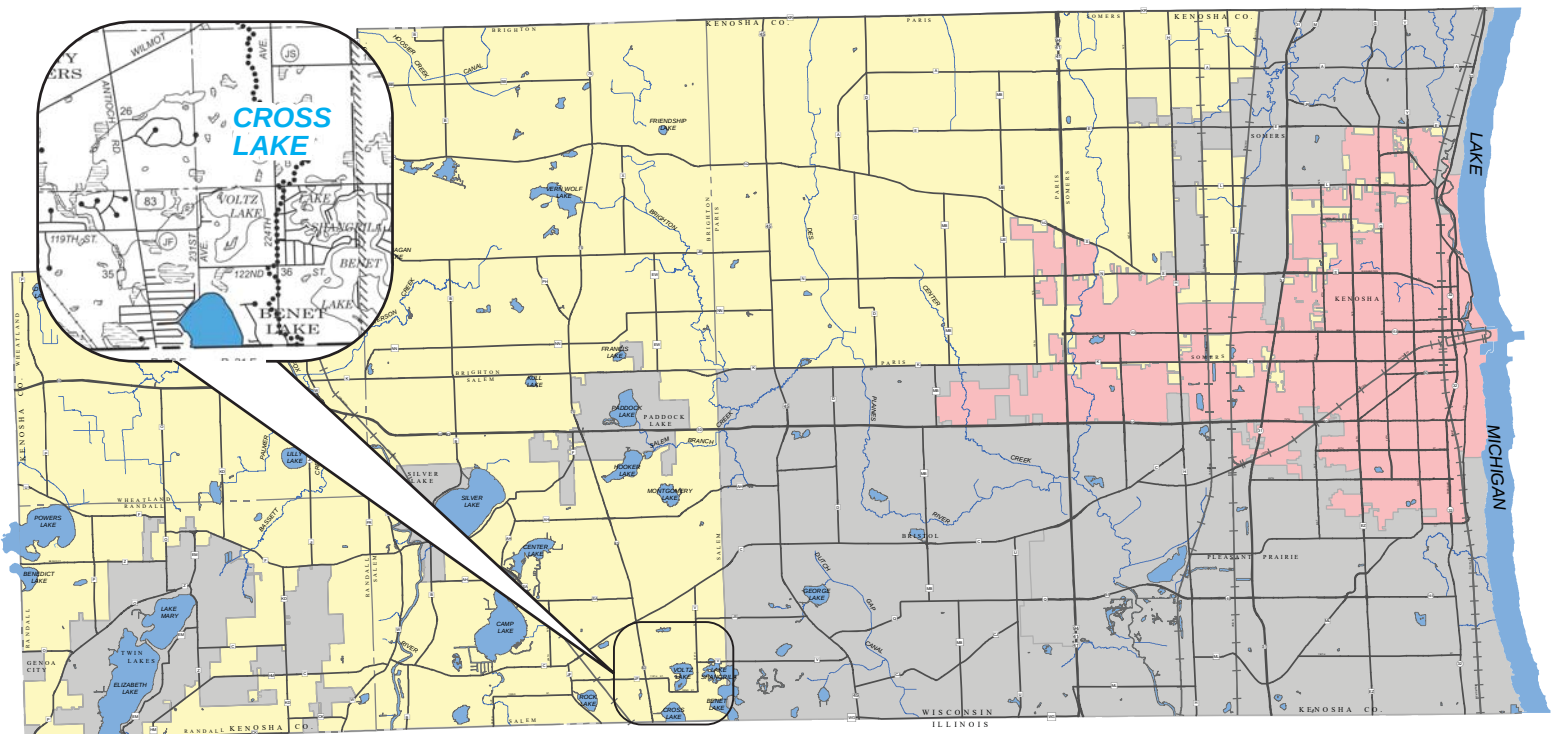


CROSS LAKE USE REPORT UPDATE LR-4

Prepared by the
Southeastern Wisconsin Regional Planning Commission
for
Kenosha County, Wisconsin
October 2017



This Lake Use Report Update is a product of the Lake and Stream Resources Classification Project for Kenosha County Wisconsin: 2017. This report is available online at co.kenosha.wi.us.

Funding for this project was provided, in part, through a Chapter NR 191 Lake Protection Grant from the Wisconsin Department of Natural Resources.



BACKGROUND	1
INTRODUCTION	1
PHYSICAL DESCRIPTION	1
Lake Characteristics.....	1
Hydrology.....	3
Watershed Characteristics and Land Use	3
WATER QUALITY	4
NATURAL RESOURCES.....	8
Aquatic Plants	8
Aquatic Invasive Species	9
Fisheries and Wildlife	12
Environmentally Significant Areas.....	13
Aesthetic Features	16
LAKE USE.....	16
Recreational Use.....	16
Public Access	16
Cottages and Homesites.....	17
EXISTING PROTECTIVE MEASURES.....	17
Sewage Disposal	17
Shoreline Protection and Erosion Control	17
Land Use Regulations.....	20
Water Use Regulations	20

LIST OF TABLES

Table 1	Hydrology and Morphometry of Cross Lake.....	3
Table 2	Existing and Planned Land Use Within the Cross Lake Watershed: 2010 and 2035.....	8
Table 3	Cross Lake Aquatic Plant Surveys: 1967, 2010, and 2015.....	11
Table 4	Population and Households in the Cross Lake Watershed: 1960-2035	17
Table 5	Land Use Regulations Within the Cross Lake Watershed in Kenosha and Lake Counties by Civil Division: 2016	20

LIST OF FIGURES

Figure 1	1970 Aerial Photograph of Cross Lake.....	5
Figure 2	2015 Orthophotograph of Cross Lake	6
Figure 3	Measuring Water Clarity with a Secchi Disk.....	9
Figure 4	Summer (June Through August) Secchi Depth Ranges for Cross Lake	10
Figure 5	Summer (June Through August) Annual Average Trophic State Indices (TSI) for Cross Lake	10
Figure 6	Eurasian Water Milfoil (<i>Myriophyllum spicatum</i>).....	12
Figure 7	Curly-leaf Pondweed (<i>Potamogeton crispus</i>).....	13
Figure 8	Special Concern and Threatened and Endangered Fish Species in Cross Lake	14
Figure 9	Typical Summer Activities on Cross Lake	16
Figure 10	Typical Winter Activities on Cross Lake	17

LIST OF MAPS

Map 1	Cross Lake	2
Map 2	2010 Land Use Within the Cross Lake Watershed	7
Map 3	Environmentally Significant Areas Within the Cross Lake Watershed: 2015.....	15
Map 4	Recreational Use on Cross Lake: 2015	18
Map 5	Shoreline Survey of Cross Lake: 2014	19

BACKGROUND

Kenosha County's lakes are vital natural resource assets adding significant value to the aesthetic and ecological value of the County and Region. The Lakes are enjoyed by large numbers of lakeshore residents and local citizens as well as those seeking water-based recreation living in nearby urban areas such as Milwaukee, Racine, Kenosha, and Chicago. Kenosha County has 34 named Lakes ranging in size from about two to about 640 acres.¹ Of the 20 that are considered "major lakes" (i.e., lakes with a surface area of 50 acres or more), 12 lie in unincorporated or recently incorporated portions of the County. Between 1968 and 1970, the Wisconsin Department of Natural Resources (WDNR) produced a series of individual Lake Use Reports for each of the 12 named major lakes within Kenosha County. Cross Lake was the subject of one such report.² This report updates the earlier Lake Use Report.

In addition to the original 1969 Lake Use Report, Cross Lake was included in two County-wide surface water resources reports published in 1961 and 1982 prepared by the U.S. Geological Survey and the Wisconsin Conservation Department (now the WDNR) and two reports developed by the Lake County Health Department of Illinois.^{3,4,5}

A private boat launch facility and pier are owned and operated by the Cross Lake Improvement Association, a volunteer organization located on the west shore of the Lake. The CLIA maintains a website (www.cliamembership.org/). The website is used to post a wide variety of information Lake users may find interesting. In addition to the above report, Cross Lake was also part of a 2017 lake and stream classification project developed for Kenosha County by the Southeastern Regional Planning Commission (SEWRPC).⁶

INTRODUCTION

Cross Lake is located mostly in the Village of Salem Lakes, Kenosha County, Wisconsin. The southern one-third of Cross Lake is located in the Township of Antioch, Lake County, Illinois. Despite its relatively small size, the Lake's water quality, fishery, and location give it significant local economic and recreational value. In addition, its healthy and relatively diverse aquatic plant community and large contiguous marshlands provide noteworthy fish and wildlife habitat. The Lake provides significant value to local ecology.

PHYSICAL DESCRIPTION

Lake Characteristics

Based upon recent orthophotography, Cross Lake has a surface area of 88 acres.⁷ As shown on Map 1, Cross Lake has a slightly oval basin with a north-south orientation and a maximum depth of 35 feet. According to 1960 depth soundings published by the WDNR, Cross Lake contains 1,593 acre-feet of water. Nineteen percent of Cross Lake is three feet deep or less, yielding an average depth of twelve feet.⁸ The Lake has normal water surface elevation of approximately 812 feet above National Geodetic Vertical Datum, 1929

¹ Wisconsin Department of Natural Resources Publication No. PUB-FH-800 2005, Wisconsin Lakes, 2005.

² Wisconsin Department of Natural Resources (WDNR), Cross Lake, Kenosha County, An Inventory with Planning Recommendations, Lake Use Report No. FX-35, Prepared by the WDNR for SEWRPC, 1969.

³ Wisconsin Conservation Department, Surface Water Resources of Kenosha County, 1961.

⁴ Wisconsin Department of Natural Resources, Surface Water Resources of Kenosha County, 1982.

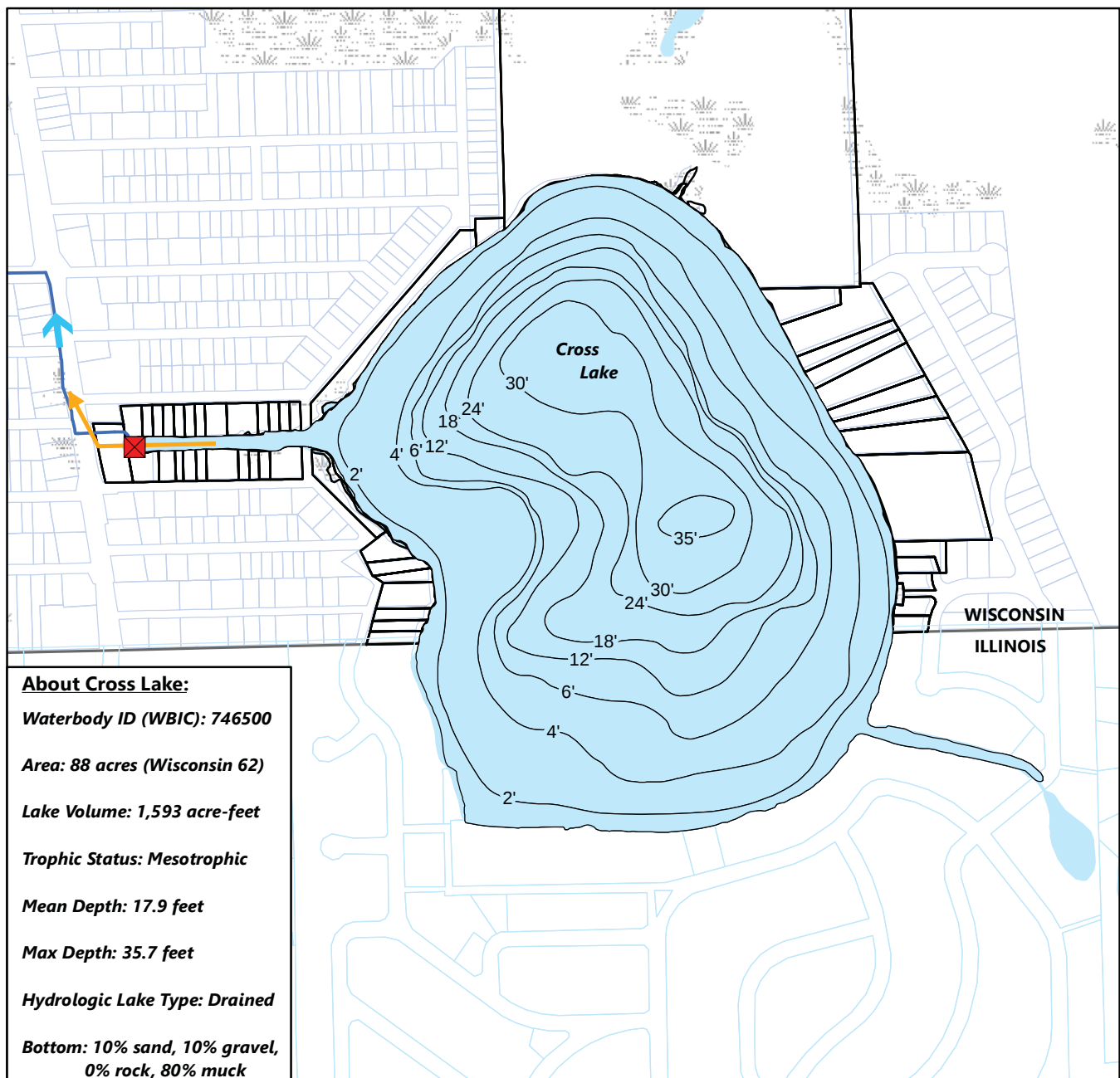
⁵ Lake County Health Department – Population Health Environmental Services (LCHD-PHES), Cross Lake Summary Report, 2010; and Lake County Health Department-Ecological Services (LCHD-ES), Cross Lake Summary Report, Lake County, Illinois, 2015.

⁶ SEWRPC Memorandum Report No. 222, Lake and Stream Resources Classification Project for Kenosha County, Wisconsin: 2017.

⁷ Reported lake areas commonly fluctuate over time and between documents. The apparent size of a lake depends upon the lake's water level at time of measurement, the type and condition of shoreline vegetation, and the accuracy of available tools and techniques. For example, nearly all lakes are larger when water levels are higher. Conversely, lakes can appear smaller on aerial photographs when shorelines are covered by dense tree canopy. See Table 1 for more detail.

⁸ Wisconsin Department of Natural Resources, Lake Use Report No. FX-35, op cit.

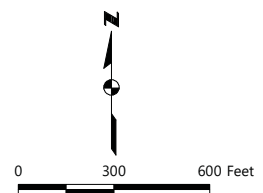
Map 1 Cross Lake



-  LAKE OUTLET STRUCTURE
 SURFACE WATER FLOW PATH
 STREAM AND FLOW DIRECTION
 15' WATER DEPTH CONTOUR IN FEET
 RIPARIAN PARCEL BOUNDARY
 PARCEL BOUNDARY
 SURFACE WATER
 WETLAND

Note: Parcel boundaries for the shoreline of Cross Lake are shown only for Wisconsin.

Note: Parcel boundaries for the shoreline of Cross Lake are shown only for Wisconsin.



Source: Wisconsin Department of Natural Resources, Lake County Health Department, and SEWRPC

adjustment.⁹ Additional information regarding Cross Lake's hydrology and morphometry is summarized in Table 1.

According to WDNR records, Cross Lake's bottom sediments are composed of 80 percent muck, 10 percent sand, and 10 percent gravel. Approximately 40 percent of Cross Lake's shoreline is composed of soft sediments; the remaining shoreline is comprised of 35 percent sand and about 25 percent gravel. Two channels have been dug back from the shoreline: one along the west shoreline and the other along the southeast shoreline. As evidenced by historical aerial photographs, these channels were excavated sometime between 1937 and 1963. The 2.2 miles of shoreline listed in Table 1 does not include these artificial channels.¹⁰

Hydrology

Based upon its depth and the topography of surrounding lands, WDNR classifies Cross Lake as a deep headwater lake and is considered the headwaters of Trevor Creek. Deep headwater lakes are relatively deep and are therefore likely to stratify during summer. Furthermore, deep headwater lakes receive most of their water supply from surface runoff and discharge most of their water via an outlet stream, a situation also classifying the Lake as a drained lake. The WDNR uses these parameters to set water quality goals for the Lake.

A drop inlet type control structure on its outlet located at the end of the channel on the west side of the Lake maintains 3.0 ft. of head. Outlet water from the Lake is confined to an underground culvert for several hundred feet to a roadside ditch where it becomes an open stream. An intermittent stream also drains the Lake at the north end when rainfall is sufficient to raise the Lake's water level; water from this stream flows north into nearby Voltz Lake.

Watershed Characteristics and Land Use

Cross Lake's small 12-acre watershed lies in close proximity to the shoreline around the Lake. A lake's watershed is the physical area from which surface-water runoff can drain to a lake. Cross Lake has a very small watershed for its size, with a watershed to lake area ratio of only 0.2:1. Lakes with ratios above 10:1 tend to develop water-quality problems.¹¹ Lakes with large watersheds are comparatively more vulnerable to human disturbance.

Table 1
Hydrology and Morphometry of Cross Lake

Parameter	Measurement
Size	
Surface Area of Lake ^a	88 acres
Watershed Area ^b	12 acres
Lake Volume	1,593 acre-feet
Residence Time ^c	Up to 9 years
Shape	
Length	0.5 mile
Width	0.38 mile
Shoreline Length	2.2 miles
Shoreline Development Factor ^d	1.7
General Lake Orientation	North to South
Depth	
Maximum Depth	35.7 feet
Mean Depth	17.9 feet
Area under 3 feet	19 percent
Area over 15 feet	32 percent

^aSurface lake surface area used in this study was believed by SEWRPC to best represent the present ordinary high water mark open water area of the Lake. It generally includes connected channels and sparsely vegetated marsh, and therefore tends toward the larger side of published values. Various sources have reported Cross Lake's surface area to be as low as 87 acres and as high as 89 acres. Reported lake surface area varies widely by source and over time. Some of the reasons why this may happen include water elevation changes, differences in vegetation over the years, inclusion or exclusion of fringing marsh, and inclusion or exclusion of channels leading off the main body of the lake or actual changes in the lake shoreline over the 60-year period of record.

^bExcludes Cross Lake and does not include portion in Illinois.

^cResidence 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.

^dShoreline development factor is the ratio of the shoreline length to the circumference of a circular lake of the same area. It can be used as an indicator of biological activity (i.e., the higher the value, the more likely the lake will be to have a productive biological community).

Source: Wisconsin Department of Natural Resources, Lake County Health Department, and SEWRPC

⁹ Wisconsin Department of Natural Resources, Detailed Information for Dam Cross Lake, 2019 dnrm.wisconsin.gov/H5/?viewer=SWDV&layerTheme=0

¹⁰ Wisconsin Department of Natural Resources, Lake Use Report No. FX-35, op cit.

¹¹ Uttormark, Paul D. and Mark L. Hutchins, 1978, Input Output Models as Decision Criteria for Lake Restoration, University of Wisconsin-Madison, Wisconsin Water Resources Center, Technical Report No. 78-03, pg. 61.

Land use immediately adjacent to Cross Lake has experienced modest development since 1970 (see Figures 1 and 2). Land use as of 2010 in the Cross Lake watershed is illustrated on Map 2 and summarized in Table 2. As of 2010, agricultural lands accounted for less than one percent of the Lake's watershed. Wetlands and woodlands covered another 3 and 2 percent, respectively, of the watershed. Urban uses accounted for about 86 percent of the Lake's watershed, with residential and transportation/communication/utility land uses accounting for nearly 80 percent of the urban land use total. Planned 2035 land use (Table 2) suggests modest changes within the Cross Lake watershed. The forecast suggests that essentially most lands within the Lake's watershed will remain unchanged, with the only significant changes occurring as various rural open lands will decrease about 67 percent while urban recreational land uses will increase about 100 percent.

WATER QUALITY

The WDNR re-evaluated Cross Lake's water quality as part of the recent impairment listing cycle and found that the Lake's water quality meets State thresholds for fish consumption as well as fish and aquatic life uses.¹²

Historic water quality gives insight into changes that may be occurring within the Lake and its watershed. By comparing data and evaluating trends, causes for change may be identified and management actions can be taken to help protect the Lake. Historically, only limited water quality data was collected at Cross Lake, starting with a few baseline measurements taken by the WDNR in 1966. From the late 1980s through 2010, Lake residents participated in the University of Wisconsin Extension (UWEX) Citizen Lakes Monitoring Network (CLMN). Citizen volunteers measured lake water clarity only. The CLMN is an extremely useful program to provide long-term water quality data. Water quality data is compiled and is available on the WDNR Lakes page.¹³ Because Cross Lake straddles the Wisconsin-Illinois state border, water quality data for Cross Lake is also available on the Illinois Environmental Protection Agency online lakes database¹⁴, and through the Lake County [Illinois] Health Department (LCHD).¹⁵

Water clarity is a commonly used and easily understood surrogate for perceived water quality. Many people equate "clear" water with "clean" water. While this is not always true, methods have been developed to allow lake water clarity to be compared and contrasted. Water clarity is measured with a Secchi disk (Figure 3). "Secchi depth" is the distance below the water surface that a Secchi disk can be seen under carefully prescribed conditions. Secchi depth has been occasionally measured in the Lake and the results over time are summarized graphically in Figure 4. On average, water clarity has generally been fair, with Secchi depth readings ranging between four and twelve feet, but typically averaging around five to seven feet. Water clarity has also been estimated from satellite imagery;¹⁶ this remote sensing technology suggests that the Lake's clarity has improved slightly since monitoring began.¹⁷

Lake trophic state index (TSI) is calculated using physical and chemical indicators of lake nutrient enrichment. Lakes with low numeric scores (i.e., less than 40) generally have clear water of excellent quality and are termed oligotrophic. Lakes with TSI values between 50 and 60 are termed eutrophic and have limited water clarity, fewer algal species, overly-abundant aquatic plant growth, and deep areas that are commonly devoid of oxygen during summer. Mesotrophic lakes (TSI values between 40 and 50) have conditions intermediate between oligotrophic and eutrophic lakes, while hypereutrophic lakes (TSI values above 70) commonly can experience algal blooms, poor water clarity, and, in extreme cases, summer fish kills. Hypereutrophic conditions rarely occur in nature and are generally associated with human activity.

¹² Wisconsin Department of Natural Resources, Cross Lake, Kenosha County website, "conditions" dnr.wi.gov/water/waterDetail.aspx?wbic=746500

¹³ Ibid.

¹⁴ Water quality data for Cross Lake and other Illinois lakes can be found at the IEPA online lakes database page: www.epa.illinois.gov/topics/water-quality/monitoring/vlmp/database/index.

¹⁵ Lake County Health Department-Ecological Services (LCHD-ES), Cross Lake Summary Report, Lake County, Illinois, 2015.

¹⁶ Environmental Remote Sensing Center data and information about the program can be found at Lakesat.org.

¹⁷ Water clarity information for 2013, 2014, 2015, 2016 is available at the WDNR's Lakes and AIS Viewer website: dnrmaps.wi.gov/H5/?viewer=Lakes_AIS_Viewer.

Figure 1
1970 Aerial Photograph of Cross Lake



Date of Photography: 1970

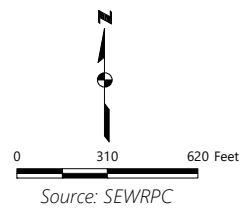
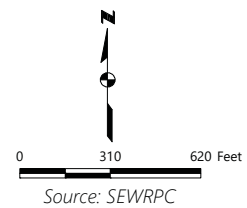


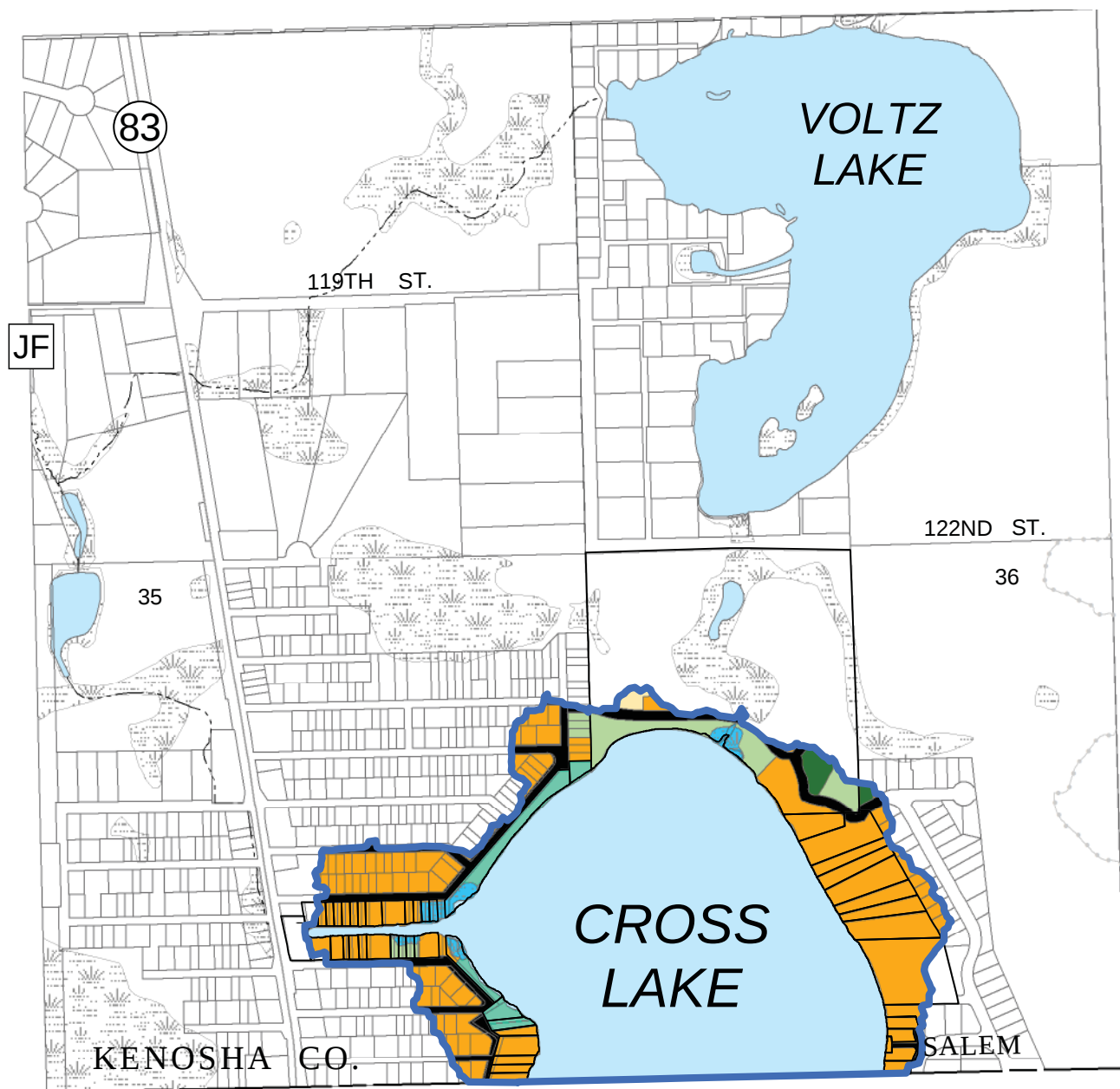
Figure 2
2015 Orthophotograph of Cross Lake



Date of Photography: 2015



Map 2
2010 Land Use Within the Cross Lake Watershed



- LOW DENSITY RESIDENTIAL
- MEDIUM DENSITY RESIDENTIAL
- MULTI-FAMILY RESIDENTIAL
- COMMERCIAL
- INDUSTRIAL
- TRANSPORTATION, COMMUNICATIONS, AND UTILITIES

- STREETS AND HIGHWAYS
- GOVERNMENT AND INSTITUTIONAL
- AGRICULTURAL
- OTHER OPEN LANDS
- RECREATION
- WETLANDS
- WOODLANDS

- SURFACE WATER
- WATERSHED BOUNDARY

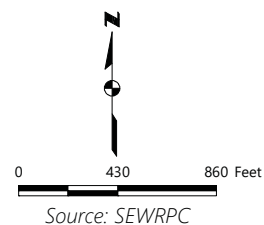


Table 2
Existing and Planned Land Use Within the Cross Lake Watershed: 2010 and 2035^a

Land Use Categories ^{a,b}	2010		2035		Change: 2010-2035	
	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent
Urban						
Residential						
Single-Family, Suburban Density	--	--	--	--	--	--
Single-Family, Low Density	--	--	--	--	--	--
Single-Family, Medium Density	24	64.1	24	64.1	0	0.0
Single-Family, High Density	--	--	--	--	--	--
Multi-Family	--	--	--	--	--	--
Commercial	<1	<1	<1	<1	0	0.0
Industrial	--	--	--	--	--	--
Governmental and Institutional	--	--	--	--	--	--
Transportation, Communication, and Utilities	6	15.8	6	15.8	0	0.0
Recreational	2	5.7	4	12.4	2	100.0
Subtotal	32	85.7	34	92.3	2	6.3
Rural						
Agricultural	<1	0.8	<1	0.8	0	0.0
Other Open Lands	3	8.2	1	1.6	-2	-66.7
Wetlands	1	3.4	1	3.4	0	0.0
Woodlands	1	1.9	1	1.9	0	0.0
Water ^c	--	--	--	--	--	--
Extractive	--	--	--	--	--	--
Landfill	--	--	--	--	--	--
Subtotal	5	14.3	3	7.7	-2	-40.0
Total	37	100.0	37	100.0	0	--

Note: The land use summary table includes internally drained areas. Internally drained areas do not contribute surface-water runoff to the Lake and are therefore not included in the Lake's watershed area listed in Table 1.

^a Does not include portion in Illinois

^b Parking included in associated use

^c Excludes Cross Lake

Source: SEWRPC

Cross Lake's TSI values are plotted over time in Figure 5. As can be seen from this graphic, TSI values based upon Secchi depth reveal an average Trophic State Index of 50, which indicates that the Lake is mesotrophic.¹⁸ The LCHD reported a Trophic Level Index of 46 in 2015, confirming that Cross Lake is still mesotrophic.¹⁹ Such lakes typically support an abundance of aquatic plant growth, although generally not to nuisance levels, and support productive fisheries. Many Southeastern Wisconsin lakes are classified as mesotrophic.

NATURAL RESOURCES

Aquatic Plants

Cross Lake's aquatic plant community was examined by WDNR staff in August 1967, and by LCHD staff in July 2010 and 2015. The 1967 survey was less detailed than subsequent surveys. Table 3 lists the frequency of occurrence of plant species noted in these studies.

¹⁸ The Trophic State Index (TSI) is calculated using Secchi depth and chlorophyll-a and phosphorus concentration data. The index assumes that Secchi depth, a measure of water clarity, is dependent on levels of algae growth, which, in turn, are dependent on levels of nutrients such as phosphorus. High nutrient levels fuel high algae growth, which reduces water clarity. The Trophic State Index, therefore, gives a measurement of the condition of a lake. Low TSI values of less than 40 indicate water clarity levels of over 12 feet, which indicates lower levels of nutrients and less biological activity. TSI values over 70 represent water clarity values of less than 1.5 feet, indicating higher nutrient concentrations and higher plant and algae growth.

¹⁹ LCHD-ES, Cross Lake Summary Report, op cit.

The 1967 reconnaissance-level survey reported that coontail (*Ceratophyllum demersum*) and water milfoil (*Myriophyllum* spp.) were abundant in deeper water; chara (*Chara* spp.) was abundant in shallow water; water lilies (both white – *Nymphaea* spp. , and yellow – *Nuphar* spp.) were abundant in the southwest corner of the Lake; Illinois pondweed (*Potamogeton illinoensis*), Sago pondweed (*Potamogeton pectinatus*) and broadleaf pondweed (*Potamogeton* spp.) were abundant throughout the entire Lake basin; bulrush (*Scirpus validus*) was scattered along the entire shoreline; and, there was a small stand of cattail (*Typha* spp.) located in the southwest corner. Vegetation was found growing to a depth of 14 feet. Chara was the dominant plant from the shoreline to a depth of eight feet. The pondweeds, especially Sago, were the dominant plants in depths of eight to 14 feet, although other common plants in these depths included the other pondweed species, milfoil, coontail, naiad (*Najas* spp.), and stoneworts (*Nitella* spp.). Overall, vegetation was not regarded as sufficiently abundant so as to require removal and swimming activity at the beach was enough to keep it relatively plant free. Ten native plant species were listed as present in 1967.²⁰

Figure 3
Measuring Water Clarity with a Secchi Disk



Source: www.burnsville.org and SEWRPC

The 2010 survey indicated that although muskgrass was still the dominant species in Cross Lake, the next two most dominant aquatic plants were Illinois pondweed (*Potamogeton illinoensis*) and water celery (*Vallisneria americana*). Stoneworts were not found during the 2010 survey. A total of eleven submerged native aquatic plant species were observed and documented within Cross Lake in 2010. Two floating aquatic species (both native) were also documented, however, emergent species were not recorded.

During the 2015 survey, the two dominant species found were muskgrass and Eurasian water milfoil (*Myriophyllum spicatum*). A total of only eight submerged native plant species were found during the 2015 survey. All of the plants found were species commonly observed in lakes within the Region.

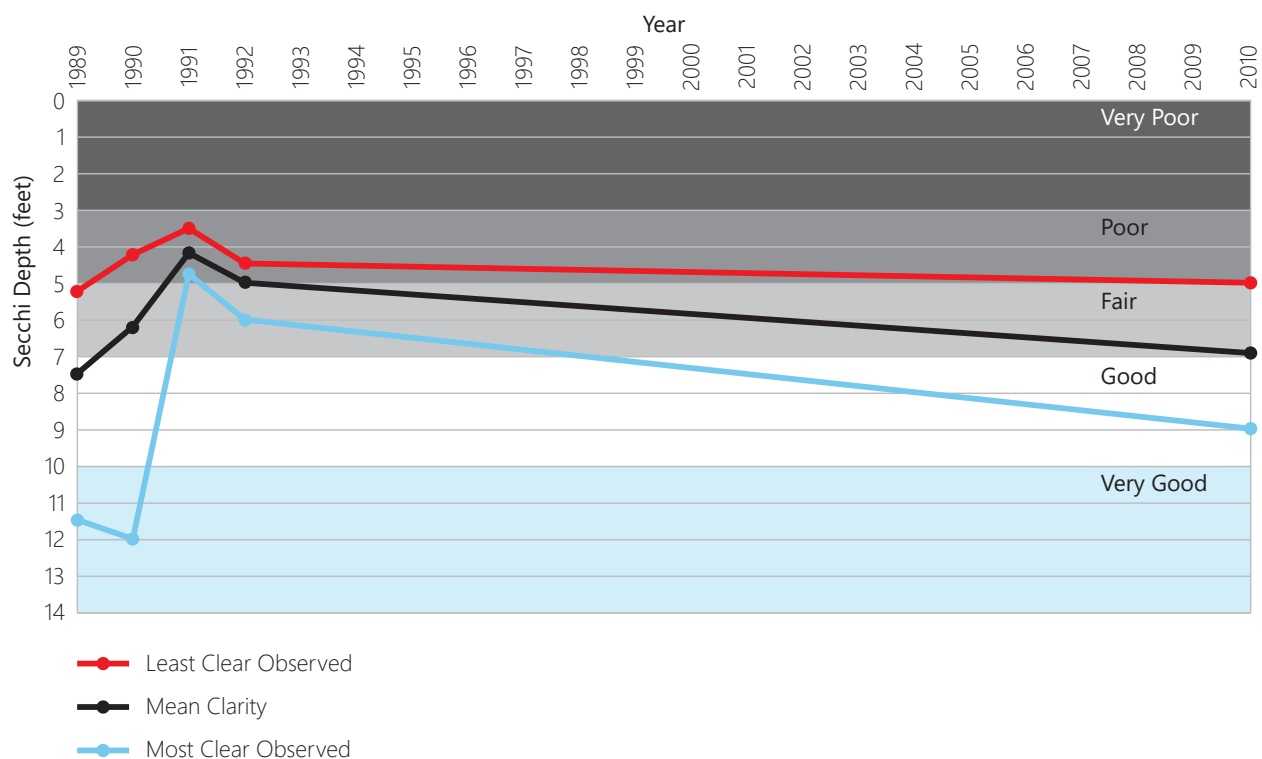
A diverse array of native aquatic plant species is generally indicative of a healthy aquatic plant community. Native species provide a variety of benefits, including food for wildfowl and fish, and shelter for fingerling fish such as trout, bluegill, and bass. The decline in the number of native submerged plant species between 2010 and 2015 is a cause for concern. Twelve high-value species are identified under Chapter NR 107, "Aquatic Plant Management," of the *Wisconsin Administrative Code* as plants that contribute important ecosystem services to lakes. Four of the submergent species are found in Cross Lake: wild celery, sago pondweed (*Stuckenia pectinata*), Robbins pondweed (*Potamogeton robbinsii*), and Illinois pondweed (*Potamogeton illinoensis*).

Aquatic Invasive Species

The terms "nonnative" and "invasive" are often confused and incorrectly assumed to be synonymous. Nonnative (sometimes also referred to as "exotic") is an overarching term describing living organisms introduced to new areas beyond their native range with intentional or unintentional human help. Nonnative species may not necessarily harm ecological function or human use values in their new environments. Invasive species are the subset of nonnative species that damage the ecological health of their new environments and/or are commonly considered nuisances to human use values. In summary, invasive species are non-native but not all non-native species are invasive.

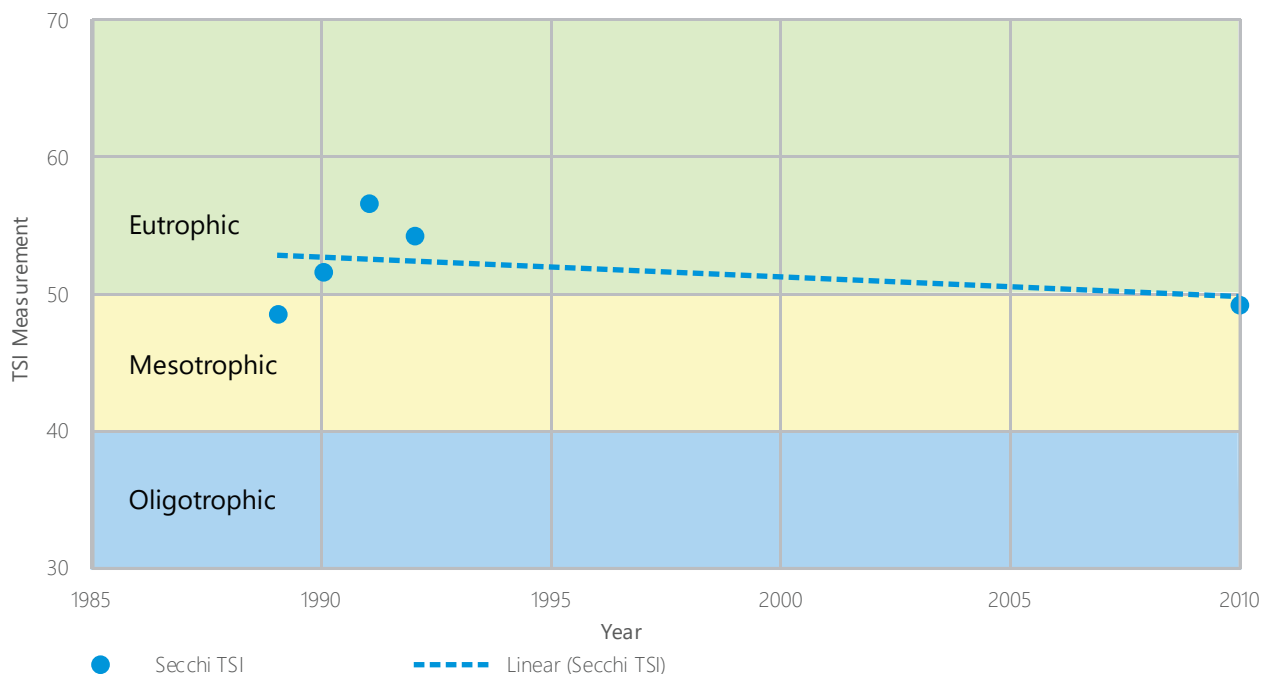
²⁰ Wisconsin Department of Natural Resources, Lake Use Report No. FX-35, op cit.

Figure 4
Summer (June Through August) Secchi Depth Ranges for Cross Lake



Source: Wisconsin Department of Natural Resources, USGS, and SEWRPC

Figure 5
Summer (June Through August) Annual Average Trophic State Indices (TSI) for Cross Lake



Note: Comparatively little data was available for Cross Lake. June-August data of each year was averaged to produce the resultant values.

Source: Wisconsin Department of Natural Resources, Lake County Health Department, and SEWRPC

Table 3
Cross Lake Aquatic Plant Surveys: 1967, 2010, and 2015

Aquatic Plant Species	1967 (August)	2010 (July)	2015 (July)
Floating Plants			
<i>Nuphar variegata</i> (spatterdock)	Scattered	1.4	1.6
<i>Nymphaea odorata</i> (white water lily)	Scattered	11.1	29.0
Emergent Plants			
<i>Potendaria cordata</i> (pickerelweed)	Scattered	--	--
<i>Scirpus validus</i> (bulrush)	Moderate	--	--
<i>Typha</i> sp. (cattail)	Scattered	--	--
Submerged Plants			
<i>Ceratophyllum demersum</i> (coontail)	Scattered	25.0	30.6
<i>Chara</i> spp. (muskgrass)	Heavy ^a	54.2	58.1
<i>Elodea canadensis</i> (waterweed)	Sparse	6.9	3.2
<i>Heteranthera dubia</i> (water stargrass)	--	8.3	--
<i>Myriophyllum sibiricum</i> (northern water milfoil)	Scattered	--	1.6
<i>Myriophyllum spicatum</i> (Eurasian water milfoil)	--	25.0	61.3
<i>Najas flexilis</i> (slender naiad)	Scattered	11.1	--
<i>Najas guadalupensis</i> (southern naiad)	--	23.6	11.3
<i>Nitella</i> spp. (stoneworts)	Moderate	--	--
<i>Potamogeton crispus</i> (curly-leaf pondweed)	Sparse	2.8	8.1
<i>Potamogeton illinoensis</i> (Illinois pondweed)	Scattered	30.6	22.6
<i>Potamogeton natans</i> (floating-leaf pondweed)	Sparse	--	--
<i>Potamogeton robbinsii</i> (Robbins pondweed)	Sparse	--	--
<i>Potamogeton zosteriformis</i> (flat-stem pondweed)	--	11.1	1.6
<i>Ruppia maritima</i> (widgeon grass)	--	9.7	--
<i>Stuckenia pectinata</i> (Sago pondweed)	Moderate	-- ^b	--
<i>Vallisneria americana</i> (water celery)	Sparse	27.8	3.2

Note: 2010 and 2015 data is for **Frequency of Occurrence**. The frequency of occurrence of a species is derived from a combination of the number of occurrences of a species and the number of sampling sites that had some kind of vegetation present; it indicates dominance of a species within a plant community.

Nonnative species above are listed in red print; all other species are native.

NR 107 Wisconsin Administrative Code high-value species are printed in green print.

^aDescribed by Wisconsin Department of Natural Resources staff as the dominant plant in the Lake at that time (August 1967).

^bDescribed by Lake County Health Department staff as the present in the Lake. Plant density and percentage were not reported.

Source: Wisconsin Department of Natural Resources and Lake County Health Department.

Eurasian Water Milfoil (*Myriophyllum spicatum*) and Eurasian/Northern Water Milfoil Hybrids

EWM, one of eight milfoil species found in Wisconsin, is the only milfoil species known to be exotic/nonnative (see Figure 6). This plant can grow profusely in nutrient-rich lakes impeding boating and recreational use. Because of this management concern, EWM is actively managed by mechanical and chemical means in many Southeastern Wisconsin lakes. In recent years, EWM/native northern milfoil hybrids have been observed in some Wisconsin lakes. These hybrids pose a difficult management problem: not only do hybrids grow quickly like EWM, but hybrids appear to be more tolerant to aquatic herbicides such as 2, 4-D and Endothall that are commonly used to manage EWM. Eurasian water milfoil was not observed during the 1967 survey. However, it was documented during the 2010 and 2015 surveys. By the time of the 2015 survey, Eurasian water milfoil had become the second most dominant aquatic plant species in Cross Lake. The Oakwood Knolls Homeowners Association has begun to actively manage Eurasian water milfoil.²¹

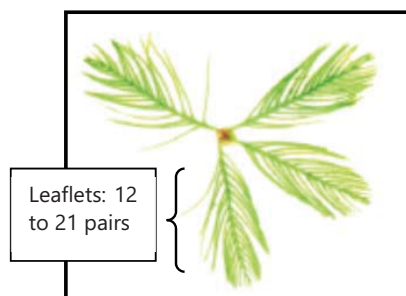
Curly-leaf Pondweed (*Potamogeton crispus*)

Curly-leaf pondweed (see Figure 7) is a plant that thrives in cool water and exhibits an early-season growth cycle that helps give it a competitive advantage over native plants. However, curly-leaf pondweed begins

²¹ LCHD-ES, Cross Lake Summary Report, op cit.

Figure 6
Eurasian Water Milfoil (*Myriophyllum spicatum*)

Identifying Features	Ecology
• Stems spaghetti-like, often pinkish, growing long with many branches near the water surface • Leaves with 12 to 21 pairs of leaflets • Produces no winter buds (turions) Eurasian water milfoil is similar to northern water milfoil (<i>M. sibiricum</i>). However, northern water milfoil has five to 12 pairs of leaflets per leaf and stouter white or pale brown stems	• Hybridizes with native northern water milfoil, resulting in plants with intermediate characteristics • Invasive, growing quickly, forming canopies, and getting a head-start in spring due to an ability to grow in cool water • Grows from root stalks and stem fragments in both lakes and streams, shallow and deep; tolerates disturbed conditions • Provides some forage to waterfowl, but supports fewer aquatic invertebrates than mixed stands of aquatic vegetation



Source: Wisconsin Department of Natural Resources and Skawinski, P. M. (2014). *Aquatic Plants of the Upper Midwest: A Photographic Field Guide to Our Underwater Forests*, 2nd Edition, Wausau, Wisconsin, USA: Self-Published

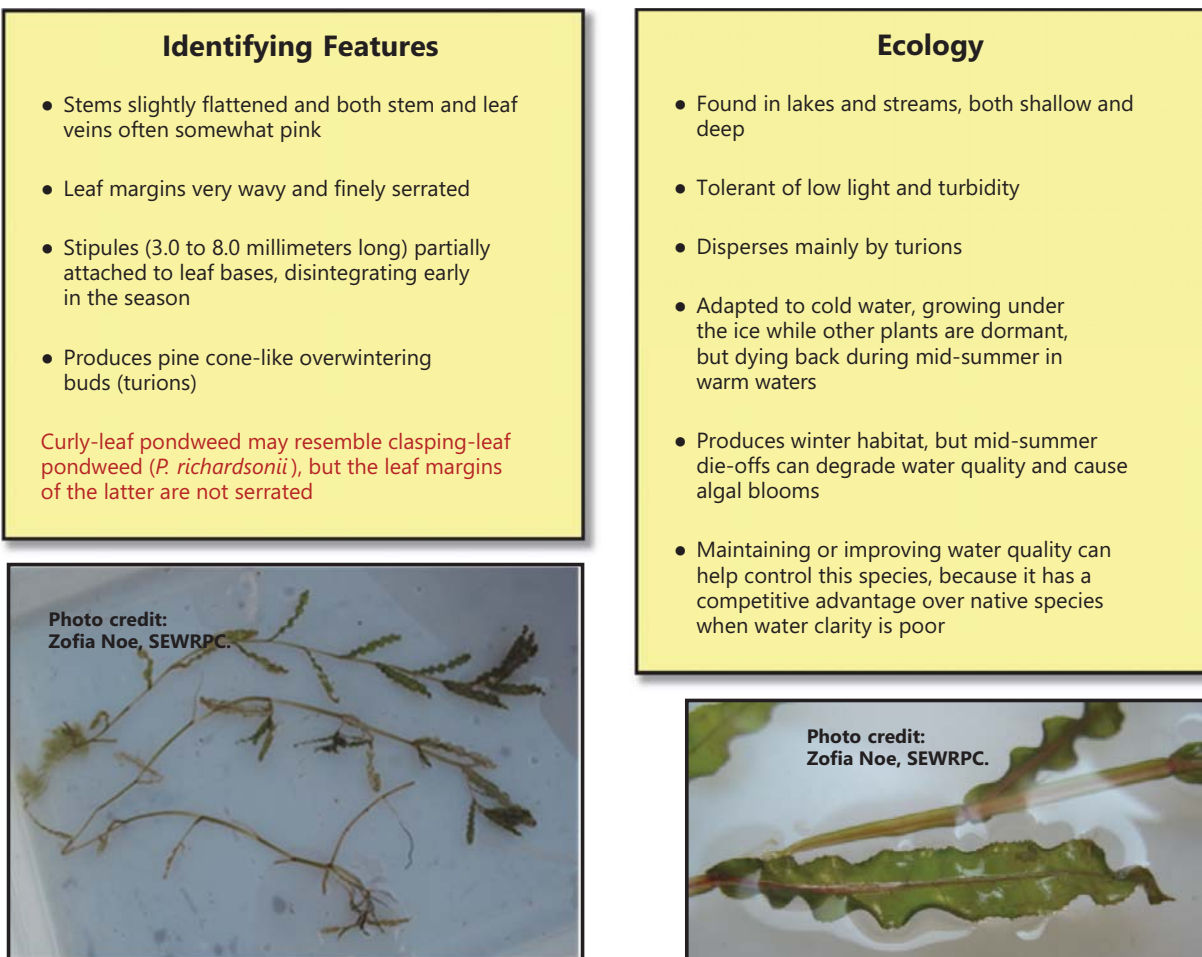
to die off during the summer when lake water temperatures start to peak. Therefore, it is not normally considered a nuisance during summer months. Furthermore, curly-leaf pondweed was present only in small quantities during all three surveys conducted on Cross Lake so it does not appear to be a management issue.

Fisheries and Wildlife

The Illinois Department of Natural Resources conducted a fish survey on Cross Lake in 2003. The survey determined that the fish community within Cross Lake was comprised of banded killifish (*Fundulus diaphanus*), blackchin shiner (*Notropis heterodon*), black crappie (*Pomoxis nigromaculatus*), bluegill (*Lepomis macrochirus*), bluntnose minnow (*Pimephales notatus*), blacknose shiner (*Notropis heterolepis*), lake chubsucker (*Erimyzon sucetta*), largemouth bass (*Micropterus salmoides*), northern pike (*Esox lucius*), pumpkinseed (*Lepomis gibbosus*), pugnose shiner (*Notropis anogenus*), redear sunfish (*Lepomis microlophus*), warmouth (*Lepomis gulosus*), and yellow perch (*Perca flavescens*). Bluegill were the most common species. The WDNR lists largemouth bass as "abundant," panfish as "common," and northern pike as "present" in Cross Lake.²²

²² Fisheries and other information about Cross Lake can be found at the WDNR Lakes page: dnr.wi.gov/lakes/lakepages/LakeDetail.aspx?wbic=746500

Figure 7
Curly-Leaf Pondweed (*Potamogeton crispus*)



Source: Wisconsin Department of Natural Resources, SEWRPC, and Skawinski, P. M. (2014). *Aquatic Plants of the Upper Midwest: A Photographic Field Guide to Our Underwater Forests*, 2nd Edition, Wausau, Wisconsin, USA: Self-Published.

The pugnose shiner is a Wisconsin State-Threatened species of fish, while the lake chubsucker is listed as Wisconsin Special Concern fish species. The pugnose shiner, banded killifish, blackchin shiner, Iowa Darter (*Etheostoma exile*) and blacknose shiner are all Illinois State Threatened and Endangered fish species (Figure 8).

Environmentally Significant Areas

As shown on Map 3, the Cross Lake watershed contains environmentally significant areas along the northern and northwestern shores. These areas are comprised of a network of wetlands, woodlands, and grass lands. These areas represent the last remaining areas of natural resources in the Wisconsin portion of the Lake's watershed. Many important interlocking and interacting relationships occur between living organisms and their environment in such areas. Destruction or deterioration of any one element of a natural environment may cause a chain reaction of deterioration and destruction among other elements. Therefore, it is important to protect such areas. In addition to the nearly 68 acres of primary environmental corridor area in Wisconsin, as shown in Map 3, there are also approximately 15 acres of additional woodlands, wetlands, and grasslands within the Illinois portion of the Lake watershed.²³

Cross Lake has been designated as a critical aquatic habitat area under the SEWRPC's Critical Habitat Designation program on the basis of its ability to provide ideal waterfowl, marsh wildlife, and critical fish

²³ Ibid.

Figure 8
Special Concern and Threatened and Endangered Fish Species in Cross Lake



Banded Killifish
Illinois Threatened and Endangered



Blackchin Shiner
Illinois Threatened and Endangered



Blacknose Shiner
Illinois Threatened and Endangered



Lake Chubsucker
Wisconsin Special Concern



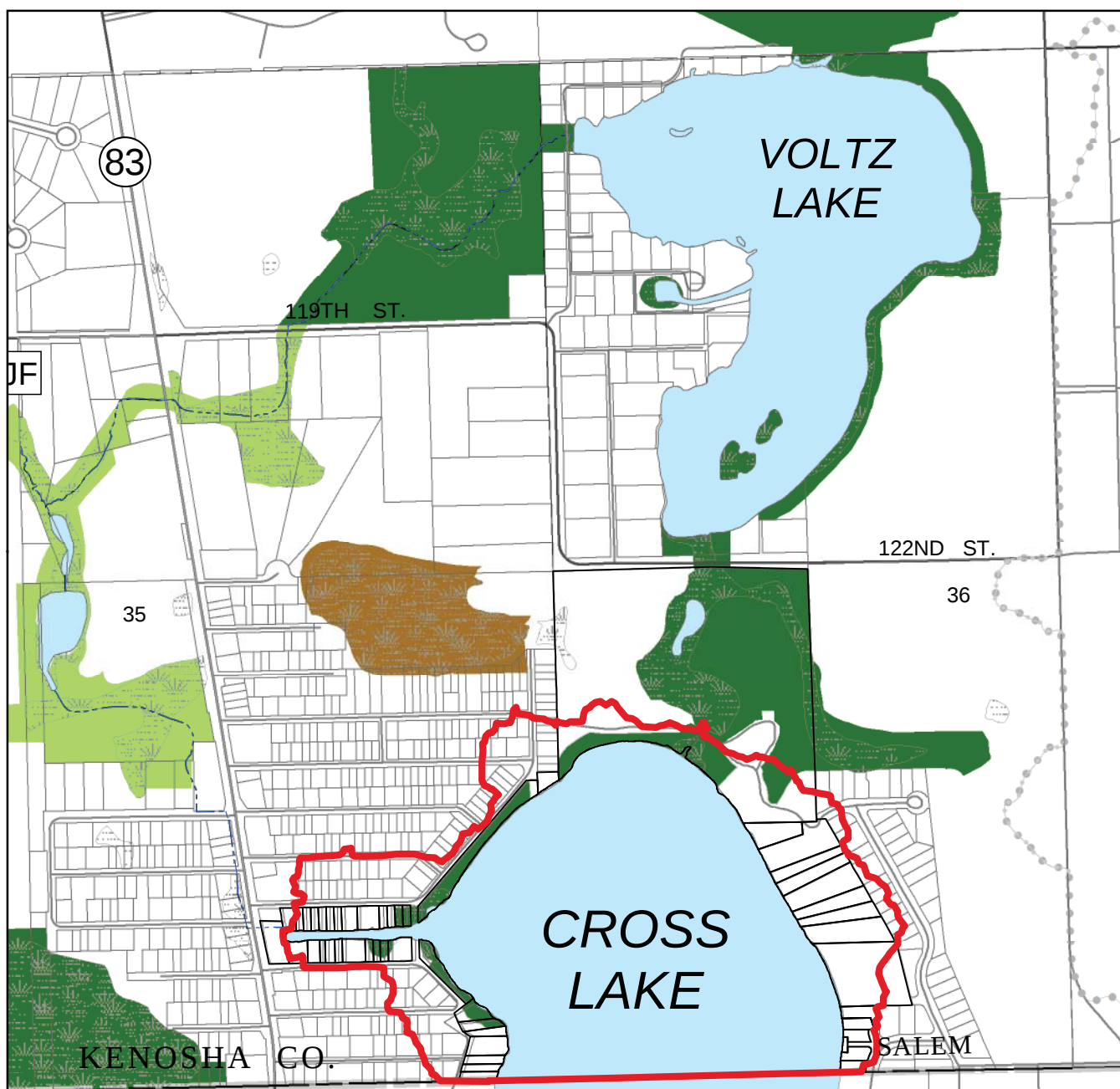
Pugnose Shiner
Wisconsin Threatened



Iowa Darter
Illinois Threatened

Source: Lake County Illinois Health Department, Wisconsin Department of Natural Resources and SEWRPC

Map 3
Environmentally Significant Areas Within the Cross Lake Watershed: 2015



- | | |
|---|--|
|  SURFACE WATER |  PRIMARY ENVIRONMENTAL CORRIDORS |
|  WATERSHED BOUNDARY |  SECONDARY ENVIRONMENTAL CORRIDORS (NONE) |
|  INTERMITTENT STREAM |  ISOLATED NATURAL RESOURCE AREA |
| |  WETLANDS |

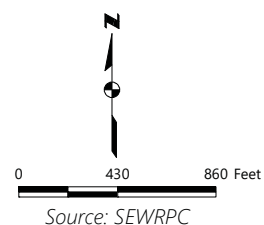


Figure 9
Typical Summer Activities on Cross Lake



Source: SEWRPC

species habitat.²⁴ The Lake is considered an aquatic area of local significance, important to the overall health of aquatic plants and animals.

Aesthetic Features

Cross Lake provides a generally peaceful and natural lake setting. Much of the lakeshore is wooded which helps to conceal the homes and developed appearances of the properties that encircle the Lake. A licensed beach located on the southern shoreline offers swimming opportunities and scenic views of Cross Lake. The Lake's lack of embayments or significant stretches of natural shoreline results in some lack of visual interest.

LAKE USE

Recreational Use

During the summer of 2014 and winter of 2014 - 2015, SEWRPC staff conducted recreational surveys to document public lake use. The surveys showed that fishing and cruising were the most popular on-water activities during the summer. Other popular summer activities included water skiing, swimming, and going to the park (Figure 9). Ice fishing and snowmobiling were popular winter activities on Cross Lake (Figure 10).

Public Access

There are no public boat ramps on Cross Lake (See Map 4). There is only private access for residents. Therefore, the WDNR deems the Lake to have inadequate public recreational boating access pursuant to standards set forth in Chapter NR 1 of the Wisconsin Administrative Code. A private boat launch facility and pier are owned and operated by the Cross Lake Improvement Association²⁵, a volunteer organization located on the west shore of the Lake.

²⁴ *SEWRPC Planning Report Number 42, A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin, September 1997.*

²⁵ www.cliamembership.org/

Figure 10
Typical Winter Activities on Cross Lake



Source: SEWRPC

Cottages and Homesites

There are 49 residential lots around the shoreline of Cross Lake. Lot sizes average 1.1 acres and range from a minimum of less than 0.1 acre to a maximum of 33 acres. The population and number of households in the Cross Lake watershed are projected to decrease slightly by 2035 (Table 4).

EXISTING PROTECTIVE MEASURES

Sewage Disposal

At present, all riparian residential lands in the Wisconsin portion of Cross Lake watershed have sewer service provided by the Village of Salem Lakes. Riparian residential lands in the Illinois portion of Cross Lake have sewer service provided by the Village of Antioch and the Antioch Wastewater Treatment Facility.

Shoreline Protection and Erosion Control

The shoreline of Cross Lake is comprised of stretches of protected shoreline (either man-made or natural), as well as some areas of unprotected shoreline, such as where riparian owners mow lawn to water's edge (see Map 5). Several areas of shoreline erosion were recorded scattered around Cross Lake during a survey conducted by SEWRPC in August 2014.²⁶ The LCHD also conducted a shoreline erosion survey in 2015 and found that approximately 38 percent of Cross Lake's shoreline had varying degrees of erosion. In both surveys, erosion sites included areas such as exposed soil and plant roots and failing protections structures.²⁷

Table 4
Population and Households in the
Cross Lake Watershed: 1960-2035

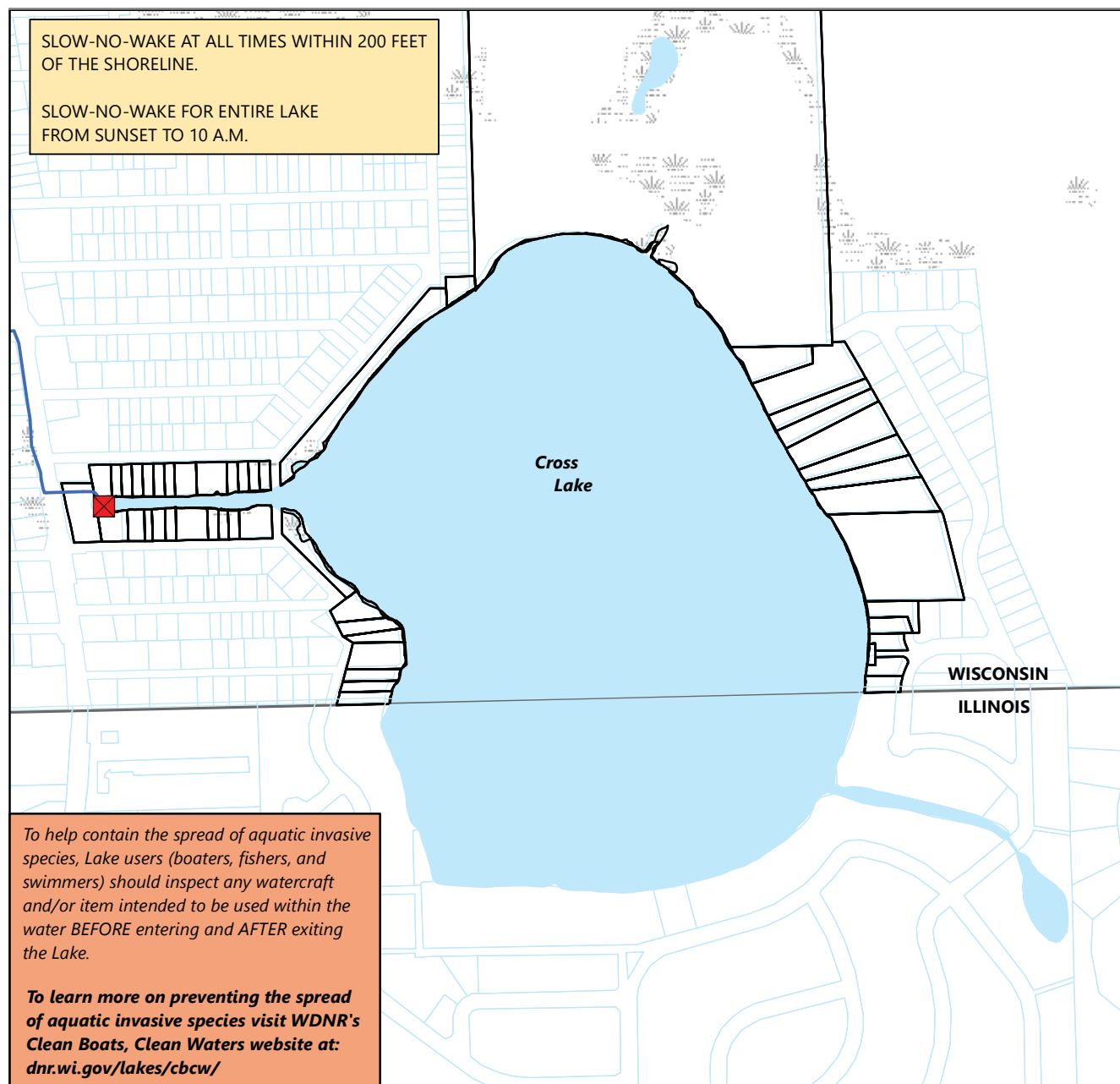
Year	Population	Households
1960	41	16
1970	470	179
1980	549	200
1990	475	185
2000	739	276
2010	841	304
Planned 2035	718	283

Source: U.S. Bureau of Census and SEWRPC

²⁶ SEWRPC Memorandum Report No. 222, op cit.

²⁷ LCHD-ES, Cross Lake Summary Report, op cit.

Map 4 Recreational Use on Cross Lake: 2015



PARCEL BOUNDARY ALONG SHORELINE

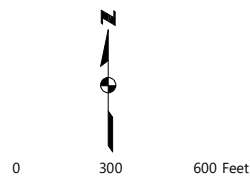
SURFACE WATER

WETLAND

STREAM

Note: Parcel boundaries for the shoreline of Cross Lake are shown only for Wisconsin.

For additional lake information or boating regulations, go to: dnr.wi.gov/lakes/lakepages/Results.aspx



Source: Wisconsin Department of Natural Resources and SEWRPC

Map 5
Shoreline Survey of Cross Lake: 2014

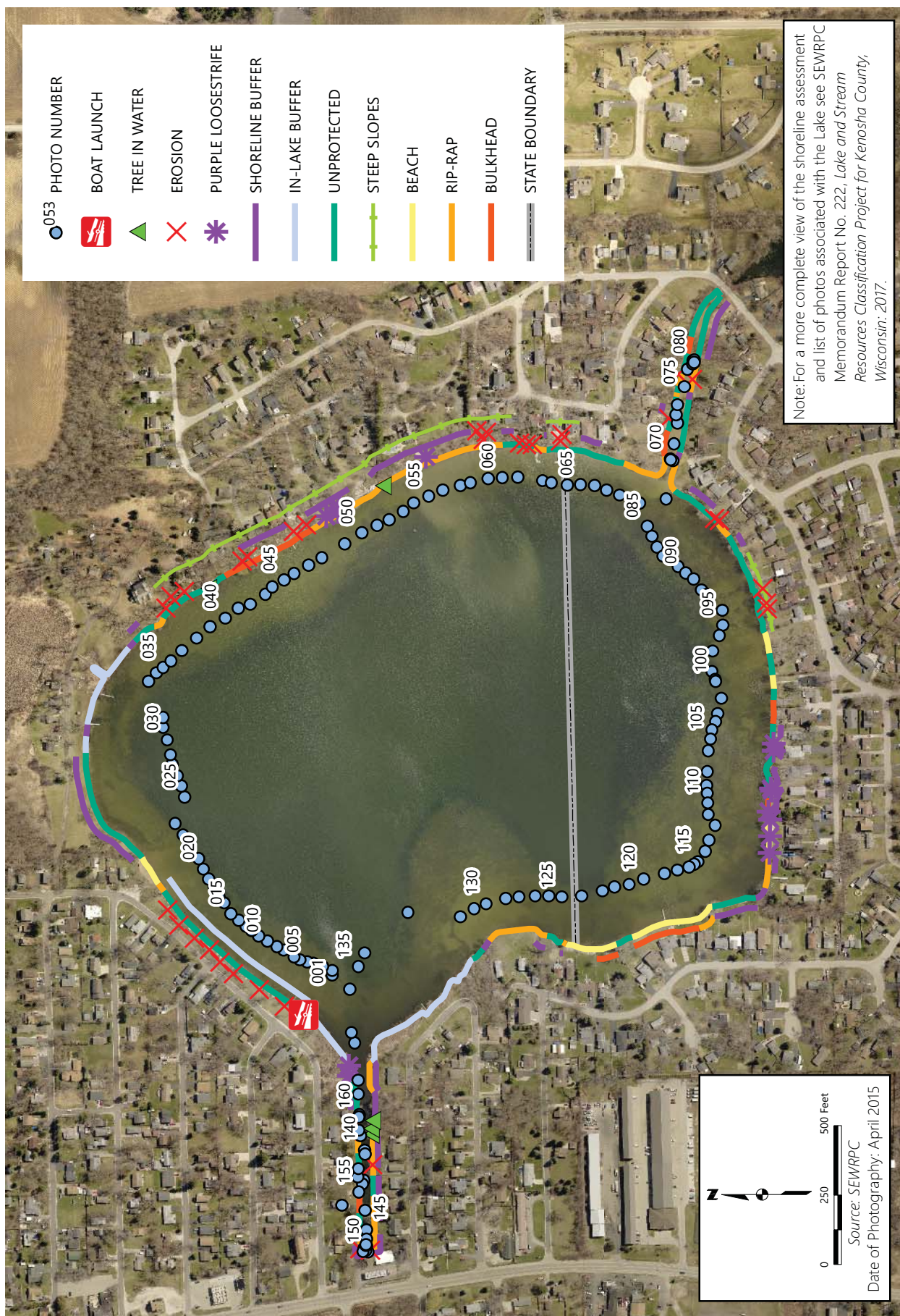


Table 5
Land Use Regulations Within the Cross Lake Watershed in
Kenosha and Lake Counties by Civil Division: 2016

Type of Ordinance	Community				
	Kenosha County	Village of Salem Lakes	Lake County (Illinois)	Township of Antioch (Illinois)	Village of Antioch (Illinois)
General Zoning	Adopted	Regulated under County ordinance	Adopted ^c	Regulated under County ordinance	Adopted
Floodplain Zoning	Adopted	Regulated under County ordinance	Adopted ^c	Regulated under County ordinance	Adopted
Shoreland Zoning	Adopted	Regulated under County ordinance	-- ^a	-- ^a	-- ^a
Subdivision Control	Adopted ^b	Adopted ^b	Adopted ^c	Regulated under County ordinance	Adopted
Construction Site Erosion Control and Stormwater Management	Adopted ^b	Adopted ^b	Adopted ^d	Regulated under County ordinance	Adopted ^d

^aAlthough the State of Illinois does not impose shoreland regulations similar to those in Chapters NR 115 and NR 117 of the Wisconsin Administrative Code, the Lake County Unified Development Ordinance and the Lake County Watershed Development Ordinance include regulations for buffer areas along streams and lakes. The buffer areas vary from 30 to 50 feet depending on the length of the stream, size of the lake, and size of the watershed. Removal of natural vegetation is limited within the buffer areas. The Unified Development Ordinance applies only within unincorporated areas. The Watershed Development Ordinance applies within both incorporated and unincorporated communities. The Village of Antioch is certified by the County to administer the Watershed Development Ordinance within the Village.

^bBoth the Kenosha County and Village of Salem Lakes subdivision ordinances and erosion control and stormwater management ordinances apply within the Village of Salem Lakes. In the event of conflicting regulations, the more restrictive regulation applies.

^cGeneral and floodplain zoning and subdivision regulations for unincorporated portions of Lake County are regulated under the Lake County Unified Development Ordinance.

^dRegulated under the Lake County Watershed Development Ordinance. The Watershed Development Ordinance applies within both incorporated and unincorporated communities. The Village of Antioch is certified by the County to administer the Watershed Development Ordinance within the Village.

Source: Lake County, Village of Antioch, and SEWRPC

Land Use Regulations

Comprehensive zoning ordinances are one of the most important tools available to local units of government for directing the proper use of lands within their area of jurisdiction. Cross Lake and its watershed are subject to ordinances and regulations developed jointly by the Village of Salem Lakes, Kenosha County, and the Township and Village of Antioch, Lake County, Illinois. Table 5 shows the general and special-purpose zoning ordinances for the civil divisions that are part of the Cross Lake watershed.

Water Use Regulations

The portion of Cross Lake in Wisconsin is subject to a Water Use Ordinance as Chapter 20 of the Village of Salem Lakes Code of Ordinances. This ordinance is consistent with Chapter 30 of the Wisconsin Statutes and applies to persons, boats, watercraft, and objects upon, in, and under the waters of Cross Lake within the jurisdiction of the Village of Salem Lakes and limits the times during which boats may operate on Cross Lake. The ordinance also allows for the enactment and enforcement of boating restrictions and limitations.