BENEDICT LAKE USE REPORT UPDATE LR-1

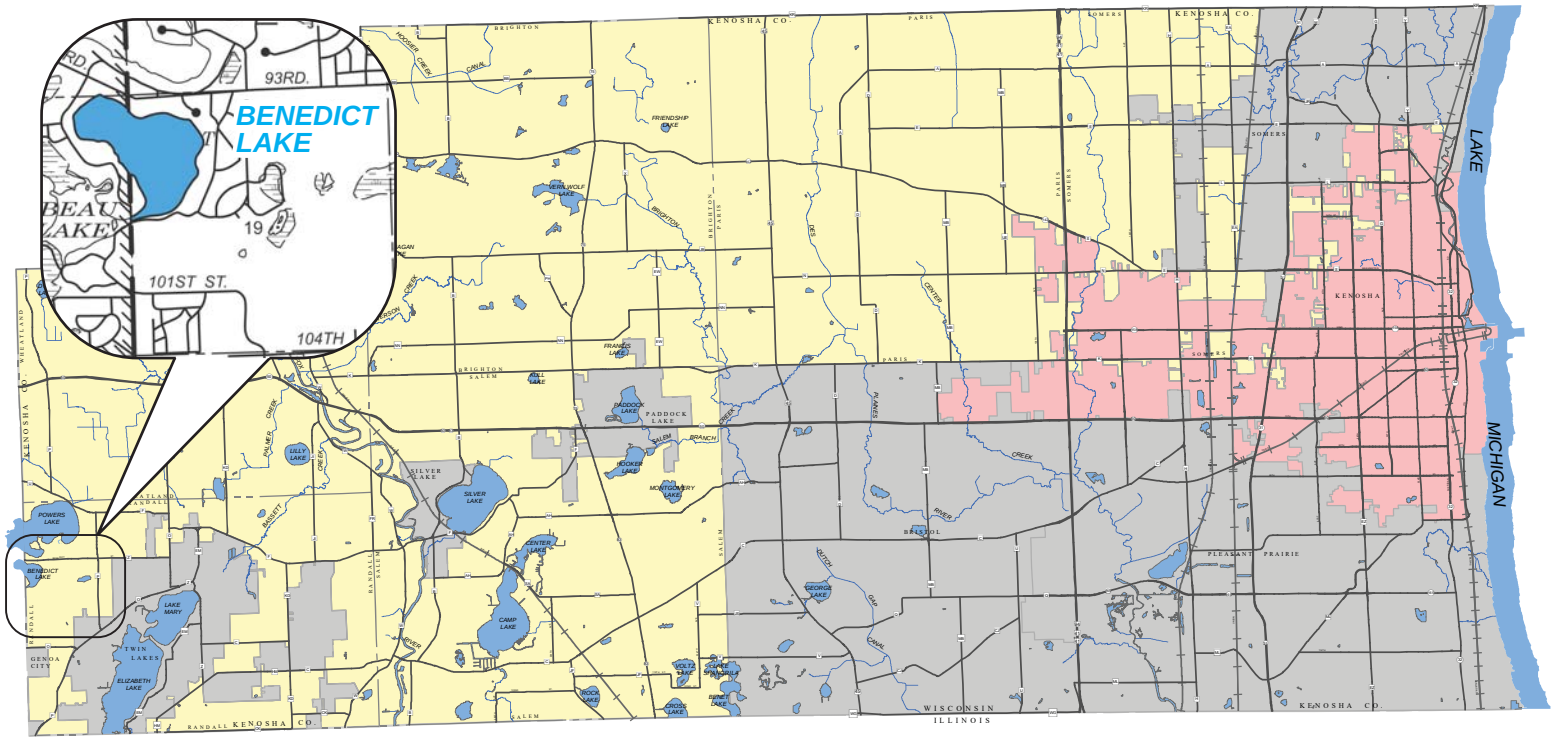
Prepared by the

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.

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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. Benedict 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, Benedict Lake, along with neighboring Tombeau Lake, was the subject of a lake protection plan developed in 2001 by the Southeastern Wisconsin Regional Planning Commission (SEWRPC) for the Benedict-Tombeau Lakes Management District (BTLMD).[3] The BTLMD is a Chapter 33, *Wisconsin Statutes* public inland lake protection and rehabilitation district that oversees management of Benedict Lake. The BTLMD maintains a website (www.lakebenedict.org). The website is used to post a wide variety of information Lake users may find interesting. In addition to the above report, Benedict Lake was also part of a 2017 lake and stream classification project developed for Kenosha County by SEWRPC.[4]

INTRODUCTION

Benedict Lake lies mostly in the Town of Randall in Kenosha County, Wisconsin. The northwestern one-third of the Lake is located in the Town of Bloomfield, Walworth County. Despite its relatively small size, the Lake's fishery, natural beauty, and location give it significant local economic and recreational value. In addition, its hydrologic connection to neighboring Tombeau Lake with its large contiguous marshlands, provides noteworthy fish and wildlife habitat.

PHYSICAL DESCRIPTION

Lake Characteristics

Based upon recent orthophotography, Benedict Lake has a surface area of 81 acres.[5] As shown on Map 1, Benedict Lake has a loosely hour-glass shape with a northwest-southeast orientation and a maximum depth of 37 feet. According to 1967 depth soundings published by the WDNR, Benedict Lake contains 1,207 acre-feet of water. Thirteen percent of Benedict Lake is three feet deep or less, yielding an average depth of about 15 feet.[6] The Lake has a mean water surface elevation of 822 feet above mean seal level (msl).[7] Additional information regarding Benedict Lake's hydrology and morphometry is summarized in Table 1.

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

[2] *Wisconsin Department of Natural Resources (WDNR), Benedict Lake,* Kenosha County, An Inventory with Planning Recommendations, Lake Use Report No. FX-40*, Prepared by the WDNR for SEWRPC, 1969.*

[3] *SEWRPC Memorandum Report No. 140,* A Lake Protection Plan for Benedict and Tombeau Lakes, Kenosha and Walworth Counties, Wisconsin, May 2001.

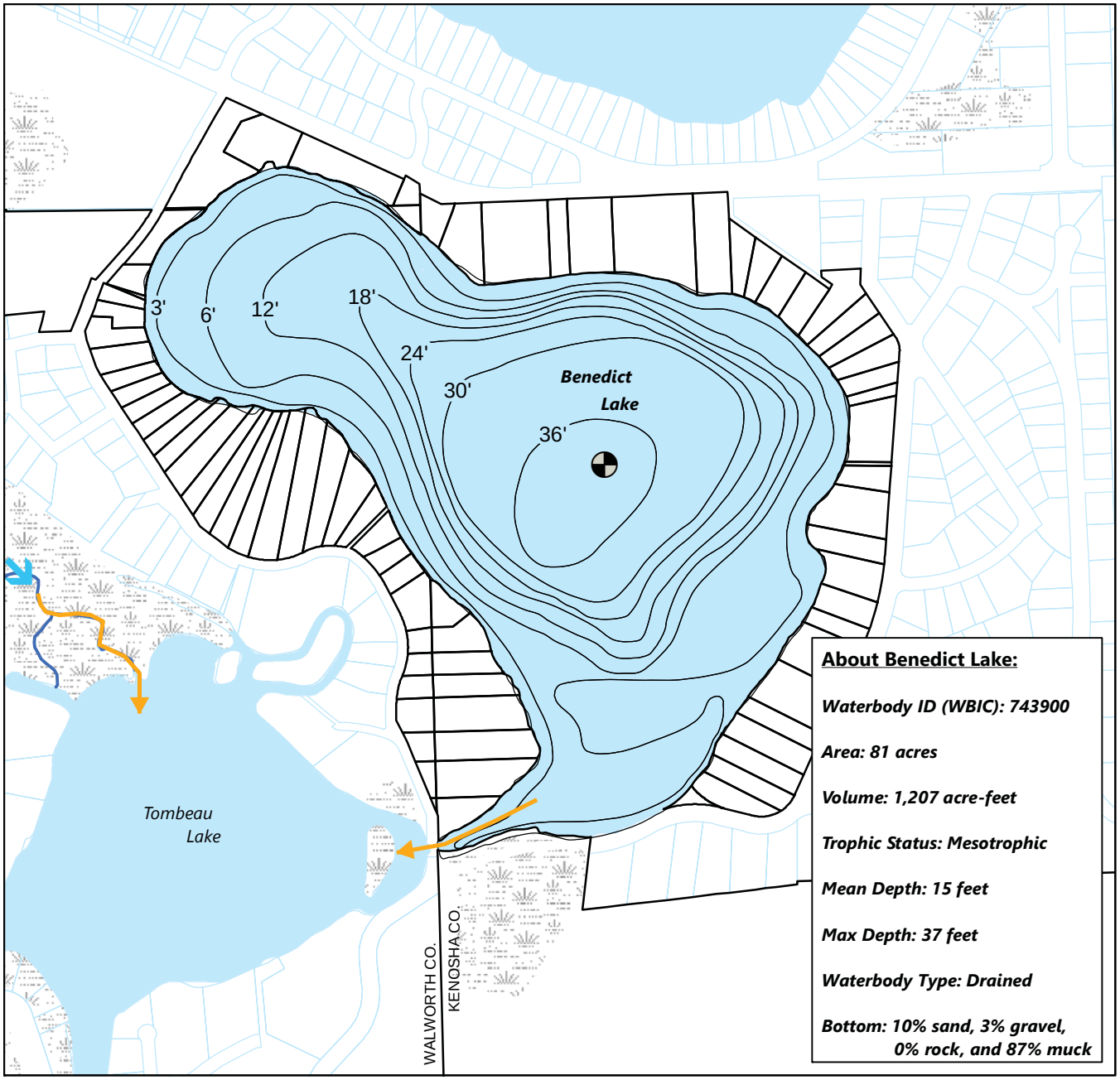
[4] *SEWRPC Memorandum Report No. 222,* Lake and Stream Resources Classification Project for Kenosha County, Wisconsin: 2017.

[5] *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.*

[6] *Wisconsin Department of Natural Resources, Lake Use Report No. FX-40,* op cit.

[7] Ibid.

Map 1
Benedict Lake



Source: Wisconsin Department of Natural Resources and SEWRPC

According to WDNR records about half of the bottom sediment near the shoreline of Benedict Lake is comprised of sand. The remaining shoreline is comprised of gravel and soft sediments.[8] In 1998, Commission staff surveyed the bottom of Benedict Lake and found a mixture of silt and sand over the vast majority of the lakebed. The survey also found stretches of a sand-gravel mixture along the western and northeastern shores and a silt bottom dominating the area immediately adjacent to the outlet channel.[9] The bottom sediment of shallow bays in the northwest and southwest corners of the Lake were predominantly composed of muck.

Hydrology

Based upon its depth and the topography of surrounding lands, WDNR classifies Benedict Lake as a deep headwater lake. 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. The WDNR uses these parameters to set water quality goals for the Lake.

The Lake also is believed to receive considerable groundwater inflow and sustains a perennial outflow to Tombeau Lake. Powers Lake, immediately to the north, has a surface elevation approximately ten feet higher than Benedict Lake and, given that the two lakes are separated by permeable glacial deposits, it is likely that there is significant groundwater flow into Benedict Lake from Powers Lake.[10] As such, Benedict Lake is defined as a drained lake. Drained lakes are fed primarily by groundwater and seepage from adjacent wetlands. Drained lakes seldom have defined inlet streams but do have an outlet that may at times carry little flow.[11]

Table 1
Hydrology and Morphometry of Benedict Lake

Parameter	Measurement
Size	
Surface Area of Lake[a]	81 acres
Watershed area[b]	895 acres
Lake Volume	1,207 acre-feet
Residence Time[c]	5.5 years
Shape	
Length	0.8 miles
Width	0.4 mile
Shoreline Length	1.7 miles
Shoreline Development Factor[d]	1.3
General Lake Orientation	NW-SE
Depth	
Maximum Depth	37.0 feet
Mean Depth	15.4 feet
Area under 3 feet	13 percent
Area over 20 Feet	41 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 Lake Benedict's surface area to be as low as 76 acres and as high as 81 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 Lake Benedict.*

[c] *Residence time is the estimated time period required for a volume of water equivalent to the volume of the lake to enter and be discharged from the lake during years of normal precipitation. The above data is based on a more accurate delineation of the watershed boundary than that used for the 1969 Lake Use Report, which identified the residence time for Benedict Lake to be approximately 11.2 years, based on seven-inch runoff from land in the watershed.*

[d] *Shoreline development factor is the ratio of the shoreline length to the circumference of a circular lake of the same area. The closer to a value of 1.0, the more nearly circular a lake is.*

Source: Wisconsin Department of Natural Resources and SEWRPC

Water drains from Benedict Lake through the outflow channel into Tombeau Lake (Figure 1). Tombeau Lake drains to Nippersink Creek (East branch) which eventually drains into the Fox River in Illinois. The water levels of both lakes are controlled by a small dam (Figure 2) located on an outlet channel extending southwest from Tombeau Lake.

[8] Ibid.

[9] *SEWRPC Memorandum Report No. 140,* op cit.

[10] Ibid.

[11] *Wisconsin Department of Natural Resources Publication No. PUB-FH-800 2005,* op cit.

Figure 1
Benedict Lake Outflow Channel into Tombeau Lake: 2014
(View is from Benedict)

Source: SEWRPC

Figure 2
Outflow Dam at Tombeau Lake

Source: SEWRPC

Watershed Characteristics and Land Use

Benedict Lake's 895-acre watershed lies primarily to the east of the Lake. A lake's watershed is the physical area from which surface-water runoff can drain to a lake. Benedict Lake has a modest-sized watershed for its size, with a watershed to lake area ratio of 11:1, which is relatively small for a drainage lake; lakes with ratios above 10:1 tend to develop water-quality problems.[12] Lakes with large watersheds are comparatively more vulnerable to human disturbance.

According to topographic maps, shoreline land slopes are steepest along the northern shore of the Lake. Low to moderate sloping shoreline is found along the southwest shore and at the end of the peninsula that separates Benedict Lake and Tombeau Lake. Away from the shoreline of the Lake, most of the lands in the watershed to the northwest are comprised of low, flat marsh through which the drainage stream from Powers Lake flows to Tombeau Lake. Most of the watershed to the southeast of the Lake is comprised of hilly terrain with moderate to steep slopes.

Significant land development has occurred around Benedict Lake since the writing of the previous lake use report (see Figures 3 and 4). Map 2 and Table 2 show the 2010 land uses in the Benedict Lake watershed. Agricultural lands comprise over 40 percent of all land use, the most between urban and rural use. Wetlands and woodlands comprise another 3 and 5 percent of total land use, respectively. Urban uses account for just over 40 percent of the watershed with low-density single-family residential areas accounting for the majority of residential land use. Projected 2035 land use (Table 2) suggest significant changes within the Benedict Lake watershed. Currently, projections indicate that almost all agricultural lands within the watershed will be converted to residential areas, resulting in an 80 percent decrease in rural lands, and a 100 percent increase in urban lands.

WATER QUALITY

The WDNR re-evaluated Benedict 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; recreational use impairment has not been assessed since 2000, although at that time the Lake met the State threshold.[13]

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. Historically, only limited water quality data was collected at Benedict Lake, starting with a few baseline measurements taken by the WDNR in 1966. From the late 1980s through 2014, Lake residents participated in the University of Wisconsin Extension (UWEX) Citizen Lakes Monitoring Network (CLMN). Citizen volunteers over this time period have measured primarily water clarity, although during 1998 through 2000, chlorophyll-*a* and total phosphorus concentrations were also measured by both CLMN volunteers and US Geological Survey staff.[14] 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.[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 5). "Secchi depth" is the distance below the water surface that a Secchi disk can be seen under carefully prescribed conditions. Secchi depth has been measured in the Lake between June and August from 1989 through 2014 (Figure 6) and indicates fairly steady water clarity that averages approximately 9 feet. Water

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[12] *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.*

[13] *Wisconsin Department of Natural Resources, Benedict Lake, Kenosha County website, "conditions" dnr.wi.gov/water/waterDetail.aspx?wbic=743900.*

[14] *USGS staff also measured pH, dissolved oxygen, and specific conductance during 1997 through 1999 as reported in SEWRPC Memorandum Report No. 140,* op. cit.

[15] *Water quality data and other information about Benedict Lake can be found at the WDNR Lakes page: dnr.wi.gov/lakes/LakePages/LakeDetail.aspx?wbic=743900.*

Figure 3
1970 Aerial Photograph of Benedict Lake

Date of Photography: 1970

N

0 500 1,000 Feet

Source: SEWRPC

Figure 4
2016 Orthophotograph of Benedict Lake

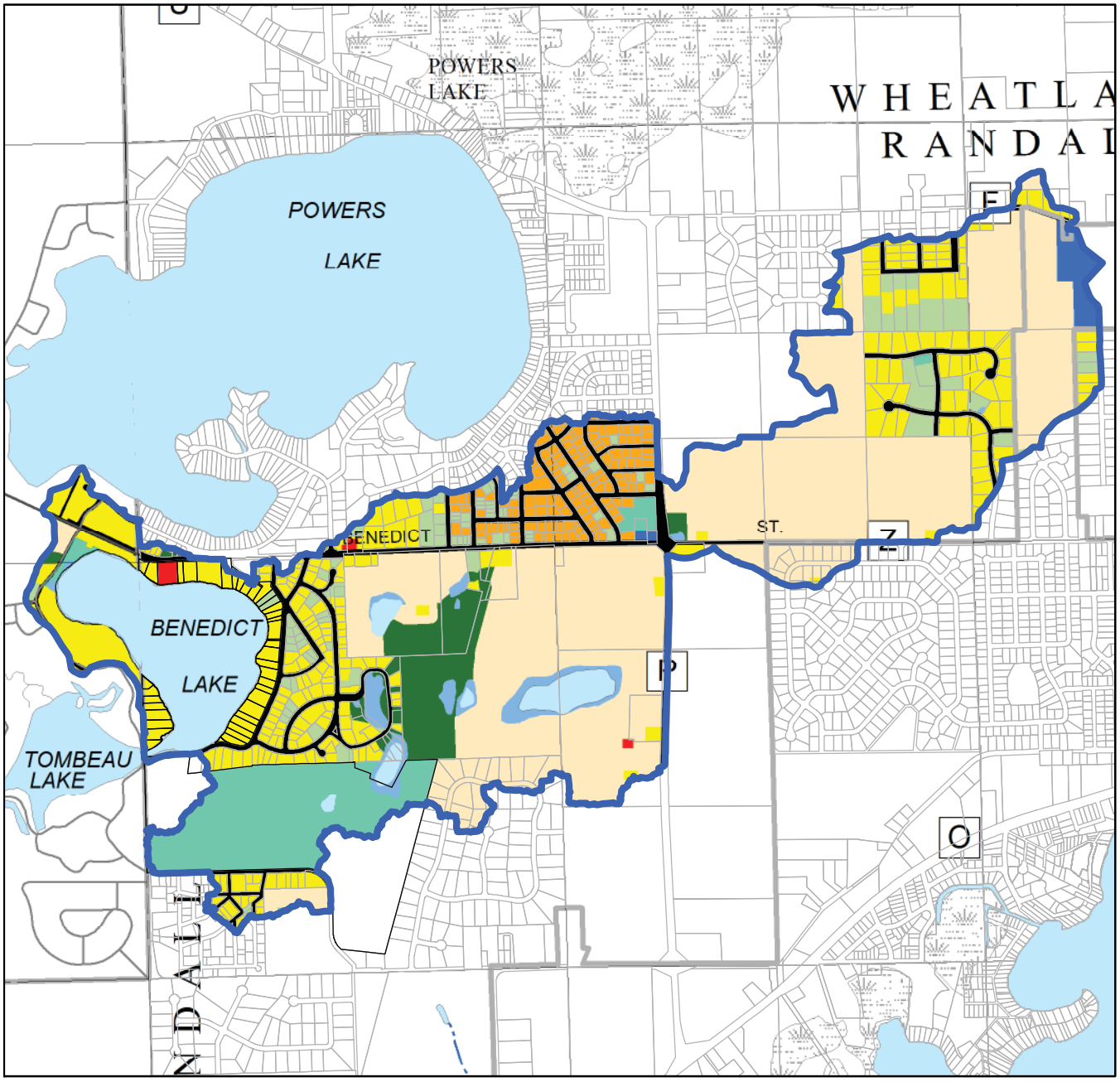
Date of Photography: 2016

N

0 500 1,000 Feet

Source: SEWRPC

Map 2
2010 Land Use Within the Benedict Lake Watershed



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

N

0 1,000 2,000 Feet

Source: SEWRPC

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

Land Use Categories [a]	2010		2035		Change: 2010-2035	
	Acres	Percent of Total	Acres	Percent of Total	Acres	Change
Urban						
Residential						
Single-Family, Suburban Density	--	--	--	--	--	--
Single-Family, Low Density	200	20.9	580	60.8	380	190.0
Single-Family, Medium Density	42	4.4	50	5.2	8	19.0
Single-Family, High Density	--	--	--	--	--	--
Multi-Family	--	--	--	--	--	--
Commercial	2	0.2	2	0.2	0	0
Industrial	--	--	--	--	--	--
Governmental and Institutional	11	1.2	50	5.2	39	354.5
Transportation, Communication, and Utilities	81	8.5	85	8.9	4	4.9
Recreational	81	8.5	81	8.5	0	0
Subtotal	417	43.7	848	88.8	431	103.4
Rural						
Agricultural	404	42.3	1	0.1	-403	-99.8
Other Open Lands	52	5.4	24	2.5	-28	-53.8
Wetlands	29	3.0	29	3.0	0	0
Woodlands	46	4.9	46	4.9	0	0
Water [b]	7	0.7	7	0.7	0	0
Extractive	--	--	--	--	--	--
Landfill	--	--	--	--	--	--
Subtotal	538	56.3	107	11.2	-431	-80.1
Total	955	100.0	955	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 Lake Benedict*

Source: SEWRPC

clarity has also been estimated from satellite imagery[16] in 2000 and 2004, and generally agrees with values actually measured on the Lake. Based upon the available information, Benedict Lake's water clarity is good and has not changed significantly since monitoring began.

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.

Benedict Lake's TSI values are plotted over time in Figure 7. As can be seen from this graphic, TSI values based primarily on Secchi depth data collected between 1989 and 2014 show an average Trophic State Index of 45, which indicates that the Lake is mesotrophic.

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

NATURAL RESOURCES

Aquatic Plants

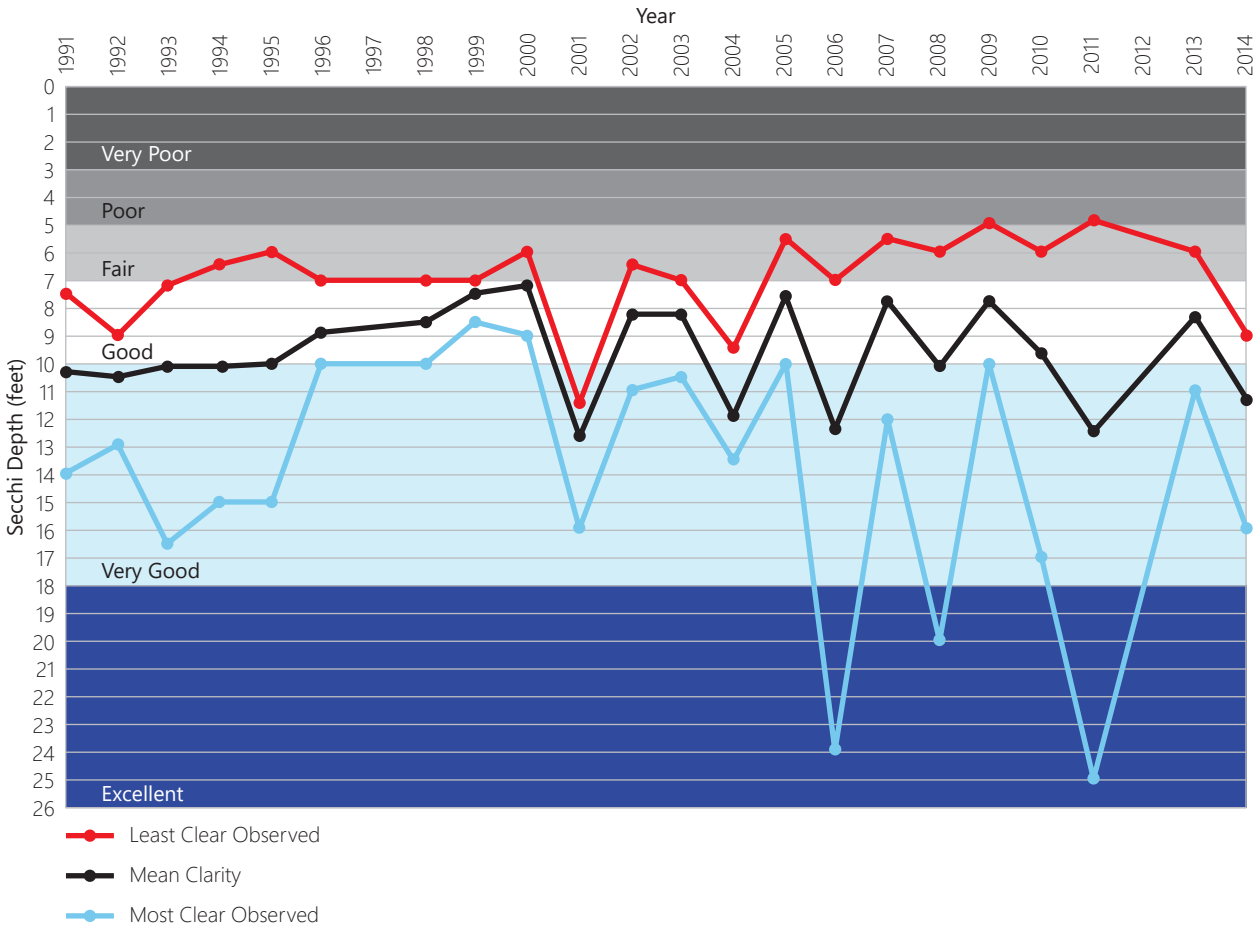
Benedict Lake's aquatic plant community was examined during August 1967 and July, 1998. The 1967 survey was less detailed than subsequent surveys. Table 3 lists the results of these studies.

The 1967 reconnaissance-level survey reported that native water milfoil (*Myriophyllum sibiricum*) was the most dominant species, followed by muskgrasses (*Chara* spp.) and stoneworts (*Nitella* spp.). Overall, fourteen native aquatic plant species were found that year. The 1998 survey indicated that the northwest bay and the southern portions of Benedict Lake contained the most abundant and diverse areas of aquatic plant growth. The most abundant plant species was muskgrass (*Chara* spp.) followed by sago pondweed (*Stuckenia pectinata*) and native water milfoil (*Myriophyllum sibiricum*). A total of thirteen native aquatic plant species were observed and documented within Benedict Lake in 1998. 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.

Figure 5
Measuring Water Clarity with a Secchi Disk

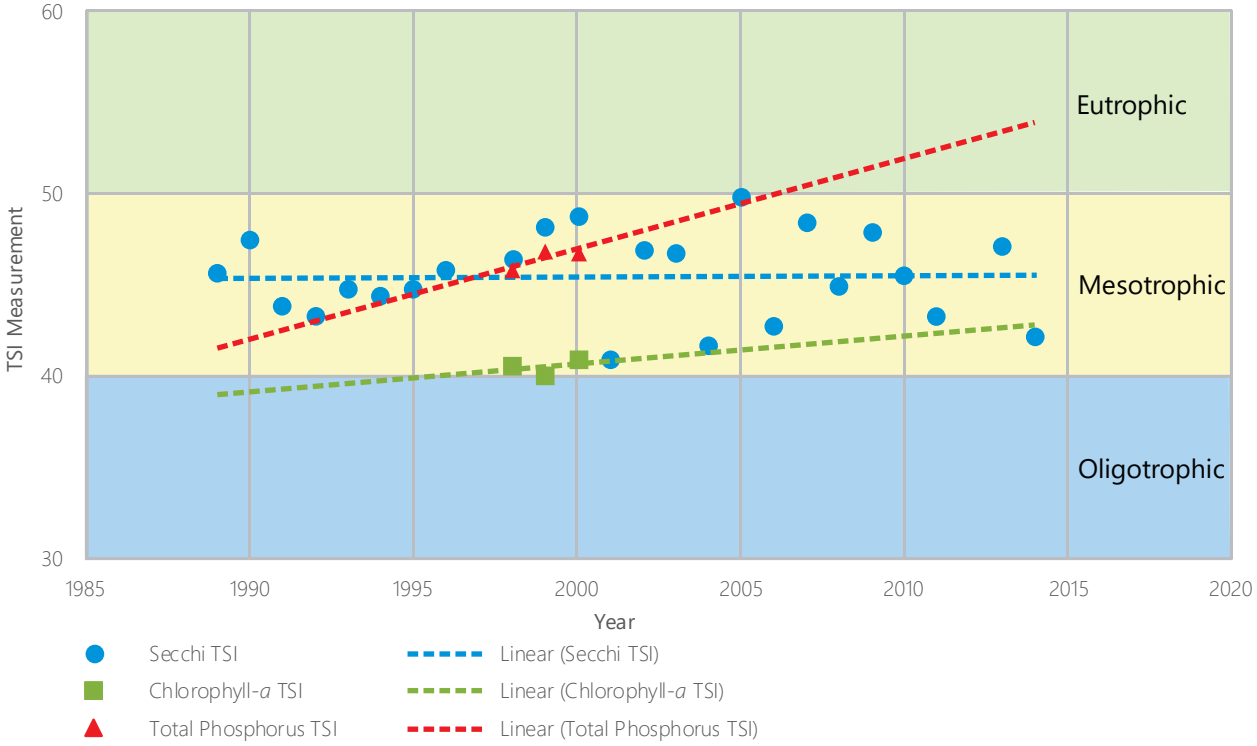
Source: www. burnsville.org and SEWRPC

Figure 6
Summer (June Through August) Secchi Depth Ranges for Benedict Lake



Source: Wisconsin Department of Natural Resources and SEWRPC

Figure 7
Summer (June Through August) Annual Average Trophic State Indices (TSI) for Benedict Lake



Note: June-August data of each year was averaged to produce the resultant values.

Source: Wisconsin Department of Natural Resources and SEWRPC

A diverse array of native aquatic plant species is generally indicative of a healthy aquatic plant community. The most recent aquatic plant sampling effort 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. Three have recently been found in Benedict Lake (water celery, sago pondweed, and Illinois 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 8). 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 hydrids 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

Table 3
Benedict Lake Aquatic Plant Surveys: 1967 and 1998

Aquatic Plant Species	1967 (anecdotal)	1998 (dominance factor)[a]
Floating Plants		
Nuphar variegata (spatterdock)	One bed	--[b]
Nymphaea odorata (white water lily)	Small scattered beds	--[b]
Submerged Plants		
Ceratophyllum demersum (coontail)	--	0.1
Chara spp. (muskgrass)	Small dense patches	111.6
Elodea canadensis (waterweed)	Found in low abundance	0.1
Heteranthera dubia (water stargrass)	--	0.1
Myriophyllum sibiricum (native milfoil)	In belt around shoreline[c]	30.5
Myriophyllum spicatum (Eurasian water milfoil)	--	0.6
Najas flexilis (bushy pondweed)	Found in low abundance	15.4
Najas marina (spiny naiad)	Scattered 17 feet	168.5
Nitella spp. (stonewort)	Present 18 to 25 feet	--
Potamogeton crispus (curly-leaf pondweed)	Small amounts 18 to 25 feet	--
Potamogeton gramineus (variable pondweed)	Found in low abundance	--
Potamogeton illinoensis (Illinois pondweed)	Shore to 17 feet	20.0
Potamogeton natans (floating-leaf pondweed)	Found in low abundance	--
Potamogeton robbinsii (Robbins' pondweed)	Found in low abundance	--
Potamogeton zosteriformis (flat-stem pondweed)	--	3.9
Ranunculus aquatilis (white water crowfoot)	Found in low abundance	--
Stuckenia pectinata (Sago pondweed)	--	83.2
Utricularia vulgaris (bladderwort)	--	1.1
Vallisneria americana (water celery)	--	6.2

Note: 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

[a] *The Dominance Factor is the product of the Relative Frequency of Occurrence of a plant species in the lake (the number of sampling sites where the plant was found compared to the total number of sites where vegetation occurred) and the Relative Density (the average abundance of the plant at each site where the plant occurred), expressed as a percentage. It provides a method for determining the dominance of a species within a community; the higher the value, the more dominant the species*

[b] *This species was observed, but not empirically documented at the time (July 1998)*

[c] *Described by Wisconsin Department of Natural Resources staff as the dominant plant in the Lake at that time (August 1967)*

Source: Wisconsin Department of Natural Resources and SEWRPC

that are commonly used to manage EWM.[17] Eurasian water milfoil was not observed during the 1967 survey. At the time of the 1998 survey, Eurasian water milfoil was only present in small numbers. It is unknown whether the species has become a significant problem in the Lake because there have been no documented aquatic plant surveys in Benedict Lake since 1998.

*Curly-leaf Pondweed (*Potamogeton crispus*)*

Curly-leaf pondweed (see Figure 9) 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 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 and at depths of 18 to 25 feet during the 1967 survey; it was not observed at all during the 1998 survey so it does not appear to be a management issue in Benedict Lake.

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

Figure 8
Eurasian Water Milfoil (*Myriophyllum spicatum*)

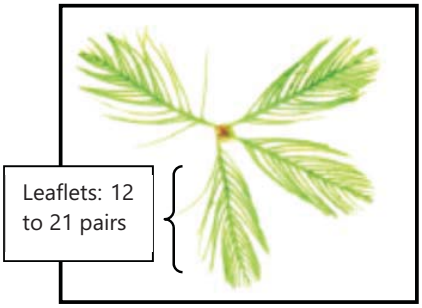
Identifying Features

- 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 (*M. sibiricum*). However, northern water milfoil has five to 12 pairs of leaflets per leaf and stouter white or pale brown stems

Ecology

- 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

*Zebra Mussel (*Dreissena polymorpha*)*

The WDNR also verified the presence of the invasive animal species zebra mussel (Dreissena polymorpha, Figure 10) in 2004. Zebra mussels have known negative impacts on native benthic organism populations that can disrupt aquatic food chains. The mussels also can cause a significant increase in water clarity that can fuel nuisance algae and aquatic plant growth. Water clarity was greater in Benedict Lake in 2004, reaching 12 feet; however, that trend did not continue in the following years. Therefore, Zebra mussels do not appear to be significantly affecting Lake water clarity.

Fisheries and Wildlife

The WDNR conducted fish surveys on Tombeau Lake between 1975 and 1978.[18] It can be assumed that Benedict Lake and Tombeau Lake have similar fish populations because they are connected by a fairly large channel. The surveys determined that the fish community within Tombeau Lake was comprised of bluegill (*Lepomis macrochirus*), pumpkinseed (*Lepomis gibbosus*), green sunfish (*Lepomis cyanellus*), rock bass (*Ambloplites rupestris*), largemouth bass (*Micropterus salmoides*), warmouth (*Lepomis gulosus*), yellow perch

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

Figure 9
Curly-Leaf Pondweed (*Potamogeton crispus*)

Identifying Features

- Stems slightly flattened and both stem and leaf veins often somewhat pink
- Leaf margins very wavy and finely serrated
- Stipules (3.0 to 8.0 millimeters long) partially attached to leaf bases, disintegrating early in the season
- Produces pine cone-like overwintering buds (turions)

Curly-leaf pondweed may resemble clasping-leaf pondweed (*P. richardsonii*), but the leaf margins of the latter are not serrated

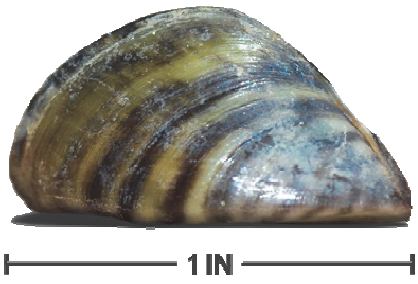
Ecology

- Found in lakes and streams, both shallow and deep
- Tolerant of low light and turbidity
- Disperses mainly by turions
- Adapted to cold water, growing under the ice while other plants are dormant, but dying back during mid-summer in warm waters
- Produces winter habitat, but mid-summer die-offs can degrade water quality and cause algal blooms
- Maintaining or improving water quality can help control this species, because it has a competitive advantage over native species when water clarity is poor

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.

Figure 10
Zebra Mussels (*Dreissena polymorpha*)

- Shell has distinct dark stripes
- Hitches rides to lakes on boats and in water buckets
- Infestations are often followed by abnormally clear waters



Source: Wisconsin Department of Natural Resources, Vic Ramey, University of Florida, Minnesota Sea Grant, Ohio Sea Grant, Texasinvasives.org, and SEWRPC

(*Perca flavescens*), northern pike (*Esox lucius*), grass pickerel (*Esox americanus*), white sucker (*Catostomus commersonii*), lake chubsucker (*Erimyzon sucetta*), bowfin (*Amia calva*), common carp (*Cyprinus carpio*), bullhead (*Ictalurus spp.*), golden shiner (*Notemigonus crysoleucas*), bluntnose minnow (*Pimephales notatus*), spotfin shiner (*Cyprinella spiloptera*), brook silverside (*Labidesthes sicculus*), and johnny darter (*Etheostoma nigrum*). Based on public input, Benedict Lake also contained several other fish species, including: longnose gar (*Lepisosteus osseus*), quillback (*Carpiodes cyprinus*), banded killifish (*Fundulus diaphanous*), blacknose shiner (*Notropis heterolepis*), spottail shiner (*Notropis hudsonius*), pugnose shiner (*Notropis anogenus*), blackchin shiner (*Notropis heterodon*), and least darter (*Etheostoma microperca*). Largemouth bass were the most common species and, to a lesser extent, northern pike could be considered the chief gamefish species according to fishing residents. Walleye (*Sander vitreus*) may have been present, though none have been encountered in surveys since 1969. Since there are no records of any gamefish stocking in Benedict Lake, largemouth bass and northern pike population are assumed to be naturally reproducing.

At the time of the 2001 Commission report, the associated wetlands and undeveloped shorelines within Tombeau Lake continued to provide major northern pike and largemouth bass spawning ground. In addition, nearly all of the Tombeau Lake shoreline was considered suitable as panfish spawning habitat. According to local fishers, panfish species were abundant and carp were perceived as becoming more abundant over the previous five years, a development that could be indicative of deteriorating habitat within the Lake.

Benedict Lake also contains a State-Threatened species of fish, the pugnose shiner, as well as two Special Concern fish species, the lake chubsucker, and the least darter.

Environmentally Significant Areas

The Benedict Lake watershed contains numerous 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, the environmentally significant areas to the east of the Lake represent about 80 acres of woodland, wetland and surface water in the watershed. The primary environmental corridor areas along the Lake's shoreline, together with a large part of Benedict Lake itself, represent a total of over 60 acres of valuable natural areas. Additionally, Benedict Lake has been designated as a lake of countywide or regional significance.

Aesthetic Features

Benedict 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. The high ridges along the north and east shorelands afford opportunities to enjoy scenic vistas overlooking the water. The Lake's lack of embayments or significant stretches of natural shoreline results in some lack of visual interest.

LAKE USE

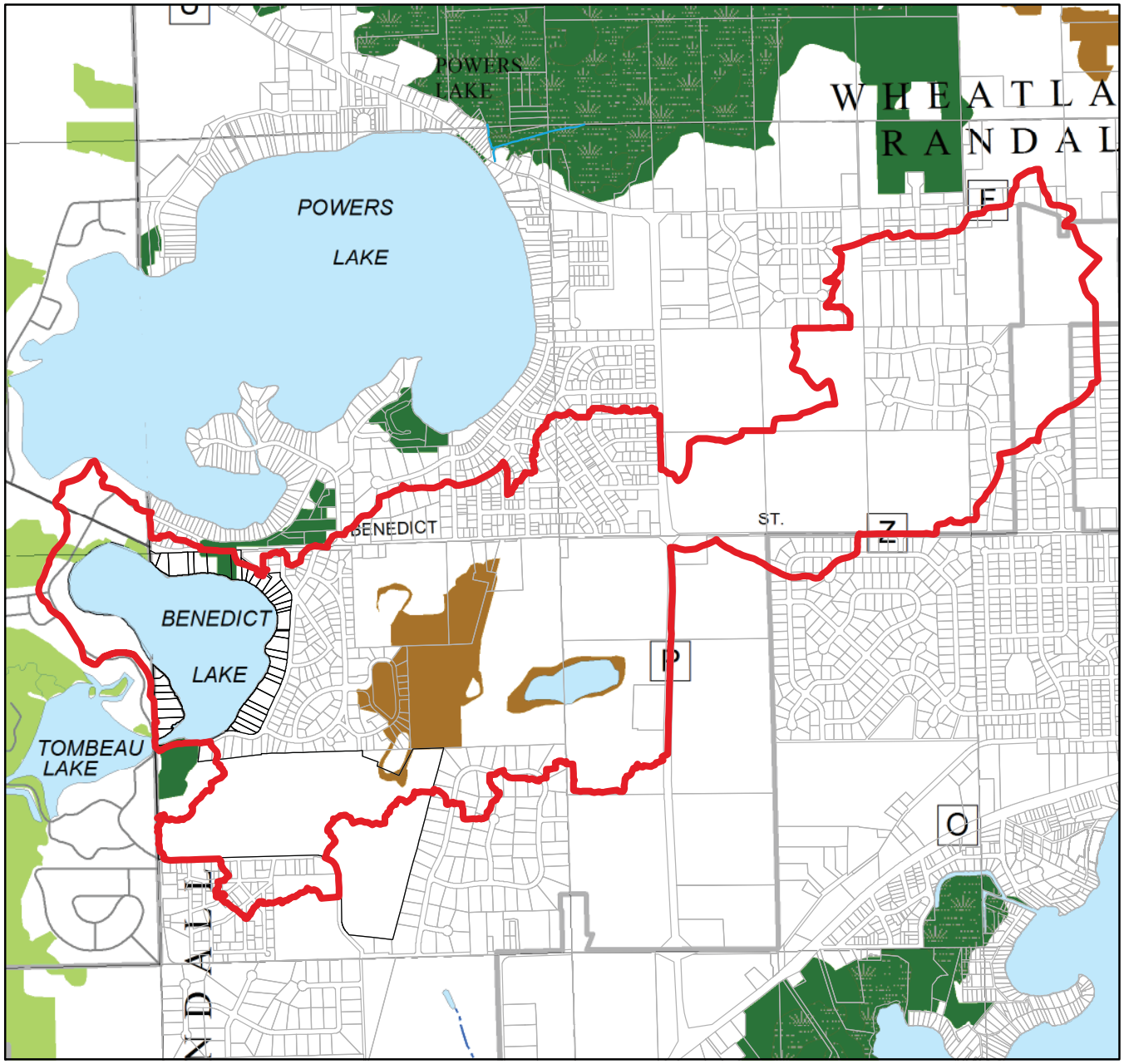
Recreational Use

During the summer and winter of 2014, SEWRPC staff conducted recreational surveys to document public lake use. The surveys showed that fishing and water skiing/tubing were the most popular on-water activities during the summer (Figure 11). Other popular summer activities included low and high speed cruising, kayaking and canoeing, and paddle-boarding. Ice fishing was the most popular winter activity observed, although it can be expected that snowmobiling is a popular pastime, as well (Figure 12).

Public Access

There are no public boat ramps on Benedict Lake. 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*.

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



SURFACE WATER

WATERSHED BOUNDARY

PRIMARY ENVIRONMENTAL CORRIDORS

SECONDARY ENVIRONMENTAL CORRIDORS

ISOLATED NATURAL RESOURCE AREA

WETLANDS

N

0 1,000 2,000 Feet

Source: SEWRPC

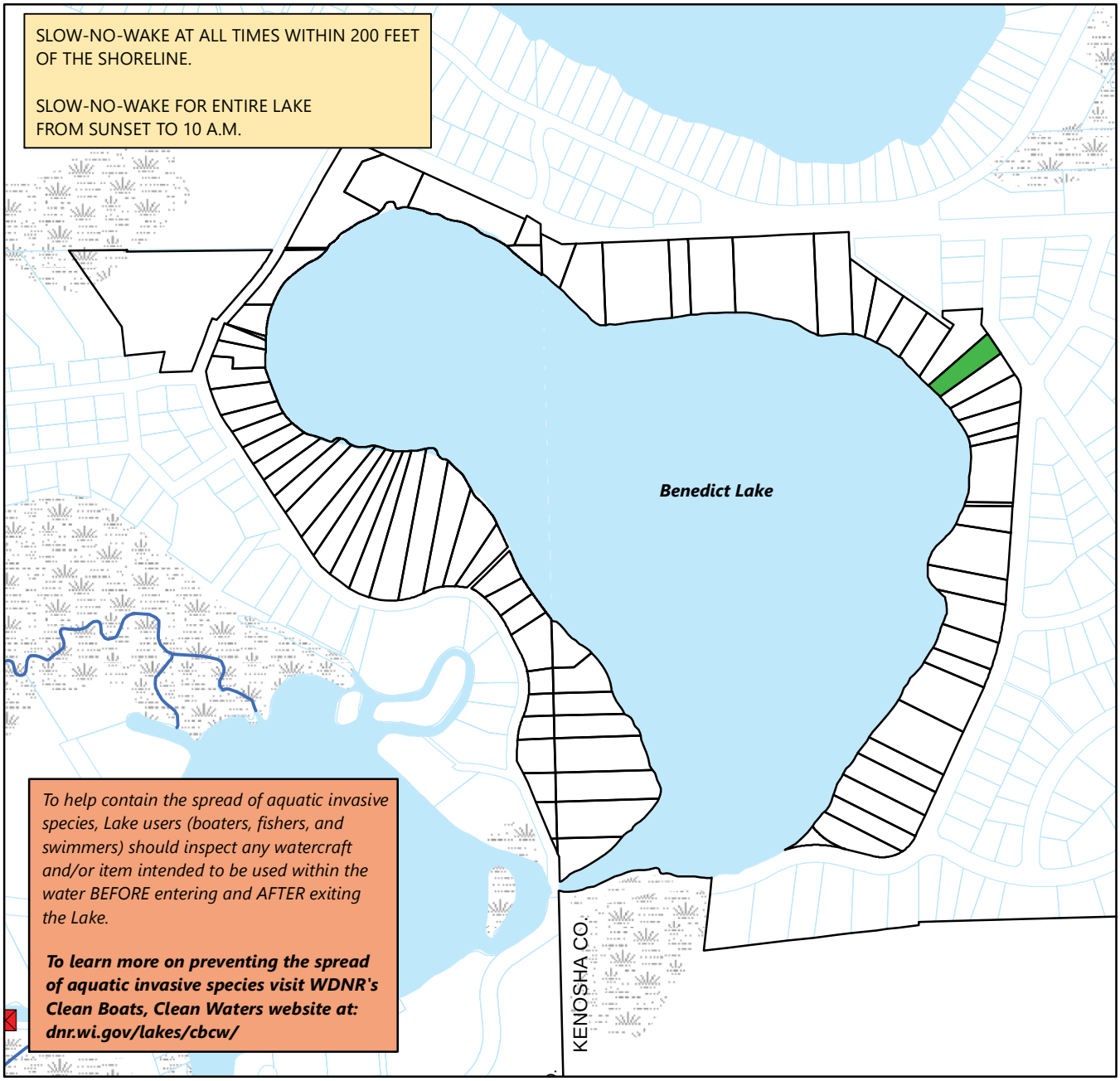
Figure 11
Typical Summer Activities on Benedict Lake

Source: SEWRPC

Figure 12
Typical Winter Activities on Benedict Lake

Source: SEWRPC

Map 4
Recreational Use on Benedict Lake: 2015



Map ID	Description	Facilities							
		Boat Ramp	Fee	Car-trailer Parking	Pier	Swim Beach	Picnic Area	Shelter	Playground
	Town of Randall – Fox Park	No	No	Yes, limited	Yes	Yes	No	No	No

PARCEL BOUNDARY ALONG SHORELINE
SURFACE WATER
WETLAND
STREAM

N

0 300 600 Feet

Source: Wisconsin Department of Natural Resources and SEWRPC

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

Figure 13
Fox Park at Benedict Lake: 2014

Source: SEWRPC

Figure 14
Parking at Fox Park at Benedict Lake: 2014

Source: SEWRPC

Currently, public Lake use is made possible through Fox Park, owned by the Town of Randall (see Figure 13). Fox Park, located along 402nd Avenue (see Map 4) offers a small swimming beach (no lifeguard) and pier. There are two paved parking spaces for cars (see Figure 14), one of which is designated for handicapped use.

Cottages and Homesites

According to recent records, 42 lakefront lots abut Benedict Lake. Lot sizes average 3.6 acre and range from less than 0.1 acre to 124 acres.[19] The population and number of households in Benedict Lake's direct tributary area is projected to increase by 2035 (Table 4).

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

Year	Population	Households
1960	167	43
1970	262	63
1980	375	130
1990	397	128
2000	492	183
2010	889	312
Planned 2035	997	399

Source: U.S. Bureau of Census and SEWRPC

EXISTING PROTECTIVE MEASURES

Sewage Disposal

At present, all riparian residential lands in the Benedict Lake watershed are served by unrefined public sanitary sewer systems. As such, a number of residential lands are still served by onsite septic systems. Such systems need to be conscientiously maintained and inspected to ensure operation compliant with county and or local ordinances.

Shoreline Protection and Erosion Control

Benedict 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 70 percent of the shorelines of Benedict and Tombeau Lakes' shorelines remain in a natural state without manmade shoreline protective structurers such as riprap, or bulkhead. No major areas of shoreline erosion were recorded during a survey conducted by SEWRPC in August 2014.[20]

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. Benedict Lake and its watershed are subject to ordinances and regulations developed jointly by the Town and Village of Randall, Kenosha County, and the Village of Bloomfield, Walworth County. Table 5 shows the general and special-purpose zoning ordinances for the civil divisions that are part of the Benedict Lake watershed.

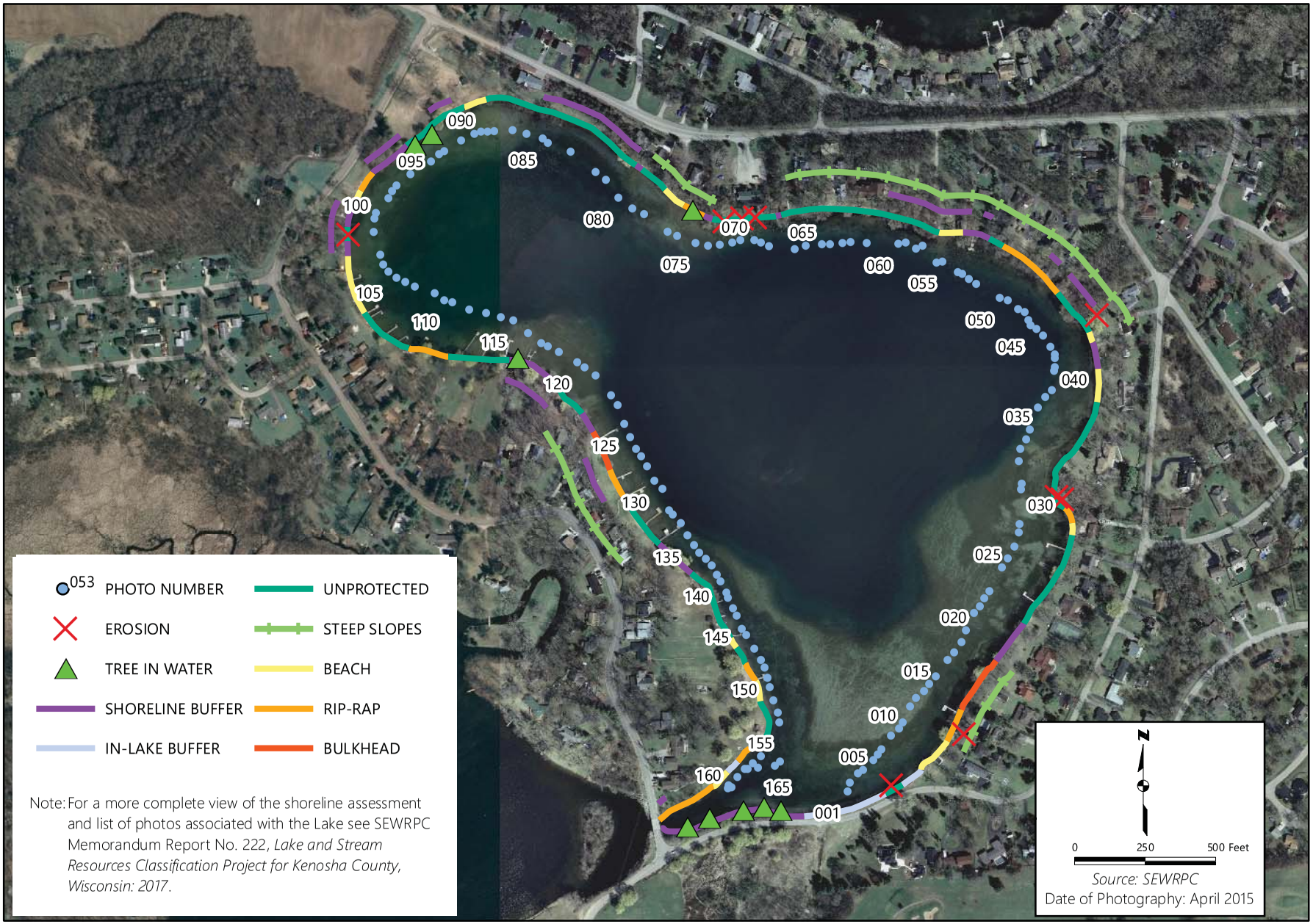
Water Use Regulations

Benedict Lake (as well as Tombeau Lake) is subject to a Water Use Ordinance promulgated jointly by the Towns of Randall, Kenosha County, and the Village of Bloomfield, Walworth County, as Chapter 20 of the Town 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 Benedict Lake within the jurisdictions of the Town and Village and limits the times during which boats may operate on Benedict Lake. The ordinance also allows for the enactment and enforcement of boating restrictions and limitations.

[19] *SEWRPC Memorandum Report No. 222,* op. cit.

[20] Ibid.

Map 5
Shoreline Survey of Benedict Lake: 2014



Note: For a more complete view of the shoreline assessment and list of photos associated with the Lake see SEWRPC Memorandum Report No. 222, *Lake and Stream Resources Classification Project for Kenosha County, Wisconsin: 2017*.

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

Type of Ordinance	Community			
	Kenosha County	Town of Randall	Walworth County	Village of Bloomfield
General Zoning	Adopted	Regulated under County ordinance	Adopted	Regulated under County ordinance
Floodplain Zoning	Adopted	Regulated under County ordinance	Adopted	Regulated under County ordinance
Shoreland Zoning	Adopted	Regulated under County ordinance	--	--[a]
Subdivision Control	Adopted[b]	Adopted[b]	Adopted	Regulated under County ordinance
Construction Site Erosion Control and Stormwater Management	Adopted	Regulated under County ordinance	Adopted[c]	Regulated under County ordinance

[a] *The Village of Bloomfield has adopted shoreland zoning regulations similar to those required for unincorporated areas under Chapter NR 115 of the* Wisconsin Administrative Code, *which are more restrictive than the shoreland regulations for villages required under Chapter NR 117 of the* Administrative Code *and Section 61.353 of the* Wisconsin Statutes

[b] *Both the Kenosha County and Town of Randall subdivision ordinances apply within the Town of Randall. In the event of conflicting regulations, the more restrictive regulation applies*

[c] *The Walworth County ordinance regulating erosion control and stormwater management is referred to as the County "Environment" Ordinance*

Source: SEWRPC