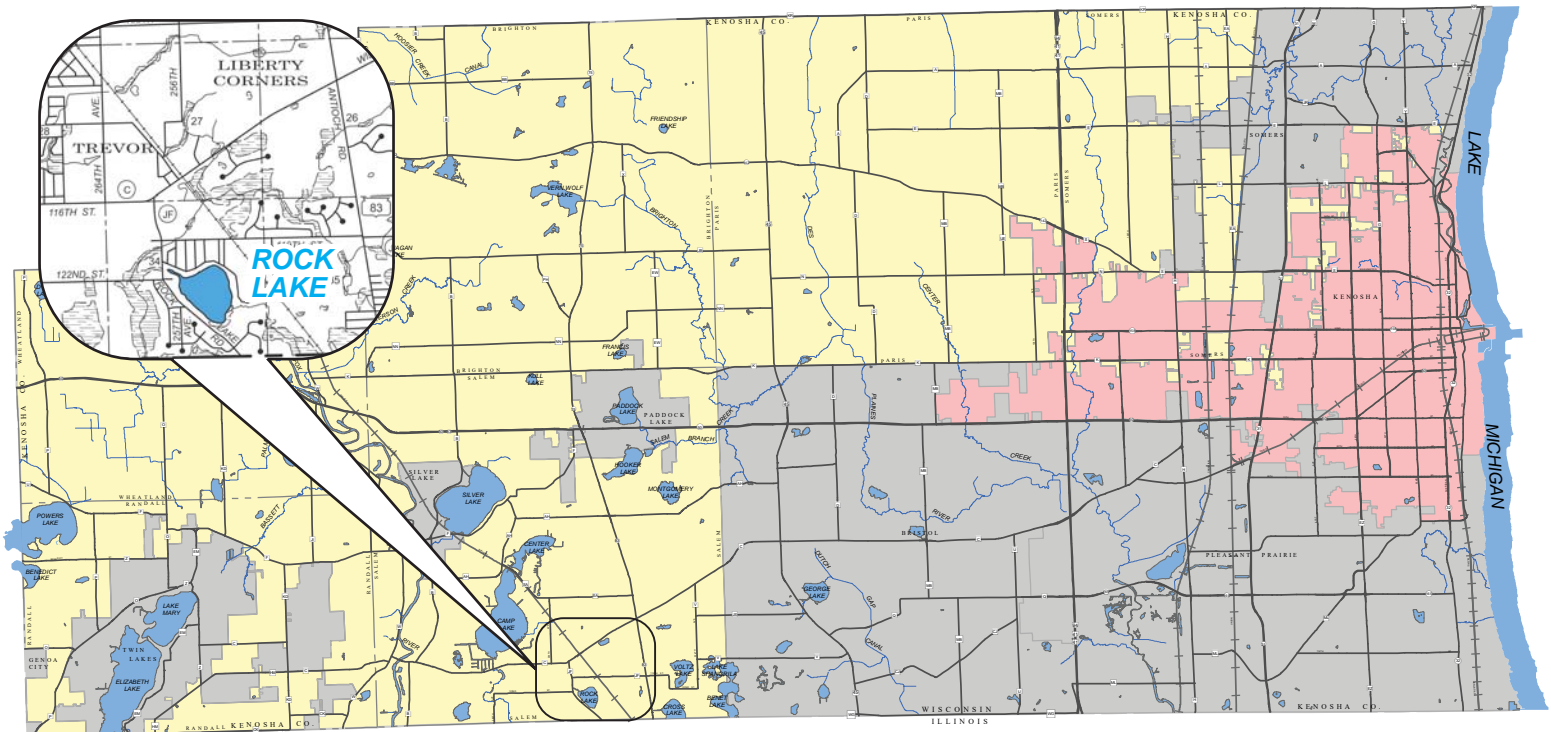


ROCK LAKE USE REPORT UPDATE LR-9

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.

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BACKGROUND	1
INTRODUCTION	1
PHYSICAL DESCRIPTION	1
Lake Characteristics.....	1
Hydrology	3
Watershed characteristics and land use.....	3
WATER QUALITY	4
NATURAL RESOURCES.....	10
Aquatic Plants	10
Aquatic Invasive Species	11
Fisheries and Wildlife	11
Environmentally Significant Areas.....	12
Aesthetic Features	15
LAKE USE.....	15
Recreational Use.....	15
Public Access	15
Cottages and Homesites.....	18
EXISTING PROTECTIVE MEASURES	18
Sewage Disposal	18
Shoreline Protection and Erosion Control	18
Land Use Regulations.....	18
Water Use Regulations	18

LIST OF TABLES

Table 1	Hydrology and Morphometry of Rock Lake	3
Table 2	Existing and Planned Land Use Within the Rock Lake Watershed: 2010 and 2035	8
Table 3	Rock Lake Water Quality Comprehensive Data Set: 1977.....	8
Table 4	Summer Annual Average Satellite Data for Rock Lake.....	9
Table 5	Rock Lake Aquatic Plant Surveys: 2004 and 2012	10
Table 6	Population and Households in the Rock Lake Watershed: 1960-2035	18
Table 7	Land Use Regulations Within the Watershed of Rock Lake in Kenosha and Lake Counties by Civil Division: 2016.....	20

LIST OF FIGURES

Figure 1	Spillway at Rock Lake.....	4
Figure 2	1970 Aerial Photograph of Rock Lake.....	5
Figure 3	2015 Orthophotograph of Rock Lake.....	6
Figure 4	Measuring Water Clarity with a Secchi Disk.....	9
Figure 5	Secchi Disk Measurements for Rock Lake: 2014	9
Figure 6	Eurasian Water Milfoil (<i>Myriophyllum spicatum</i>).....	12
Figure 7	Spiny Naiad (<i>Najas marina</i>).....	13
Figure 8	Least Darter (Left) and Lake Chubsucker (Right).....	13
Figure 9	Typical Winter Activities on Rock Lake.....	15
Figure 10	Lobeno Park and Wilson-Runyard Park.....	17

LIST OF MAPS

Map 1	Rock Lake	2
Map 2	2010 Land Use Within the Rock Lake Watershed	7
Map 3	Environmentally Significant Areas Within the Rock Lake Watershed: 2015.....	14
Map 4	Recreational Uses on Rock Lake: 2015.....	16
Map 5	Shoreline Survey of Rock 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. Even though Rock Lake is one of the 12 named major lakes, it was not included in the 1968 to 1970 reports. However, this report is being included as an update to the earlier reports to complete the set.

Rock Lake was the subject of a lake protection and aquatic plant management plan developed in 2015 by the Southeastern Wisconsin Regional Planning Commission (SEWRPC) for the Town of Salem (now the Village of Salem Lakes) and the Rock Lake Restoration Association (RLRA).² The RLRA is an incorporated association which is qualified to receive state grant dollars and engages in management activities on Rock Lake. The Association does not maintain a website. However, Association officers can be reached via email through the Village of Salem Lakes website (www.villageofsalemlakes.org). In addition to the above report, Rock Lake was also part of a 2017 lake and stream classification project developed for Kenosha County by SEWRPC.³

INTRODUCTION

Rock Lake is located in the Village of Salem Lakes, Kenosha County, Wisconsin. Despite its relatively small size, the Lake's fishery, natural beauty, and location give it significant local economic and recreational value. In addition, its healthy and relatively diverse aquatic plant community and contiguous marshlands provide noteworthy fish and wildlife habitat. The Lake provides significant value to local ecology.

PHYSICAL DESCRIPTION

Lake Characteristics

Based upon recent orthophotography, Rock Lake has a surface area of 53 acres.⁴ As shown on Map 1, Rock Lake has a relatively circular basin and a maximum depth of 33 feet. According to 1967 (revised from 1960) depth soundings published by the WDNR, Rock Lake contains 1,062 acre-feet of water. Only nine percent of Rock Lake is three feet deep or less, yielding an average depth of 20 feet.⁵ Additional information regarding Rock Lake's hydrology and morphometry is summarized in Table 1.

According to WDNR records, Rock Lake's bottom sediments are composed 90 percent of muck, eight percent sand, and two percent gravel.

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

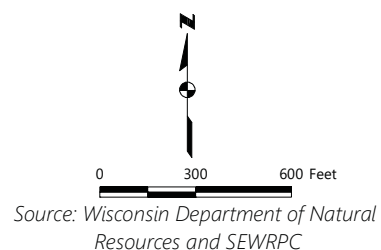
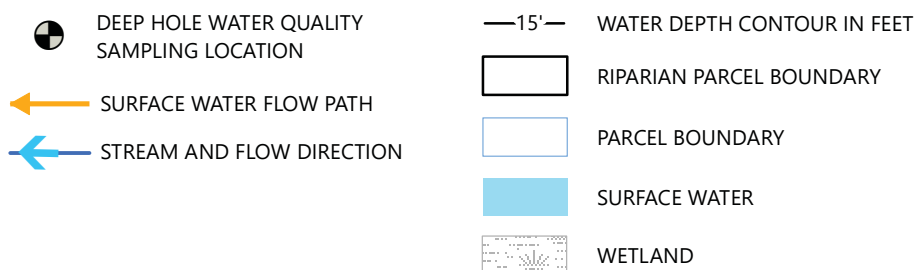
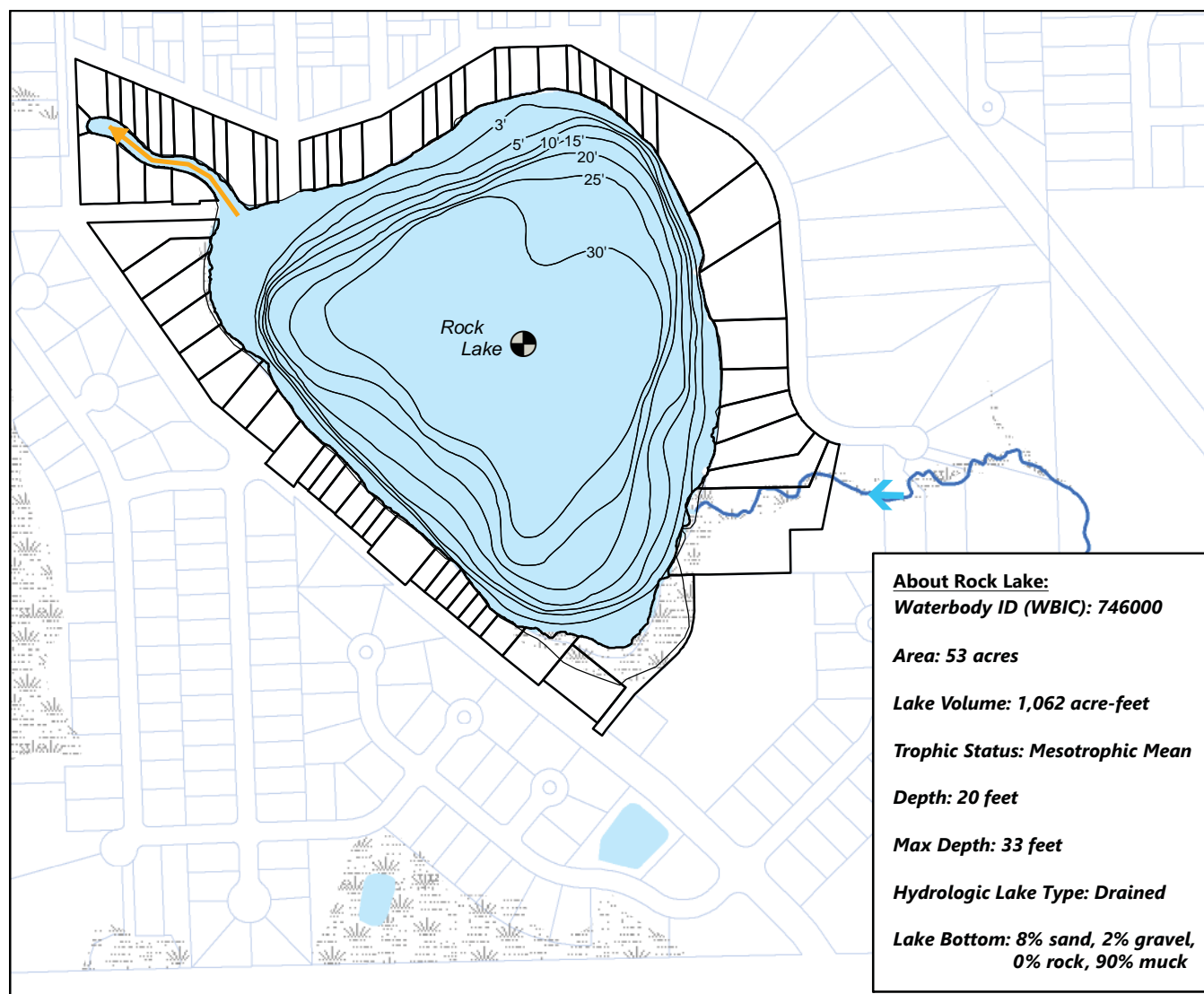
² SEWRPC Community Assistant Planning Report No. 323, A Lake Protection and Aquatic Plant Management Plan for Rock Lake, Kenosha County, Wisconsin, June 2015.

³ SEWRPC Memorandum Report No. 222, Lake and Stream Resources Classification Project for Kenosha County, Wisconsin: 2017.

⁴ 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.

⁵ <https://dnr.wi.gov/lakes/lakepages/LakeDetail.aspx?wbic=746000&page=facts>

Map 1 Rock Lake



Hydrology

Based upon its depth and the topography of surrounding lands, WDNR classifies Rock Lake as a deep seepage lake. Such lakes receive most of their water supply from surface runoff and precipitation to the lake's surface; they also are likely to stratify during summer. Furthermore, Rock Lake discharge most of its 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.

Although the Lake has no true inlet or continuously flowing inflow stream, an intermittent stream enters the Lake on the southeast shore. The Lake's levels are maintained by a spillway located on the outlet channel (Figure 1). Rock Lake forms part of a network of waterbodies that drain to Trevor Creek, a tributary to the Fox River.

Watershed Characteristics and Land Use

Rock Lake's 487 acre watershed lies primarily to the south and east of the Lake. A lake's watershed is the physical area from which surface-water runoff can drain to a lake. Rock Lake has a modest-sized watershed for its size, with a watershed to lake area ratio of 9.2:1. Lakes with ratios above 10:1 tend to develop water-quality problems.⁶ Lakes with large watersheds are comparatively more vulnerable to human disturbance.

According to topographic maps, shoreline land slopes are steep along the entire shore of the Lake except the northwest corner. Away from the shoreline of the Lake, most of the lands in the watershed to the east and southeast are comprised of moderately-sloped hilly terrain which drains toward the Lake.

Significant land development occurred around Rock Lake between 1970 and 2015 (see Figures 2 and 3). Map 2 and Table 2 show the 2010 land uses in the Rock Lake watershed. Agricultural and other open lands comprise approximately 45 percent of watershed land use. Wetlands and woodlands comprise another 9 and 2 percent of watershed land use, respectively. Urban uses account for approximately 44 percent of the watershed with low- and medium-density single-family residential areas accounting for the majority of residential land use. Projected 2035 land use (Table 3) indicates significant changes within the Rock Lake watershed. Currently, projections indicate that a majority of the agricultural and other open lands within the watershed will be converted to residential and recreational areas, resulting in a 43 percent decrease in rural lands, and a 54 percent increase in urban lands.

Table 1
Hydrology and Morphometry of Rock Lake

Parameter	Measurement
Size	
Surface Area of Lake	53 acres ^a
Watershed Area ^b	487 acres
Lake Volume	1,062 acre-feet
Residence Time ^c	1.8 years
Shape	
Length	0.3 mile
Width	0.25 mile
Shoreline Length	1.4 miles
Shoreline Development Factor ^d	1.2
General Lake Orientation	None
Depth	
Maximum Depth	33 feet
Mean Depth	20 feet
Area under 3 feet	9 percent
Area over 15 Feet	66 percent

^a Surface 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 Rock Lake's surface area to be as low as 44 acres and as high as 55 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.

^b Excludes Rock lake.

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

^d Shoreline development factor is the ratio of the shoreline length to the circumference of a circular lake of the same area. 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, U.S. Geological Survey, and SEWRPC

⁶ 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.

Figure 1
Spillway at Rock Lake



Source: SEWRPC

WATER QUALITY

The WDNR re-evaluated Rock Lake's water quality as part of the recent impairment listing cycle and found that the Lake's water quality clearly meets State thresholds for fish and aquatic life uses.⁷

Historical 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. Unfortunately, no long-term water quality monitoring program has been conducted on Rock Lake. Aside from a small data set collected in 1977 (Table 3), and a few water clarity measurements taken during summer 2014 as part of an initial monitoring effort by the Rock Lake Restoration Association and the Rock Lake Highlands Association, the only other recent water quality data is derived from satellite images.

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 4). "Secchi depth" is the distance below the water surface that a Secchi disk can be seen under carefully prescribed conditions. Water clarity, measured with a Secchi disk during the months of June and August 2014 (Figure 5), show water clarity can be almost 12 feet in the beginning of the summer and decreases

⁷ Wisconsin Department of Natural Resources, Rock Lake, Kenosha County website, "conditions" dnr.wi.gov/water/waterDetail.aspx?wbic=746000.

Figure 2
1970 Aerial Photograph of Rock Lake



Date of Photography: 1970

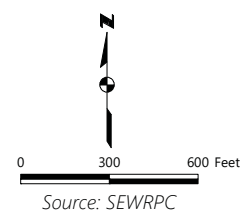
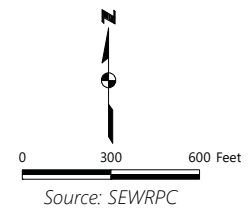


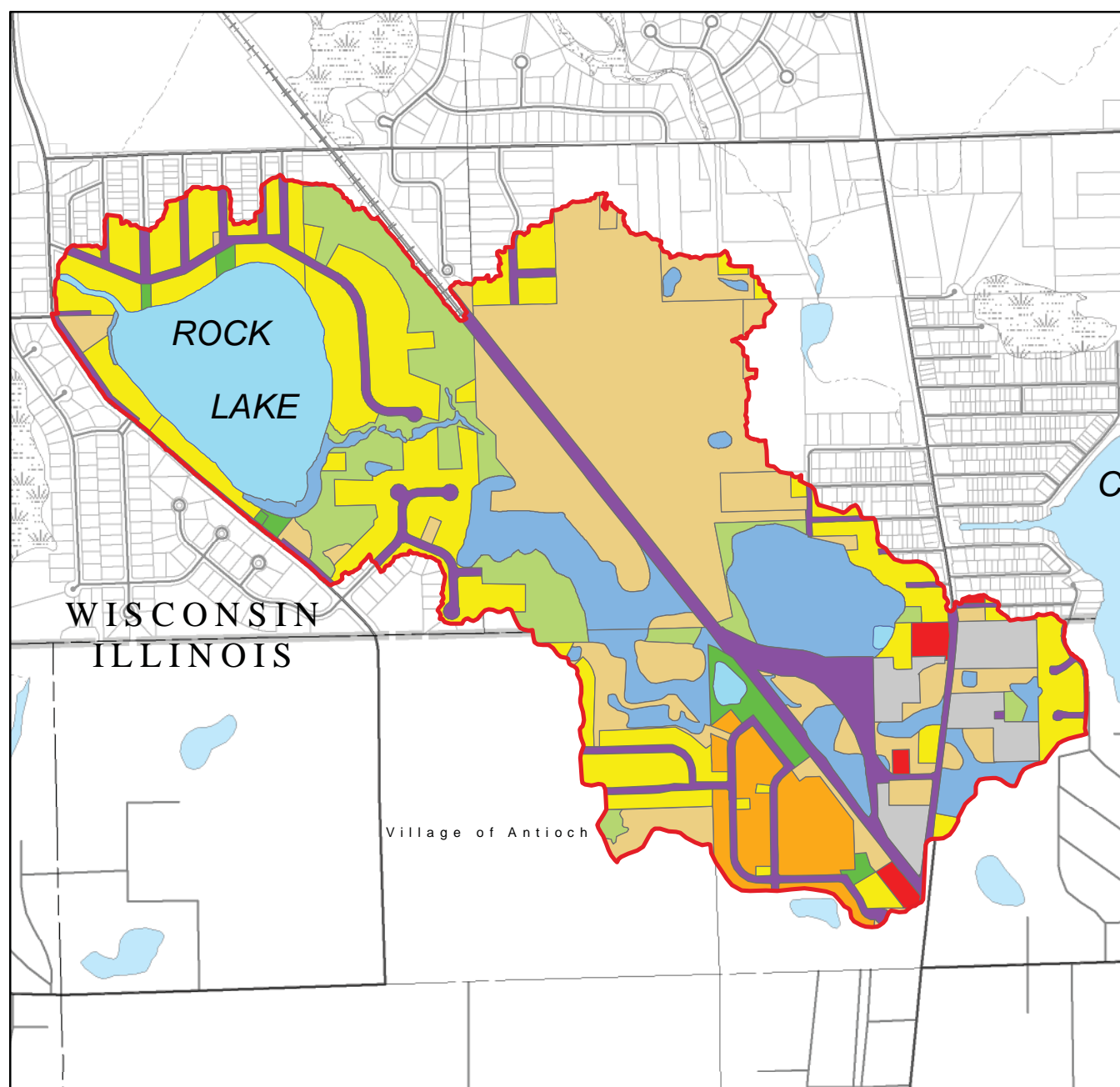
Figure 3
2015 Orthophotograph of Rock Lake



Date of Photography: 2015



Map 2
2010 Land Use Within the Rock Lake Watershed



- | | | |
|---|--|--|
| LOW DENSITY RESIDENTIAL | GOVERNMENT AND INSTITUTIONAL | SURFACE WATER |
| MEDIUM DENSITY RESIDENTIAL | AGRICULTURAL | WATERSHED BOUNDARY |
| MULTI-FAMILY RESIDENTIAL | OTHER OPEN LANDS | |
| COMMERCIAL | RECREATION | |
| INDUSTRIAL | WETLANDS | |
| TRANSPORTATION, COMMUNICATIONS, AND UTILITIES | WOODLANDS | |

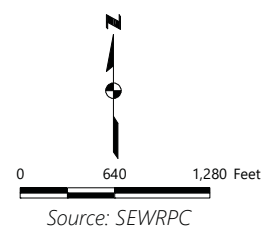


Table 2
Existing and Planned Land Use Within the Rock Lake Watershed: 2010 and 2035

Land Use Categories ^a	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	57	11.5	135	27.3	78	136.8
Single-Family, Medium Density	54	10.9	54	10.9	0	0
Single-Family, High Density	--	--	--	--	--	--
Multi-Family	22	4.5	22	4.5	0	0
Commercial	4	0.8	5	1.0	1	25.0
Industrial	19	3.8	28	5.7	9	47.4
Governmental and Institutional	--	--	--	--	--	--
Transportation, Communication, and Utilities	55	11.2	74	15.0	19	34.5
Recreational	7	1.4	18	3.6	11	157.1
Subtotal	218	44.1	336	68.0	118	54.1
Rural						
Agricultural	152	30.8	34	6.9	-118	-77.6
Other Open Lands	70	14.2	70	14.2	0	0
Wetlands	45	9.1	45	9.1	0	0
Woodlands	9	1.8	9	1.8	0	0
Water ^b	--	--	--	--	--	--
Extractive	--	--	--	--	--	--
Subtotal	276	55.9	158	32.0	-118	-42.8
Total	494	100.0	494	100.0	0	--

Note: This 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 Parking included in associated use

^b Excludes Rock Lake

Source: SEWRPC

Table 3
Rock Lake Water Quality Comprehensive Data Set: 1977

Parameter	07/12/1977			07/13/1977
	0 Foot	12 Feet	32 Feet	19 Feet
Alkalinity	144.000	140.000	180.000	158.000
Calcium	26.000	26.000	38.000	31.000
Chloride	26.000	28.000	27.000	28.000
Conductivity (µS/cm)	398.000	388.000	470.000	418.000
Dissolved Oxygen	6.400	6.900	0.100	--
Iron	0.150	0.150	0.180	0.180
Magnesium Total	29.000	33.000	28.000	30.000
Manganese (µg/l)	<0.030	<0.030	0.400	<0.030
Nitrogen NH3 Dissolved	<0.040	<0.040	1.620	0.210
Nitrogen NH3-N Total	0.830	0.750	0.940	2.600
Nitrogen, Total	0.042	<0.022	<0.032	0.054
Ortho-Phosphorus Dissolved (µg/l)	0.009	0.008	0.225	0.025
pH (SU)	8.600	8.400	7.500	7.800
Potassium	1.500	2.100	2.500	2.400
Secchi Depth (feet)	8.500	8.500	8.500	--
Sodium	18.000	17.000	18.000	18.000
Sulfate	30.000	30.000	30.000	23.000
Total Phosphorus	0.020	0.020	0.270	0.030
Turbidity (NTU)	1.600	1.400	1.800	3.400
Water Temperature (°C)	27.000	25.000	10.000	--

Source: Wisconsin Department of Natural Resources and SEWRPC

Table 4
Summer Annual Average
Satellite Data for Rock Lake

Summer Average	Depth (feet)
2017	8.3
2016	7.3
2013	5.3
2011	7.6
2010	5.2
2009	6.0
2008	9.4
2007	15.5
2003	9.5
2001	4.6

Source: Wisconsin Department of Natural Resources and SEWRPC

to approximately 8 feet by the end of August, corresponding to a Tropic State Index of 45. In addition, WDNR satellite data collected between 2001 and 2017 show an average water clarity of 7.9 feet which is equivalent to a Trophic State Index of 47, and indicates that the Lake is mesotrophic (Table 4).

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.

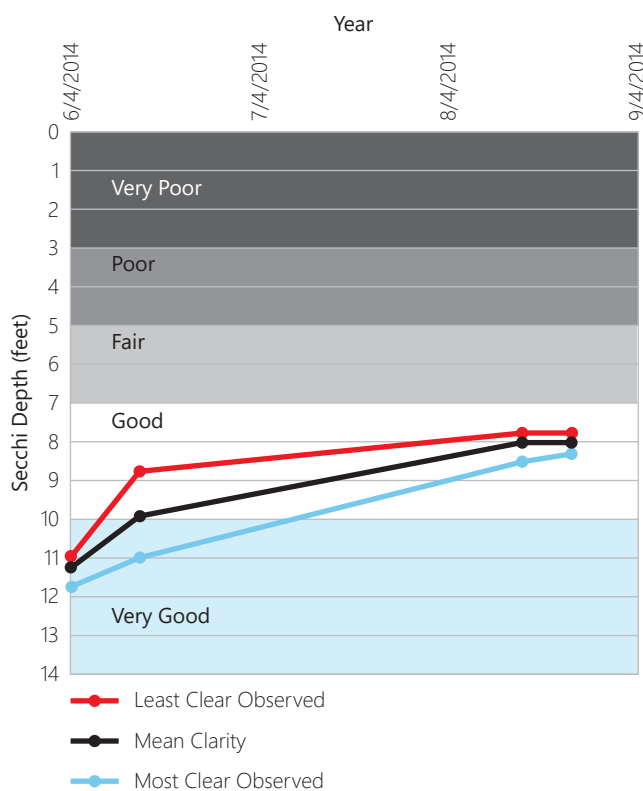
Data from 1977 indicate that Rock Lake stratified, or formed layers of water with different temperatures. This process occurs in deep lakes because water is different densities at different temperatures. Stratification can occur in winter and summer. The 1977 temperature and dissolved oxygen data indicate that Rock Lake thermally stratified somewhere below 12 feet (Table 3). The exact depth is unknown because measurements were only taken at three depths. As a result of stratification, waters below the depth of stratification can become anoxic, or void of oxygen. However, the extent to which anoxia occurs cannot be determined with available data.

Figure 4
Measuring Water Clarity with a Secchi Disk



Source: www.burnsville.org and SEWRPC

Figure 5
Secchi Disk Measurements for Rock Lake: 2014



Source: Rock Lake Highlands Association and SEWRPC

Table 5
Rock Lake Aquatic Plant Surveys: 2004 and 2012

Aquatic Plant Species	2004 (July)	2012 (June)
Floating Plants		
<i>Lemna minor</i> (small duckweed)	2.1	- -
<i>Nuphar variegata</i> (spatterdock)	9.0	9.1
<i>Nymphaea odorata</i> (white water lily)	44.4	65.2
Emergent Plants		
<i>Pontederia cordata</i> (pickerel weed)	- -	3.0
Submerged Plants		
<i>Ceratophyllum demersum</i> (coontail)	86.8	95.5
<i>Chara</i> spp. (muskgrass)	- -	51.5
<i>Elodea canadensis</i> (waterweed)	- -	40.9
<i>Heteranthera dubia</i> (water stargrass)	- -	12.1
<i>Myriophyllum sibiricum</i> (native milfoil)	28.5	3.0
<i>Myriophyllum spicatum</i> (Eurasian water milfoil)	59.0	66.7
<i>Najas flexilis</i> (bushy pondweed)	2.8	- -
<i>Najas marina</i> (spiny naiad)	1.4	- -
<i>Potamogeton epihydrus</i> (ribbon-leaf pondweed)	9.7	- -
<i>Potamogeton foliosus</i> (leafy pondweed)	5.6	- -
<i>Potamogeton gramineus</i> (variable pondweed)	0.7	6.1
<i>Potamogeton illinoensis</i> (Illinois pondweed)	6.9	- -
<i>Potamogeton praelongus</i> (white-stem pondweed)	- -	15.2
<i>Potamogeton richardsonii</i> (clasping-leaf pondweed)	7.6	- -
<i>Potamogeton robbinsii</i> (Robbins pondweed)	0.7	- -
<i>Potamogeton zosteriformis</i> (flat-stem pondweed)	9.7	4.6
<i>Ranunculus aquatilis</i> (white water crowfoot)	2.1	1.5
<i>Stuckenia pectinata</i> (Sago pondweed)	1.4	13.6
<i>Vallisneria americana</i> (water celery)	27.1	1.5

Note: Data above 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.

Source: Wisconsin Department of Natural Resources and SEWRPC.

NATURAL RESOURCES

Aquatic Plants

Aquatic plant growth in Rock Lake was observed and surveyed by WDNR staff in July 2004 and by SEWRPC staff in June 2012 (Table 5). The 2004 survey utilized a transect survey method while the 2012 survey utilized a grid-point survey methodology. Therefore, plant abundance was presented differently in each survey and cannot be directly compared.

The 2004 survey indicated that coontail (*Ceratophyllum demersum*) was the most dominant species, followed by Eurasian water milfoil (*Myriophyllum spicatum*) and white water lilies (*Nymphaea odorata*). Overall, sixteen native aquatic plant species were found that year. The 2012 survey indicated that the most abundant plant species was, again, coontail (*Ceratophyllum demersum*) followed by muskgrasses (*Chara* spp.) and white water lilies (*Nymphaea odorata*). A total of thirteen native aquatic plant species were observed and documented within Rock Lake in 2012. These native species provide a variety of benefits, including food for wildfowl and fish, and shelter for fingerling fish such as trout, bluegill, and bass. 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. The substantial number of native submerged plant species in both the 2004 (16 native species) and 2012

(13 native species) surveys is indicative of a diverse and healthy aquatic plant community. Moreover, these surveys indicated that the Lake native aquatic plant community contains several high-value species. 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. Six such species have recently been found in Rock Lake: water celery, Sago pondweed, Illinois pondweed, clasping-leaf pondweed, Robbins pondweed, and white-stem pondweed.

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.

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. Eurasian water milfoil was observed during both the 2004 and 2012 surveys. However, the overall dominance of Eurasian water milfoil has not significantly changed from the 2004 survey. Currently, Rock Lake actively manages its aquatic plant population through chemical and mechanical means.

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.⁸ EWM/native milfoil hybrids have not been identified in Rock Lake.

Spiny naiad (Najas marina)

Spiny naiad (see Figure 7) is a plant that is native to other states, including Minnesota, but is introduced in Wisconsin. It has been documented that spiny naiad can grow to nuisance levels in northern Wisconsin, hard-water lakes with poor water quality.⁹ The species was added to Chapter NR 40 of the *Wisconsin Administrative Code* in 2015.¹⁰ Although spiny naiad was found in Rock Lake in 2004, it was only found in small numbers, and was not documented during the 2012 aquatic plant survey.

Fisheries and Wildlife

The WDNR conducted a fish survey on Rock Lake in 2008. The survey determined that Rock Lake contains a generally healthy fish community comprised of bluegill (*Lepomis macrochirus*), northern pike (*Esox lucius*), warmouth (*Lepomis gulosus*), largemouth bass (*Micropterus salmoides*), grass pickerel (*Esox americanus vermiculatus*), and pumpkinseed (*Lepomis gibbosus*). Rock Lake is the only lake in the southeastern Wisconsin region that is maintained as a coldwater trout fishery and is frequently stocked with rainbow (*Oncorhynchus mykiss*) and brown trout (*Salmo trutta*).

Two species of special concern, the least darter (*Etheostoma microperca*) and the lake chubsucker (*Erimyzon sucetta*), are contained in Rock Lake (Figure 8). In addition, the Lake contains one restricted species, common carp (*Cyprinus carpio*). However, the carp population was small at the time of the 2008 survey.

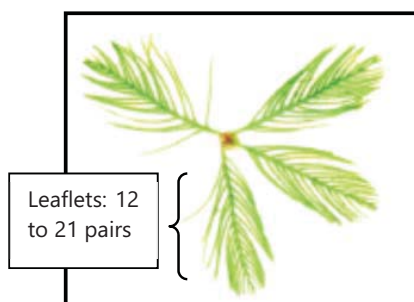
⁸ T. Groves, P. Hausler, and P. Tynning, Water Resources Group, Progressive AE, Hybrid Milfoil: Management Implications and Challenges, *The Michigan Riparian*, Winter 2015.

⁹ Personal communication with Southeastern Wisconsin Water Resources Specialist.

¹⁰ The NR 40 list is a compilation of species (both flora and fauna, terrestrial and aquatic) that are non-native to the State of Wisconsin and are, therefore, listed as either restricted or prohibited. For more information or for the list of species go to <http://dnr.wi.gov/topic/invasives/classification.html>.

Figure 6
Eurasian Water Milfoil (*Myriophyllum spicatum*)

Identifying Features	Ecology
<ul style="list-style-type: none"> • 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) <p>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</p>	<ul style="list-style-type: none"> • 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

Environmentally Significant Areas

The Rock Lake watershed contains environmentally significant areas. These areas generally represent the best remaining natural resource areas in the Lake's watershed. Many important interdependent relationships occur between living organisms and their environment in such areas. Destruction or deterioration of any one element of a natural environment may unravel the value and stability of the overall resource. Therefore, it is important to protect such areas.

As shown on Map 3, primary environmental corridor areas occupy nearly 144 acres of land and water area (including the Lake itself) in the Lake's watershed area, much of it in close proximity to the Lake. Preserving these areas is critically important to maintaining the ecological integrity of the Lake.

Rock 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 species habitat.¹¹ The Lake is considered an aquatic area of local significance, important to the overall health of aquatic plants and animals.

¹¹ SEWRPC Planning Report Number 42, A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin, September 1997.

Figure 7
Spiny Naiad (*Najas marina*)

Identifying Features

- Stems stiff and spiny, often branching many times
- Leaves stiff, 1.0 to 4.0 millimeters thick, with coarse teeth along the margins and midvein on the underside

Spiny naiad is quite distinct from other naiads due to its larger, coarsely toothed leaves and the irregularly pitted surface of its fruits. Spiny naiad is presumably introduced in Wisconsin but it is considered native in other states, including Minnesota

Ecology

- Alkaline lakes, water quality ranging from good to poor
- An annual, regenerating from seed each year
- Occurs as separate male and female plants
- Capable of growing aggressively



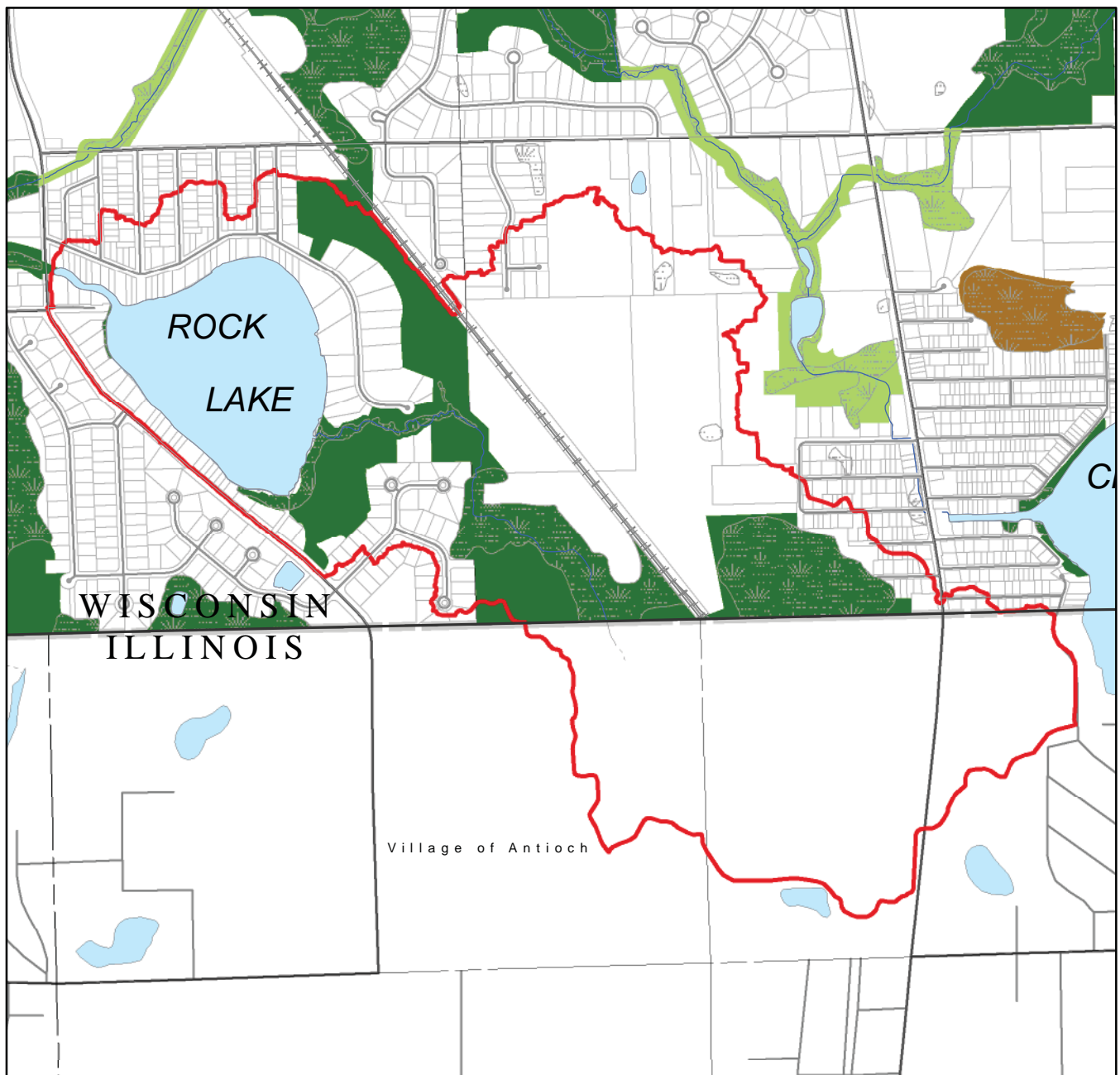
Source: Wisconsin Department of Natural Resources and Skawinski, P.M. (2014). *Aquatic Plants of the Upper Midwest: A Photographic Field Guide to Out Underwater Forests*, 2nd Edition, Wausau, Wisconsin, USA,: Self-Published.









Figure 8
Least Darter (Left) and Lake Chubsucker (Right)



Source: Wisconsin Department of Natural Resources and SEWRPC

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



- | | |
|---|---|
|  SURFACE WATER |  PRIMARY ENVIRONMENTAL CORRIDORS |
|  WATERSHED BOUNDARY |  SECONDARY ENVIRONMENTAL CORRIDORS |
|  PERENNIAL STREAM |  ISOLATED NATURAL RESOURCE AREA |
|  INTERMITTENT STREAM |  WETLANDS |

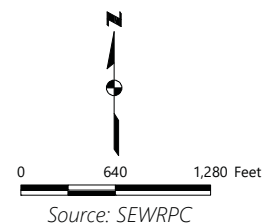


Figure 9
Typical Winter Activities on Rock Lake



Source: SEWRPC

Aesthetic Features

Rock Lake provides a generally peaceful lake setting as the Lake has an ordinance prohibiting non-electric motors. Much of the lakeshore is developed and may result in some lack of visual interest to Lake users. However, the heavily wooded marsh in the southeastern corner of the Lake offers opportunities for viewing birds and wildlife.

LAKE USE

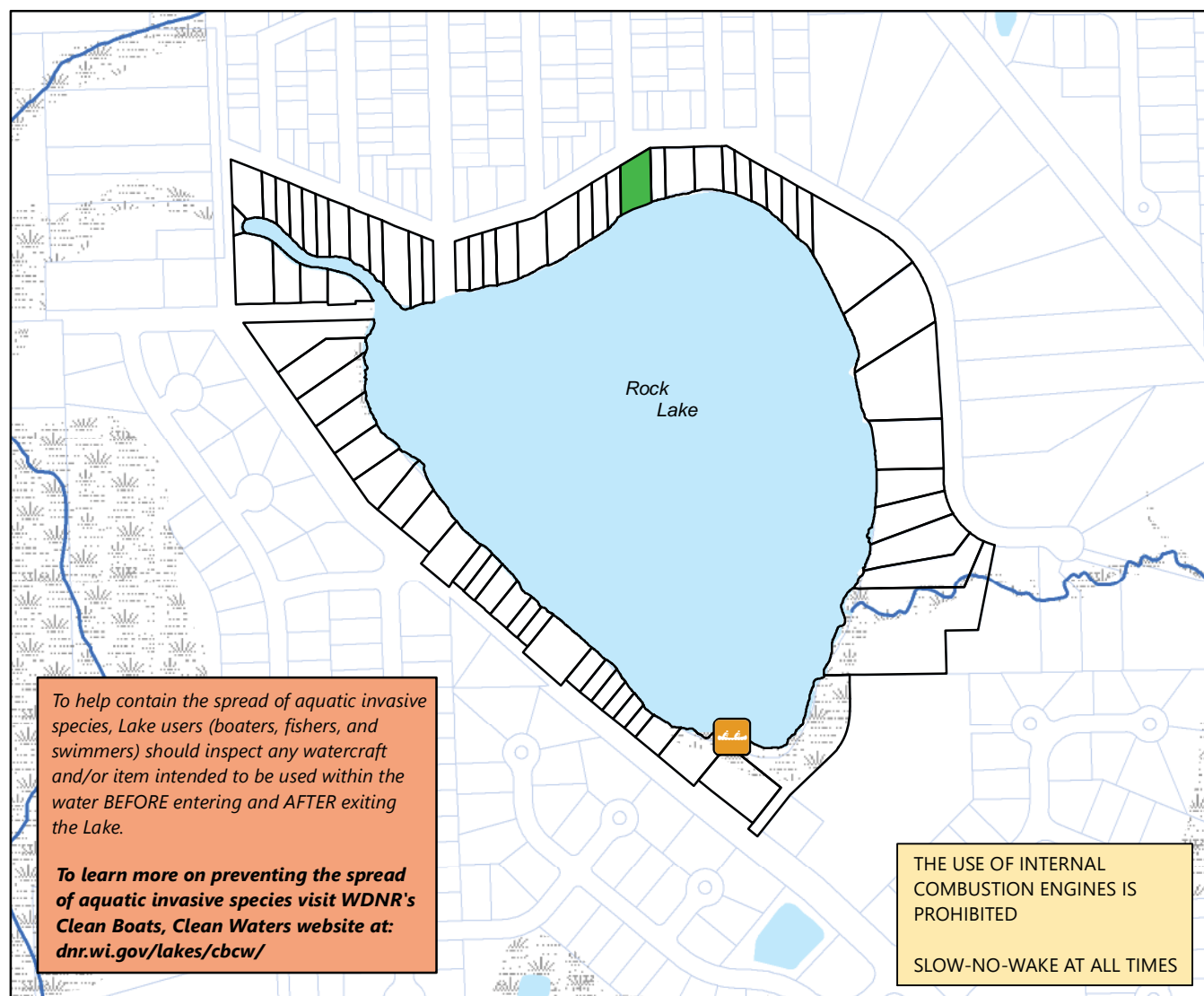
Recreational Use

During the summer of 2012 and winter of 2015, SEWRPC staff conducted recreational surveys to document public lake use. The surveys showed that fishing and low-speed cruising were the most popular on-water activities during the summer. Other popular summer activities included swimming on the beach and going to the park. Ice fishing was the most popular winter activity observed (Figure 9).

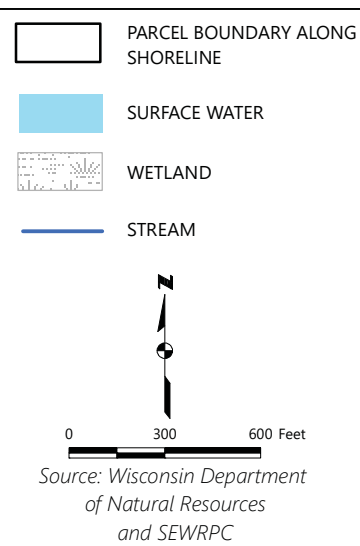
Public Access

As shown in Map 4, there is one official public access site located in Wilson-Runyard Park (owned by the Village of Salem Lakes) at the southern corner of Rock Lake (Figure 10). However, it is a carry-in only site, effectively eliminating the use of boats larger than kayaks or canoes. Currently, WDNR deems the Lake to have adequate public recreational boating access for a lake of less than 50 acres pursuant to standards set forth in Chapter NR 1 of the Wisconsin Administrative Code. Lobeno Park (Figure 10 and Map 4) is another Village of Salem Lakes Park located on Rock Lake.

Map 4 Recreational Uses on Rock Lake: 2015



Map ID	Description	Boat Ramp	Fee	Car-trailer Parking	Car Parking	Facilities				
						Pier	Swim Beach	Picnic Area	Shelter	Playground
	Village of Salem Lakes – Wilson Park	Carry-In	No	No	Yes	Yes	No	Yes	Yes	No
	Village of Salem Lakes – Lubeno Park	No	No	No	No	No	Yes	Yes	No	No



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

Figure 10
Lobeno Park and Wilson-Runyard Park

Lobeno Park



Wilson-Runyard Park



Source: SEWRPC

Table 6
Population and Households in the Rock Lake Watershed: 1960-2035

Year	Population			Households		
	Wisconsin	Illinois	Total	Wisconsin	Illinois	Total
1960	138	--	--	46	--	--
1970	212	--	--	65	--	--
1980	191	--	--	67	--	--
1990	191	282	473	78	121	199
2000	331	620	951	120	291	411
2010	450	892	1,342	155	351	506
Planned 2035	947	--	--	363	--	--

Source: U.S. Bureau of Census and SEWRPC

Cottages and Homesites

According to recent records, 70 lakefront lots abut Rock Lake. Lot sizes average 0.5 acre and range from less than 0.1 acre to 125 acres.¹² The population and number of households in Rock Lake's watershed area is projected to increase significantly by 2035 (Table 6).

EXISTING PROTECTIVE MEASURES

Sewage Disposal

At present, the entire Wisconsin portion of the watershed is within the Salem planned sewer service area. Existing development in the Wisconsin portion is serviced by the Village of Salem Lakes Utility District wastewater treatment plant. The Village of Antioch, Illinois, also has sanitary sewer service.

Shoreline Protection and Erosion Control

Rock Lake's shoreline includes stretches of protected shoreline (either man-made or natural) as well as some areas of unprotected shoreline, such as where a riparian owner mows lawn to the water's edge (see Map 5). About 40 percent of the shoreline of Rock Lake remains in a natural state without manmade shoreline protective structures such as riprap or bulkhead. A few areas of shoreline erosion were recorded scattered around the Lake during a survey conducted by SEWRPC in July 2014.¹³

Land Use Regulations

Comprehensive zoning ordinances are one of the most important tools available to local units of government for encouraging orderly development and land use that contributes to long-term human and environmental welfare. Rock Lake and its watershed are subject to ordinances and regulations adopted by the Village of Salem Lakes. The Village of Salem Lakes was incorporated on February 14, 2017, and, as an interim measure, continues to follow the ordinances adopted by the Town of Salem and Kenosha County. Table 7 summarizes general and special-purpose zoning ordinances for the civil divisions within the Rock Lake watershed.

Water Use Regulations

Rock Lake is subject to Village of Salem Lakes boating ordinances, which as mentioned in the previous paragraph, were originally adopted by the Town of Salem. These ordinances apply to persons, boats, watercraft, and objects upon, in, and under the waters of Rock Lake. 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 Rock Lake within the jurisdiction of the Village and limits the times during which boats may operate on Rock Lake.

¹² SEWRPC Memorandum Report No. 222, op.cit.

¹³ Ibid..

Map 5
Shoreline Survey of Rock Lake: 2014

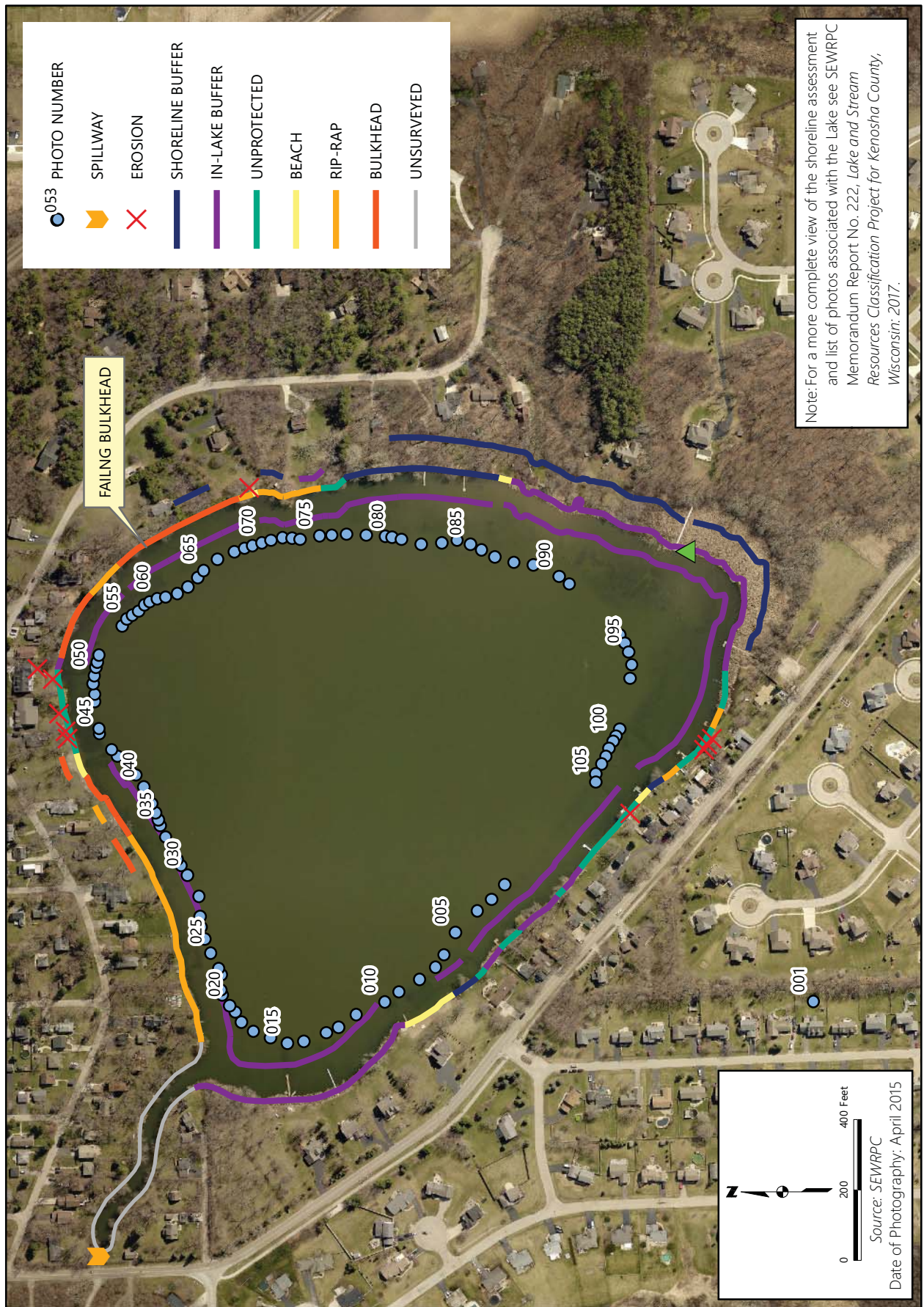


Table 7
Land Use Regulations Within the Watershed of Rock Lake in
Kenosha and Lake Counties by Civil Division: 2016

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 ^a	Regulated under County ordinance	Adopted
Floodplain Zoning	Adopted	Regulated under County ordinance	Adopted ^a	Regulated under County ordinance	Adopted
Shoreland Zoning	Adopted	Regulated under County ordinance	-- ^b	-- ^b	-- ^b
Subdivision Control	Adopted ^c	Adopted ^c	Adopted ^a	Regulated under County ordinance	Adopted
Construction Site Erosion Control and Stormwater Management	Adopted ^c	Adopted ^c	Adopted ^d	Regulated under County ordinance	Adopted ^d

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

^bAlthough 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.

^cBoth 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.

^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