideration. The USGS program would be especially valuable as a means to attain a comprehensive water quality determination on a periodic basis, every three to five years, while maintaining yearly UWEX CLMN data collection.

Fisheries Management

Based upon fisheries surveys described in Chapter II of this report, Pleasant Lake appeared to have a fairly diverse and healthy fishery. Pleasant Lake provides a suitable habitat for a warmwater fishery with adequate water quality and dissolved oxygen levels that can contribute to the maintenance of a fish population that is dominated by desirable sportfish. To this end, a rigorous fisheries survey should be considered in order to better identify fish population composition, length-weight distributions, community age structure, and related life history information, such as proportion of available spawning habitat, spawning success, and juvenile recruitment, that will be important for making stocking-related decisions. The WDNR conducts periodic fisheries surveys throughout the State, based upon which, the WDNR develop alternatives for improving the fishery. Viable alternatives include protecting existing fish spawning sites and establishing additional habitat sites through the development of a desirable aquatic plant community, especially in the shallow water habitat areas of the Lake, which elements overlap with the aquatic plant management strategy recommended above. These alternatives can be supplemented by regulatory provisions relating to the removal of fishes from the Lake and the addition of fishes to the Lake by stocking. All of these measures appear to be appropriate for use in Pleasant Lake.

Recommended Management Measures

The following fisheries management measures, designed to improve and enhance the lake fishery in Pleasant Lake, are recommended to be considered:

- Encourage the use of natural vegetation and other “soft” shoreline protection options in shoreland management zones to aid in habitat protection;

- Monitor fish populations periodically through WDNR-conducted fisheries surveys and utilize these fisheries surveys and stocking recommendations to promote a more robust and diverse fishery in the Lake;

- Continue the stocking of fishes in Pleasant Lake as per WDNR recommendations; and,

- Utilize fishing regulations to protect stocked fishes and to improve the opportunity for their populations to become self-sustaining.

Land Use Management

A basic element of any management effort for a lake is the promotion of sound land use development and management in the tributary area. The type and location of future urban and rural land uses in the area tributary to Pleasant Lake will determine, to a large degree, the character, magnitude, and distribution of nonpoint sources of pollution; the practicality of, as well as the need for, various land management measures; and, to some considerable degree, the water quality of the Lake itself.

The recommended future land use conditions for the area tributary to Pleasant Lake are set forth in the adopted regional land use plan.[9] This plan presents alternatives for the preservation of primary environmental corridor lands in essentially natural, open space use. The delineated environmental corridors contain most of the

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

ecologically valuable lands in the vicinity and adjacent to the Lake. Hence, the protection and preservation of the environmental corridor lands is to be recommended. All lakes, wetlands, and woodlands are recommended to be placed in conservancy protection districts. To this end, the PLPRD and PLPOA have specifically proposed various alternatives for preserving the essential character and viewshed of the northern shoreline of Pleasant Lake, consistent with the objective of maintaining the integrity of the environmental corridor, to the Girl Scouts of Greater Chicago and Northwest Indiana, who have taken such proposals under consideration.

Current estimates for future urban land use development, as set forth in Chapter II, project 2035 urban land use to comprise 19 percent of the tributary area as lands currently in agricultural use are developed into urban residential lands, these changes occurring primarily in the southern section of the Pleasant Lake total tributary area. Some limited infilling of existing, platted lots would be expected to occur, and, in addition, the redevelopment and reconstruction of existing single-family homes on lakefront properties may be expected. Increases in urban land uses and associated impervious surfaces will increase runoff into the Lake and waterways tributary to the Lake, and may increase some nonpoint source pollutant loadings that represent a potentially significant threat to the Lake's water quality. Sources of nonpoint source pollutants include both rural and urban land uses, including land disturbing activities associated with construction and redevelopment within the tributary area.

Management measures that can be applied within the Towns of LaGrange and Troy in the immediate vicinity of Pleasant Lake are limited largely to good urban housekeeping practices and vegetative lakeshore buffers. However, structural measures could be considered for installation as part of the development process in urbanizing areas within those currently undeveloped portions of the tributary area, and in those portions of the watershed along roadways where provision of measures to reduce runoff velocities from the impervious surfaces may be desirable.

The recommended urban measures set forth in the adopted regional and local land use and water quality management plans were directed largely at the urban and urbanizing areas. The recommended urban measures set forth in the adopted regional and local plans were directed at urban nonpoint sources within the area tributary to Pleasant Lake, and were estimated to achieve a 25 percent reduction in nonpoint source pollutant loads to the Lake.[10]

Recommended Management Measures

Insofar as future land use reflects these latter recommendations, it is recommended that development proceed with due regard for the management of stormwater and other urban runoff so as not to impair the water quality of the Lake. To wit, it is recommended that:

- Development within the area tributary to Pleasant Lake should occur at densities consistent with those set forth in the adopted Town and County land use plans;

- Land use development, or redevelopment, proposals around the shoreline of the Lake be carefully reviewed for potential impacts on the Lake, and for their potential impact on the viewsheds currently present within the community;

- Residential developments be placed in conservation development on smaller lots, while preserving portions of the open space on each property or group of properties considered for development and preserving the natural and cultural resources to the extent practicable;[11]

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

[11]*See SEWRPC Planning Guide No. 7,* Rural Cluster Development Guide, *December 1996.*

- A regular program of inspection and maintenance, as necessary, be implemented with respect to onsite sewage disposal systems to ensure their continued capacity and functioning, until such time as public sanitary sewerage service is provided;

- Urban pollution control measures, including wet detention-infiltration basins, grassed swales, and good urban "housekeeping" practices, be encouraged to minimize pollutant loadings while maintaining water loadings to the Lake;

- Where new development or redevelopment is proposed, it is recommended that the provisions of the relevant Towns of LaGrange and Troy land division and construction site erosion control ordinances be strictly enforced within the area tributary to Pleasant Lake; and,

- Promote sound rural land management practices to reduce soil loss and contaminant loadings through preparation of farm conservation plans and other practices in accordance with the regional land use plan.

Public Informational and Educational Programming

As part of the overall citizen informational and educational programming to be conducted in the Pleasant Lake community, residents and visitors in the vicinity of the Lake should be made aware of the value of the ecologically significant areas in the overall structure and functioning of the ecosystems of the Lakes. Specifically, informational programming related to the protection of ecologically valuable areas in and around the Lake should focus on the need to minimize the spread of nuisance aquatic species, such as purple loosestrife and Eurasian water milfoil. In this regard, it is recommended that appropriate signage at the public recreational boating access site be provided with inclusion of information on Eurasian water milfoil in the District's informational programming, consistent with the aquatic plant management measures set forth in this plan, along with information regarding the UWEX "Clean Boats-Clean Waters" Program.

With respect to aquatic plants, distribution of posters and pamphlets, available from the UWEX and the WDNR, that provide information and illustrations of aquatic plants, their importance in providing habitat and food resources in aquatic environments, and the need to control the spread of undesirable and nuisance plant species is recommended. Currently, many lake residents seem to view all aquatic plants as "weeds" and residents often spend considerable time and money removing desirable plant species from a lake without considering their environmental impact. Inclusion of specific public informational and educational programming within the activities of the Town of LaGrange, PLPRD, and PLPOA is recommended. These programs should focus on the value of and the impacts of these plants on water quality, on fish, and on wildlife; and on alternative methods for controlling existing nuisance plants, including the positive and negative aspects of each method. These programs can be incorporated into the comprehensive informational and educational programs that also would include information on related topics, such as water quality, recreational use, fisheries, and onsite sewage disposal systems.

Educational and informational brochures and pamphlets of interest to homeowners and supportive of the lake management program are available from the UWEX, the WDNR, the Walworth County Government Offices, and many Federal government agencies. These brochures could be provided to homeowners through local media, direct distribution, or targeted library/civic center displays. Alternately, they could be incorporated into the newsletters produced and distributed by the PLPRD and PLPOA. Many of the ideas contained in these publications can be integrated into ongoing, larger-scale activities, such as anti-littering campaigns, recycling drives and similar pro-environment activities.

Other informational programming offered by the WDNR, Walworth County, and UWEX, such as the Adopt-A-Lake program and Project WET (Water Education Training) curriculum, can contribute to an informed public, actively involved in the protection of ecologically valuable areas within the area tributary to Pleasant Lake. Citizen monitoring and awareness of the positive value of native aquatic plant communities are important opportunities for public informational programming and participation that are recommended for the Lake.

SUMMARY

This plan, which documents the findings and recommendations of a study requested by the Town of LaGrange, PLPRD, and PLPOA, examines existing and anticipated conditions, potential aquatic plant management problems, and recreational use problems on Pleasant Lake. The plan sets forth recommended actions and management measures for the resolution of those problems. The recommended plan is summarized in Table 14 and shown on Map 9.

Pleasant Lake was found to be a mesotrophic lake of above average water quality. Preservation of environmental corridor lands, and especially within the shoreland and nearshore areas situated immediately adjacent to the Lake, is recommended. Walworth County and the Towns of LaGrange and Troy, together with the PLPRD and PLPOA, should support appropriate land management practices designed to reduce nonpoint source pollutant discharges in stormwater runoff into the Lake. Further, the Town, PLPRD, and PLPOA should promote appropriate shoreline management practices, including the use of riprap and vegetative buffer strips, where applicable.

The shoreland and aquatic plant management elements of this plan recommend actions be taken to reduce human impacts on ecologically valuable areas in and adjacent to the Lake, and to limit the spread of nonnative invasive plant species. The plan recommends periodic in-lake aquatic plant surveys, limited use of chemical herbicides mainly to areas where nuisance levels of nonnative invasive species are present, manually harvesting aquatic plants around piers and docks, with subsequent removal of cut material from the Lake, and monitoring of invasive species populations.

The plan recommends continued participation in the UWEX CLMN volunteer water quality monitoring program, with consideration to periodic USGS or similar comprehensive water quality surveys. With regard to fisheries, the plan recommends periodic WDNR-conducted fish surveys to determine management and stocking needs and recommends the use of natural vegetation in shoreland areas to aid in habitat protection.

Finally, the recommended plan includes continuation of an ongoing program of public information and education, focusing on providing riparian residents and lake users with an improved understanding of the lake ecosystem. For example, additional options regarding household chemical use, lawn and garden care, onsite sewage disposal system operation and maintenance, shoreland protection and maintenance, and recreational use of the Lake should be made available to riparian property owners, thereby providing riparian residents with alternatives to traditional activities.

Table 14

RECOMMENDED MANAGEMENT PLAN ELEMENTS FOR PLEASANT LAKE

Plan Element	Subelement	Management Measures	Management Responsibility
Aquatic Plant and Shoreline Protection Management Measures	Aquatic plant management	Conduct periodic in-lake reconnaissance surveys of aquatic plant communities and update aquatic plant management plan every three to five years Limited use of aquatic herbicides for control of nuisance nonnative aquatic plant growth where necessary; specifically target Eurasian water milfoil[a] Additional periodic monitoring of the aquatic plant community for the early detection and control of future-designated nonnative species that may occur	WDNR, PLPRD, Town of LaGrange
		Manually harvest around piers and docks as necessary[b] Collect floating plant fragments from shoreland areas to minimize rooting of Eurasian water milfoil and deposition of organic materials in Lake	Private landowners
		Monitor invasive species populations; where they occur, remove isolated stands of purple loosestrife through bagging, cutting, and herbicide application to cut stems	WDNR, PLPRD, Town of LaGrange, private landowners
	Shoreline protection management	Maintain existing shoreline structures and repair as necessary using vegetative means insofar as practicable; reconstruction may require WDNR Chapter 30 permits	Walworth County, Town of LaGrange, WDNR, and private landowners
Ancillary Management Measures	Water quality management	Continue participation in WDNR Self-Help monitoring program; consider periodic participation in U.S. Geological Survey TSI or similar programs	WDNR, USGS, Town of LaGrange, PLPRD
	Fisheries management	Conduct periodic fish surveys to determine management and stocking needs; continue stocking; enforce size and catch limit regulations	WDNR
		Protect fish habitat, including environmentally sensitive lands such as wetlands; encourage use of natural vegetation in shoreland areas to aid in habitat protection	Town of LaGrange, PLPRD, WDNR, individuals
	Land use	Observe development area guidelines set forth in the regional land use plan; consider conservation development principles	Walworth County and Town of LaGrange
		Establish adequate protection of wetlands and shorelands, and other environmental corridor lands and isolated natural features	Walworth County, Town of LaGrange, and WDNR
		Continue to pursue conservation easements or purchase of Girl Scout properties in shoreland area	PLPRD, Girl Scouts of Greater Chicago and Northwest Indiana, WDNR
		Maintain historic lake front residential dwelling densities to extent practicable	Walworth County, Town of LaGrange
		Promote sound rural land management practices to reduce soil loss and contaminant loadings through preparation of farm conservation plans in accordance with regional land use plan	USDA, WDATCP, and Walworth County
		Promote sound urban housekeeping and yard care practices through informational programming; implement stormwater management measures	PLPRD, Walworth County, Town of LaGrange
		Strictly enforce construction site erosion control and stormwater management ordinances	Walworth County, Town of LaGrange
		Implement onsite sewage disposal system management, including inspection and maintenance, in those portions of the watershed not served by public sanitary sewerage systems	Walworth County and private landowners

Table 14 (continued)

Plan Element	Subelement	Management Measures	Management Responsibility
Ancillary Management Measures (continued)	Public informational and educational programming	Continue to provide informational material and pamphlets on lake-related topics, especially the importance of aquatic plants and the protection of ecologically significant areas; consider offering public informational programming on topics of lake-oriented interest and education; maintain signage at public access site regarding invasive species and WDNR Clean Boats-Clean Waters Program; provide disposal containers for disposal of plant material removed from watercraft	Town of LaGrange, PLPRD, WDNR, and UWEX
		Encourage inclusion of lake studies in environmental curricula (e.g., Pontoon Classroom, Project WET, Adopt-A-Lake)	Area school districts, UWEX, WDNR, Town of LaGrange, and PLPRD
		Encourage riparian owners to monitor their shoreline areas as well as open-water areas of the Lake for new growths of nonnative plants and report same immediately to PLPRD	PLPRD
	Lake district board continuing education	Maintain awareness of current developments in the area of lake management through informative publications such as “Lake Tides” (available free through the Wisconsin Lakes Partnership) and attendance at lake education conventions, workshops, and seminars	PLPRD

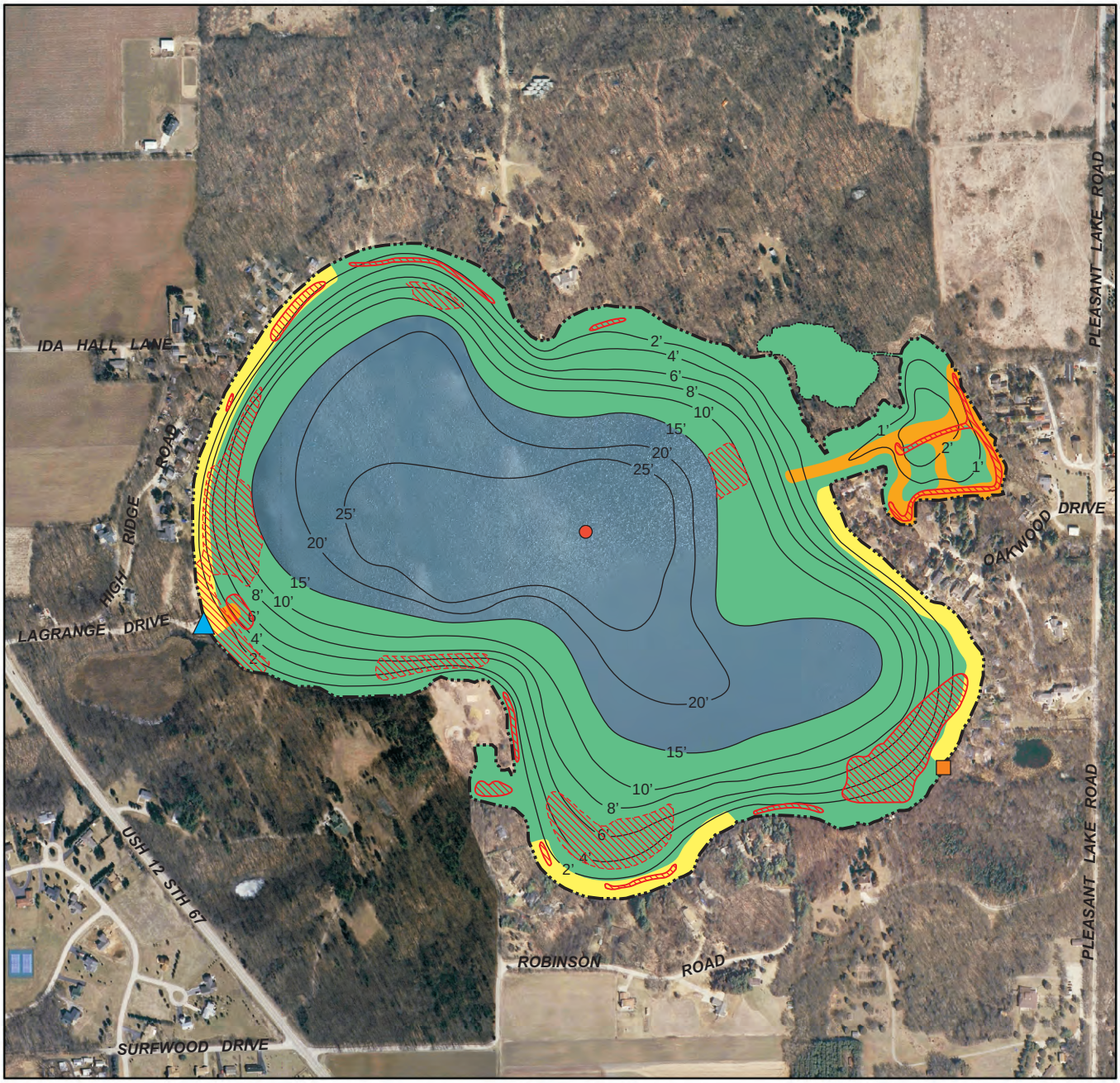
[a]*Use of aquatic herbicides requires a WDNR permit pursuant to Chapter NR 107 of the* Wisconsin Administrative Code*.*

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

Source: SEWRPC.

Map 9

RECOMMENDED AQUATIC PLANT MANAGEMENT PLAN FOR PLEASANT LAKE



DATE OF PHOTOGRAPHY: APRIL 2005

— 20' — WATER DEPTH CONTOUR IN FEET

PUBLIC RECREATIONAL BOATING ACCESS

WATER LEVEL CONTROL STRUCTURE

OPEN WATER

SHORELAND ZONE - LIMITED CONTROL

- MAINTAIN SHORELAND VEGETATION
- MANUALLY REMOVE PLANTS AROUND PIERS AND DOCKS
- CONSIDER LIMITED HERBICIDE USE TO CONTROL NONNATIVE SPECIES SUCH AS EURASIAN WATER MILFOIL AND PURPLE LOOSESTRIFE

MAINTAIN BOATING ACCESS - LIMITED CONTROL

- CONSIDER LIMITED HERBICIDE USE TO CONTROL NONNATIVE SPECIES

OBSERVE WDNR CHAPTER NR 107 ENVIRONMENTALLY SENSITIVE AREA REQUIRMENTS

EURASIAN WATER MILFOIL CONTROL AREA

- CONSIDER LIMITED HERBICIDE USE

MONITORING PROGRAM

- CONTINUE WATER QUALITY MONITORING
- CONTINUE AQUATIC PLANT MONITORING AT 3 TO 5 YEAR INTERVALS
- CONDUCT PERIODIC FISH SURVEY: STOCK AS NECESSARY, PROTECT FISH HABITAT
- MONITOR AQUATIC INVASIVE SPECIES OCCURRENCES

PUBLIC INFORMATION AND EDUCATION

- CONTINUE PUBLIC AWARENESS PROGRAMS

GRAPHIC SCALE
0 350 700 FEET

Source: SEWRPC.

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APPENDICES

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Appendix A

AQUATIC PLANT ILLUSTRATIONS FOR PLEASANT LAKE

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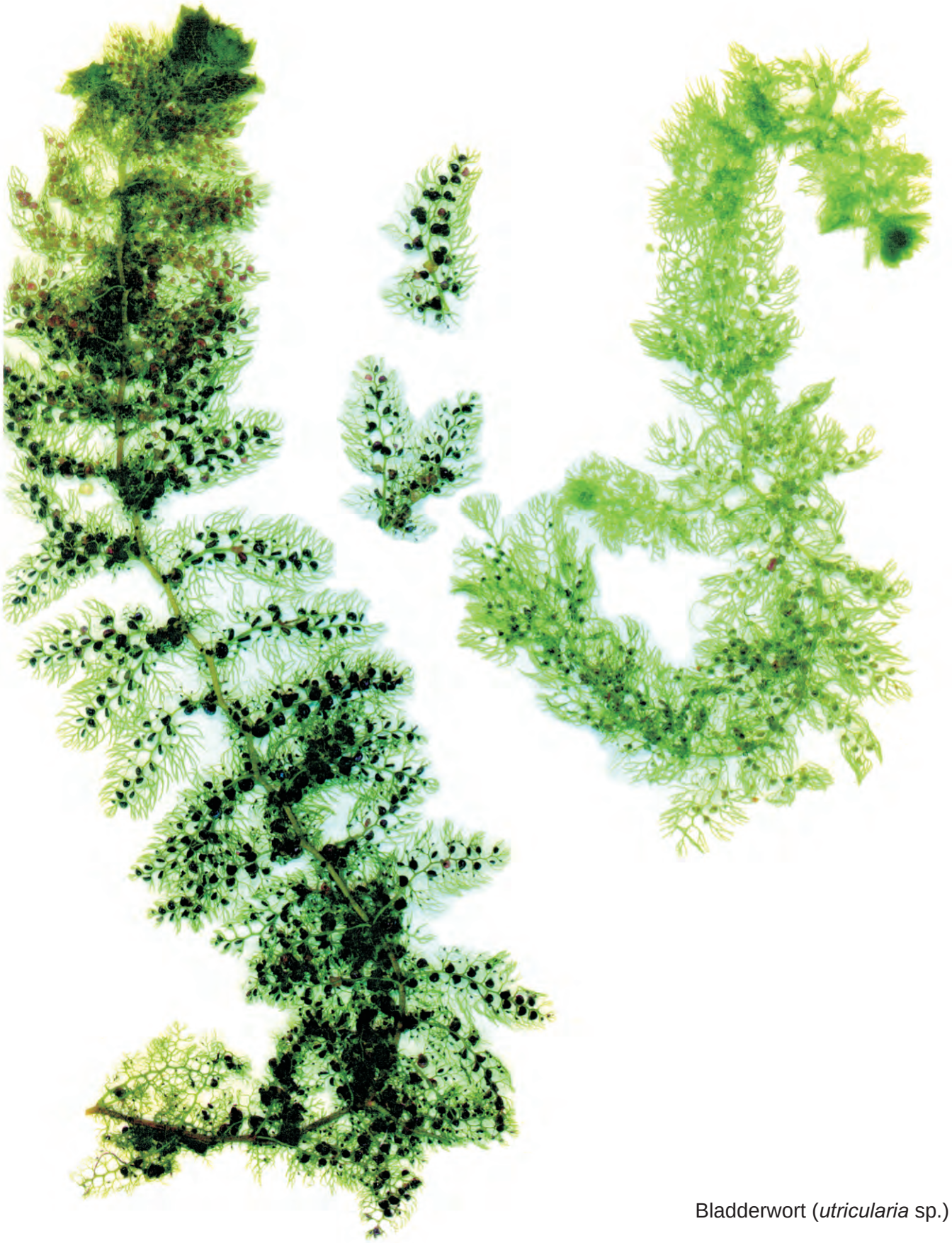


Bladderwort (*utricularia* sp.)

Bushy Pondweed (*najas flexilis*)

Coontail (*ceratophyllum demersum*)

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

Flat-Stem Pondweed (*potamogeton zosteriformis*)

Floating-Leaf Pondweed (*potamogeton natans*)

Illinois Pondweed (*potamogeton illinoensis*)

Large-Leaf Pondweed (*potamogeton amplifolius*)

Leafy Pondweed (*potamofeton foliosus*)

Muskgrass (*chara vulgaris*)

Native Water Milfoil (*myriophyllum* sp.)

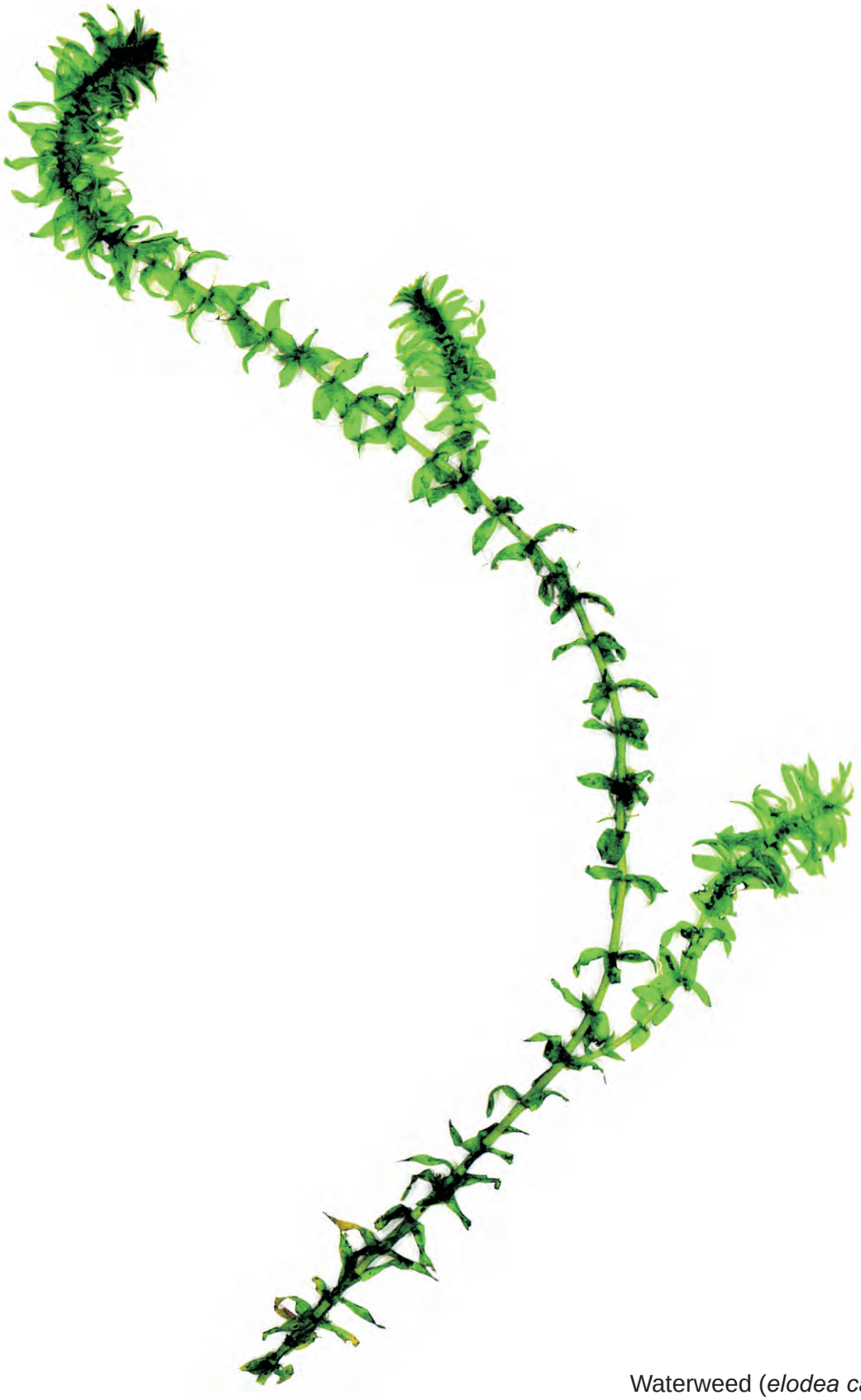
Sago Pondweed (*potamogeton pectinatus*)

Small Pondweed (*potamogeton pusillus*)

Spiny Naiad (*najas marina*)

Variable Pondweed (*potamogeton gramineus*)

Water Stargrass (*zosterella dubia*)



Waterweed (*elodea canadensis*)

White Water Crowfoot (*ranunculus longirostris*)

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

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Appendix B

WDNR SENSITIVE AREA DELINEATION FOR PLEASANT LAKE (PROPOSED)

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Pleasant Lake (Walworth County, Wisconsin)
Integrated Sensitive Area Report

Assessment Dates:	August 17, 2005 August 29, 2005 October 11, 2005
Number of Sensitive Areas Surveyed:	4 total
Site Evaluators:	Doug Welch, Fisheries Biologist Jenny Herrmann, Wildlife Technician Heidi Bunk, Lakes Biologist Pam Schense, Water Regulation and Zoning Ozzie Mohr, Commissioner Lars Higdon, Lake Resident Rick Callaway, Town Appointed Commissioner Doug Behrens, Commisioner
Authors:	Mike Hemmingsen, Water Resources Specialist Heidi Bunk, Lakes Biologist

General Lake Information

Pleasant Lake is located in north central Walworth County near the intersection of highway 67 and highway 20. The lake has an area of approximately 154 acres, a maximum depth of about 29 feet, and an average depth of approximately 12.4 feet. Pleasant Lake is an ice block kettle at the border of a terminal moraine and outwash terrace. The steep slopes on all but the southeast side of the lake represent moraine deposits while the gentler terrain southeast of the lake reflects outwash deposits.

The Pleasant Lake watershed (drainage basin) is approximately 216 acres. Land use within the watershed consists of 91 acres of agricultural land, 60 acres of low density residential area, 55 acres of woodlands, and 10 acres of wetlands. Data from observation wells indicates that the western half of the lake is a region of groundwater inflow and the eastern half of the lake is a region of groundwater outflow.

Pleasant Lake now has multiple recreational uses including the seasonal activities of: fishing, pleasure boating, swimming, small craft sailing, ice fishing, cross-country skiing, ice-skating, and hunting. The lake also provides natural scenic beauty throughout the year, and opportunities for walking, jogging, bird watching, and picnicking. The entire lake is “Slow, No Wake”.

Pleasant Lake supports a moderately diverse fish population. Northern pike, walleye, LM bass, forage fish and panfish are all present on the lake. Doug Welch, DNR Fisheries Biologist, conducted an electrofishing survey in May 2000. A fyke net survey and seine net survey was conducted in August 2000. Bluegill and largemouth bass were the most numerous fish found in the lake. The average length of bluegill caught was 5.7 inches, with a range of 1.4 inches to 7.8 inches. The average length of largemouth bass caught was 10.5 inches, with a range of 5.4 inches to 15.9 inches. The surveys also documented warmouth, pumpkinseed, yellow bullhead, grass pickerel, brown bullhead, rock bass, iowa darter and johnny darter. The next fish survey is scheduled for 2008.

Exotic Species

Exotic species, most notably zebra mussels, Eurasian watermilfoil, and purple loosestrife have invaded southeastern Wisconsin lakes. Boaters traveling from lake to lake often facilitate the propagation of exotic species. The introduction of exotic species into a lake ecosystem can lead to a decline in the native plant population and cause problems with nutrient loading. Also, the disturbance of lake bottoms from human activity (boating, plant harvesting, chemical treatments, etc.) enhances the colonization and/or expansion of exotic species. Two simple steps to prevent the spread of exotic species include 1) Removing aquatic plants, animals, and mud from trailers and boats before leaving the water access; and 2) Draining water from boats, motors, bilges, live wells, and bait containers before leaving the water access.

Eurasian watermilfoil is present in Pleasant Lake. Eurasian watermilfoil is one of eight milfoil species currently found in Wisconsin. It is often misidentified as one of its seven native cousins, and vice versa. In many areas within the Lakes, this non-native milfoil has established large monocultures and out competed many native plants. These dense beds of milfoil not only impede the growth of native plant species but also inhibit fish movement and create navigational problems for boaters.

The regenerative ability of Eurasian watermilfoil is another obstacle when attempting to control this species. Fragments of Eurasian watermilfoil detached by harvesting, boating, and other recreational activities can float to non-colonized areas of the lake or downstream to additional lakes in the drainage system and create new colonies. Therefore, when controlling Eurasian watermilfoil, selective chemicals and harvesting, coupled with skimming, often produces the best results. In some lakes, biological agents such as the milfoil weevil have helped suppress milfoil populations. However, the most effective “treatment” of exotic milfoil is prevention through public education.

Curly-leaf pondweed is another submerged, exotic species found in Many Wisconsin lakes. Like Eurasian watermilfoil, curly-leaf often grows into large, homogenous stands. It can crowd out native vegetation, create navigational problems, and limit fish movement. Curly-leaf pondweed dies off in mid-summer, increasing nutrient

availability in the water column. This often contributes to summer algal blooms and decreasing water quality.

The unusual life cycle of curly-leaf pondweed makes management difficult. The plant germinates as temperatures decrease in fall. Curly-leaf is highly tolerant of cold temperatures and reduced sunlight, continuing to grow under lake ice and snow cover. With ice-off and increasing water temperatures in the spring, the plant produces fruit, flowers, and buds (turions). Turions are the main reproductive mechanism of curly-leaf. To control the species in lakes, the plant must be combated before turions become viable. Most plant harvesters have not started cutting when curly-leaf is most susceptible and a small window of opportunity exists for chemical treatment. Therefore, prevention through public education is once again very important.

Purple loosestrife, a hardy perennial native to Europe, is another exotic species common to Wisconsin. Since its introduction to North America in the early 1800s, purple loosestrife has become common in gardens and wetlands, and around lakes, rivers, and roadways. The species is highly invasive and thrives in disturbed areas. Purple loosestrife plants often out compete native plants, resulting in the destruction of food, cover, and nesting sites for wildlife and fish.

Purple loosestrife most often spreads when seeds adhere to animals. Humans should be aware of picking up seeds on clothing and equipment when in the vicinity of the plant. Loosestrife can be controlled manually, biologically, or with a broad-leaf herbicide. Young plants can be pulled, but adult plants have large root structures and must be excavated with a garden fork. Biological control is most effective on large stands of purple loosestrife. Five different insects are known to feed on this plant. Four of those have been used as control agents in the United States. Of the five species, *Galerucella pusilla* and *G. calmariensis* are leaf-eating beetles; *Nanophyes brevis* and *N. marmoratus* are flower-eating beetles; and *Hylobius trasversovittatus* is a root-boring weevil. Only *N. brevis* has not been released in the United States (WDNR 2003). Lastly and most importantly, prevention through public education plays an important role in the management of this species.

Shoreland Management

Wisconsin's Shoreland Management Program, a partnership between state and local governments, works to protect clean water, habitat for fish and wildlife, and natural scenic beauty. The program establishes minimum standards for lot sizes, structural setbacks, shoreland buffers, vegetation removal, and other activities within the shoreland zone. The shoreland zone includes land within 1000 feet of lakes, 300 feet of rivers, and floodplains. Current research shows that present standards are probably inadequate for the protection of water resources (Woodford and Meyer 2003, Garn 2002). Therefore, many communities have chosen to go beyond minimum standards to ensure protection of our natural resources. This report provides management guidelines for activities within

the lake and in the immediate shoreland areas. Before any recommendations in this report are completed, please check with the Department of Natural Resources and local units of government for required approvals.

Walworth County administers several ordinances that help protect the water quality, recreational use, scenic beauty and wildlife habitat of Pleasant Lake. Walworth County regulates the use, development and construction activities on land adjacent to Pleasant Lake. The Walworth County Shoreland Zoning Ordinance limits vegetation removal, earth movements, placement of structures, water view and water access within 1000 feet of the edge of Pleasant Lake.

The Walworth County Zoning Ordinance and Subdivision Ordinance includes Conservation Development Design Standards as a tool to protect the County's resource base, including County lakes and lakeshores.

Walworth County also requires Construction Site Erosion Control Plans and Post-construction Storm Water Management Plans on most construction sites and developments.

The Town of LaGrange has developed local ordinances regarding pyramiding (Ordinance 2005-001), piers (Ordinance 2001-02), fertilizers (Ordinance 03-007) and conservation subdivisions (Ordinance 2004-04). Pyramiding is defined as "the use of a lot zoned for residential use in a manner that increases the number of persons who have access to a lake, to a greater degree than would occur if a single family property owner were using a single lot fronting on a lake." The conservation subdivision ordinance for the Town of LaGrange adopts the Walworth County ordinance.

A vital step in protecting our water resources is to maintain effective vegetative buffers. A shoreland buffer should extend from the water onto the land at least 35 to 50 feet. Studies have shown that buffers less than 35 feet are not effective in reducing nutrient loading. (Wenger, 1999) Wider buffers of 50 feet or more can help provide important wildlife habitat for songbirds, turtles, frogs, and other animals, as well as filter pollutants from runoff. (Castelle 1994) In general, no mowing should occur in the buffer area, except perhaps in a viewing access corridor. The plant composition of a buffer should match the flora found in natural Wisconsin lakeshores. A buffer should include three layers - herbaceous, shrub, and tree.

In addition, citizens living on Pleasant Lake and the community at large should investigate other innovative ways to reduce the impacts of runoff flowing into the lake while improving critical shoreline habitat (see A. Greene 2003). This may include the use of phosphorus-free fertilizers, installing rain gardens, setting the lawnmower at a higher mower height, decreasing the area of impervious surfaces, or restoring aquatic plant communities.

Introduction

Department personnel conducted Pleasant Lake sensitive area designation surveys on August 17, 2005, August 29, 2005 and October 11, 2005, following the Wisconsin Department of Natural Resources' sensitive area survey protocol. This study utilized an integrated team of DNR resource managers with input from multiple disciplines: water regulation and zoning, fisheries, lake biology, and wildlife. Four lake residents also participated in the survey.

Sensitive areas are defined in Wisconsin Administrative Code NR 107.05 (3)(i)(1) as *areas of aquatic vegetation identified by the department as offering critical or unique fish and wildlife habitat, including seasonal or life stage requirements, or offering water quality or erosion control benefits to the body of water*. **Department resource managers determined that the entire lake met the criteria, with the exception of select portions of the developed shoreline. Three shoreline areas are excluded from the shore out to 60 feet** (see Map 1).

The companion document, *Guidelines for Protecting, Maintaining, and Understanding Lake Sensitive Areas*, provides additional information to help interpret lake sensitive area reports. The document is designed to help people understand the important factors that determine the health of a lake's ecosystem. It discusses aquatic plant sensitive areas, shoreland use and lakeshore buffers, gravel and coarse rock rubble habitat, large woody cover, and various water regulation and zoning issues.

Overview of Sensitive Area Designations

Sensitive areas often have aquatic or wetland vegetation, terrestrial vegetation, gravel or rubble lake substrate, or areas that contain large woody cover (fallen trees or logs). These areas provide water quality benefits to the lake, reduce shoreline erosion, and provide habitat necessary for seasonal and/or life stage requirements of fish, invertebrates, and wildlife. A designated sensitive area alerts interested parties (i.e., DNR personnel, county zoning personnel, lake associations, etc.) that the area contains critical habitat vital to sustaining a healthy lake ecosystem, or may feature an endangered plant or animal. Information presented in a sensitive area report may discourage certain permits from being approved within these sites.

Whole Lake Recommendations:

Several recommendations from Department staff pertain to Pleasant Lake as a whole rather than to individual sensitive areas:

1. Native aquatic plant beds should be protected and maintained whether located in the sensitive area or in the excluded shoreline.

2. Prevent the spread of exotic species through sign postings, education, etc. and control exotic species where established.
3. Create shoreland buffers and maintain existing buffers, especially in areas not currently developed.
4. Monitor water quality for early detection of changes and possible degradation.
5. Maintain the whole lake "Slow No Wake" ordinance. This ordinance minimizes boat motor disturbance of aquatic plants, fish and wildlife.
6. Recommendations regarding **local and county zoning**:
    - Strictly enforce shoreland and wetland ordinances by maintaining buffers, removing non conforming structures and limited impervious surfaces
    - New development should comply with the Walworth County Land Use Plan
    - Require a buffer/"no touch" zone for grading projects along the currently undeveloped shoreline. This buffer/"no touch" zone should be at least 100 feet from the edge of the wetland back into the (landward) upland portion of parcels.
    - Require a buffer/"no touch" zone for grading projects located along steep slopes. The zone should extend at least 100 feet from the edge of a steep slope towards the landward side of the parcel.
    - Grading proposals should be strictly examined for superior erosion control and nutrient management plans.
    - Maintain Town of LaGrange Ordinance 2004-04, An Ordinance to Amend the Land Division Ordinance and Adopt Conservation Development Design for Subdivisions.
    - Maintain Town of LaGrange Ordinance 2005-001, An Ordinance to Regulate Access to Lakes Within the Town of LaGrange (Pyramiding).
    - Maintain Town of LaGrange Ordinance 2006-04, An Ordinance to Regulate Wharfs, Piers and Mooring Facilities and Establish a Pierhead Line for Lauderdale Lakes.
    - Maintain Town of LaGrange Ordinance 03-007, An Ordinance to Regulate Fertilizers Near Lakes.

Resource Value of Sensitive Area Site 1 – Pleasant Lake

Sensitive area 1 is a small bay on the northeast side of Pleasant Lake almost totally isolated from the main lake. This sensitive area is part of Camp Juniper Knoll, operated by the Girl Scouts of Chicago. This approximately three-acre plant community consists of open water, deep marsh, and shallow marsh.

The Southeastern Wisconsin Regional Planning Commission (SEWRPC) conducted a plant survey on sensitive area #1 in 1999. The following 30 plants were observed: marsh fern, broad-leaf cat-tail, narrow-leaf cat-tail, long-leaf pondweed, flat-stemmed pondweed, reed canary grass, spike-rush, soft-stemmed bulrush, hard-stemmed bulrush, river bulrush, sedge, lake sedge, wooly sedge, bottlebrush sedge, lesser duckweed, sand-bar willow, stinging nettle, yellow water lily, silver maple, jewelweed,

river-bank grape, purple loosestrife, red osier dogwood, tufted loosestrife, green ash, hoary vervain, cutleaf bugleweed, deadly nightshade, bladderwort, and boneset.

Sensitive area 1 provides northern pike with spawning habitat, nursery area, feeding area, and protective cover. This is unique to Pleasant Lake because of the abundance of water lilies. Largemouth bass, bluegills, pumpkinseed, and yellow perch use the area for feeding, nursery, and for cover from predators. This area is generally not navigable from the main lake.

Management Recommendations for Sensitive Area #1

1. Do not remove fallen trees along the shoreline.

2. A no motor zone is recommended for this area to protect emergent vegetation. No aquatic plant removal (either mechanical or manual) should be permitted.

3. A DNR permit should not be issued for any of the following:

Dredging	Pea gravel/sand blankets
Filling of wetlands	Rip Rap
Aquatic plant screens	New Piers
Boat Ramps	Sea Walls/Retaining Walls
Recreational floating devices	Boardwalks

4. No chemical treatment should be allowed except to target an infestation of an exotic species such as purple loosestrife, eurasian watermilfoil or curly leaf pondweed. Biological controls such as the purple loosestrife beetle and the milfoil weevil should be considered where appropriate.

Resource Value of Sensitive Area Site 2 – Pleasant Lake

Sensitive area 2 is a bay located just east of sensitive area 1 and is known locally as “The Bay.” The area acts as a nutrient buffer to reduce algae blooms, a biological buffer that reduces the likelihood of exotic invasions, a physical buffer that protects against shoreline erosion, and a diverse aquatic plant community that allows for sediment stabilization. See Appendix 1 for a complete list of aquatic plants found in sensitive areas of Pleasant Lake.

Sensitive area habitat includes near-shore terrestrial, shoreline, and littoral zone locations. Bottom substrate is composed of silt and detritus and shoreland buffer consists of 50 percent wooded-wetland and 50 percent developed shoreline. Herbaceous plant growth is present, lawn is common, and trees are abundant on the shoreland buffer. The wetland consists of a deep marsh and large woody cover is present at a rate of 3-6 pieces / 30 meters of shoreline. The natural scenic beauty (NSB) rating is average overall but good on the undeveloped side.

This sensitive area provides excellent spawning habitat for northern pike. Yellow perch will drape their eggs over the submergent vegetation in this area. Excellent nursery, feeding and cover habitat is available for northern pike, largemouth bass, bluegill, pumpkinseed, crappie, yellow perch and minnows. Largemouth bass and bluegill will build spawning nests in areas of this bay where relatively thin layers of silt are underlain with sand and gravel.

Table 3. Plants observed in sensitive area 2.

	Emergent	**Submergent**	**Algae**	**Exotic**
PRESENT (0-25% Cover)	*Pontederia* (pickerelweed) *Scirpus* (bulrush) *Nuphar advena* (yellow water lily)	*Elodea* (waterweed)	Filamentous (algae)	*Myriophyllum spicatum* (Eurasian watermilfoil)
COMMON (26-50% Cover)				
ABUNDANT (51-75% Cover)	*Typha* (cattail)	*Vallisneria* (wild celery)		
DOMINANT (76-100% Cover)	*Nymphaea odorata* (white water lily)	*Utricularia* (bladderwort)	*Chara* (muskgrass)	

Management Recommendations for Sensitive Area # 2

1. Do not remove fallen trees along shoreline, except where navigation is impaired. If navigation is impaired by a fallen tree, cut into smaller pieces and place outside of boating lane.

2. The no wake zone should be maintained for this area to protect emergent, submergent and floating leafed aquatic vegetation.

3. No chemical treatment allowed except to target an infestation of an exotic species such as purple loosestrife, eurasian watermilfoil or curly leaf pondweed. Biological controls such as the purple loosestrife beetle and the milfoil weevil should be considered where appropriate.

4. No **new** mechanical harvesting permits should be issued in this sensitive area. One mechanical harvesting permit is on file (originally issued in 2005). A total of 0.36 acres is permitted for harvesting. The depth of the harvest may not exceed 2 feet downward from the surface of the water. This permit will continue to be issued but with a time of year restriction (No harvesting before August 1st of any given year starting in 2008). The permit cannot be transferred to a new landowner.

5. Manual removal permits should be limited to a maximum of 20 feet along each landowner's shoreline and a maximum of 30 feet from the shoreline out into the lake. A NR 109 permit is needed for manual removal. Manual removal permits should only be issued in the area where the pier and boats are located for each property and should only be issued along the currently developed shoreline.

6. A DNR permit should not be issued for any of the following along the currently developed shoreline:

Filling of wetlands	Rip Rap
Aquatic plant screens	Recreational floating devices
Sea Walls/Retaining Walls	Pea Gravel/Sand Blankets

7. New piers along the currently developed shoreline will be permitted. The number of moorings allowed will be equal to that listed in State Statutes 30.12 (1g) (f). This would allow for 2 moorings for the first 50 feet of frontage owned and 1 additional mooring for each additional 50 feet of frontage owned.

8. Limited dredging to maintain the navigational channel may be considered if the water depth in the navigation channel becomes less than 2 feet deep. The navigational channel is located mainly along the currently developed shoreline.

9. A DNR permit should not be issued for any of the following along the undeveloped shoreline:

Dredging	Pea gravel/sand blankets
Filling of wetlands	Rip Rap
Aquatic plant screens	Recreational floating devices
Sea Walls/Retaining Walls	New Piers

10. A DNR permit should not be issued for boardwalk or ramp construction along the currently undeveloped shoreline. If condos or a subdivision are built, a rustic canoe access path can be marked.

In summary, the ecological community of Sensitive Area 2 has distinctly unique features when compared to the waterbody due to the abundant native aquatic plants and the undeveloped shoreline. This site provides a visual buffer from shoreline structures, roads, and boat traffic. Aquatic plants in the sensitive area include emergents, algae, potamogetons (pondweeds), exotics, free floating, floating leaf, and submergent vegetation. Wet edge plants include herbs, sedges, rushes, shrubs, and grasses. Game fish, panfish, fryfish and forage fish utilize the sensitive area. Wildlife utilizing the sensitive area include furbearers, waterfowl, shore birds (including wood ducks and brood), amphibians, and reptiles. This site provides an excellent educational area to explore by canoe.

Resource Value of Sensitive Area Site 3 – Pleasant Lake

Sensitive area 3, locally known as "The Pond" in Pleasant Lake serves as a wildlife refuge. The area also supports many small fish, green heron, and great blue heron. The substrate in Sensitive Area 3 consists of 2" of silt on top of hard sand. A large amount of woody cover and snags (standing and fallen branches in the water) are present. This sensitive area acts as a nesting area for upland wildlife and a feeding area for ducks. Song birds such as the belted kingfisher use this area for nesting and feeding. Frogs and toads use the sensitive area for shelter/cover, nesting and feeding. Turtles use the area for shelter/cover and feeding. Floating leaf vegetation, shrubs/brush and snag trees are all important habitat components present at this site. Water depth in sensitive area 3 is an average of approximately 1.5 feet.

Table 5. Plants observed in sensitive area 3.

	Emergents	**Submergents**	**Exotics**	**Free Floating**
PRESENT (0-25% Cover)		*Potamogeton amplifolius* (large-leaf pondweed) *P. illinoensis* (Illinois pondweed)	*Myriophyllum spicatum* (Eurasian watermilfoil)	
COMMON (26-50% Cover)		*Najas flexilis* (slender naiad) *Vallisneria* (wild celery) *Najas marina* (Spiney naiad) *P. zosteriformis* (flat-stemmed pondweed)		
ABUNDANT (51-75% Cover)		*Stuckenia pectinata* (sago pondweed) *Chara* (muskgrass)		*Nymphaea odorata* (white water lily)
DOMINANT (76-100% Cover)				

Management Recommendations for Sensitive Area # 3

1. Do not remove fallen trees along the shoreline.

2. A no motor zone is recommended for this area to protect emergent and floating leafed vegetation. No aquatic plant removal (either mechanical or manual) should be permitted except to remove exotic species such as Eurasian water milfoil, curly leaf pondweed or purple loosestrife. A permit will be needed for any removal.

3. A DNR permit should not be issued for any of the following:

Dredging	Pea gravel/sand blankets
Filling of wetlands	Rip Rap
Aquatic plant screens	New Piers
Boat Ramps	Sea Walls/Retaining Walls
Recreational floating devices	

4. Boardwalks will be allowed on a case by case basis to provide open water access only for a riparian landowner. Watercraft moored at the boardwalk must be able to navigate the water without any additional dredging. The number of moorings allowed will be less than "reasonable use" as defined by state law.

5. No chemical treatment should be allowed except to target an infestation of an exotic species such as purple loosestrife, eurasian watermilfoil or curly leaf pondweed. Biological controls such as the purple loosestrife beetle and the milfoil weevil should be considered where appropriate.

Resource Value of Sensitive Area # 4 – Pleasant Lake

Sensitive area # 4 includes most of the remaining shoreline of Pleasant Lake with the exception of the developed shoreline. Three shoreline areas are excluded from the shore out to 60 feet (see Map 1). Aquatic plants typically noted in this sensitive area included large leaf pondweed, long leaf pondweed, sago pondweed, wild celery, flat stemmed pondweed, Illinois pondweed, slender naiad, water stargrass, spiny naiad, white water lily, chara and Eurasian water milfoil.

The excluded areas of shoreline lacked aquatic plant diversity, had a higher concentration of exotic species (mainly Eurasian water milfoil and often lacked plant cover altogether. The three excluded areas are outlined in pink on Map 1 and extend from the shoreline out 60 feet into the water. Sensitive area 4 includes plant communities along the excluded shoreline that are greater than 60 feet from shore.

The substrate along the majority of the shoreline was either rock, gravel, sand or a combination of the three. Mollusks, mainly snails and native mussels, were found along the majority of the shoreline in sensitive area # 4. Shorebirds, especially herons, were documented feeding along many of the sandbars containing mollusks.

Management Recommendations for Sensitive Area # 4

1. Do not remove fallen trees along shoreline, except where navigation is impaired. If navigation is impaired by a fallen tree, cut into smaller pieces and place outside of boating lane.

2. No chemical treatment should be allowed except to target an infestation of an exotic species such as purple loosestrife, eurasian watermilfoil or curly leaf pondweed. Biological controls such as the purple loosestrife beetle and the milfoil weevil should be considered where appropriate.

3. New piers will be permitted. The number of moorings allowed will be less than listed in State Statutes 30.12 (1g) (f). The number of moorings permitted will be limited and based on the carrying capacity of the resource. Boats will likely be required to be grouped on a shared pier to minimize impact.

4. A DNR permit should not be issued for any of the following:

Dredging	Pea gravel/sand blankets
Filling of wetlands	Wetland removal
New sea walls	

5. No new rip rap should be permitted if shoreline littoral zone has emergent vegetation such as bulrush, pickerelweed, sedges, etc. Existing rip rap should be maintained in compliance with Natural Resource Code 328.

CONCLUSION

The majority of Pleasant Lake has been designated as Sensitive Area. There are four distinct plant communities and three excluded shorelines. The excluded shorelines contained rip rap or sea walls along the shoreline and the lake bed near the piers was often devoid of vegetation (likely due to boat traffic and hand raking).

Landowners living in the excluded shorelines must still follow all applicable state, county and local permitting requirements. New laws were passed by the State Legislature in 2004. Landowners with existing sea walls that need replacement should check the Department of Natural Resources website to see if replacement is possible. The website can be found at: http://dnr.wi.gov/org/water/fhp/waterway/erosioncontrol.shtml.

Sensitive area 2, locally known as "The Bay" is actively managed by both the Pleasant Lake Management District and individual landowners. Chemical treatment for Eurasian water milfoil occurs in the spring (by the District), and landowners manually rake up plants. There is one historical harvesting permit issued each year to an individual landowner. The aquatic plant community is very diverse. Management activities conducted in future years need to continue to balance the management of Eurasian water milfoil and the preservation of valuable native plant species.

A large area of Eurasian water milfoil is present on the SE corner of Pleasant Lake. The Pleasant Lake Management District should continue actively managing the area for control of Eurasian water milfoil.

Pleasant Lake enjoys a largely sandy or rock/cobble substrate as well as a healthy aquatic plant community. Water clarity is generally good. The fish community is moderately diverse. Game fish size structure is slightly below average. Preservation of native plant communities (regardless of location in the lake) will help preserve the value of Pleasant Lake for fish and wildlife.

APPENDIX 1 - Aquatic plants within sensitive areas of Pleasant Lake

Emergent	**Area 1**	**Area 2**	**Area 3**	**Area 4**
Rubus (red raspberry)				X
Zizania (wild rice)				
Typha (cattail)	X	X		X
Jancus (rush)	X			
Scirpus (bulrush)	X	X		X
Eleocharis (spike-rush)				
Carex (sedges)	X			X
Decodon (water-willow)				X
Pontederia (pickerelweed)		X		
Vitis (riverbank grape)	X			
Acorus (sweet flag)				
Aster (aster)				X
Thelypteris (marsh fern)	X			
Glyceria (mannagrass)				
Ambrosia artemisiifolia (ragweed)				X
Bidens (beggar Tick)				
Vitis Hederacea (virginia creeper)				X
Iris (blue flag)				
Eupatorium (joe pye weed)				X
Eupatorium (boneset)	X			X
Polygonum (smartweed)				X
Arundo (giant reed)				
Phalaris (reed canarygrass)	X			
Lycopus americanus Muhl. (Bugleweed)				X
Asclepias (marsh milkweed)				
Verbena (horay vervain)	X			
Coreopsis (tick seed)				
Impatiens (jewelweed)	X			X
Rumex (marsh dock)				
Cornus (dogwood)	X			X
Salix (willow)	X			
Solidago (goldenrod)				X

Submergent	**Area 1**	**Area 2**	**Area 3**	**Area 4**
Myriophyllum sibiricum (northern watermilfoil)				
Chara (muskgrass)		X	X	X
Potamogeton amplifolius (large-leaf pondweed)			X	X
Potamogeton nodosus (longleaf pondweed)	X			
Elodea (waterweed)		X		
Utricularia (bladderwort)	X	X		
Ceratophyllum (coontail)				
Stuckenia pectinata (sago pondweed)			X	X
Ranunculus trichophyllus (water crow foot)				
Vallisneria (wild celery)		X	X	X
P. zosteriformis (flat-stemmed pondweed)	X		X	X
P. illinoensis (Illinois pondweed)			X	X
Najas flexilis (slender naiad)			X	X
Heteranthera dubia (water stargrass)				X
Najas marina (spiney naiad)			X	X

Free-floating	**Area 1**	**Area 2**	**Area 3**	**Area 4**
Nuphar advena (yellow water lily)	X	X		
Nymphaea odorata (white water lily)		X	X	X
Wolffia (watermeal)				
P. natans (floating-leaf pondweed)				
Lemna (duckweed)	X			
Spirodela (large duckweed)				

Exotic				
Myriophyllum spicatum (Eurasian watermilfoil)		X	X	X
P. crispus (curly-leaf pondweed)				
Lythrum (purple loosestrife)	X			

Algae				
Chara (muskgrass)		X	X	X
filamentous		X		

Works Cited

Becker, G.C., 1983. Fishes of Wisconsin, *The University of Wisconsin Press*

Borman, S., R. Korth, and J. Temte, 1997. Through the Looking Glass: A Field Guide to Aquatic Plants, *Wisconsin Lakes Partnership*.

Castelle, A. J, Johnson, A.W. and Conolly, C. Wetland and Stream Buffer Size Requirements – A Review. Journal of Environmental Quality 23, (1994), pp. 878-882.

Chapter 30, Wisconsin State Statute.

Garn, H. S. Effects of Lawn Fertilizer on Nutrient Concentration in Runoff from Lakeshore Lawns, Lauderdale Lakes, Wisconsin. USGS Water Resources Investigations Report 02-4130, July 2002.

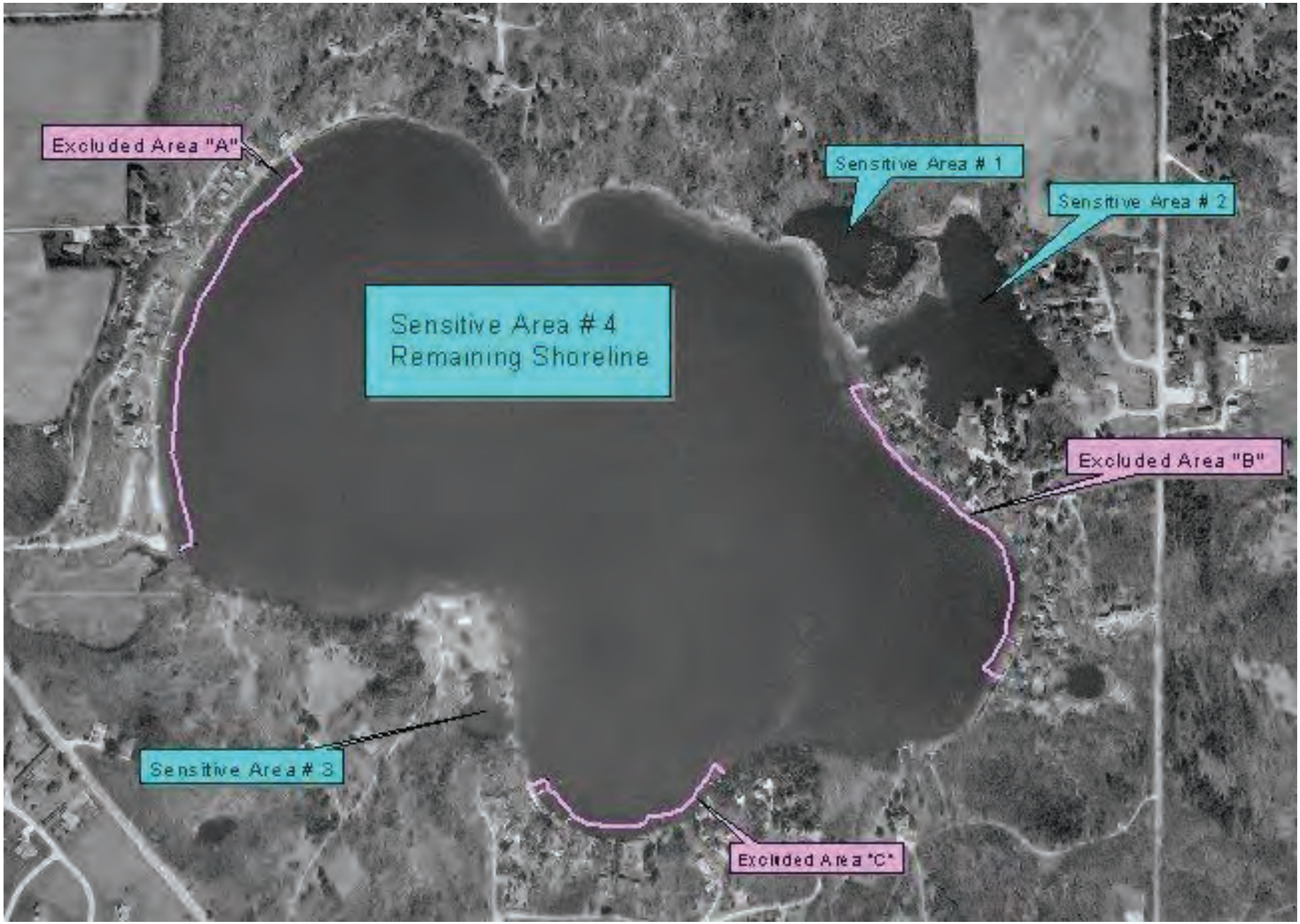
Greene, A. 2003. A Homeowners Guide to Native Shoreline Buffers, *Walworth County Publication.*

Lyons, J., P.A. Cochran, and D. Fago, 2000. Wisconsin Fishes 2000: Status and Distribution, *University of Wisconsin Sea Grant Institute*.

NR 1, 107, 109, Wisconsin Administrative Code.
Purple Loosestrife: What You Should Know, What You Can Do, *WDNR*, PUB-WT-276 2003.

Wenger, Seth. A Review of the Scientific Literature on Riparian Buffer Width, Extent and Vegetation. Institute of Ecology, University of Georgia, March 1999.

Woodford, J. E. and Meyer, M. W. Impact of Lakeshore Development on Green Frog Abundance. Biological Conservation 110 (2003), pp. 277-284


Excluded Area "A"
Sensitive Area # 1
Sensitive Area # 2
Sensitive Area # 4
Remaining Shoreline
Excluded Area "B"
Sensitive Area # 3
Excluded Area "C"

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Appendix C

TOWN OF LA GRANGE ORDINANCES APPLICABLE TO PLEASANT LAKE

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TOWN OF LA GRANGE ORDINANCE DETAILS

Title: Ordinance to Regulate Water Traffic, Boating and Water Sports

Effective Date: 4/9/2001

Category: Lakes

STATE OF WISCONSIN
TOWNS OF LAGRANGE & SUGAR CREEK
WALWORTH COUNTY

ORDINANCE NO. 01-2001

AN ORDINANCE TO REGULATE WATER TRAFFIC, BOATING AND WATER SPORTS UPON THE WATERS OF LAUDERDALE LAKES, WALWORTH COUNTY, WISCONSIN

The Town Boards of LaGrange and Sugar Creek ordain as follows:

SECTION I. REPEAL OF CONFLICTING ORDINANCES

All ordinances regulating water traffic, boats, boating or water sports upon the waters covered by this ordinance and all ordinances and parts of ordinances in conflict with this ordinance heretofore enacted by the Towns of LaGrange and Sugar Creek, Walworth County, Wisconsin, are hereby repealed.

SECTION II. APPLICABILITY

A. This ordinance shall apply to the waters of Lauderdale Lakes, the Town of LaGrange and the Town of Sugar Creek, unless otherwise specified. (March 1983)

B. Drivers or operators of all boats by means of which aquaplanes, water ski or similar objects are being towed, and the riders of such aquaplanes, water skis or similar objects, must conform to the same rules and clearances as provided for in this ordinance.

SECTION III. DEFINITIONS

A. The definitions set forth in Section 30.01 and 30.50, Wisconsin Statutes, as amended from time to time, are adopted by reference.

B. “Swimming zone” means an authorized area marked by regulatory markers to designate a swimming area.

C. “Slow-no-wake” is defined as the slowest possible speed so as to maintain steerage.

SECTION IV. STATE LAWS ADOPTED

The statutory provisions describing and defining regulations with respect to water traffic, boats, boating and related water activities in the following enumerated sections of the Wisconsin Statutes, exclusive of any provisions therein relating to the penalties to be imposed or the punishment for violation of said statutes, are hereby adopted and by reference made a part of this ordinance as if fully set forth herein as amended, repealed or recreated by the State of Wisconsin from time to time. Any act required to be performed or prohibited by the provisions of any statute incorporated by reference herein is required or prohibited by this ordinance.

30.16 Removal of Obstructions to Navigation
30.501 Capacity Plate on Boat
30.51 Operation of Unnumbered Boats Prohibited
30.52 Certificate of Number
30.53 Identification Number to be Displayed on Boat; Certificate to be Carried
30.54 (2) Tranfer of Ownership of Numbered Boat
30.55 Notice of Abandonment or Destruction of Boat or Change of Address
30.60 Classification of Motor Boats
30.61 Lighting Equipment
30.62 Other Equipment
30.63 (2) Use of Certain Outboard Motors Restricted and Draining Fuel into Lake Prohibited (March 1983)
30.64 Patrol Boats (March 1983)
30.65 Traffic Rules
30.66 Speed Restrictions
30.67 Accidents and Accident Reports
30.675 Distress Signal Flag
30.68 Prohibited Operations
30.69 Water Skiing
30.70 Skin Diving
30.71 Boats Equipped with Toilets
30.99 Parties to a Violation (March 1983)
287.81 Littering

SECTION V. AIRCRAFT LANDING ON LAKES

It is hereby prohibited for any aircraft to land upon the surface of Lauderdale Lakes within the corporate limits of the Towns of LaGrange or Sugar Creek, Walworth County, Wisconsin, except in case of emergency.

SECTION VI. ADDITIONAL TRAFFIC RULES

In addition to the provisions of the Wisconsin Statutes adopted in this ordinance, the following rules shall apply to boats or persons using the waters covered by this ordinance. (May 1989)

A. Mooring Lights Required. No person shall moor or anchor any boat, raft, buoy or other floating object, or permit the same to drift in the traffic lane described in this ordinance between sunset and sunrise unless there is prominently displayed thereon a bright white light of sufficient intensity and placed so as to be visible from any direction (360 degrees) for a distance of two (2) miles on a dark night with clear atmosphere. (March 1983)

B. Lights Required for Row Boats and Sailboats Without Motors. No person shall operate any boat propelled by muscular power or any sailboat not equipped with a motor in the traffic lane described in Section VII of this ordinance, between the hours of sunset and sunrise, unless there is prominently displayed thereon, a bright white light of sufficient intensity and placed so as to be visible from any direction (360 degrees) for a distance of two (2) miles on a dark night with clear atmosphere. (March 1983)

C. Use of Spot Lamps Restricted. No person aboard a boat, other than a law enforcement officer or a person in need of assistance to prevent bodily injury or destruction of property, shall direct the beam of any spot lamp or any similar device so as to project any glaring light into the eyes of another boat operator. (March 1983)

D. No person shall operate any boat, when there are any persons or objects so situated as to obstruct the view of the operator to the front or to the side, or as to interfere with the operator’s control of the operating mechanisms of the boat. Spot lamps and horns placed on the foredeck of any boat and signal lamps or speakers of authorized patrol boats shall not be considered a violation of this section. (March 1983)

E. No person shall take or operate any boat without the consent of the owner. (March 1983)

F. Organized Events and Displays. Any person organizing an event or display on Lauderdale Lakes shall provide the clerk of the respective Town written notice describing the event or display and its date and times two weeks in advance.

SECTION VII. SPEED RESTRICTIONS

A.Shore Zone.
1. Except under § 30.69(3) relating to water skiing, no person may operate a motorboat within 100 feet of the shoreline or any dock, raft, pier or buoyed restricted area at a speed in excess of slow-no-wake.

2. Except under § 30.69(3)(a), (c) or (d) relating to water skiing, no person may operate a personal watercraft within 200 feet of the shoreline at a speed in excess of slow-no-wake.

B. Except for law enforcement and/or rescue vessels, no person may operate a motorboat on the waters of Middle Lake west of a line from LL 741 (W6734 Park Lane) on the north and LL 560E (W5534 Lost Nation Road) on the south at a speed in excess of “slow-no-wake” speed. A designee of the Town Board of LaGrange is authorized and directed to place and maintain appropriate regulatory markers to advise the public of the location of said zone. (May 1989)

C. Except for law enforcement and/or rescue vessels, and except when or where such speed would otherwise be prohibited by law or is otherwise regulated by this ordinance, no person may operate a motorboat at a speed in excess of fifteen miles per hour (15 MPH) during the hours between sunset Friday and 9:00 a.m. Saturday, sunset Saturday and 9:00 a.m. Sunday, and sunset on the eve of any public holiday and 9:00 a.m. on such holiday. (May 14, 1990)

SECTION VIII. SWIMMING REGULATIONS

A. Swimming from Boats Regulated. No person shall swim from any boat unless such boat is anchored.

B. Distance from Shore or Base. No person shall swim more than ONE HUNDRED (100) FEET from shore or from the end of any pier or more than FIFTY (50) FEET from any anchored raft or boat unless he or she is accompanied by a boat manned by a competent person having immediately available a U.S. Coast Guard approved Type IV personal flotation device for each swimmer being escorted in addition to those required to be on board under applicable regulations. Such boat shall stay reasonably close to and guard such swimmer or swimmers. A person manning such an escort boat shall be considered competent if he can, in fact, observe the swimmer or swimmers, throw the flotation device to them should the need arise, and is otherwise qualified to operate the escort boat under applicable regulations. (March 1983)

C. Hours Limited. No person may swim more than 100 feet from shore, or the projecting extremities, of piers or wharfs from sunset to sunrise.

SECTION IX. WATER SKIING

In addition to the provisions of the Wisconsin statutes adopted in this ordinance, the following regulations apply to boats and persons using the waters covered by this ordinance:

A. Careful and Prudent Operation. A person operating a boat having in tow a person on water skis, aquaplane or similar device and the users of such water skis, aquaplane or similar devices shall operate such boat or use such device in a careful and prudent manner and at a reasonable distance from persons and property so as not to endanger the life or property of any person, and shall conform to all applicable rules and clearances as provided for in this ordinance.

B. Hours Limited. No person shall engage in water-skiing, aquaplaning or similar activity between the hours of sunset and sunrise. This shall not supercede the 15 MPH speed limit on weekends and holidays in Section VII. D.

C. Area Limited. No person shall engage in water-skiing, aquaplaning or similar activity outside the traffic lane described in Section VII of this ordinance.

D. Observer required. No person shall operate a boat having in tow a person on water skis, aquaplane or similar device unless there is in the boat a competent person, in addition to the operator, in a position to observe the progress of the person being towed. An observer shall be considered competent if the observer can, in fact, observe the person being towed and relay any signals to the operator. This observer requirement does not apply to Class A motorboats actually operated by the person being towed and so constructed as to be incapable of carrying the operator in or on the motorboat.

E. Number of Skiers Limited. No more than two (2) persons shall use towlines as a means of water skiing, aquaplaning or similar activity behind a boat.

F. Flotation Required.
1. All persons engaged in water skiing, aquaplaning or similar activity shall wear U.S. Coast Guard approved Type I, II or III Personal Flotation Devices. However, persons engaged in trick skiing may elect to wear a non-Coast Guard approved personal flotation device, other than a so-called “ski-belt.” A trick skier shall be identified by skiing positions which readily differentiate the skier from the ordinary “front-forward” skier, and also by the following: (a) Skis: Short, wide or swivel skis, wakeboards and similar devices; and (b) Towrope: Less than 75 feet.

2. Persons engaged in barefoot skiing may elect to wear a non-Coast Guard approved barefoot wet suit designed specifically for the activity. 3. Whenever a water skier elects to wear a non-Coast Guard approved device pursuant to these regulations, there shall be a Coast Guard approved device carried in the boat for the use of such skier.

G. Restrictions. No person operating a boat having in tow a person on water skis, tube, aquaplane or similar device, nor the users of such water-skis, aquaplanes, tubes or similar devices, shall engage in such activity within one hundred (100) feet of any occupied anchored boat or marked swimming area or public boat landing.

H. Exceptions. Duly authorized water ski tournaments, competitions, exhibitions or trials therefore, for which notice has been given to the Town Clerk pursuant to this ordinance, shall be exempt from the following provisions of this Section:

Paragraph (b) (Hours limited) where adequate lighting is provided and at designated times and places for which notice was given.

Paragraph (c) (Area limited) at designated times and places for which notice was given.

Paragraph (e) (Numbers of skiers limited) at designated times and places for which notice was given.

Paragraph (f) (Flotation required) where pick-up boats are provided and at designated times and places for which notice was given.

I. Emergency Permit. Where it is impossible or impractical as a result of lack of advance knowledge to provide two (2) weeks notice for a special organized event or emergency practice, an emergency notice under this Section may be made to the head of the Water Safety Patrol and that same request is reasonable and fully describes the event, time of the event, and area of the lake to be used. (March 1983)

SECTION X. MARKERS, NAVIGATION AIDS AND POSTING

A. The designee of the LaGrange Town Board is authorized and directed to place and maintain authorized markers, navigation aids and signs as shall be appropriate to advise the public of the provisions of this ordinance and to post and maintain a copy of this ordinance at all public access points within the jurisdiction of the Towns of LaGrange and Sugar Creek, Walworth County, Wisconsin.

B. Standard Markers. No person shall place or maintain any marker upon waters of the lake except the designee of the Town Board of LaGrange.

C. Interference with Markers Prohibited. No person shall without authority remove, damage, destroy, moor or attach any watercraft to any buoy, beacon or marker placed in the waters by authority of the United States.

D. Race course markers, water ski course markers, water ski jumps, and similar devices may be temporarily placed in the traffic lane during the hours between sunrise and sunset when authorized by the Town Board of the Town of LaGrange upon application to the LaGrange Town Clerk.

SECTION XI. REGULATION OF ICEBOUND WATERS

A. Permit.
1. No person shall remove ice or cause its removal from Lauderdale Lakes without first obtaining a permit from the Town Board of LaGrange or Sugar Creek, depending upon the location of the proposed ice removal. (April 1983)

2. The application for permit shall be made in writing and filed in the office of the Clerk of the Town of LaGrange or Sugar Creek. The application shall describe the area from which the ice will be removed together with any additional details that the Town Board might require. It shall also state the name, residence and post office, and telephone number of the applicant.

B. Ice Holes.
1. Any person or persons who shall remove ice or cause its removal from Lauderdale Lakes shall place around the margin of the opening made by such removal, a fence, by setting posts of not less than two (2) by four (4) inches in size with a fence board thoroughly nailed thereto not less than 3½ feet above the surface of the ice on said lakes.

2. Any person or persons creating ice holes by aeration of water may, in lieu of the requirements of sub (1), erect and maintain a barricade around such holes consisting of uprights spaced every twenty-five (25) feet or less, connected by a continuous rope, cord or similar material placed 3½ feet off the surface of the ice. The connecting rope, cord or similar material shall have reflectorized ribbon or tape attached to it, so as to be highly visible, and shall be of sufficient strength to permit retrieval of the barricade following melting of ice. Any person or persons erecting such barricade shall remove the barricade and all parts thereof from the ice or water immediately after the ice has melted.

3. Removal of ice shall not interfere with the rights of the public to lawfully use the icebound waters of Lauderdale Lakes. Removal of ice for a distance of more than ten (10) feet beyond any existing pier is prohibited.

4. Each day during which an opening exists in violation of this ordinance is a separate offense.

5. Removal of ice shall not interfere with the rights of neighboring riparian proprietors. Removal of ice along the shoreline of neighboring riparian properties, except by permission of the owner or owners, is hereby declared to be a public nuisance and the maintenance of such ice holes may be abated by action at the suit of the Town. (April 1983)

C. This section shall not apply to ice fishermen as long as the hole or removal of ice does not leave a hole in the ice greater than twelve (12) inches at its greatest dimension.

SECTION XII. ENFORCEMENT, POWERS, PENALTIES AND DEPOSITS

A. This ordinance shall be enforced by the officers of the Water Safety Patrol, which shall be operated under the jurisdiction of the Town of LaGrange, Walworth County, Wisconsin. Every Water Safety Patrol officer appointed by the Town of LaGrange shall be a qualified law enforcement officer. To the extent that the Water Safety Patrol operates within the Township of Sugar Creek on Lauderdale Lakes, the authority of said officers shall be limited to the waters of Lauderdale Lakes, unless said officers, in the enforcement of their duties are, by other law, permitted to pursue such duties off the water, upon land or piers otherwise within the Township of Sugar Creek boundaries.

B. The members of the Water Safety Patrol shall have supervision over the waters of Lauderdale Lakes and may stop and board any boat for the purpose of enforcing any provisions of this ordinance and for conducting search and rescue operations, if the officers have reasonable cause to believe there is a violation, is about to be a violation, or has been a violation of such ordinances, or the stopping and boarding of any boat is essential to conduct a search and rescue operation. Said officers may arrest any person found on the waters of Lauderdale Lakes, or within the Towns of LaGrange or Sugar Creek, violating such ordinance, whether at the time of arrest the person is on the waterways or upon land, except as above set forth with respect to the Township of Sugar Creek. Such persons will be delivered to the Circuit Court of Walworth County and the arresting officer shall make and execute a complaint charging such person with the offense committed unless otherwise provided by law. Provisions relating to citations, arrests, questioning, releases, searches, deposits and stipulations of no contests in the Wisconsin Statutes, as they are amended or repealed and recreated from time to time hereafter, shall apply to all civil forfeiture violations. Provisions relating to complaints, arrests, questioning and releases and searches under Sections 968.01 to 968.256 as they may be from time to time hereafter amended, shall apply to all criminal violations, unless otherwise provided by law.

C. All actions to recover forfeitures and penalty assessments under this ordinance are civil actions in the name of the Town of LaGrange, shall be heard in Circuit Court of Walworth County, and shall be recovered under the procedure set forth in the Wisconsin Statutes. (March 1983)

D. (1) Wisconsin state boating penalties as found in Section 30.80, Wis. Stats., as amended from time to time, and deposits as established in the Uniform Deposit and Bail Schedule established by the Wisconsin Judicial Conference, are adopted by reference for all violations for which there is a statutory counterpart.

(2) Any person who unlawfully obstructs navigation under this ordinance shall forfeit not more than Fifty Dollars ($50.00) for each offense. Each day the obstruction exists is a separate offense.

(3) The forfeitures and bail schedule for offenses in this ordinance for which no statutory counterpart exists are all assessments imposed by statute, court costs and fees, and as follows:

Offense
Forfeiture
Minimum Maximum Bail
a. Aircraft Landing on Lakes, Sec. V.
$50 $200 $75
b. Mooring Lights Required, Sec. VI.A.
$20 $100 $30
c. Lights For Row Boats and Sailboats, Sec.VI.B.
$20 $100 $30
d. Use of Spot Lamps Restricted, Sec. VI.C.
$20 $100 $30

e. Operator View Restricted, Sec. VI.D.
$20 $100 $30
f. Excess Number of Skiers, Sec. IX.E.
$20 $100 $30
g. Unauthorized Marker Placement, Sec. X.B.
$20 $100 $30
h. Ice Violation, Sec. XI.
$20 $100 $30
i. Events and Displays Without Notice, Sec. VI.F.
$10 $80 $20
j. Water-skier Flotation Violation, Sec. IX.F.
$10 $80 $20
k. Interference With Markers, Sec. X.C.
$30 $100 $40
l. Careful and Prudent Operation, Sec. IX.A.
$30 $100 $40
m. Speed in Traffic Lane, Sec. VII.A.
$40 $130 $50
n. Speed Excess of 15 MPH, Sec. VII.D.
$40 $130 $50
o. Swimming From Unanchored Boat, Sec. VIII.A.
$40 $130 $50
p. Swimming in Restricted Areas or at Restricted Times, Sec. VIII.B. and C.
$40 $130 $50
q. Speed Excess Slow-No-Wake, Sec. VII.C.
$50 $140 $60
r. Speed in Shore Zone, Sec. VII.B.
$50 $140 $60
s. Operation Without Consent, Sec. VI.E.
$50 $500 $200
t. The above forfeitures and bail amounts shall be double for a second or third subsequent offense within one (1) year.

(4) Any person violating any provisions of this ordinance for which a penalty is not set forth above shall, upon conviction thereof, forfeit not more than $500, nor less than $10 for each violation, together with penalty assessments and the costs of prosecution and in default of payment of such forfeiture, assessments and costs of prosection shall be imprisoned in the County Jail until full payment is made, but not exceeding sixty (60) days. (April 1990)

SECTION XIII. SEVERABILITY

The provisions of this ordinance shall be deemed severable and it is expressly declared that the Town Boards would have passed the other provisions of this ordinance irrespective as to whether or not one or more provisions may be declared invalid and any provision of this ordinance or the application thereof to any person or circumstance is held invalid, the remainder of the ordinance and the application of such provisions other persons or circumstances shall not be affected thereby.

SECTION IV. EFFECTIVE DATE AND CLERK’S DUTY

A. This ordinance shall take effect and be in force from and after its passage and publication as provided by law, and after review by the Department of Natural Resources.

B. The LaGrange Clerk is directed to file a signed copy of this ordinance with the Department of Natural Resources in Madison, Wisconsin.

Enacted by the Town Board of LaGrange this ____ day of _____, 2001.
Approved:
David Heilmeier, Town Chairman
Richard Callaway,Supervisor
Donald Sukala,Supervisor
Ann Lohrmann,Supervisor
Louise Olson, Supervisor

ATTEST:
Elizabeth A. Sukala, Town Clerk, LaGrange
Enacted by the Town Board of Sugar Creek this ____ day of _____, 2001.
Approved:
Loren Waite, Chairman
Charles Papke, Supervisor
Edward Nezweiske

ATTEST:
Diane Boyd, Town Clerk, Sugar Creek

Title: Ordinance to Regulate Regulate Fertilizers Near Lakes

Effective Date: 6/9/2003

Category: Lakes

STATE OF WISCONSIN
TOWN OF LAGRANGE
WALWORTH COUNTY

ORDINANCE NO.03-007

AN ORDINANCE TO REGULATE FERTILIZERS NEAR LAKES

WHEREAS, fertilizers applied to land surface near lakes can wash into the lakes causing excessive weed growth in the lakes resulting in problems for boaters, fishermen and other recreational users of the lakes;

THEREFORE, the Town Board of LaGrange enacts this Ordinance:

Section 1: Definitions. The following terms as used in this Ordinance are defined as follows:

A.“Commercial Applicator” is a person who applies fertilizer for hire.

B.“Fertilizer” means any substance, containing one or more plant nutrients, which is used for its plant nutrient content and which is designed for use or claimed to have value in promoting plant growth, except unmanipulated animal or vegetable manures, marl and liming material.

C.“Non-commercial applicator” is a person who applies fertilizer, but not for hire.

Section 2. Application. This Ordinance shall apply within the boundaries of the Lauderdale Lakes Lake Management District and the Pleasant Lake Lake Management District, hereafter called “Lake Districts.”

Section 3. Phosphorous Prohibition. No person, firm, corporation, franchise, commercial applicator, whether or not licensed by the Wisconsin Department of Agriculture, Trade and Consumer Affairs, non-commercial applicator, property owner or tenant, shall apply lawn fertilizer in any form containing any amount of phosphorous or any amount of any other compound containing phosphorous, such as phosphate within the Lake Districts, except as follows:

A. Naturally occurring phosphorous in unadulterated natural or organic fertilizing products such as yard waste compost.

B. Lawn areas where soil tests confirm that the soil contains levels of phosphorous below the quantity in typical soils in Southeastern Wisconsin. If this exception applies the amount of phosphorous applied shall not exceed the appropriate application rate recommended in the soil test and shall be incorporated into the soil to minimize runoff.

C. Application to any farming or agricultural business, providing the use of fertilizers is related to the growth of a product or maintenance of growing fields. Appropriate steps shall be taken to incorporate the fertilizer into the soil to minimize runoff. This exception shall not apply to lawn areas on a farm or agricultural business.

Section 4. Regulation of All Fertilizers. No person, firm, corporation, franchise, commercial applicator, whether or not licensed by the Wisconsin Department of Agriculture, Trade and Consumer Affairs, non-commercial applicator, property owner or tenant, shall apply any fertilizer applied to the following locations:

To impervious surfaces, drainage ditches, waterways, natural buffer zones, delineated wetlands, below the ordinary high water mark, or within 10 feet of any wetland or water resource, except as follows:

Application to any farming or agricultural business, providing the use of fertilizers is related to the growth of a product or maintenance of growing fields. Appropriate steps shall be taken to incorporate the fertilizer into the soil to minimize runoff. This exception shall not apply to lawn areas on a farm or agricultural business.

Section 5. Enforcement. This Ordinance shall be enforced by the Town of LaGrange police, who are authorized to issue citations. Violators shall forfeit a minimum of $50 up to a maximum of $ 350 plus costs and assessments, and, upon failure to pay shall serve up to 30 days in the Walworth County jail. The bond amount shall be $_____.

Adopted the ____day of September, 2003 by the Town of LaGrange Town Board. Town Board:

David Heilmeier, Chairman
Richard Callaway, Supervisor
Donald Sukala, Supervisor
Ann Lohrmann, Supervisor
Frank Taylor, Supervisor

ATTEST:
Crystal Hoffmann

Title: Boat Launch Ordinance

Effective Date: 4/9/2007

Category: Lakes

STATE OF WISCONSIN
TOWN OF LAGRANGE
WALWORTH COUNTY

ORDINANCE NO. 2007-003

AN ORDINANCE TO REGULATE USE OF THE TOWN'S PUBLIC BOAT LAUNCHES

The Town Board hereby enacts this Ordinance as follows:

SECTION 1. FEES FOR USE OF PUBLIC BOAT LAUNCH.

A. No person shall use or otherwise launch a watercraft at or on the public boat launches owned by the Town of LaGrange without prepayment of the following fees: Per day watercraft launch fee (entitling the holder to launch watercraft for one day); Per season fee (entitling unlimited launches from January 1 to December 31);

B. The amount of fees shall be established by the Town Board from time to time by motion.

SECTION 2. PAYMENT OF FEES AND DISPLAY OF PERMIT.

A. Fees shall be paid in advance. Upon payment the person shall receive a permit.

B. Fees may be paid as follows:
At the launch ramp; or
At the Town Hall either in person or by mail by sending a check or money order to the Town Clerk at P.O. Box 359, Whitewater WI 53190.

C. Every person or vehicle using the launch ramp shall either carry with them or display on the vehicle dashboard the permit that they receive when paying the fee.

SECTION 3. NO OVERNIGHT TIE UP.

No person, firm or association shall tie a watercraft to a launch ramp owned by the Town of LaGrange at any time from 11 PM to 5AM the following day. This prohibition shall not apply to watercraft owned or operated by the Town of LaGrange, the Fire Department or the Lauderdale Lakes Lake Association.

SECTION 4. ITEMS ALLOWED ON RAMP.

No person, firm or association shall place any thing on the launch ramp except watercrafts, motor vehicles and trailers.

SECTION 5. ENFORCEMENT.

This ordinance may be enforced by the Walworth County Sheriff's Department and the Lake Patrol by issuing citations. Violations shall be punishable by a forfeiture in the amount of a minimum of $25 up to a maximum of $100. Each day of a violation takes place shall be a separate violation. Failure to pay the forfeiture may result in a jail term.

SECTION 6. SEVERABILITY AND REPEAL.

A. The provisions of this ordinance shall be deemed severable and it is expressly declared that the Town Board would have passed the other provisions of this ordinance irrespective as to whether or not one or more provisions may be declared invalid and any provision of this ordinance or the application thereof to any person or circumstance is held invalid, the remainder of the ordinance and the application of such provisions, other persons or circumstances shall not be affected thereby.

B. All ordinances and parts of ordinances in conflict with this ordinance heretofore enacted by the Town of LaGrange are hereby repealed.

Adopted on motion of Supervisor Bromley, seconded by Supervisor Schramm on the 9th day of April, 2007.

Approved:
Frank Taylor,Chairman
Mark Bromley, Supervisor
Don Sukala, Supervisor
Rick Callaway, Supervisor
Jeff Schramm, Supervisor

Attest:
Crystal Hoffmann, Clerk