Chapter 7
Wonder Lake Subwatershed Assessment

This section presents a summary of the characteristics of the Wonder Lake Subwatershed, as well as specific issues and challenges in this subwatershed that must be addressed in the Nippersink Creek Watershed Management Plan.

7.1 Subwatershed Characteristics

The following section provides an overview of the physical characteristics of the subwatershed.

7.1.1 Subwatershed Location

The Wonder Lake Subwatershed is located in the southeastern portion of the Nippersink Creek Watershed, and has a drainage area of 7,884 acres (12.3 square miles). The boundary of the subwatershed shown in Figure 7.1, and includes all land that drains directly into Wonder Lake. The subwatershed is centered on the north-south border between Greenwood Township and McHenry Township. The northern boundary of the subwatershed is located at the dam embankment at the north end of Wonder Lake. The southern boundary is roughly parallel with Illinois Route 120, ranging from ½ mile to one mile south of Route 120. The eastern boundary is just west of Ringwood Road and the western boundary is just east of Greenwood Road.

Figure 7.1

Wonder Lake Subwatershed Location Map

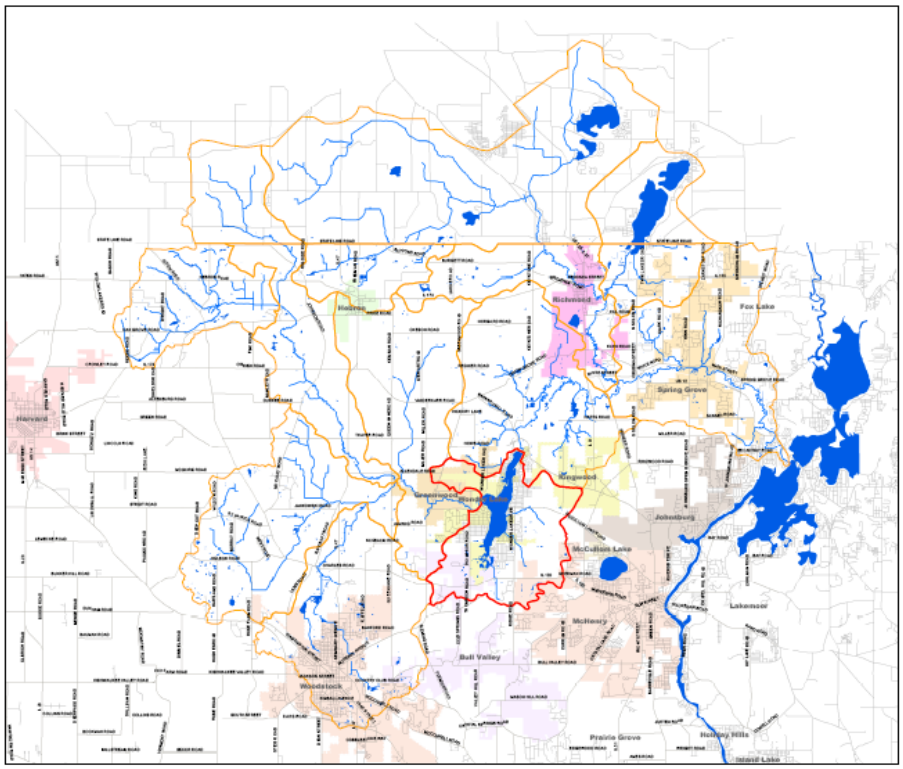
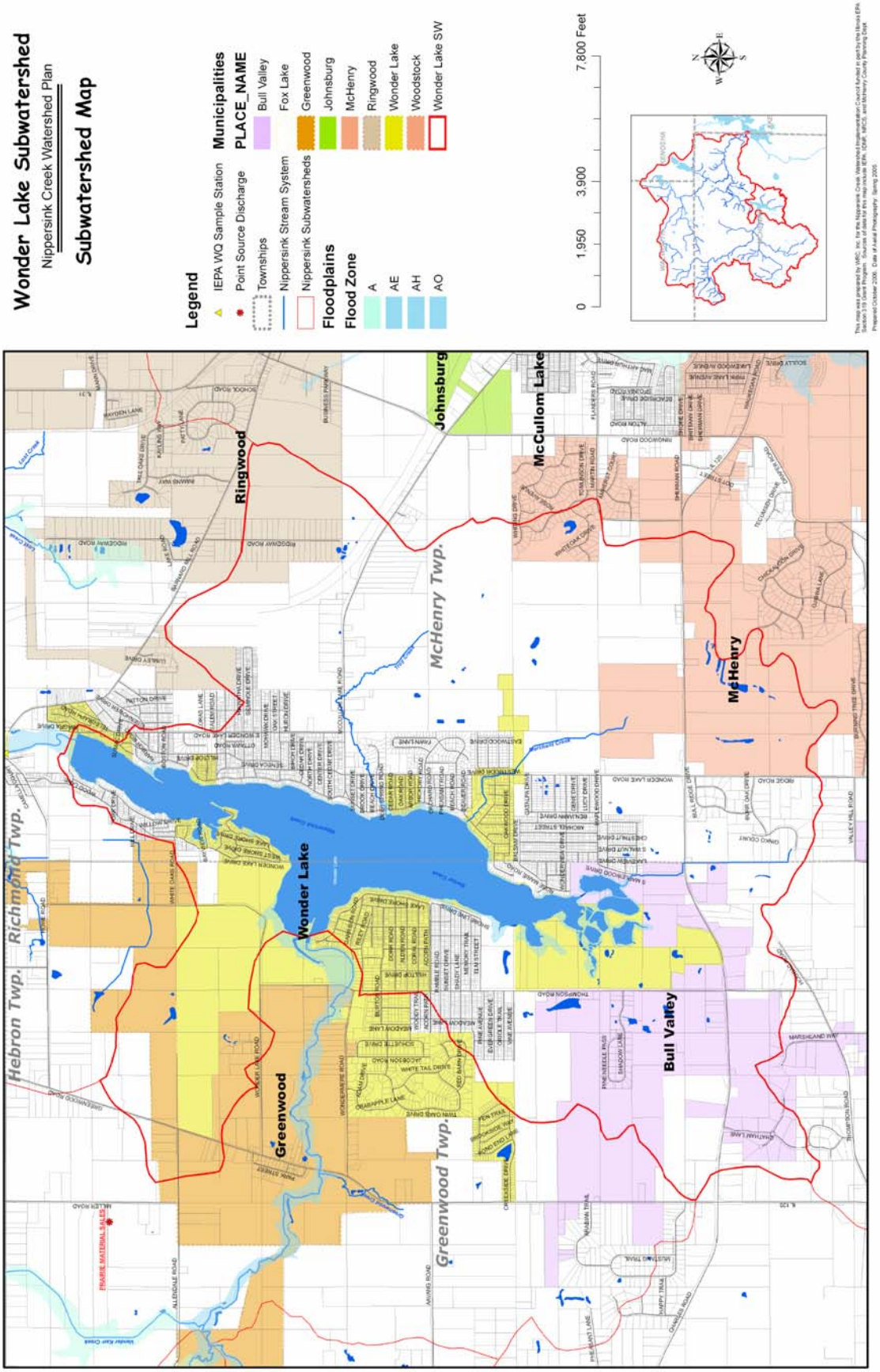


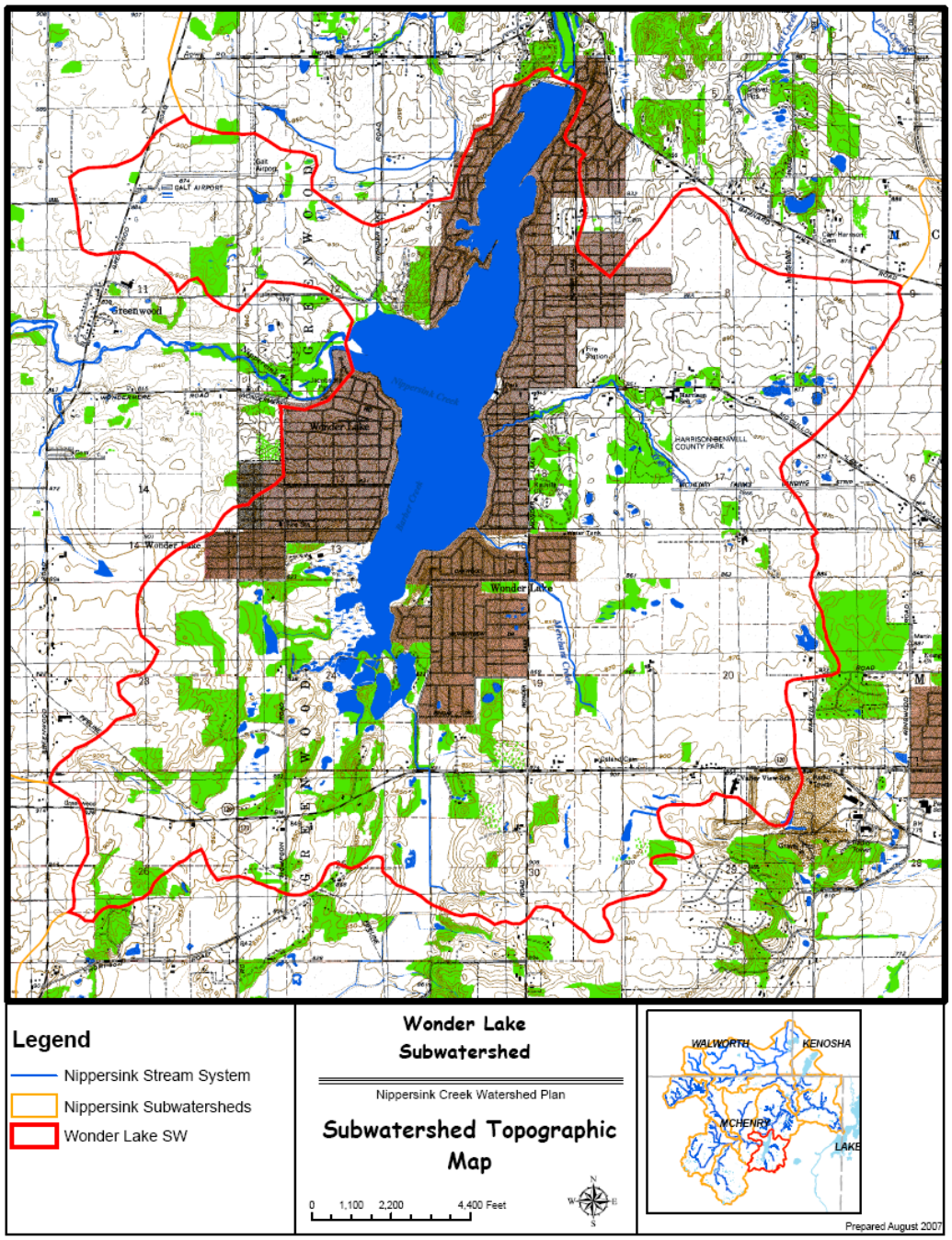
Figure 7.2 Wonder Lake Subwatershed Map



7.1.2 Topography & Geology

The topography of the subwatershed is somewhat unique in that it slopes to the center of the subwatershed, which has been dammed to create Wonder Lake. Slopes are generally steep, ranging from 3% to 5% along much of the valley that slopes towards the lake. The land east of Wonder Lake is considerably more flat, with 1% - 2% slopes east of Wonder Lake Road. The maximum elevation in the subwatershed is around 940 feet above MSL near the intersection of Ridge Road and Valley Hill Road, and the minimum elevation is 804 at the subwatershed outlet at the Wonder Lake Dam.

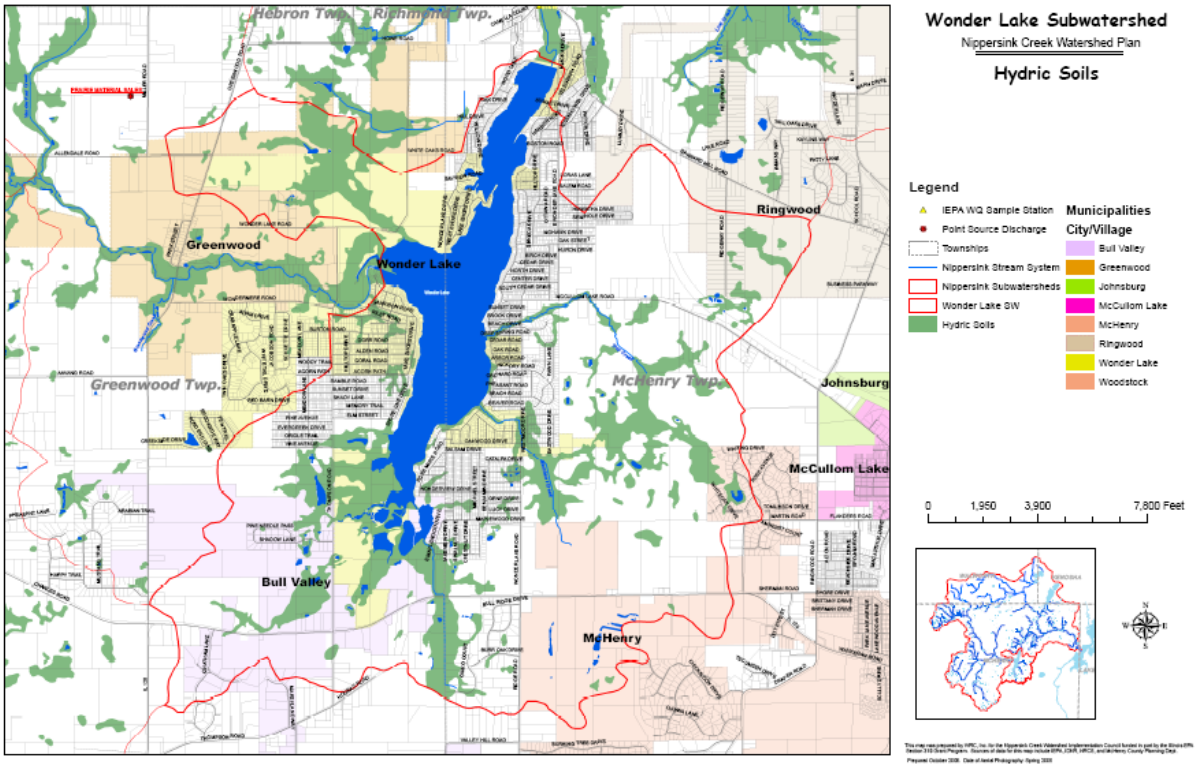
Figure 7.3 USGS Topographic Map of the Wonder Lake Subwatershed



7.1.3 Soil Characteristics

The glacial advances across McHenry County resulted in a wide variety of soil associations. The soils in the subwatershed consist of mostly silty and silty loams soil units on 2% - 5% slopes. Each major grouping of soil associations has potential impact on current and future land uses within the subwatershed. For example, hydric (wetland) soils constitute 1,207 acres, or 15% of the 7,884 acre subwatershed, and indicate those areas that contain functional wetlands, or former / degraded wetland areas that could be restored or enhanced.

Figure 7.4 Hydric Soils Map for the Wonder Lake Subwatershed



7.1.4 Pre-Settlement Vegetation

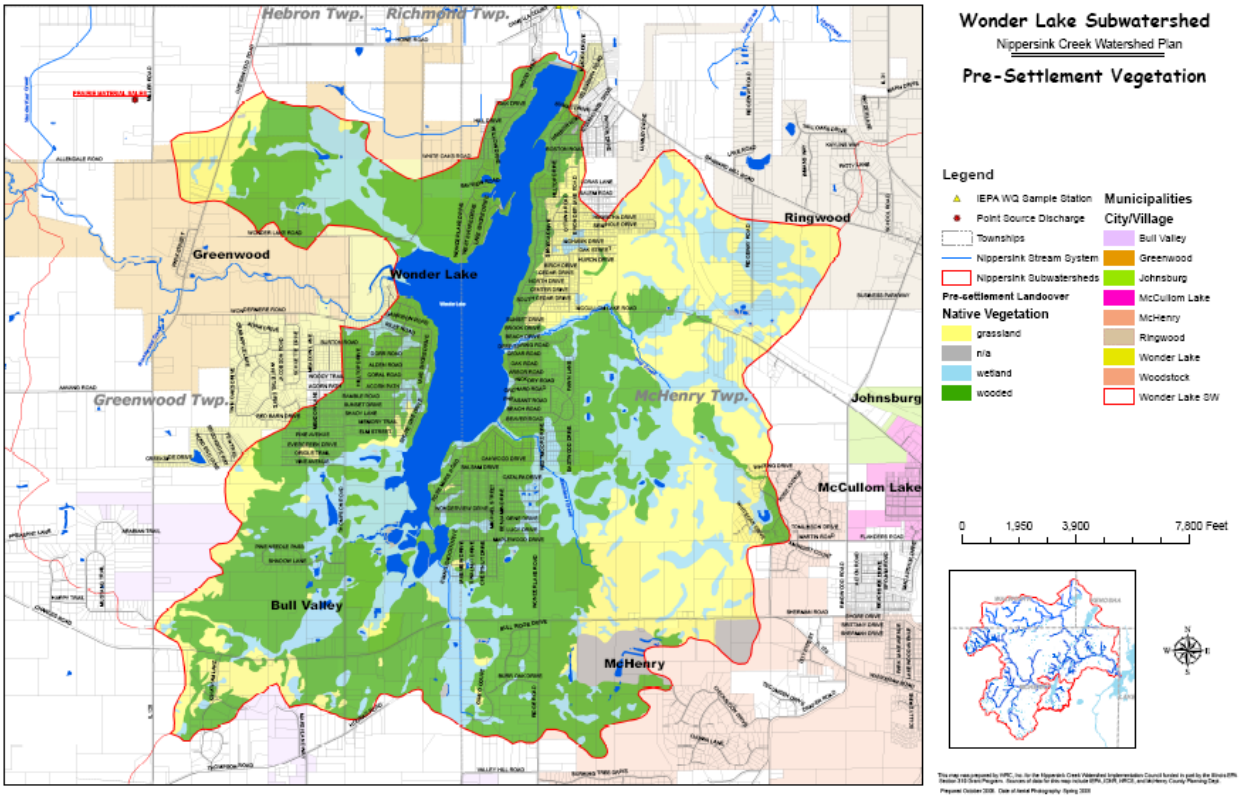
To guide future land management or restoration efforts, it is important to recognize the native plant communities that naturally evolved subsequent to the last glacial advances. Prior to European settlement in the 1830's, the Wonder Lake Subwatershed was fairly evenly divided between grasslands, woodlands, and wetlands, as described in Table 7.1, and depicted in Figure 7.5. Woodlands dominated the southern half of the subwatershed; wetlands the northwestern portion, and prairies communities thrived in the northeastern portion of the subwatershed.

Table 7.1 Pre-Settlement Land Cover Conditions

Cover Type	Area	Percent of Subwatershed
Grasslands	3,430 acres	29%
Wooded	4,460 acres	37%
Wetlands	3,978 acres	33%
n/a	141 acres	1%

Source: MCCD Soils Analysis using GIS data

Figure 7.5 Pre-settlement Vegetation for the Wonder Lake Subwatershed



7.1.5 Subwatershed Drainage Features

Streams

The principal stream in the Wonder Lake Subwatershed is Nippersink Creek, which was dammed in 1929 to form Wonder Lake.

There are four tributary streams in the Wonder Lake subwatershed; three of these drain the southern and eastern portions of the subwatershed. Barber Creek drains the low-lying area south of Wonder Lake. This area is relatively low-lying up to the subwatershed boundary, and may have provided an interconnection between Nippersink Creek and Boone Creek.

The second tributary is Merchant Creek. This stream originates in the 15+ acre woodland northeast of the Wonder Lake Road / Illinois Route 120 intersection. The upper 60% of the stream is not maintained and flows through a large farmed wetland complex before entering a highly urbanized area on the edge of Wonder Lake. The stream channel is extensively channelized along Wonder Lake Road.

The third tributary is Troy Creek. Troy Creek originates at a drain tile outlet in the farm field just southeast of the MCCD Harrison-Benwell property. The stream travels northwest and crosses under McCullom Lake Road twice before flowing west into Wonder Lake. The first ¼ mile of the stream east of Wonder Lake passes through an older, high-density residential area and urban encroachment has taken a significant toll on the integrity of the stream's condition. Upstream of Wonder Lake Drive, the stream corridor is fairly well preserved and flows through the Harrison-Benwell McHenry County Natural Area Inventory (MCNAI) Site.

The fourth tributary is Galt Creek. Galt Creek originates between Galt Airport and West Wonder Lake Road, and flows southeast, entering the West Bay of Wonder Lake.

Channelization Analysis of aerial photography indicates that the streams in the Wonder Lake SW have been subjected to extensive channelization. Of the 9.37 miles of stream channels in the subwatershed, about 83% have been ditched and channelized.

Stream Channel Condition There is no documented information regarding stream conditions in the Wonder Lake Subwatershed.

Impoundments The major impoundment in the subwatershed is Wonder Lake. Wonder Lake is an 830 acre, man-made reservoir built by constructing a dam across Nippersink Creek near Barnard Mill Road in 1929. The lake is considered part of the Village of Wonder Lake and there are more than 6,000+ residents who live around the lake, making it, without a doubt, the focal point and major surface water resource of the region. The lake has been the subject of numerous studies over the years to attempt to solve the sediment and nutrient loading problems that have caused the water quality of the lake to decline.

Excluding Wonder Lake itself, there are 90 impoundments or open water features (ponds, lakes, or wetlands) within the subwatershed, ranging in size from less than a 1/10th acre to about 13 acres. About half of the impoundments appear to have been manmade ponds or small lakes constructed for either landowner recreation or for agricultural purposes. Many of them may have been isolated wetland pockets that were excavated to create a permanent open water feature.

Manmade Drainage Systems

Although storm sewer information was not available from the municipalities in the subwatershed, the age and density of several developed areas in the subwatershed suggest that storm sewers are in place and play a critical role in the collection and conveyance of runoff into Wonder Lake and its tributaries. The Village of Wonder Lake, as well as the unincorporated developments along the east side of Wonder Lake, contains several storm sewer networks. In 2005, the Village of Wonder Lake conducted a storm sewer inventory, and identified numerous storm sewer outfalls draining directly into Wonder Lake, or its tributary streams. None of these storm sewer systems were designed to provide any type of water quality treatment benefits to improve water quality draining to the lake. This is not surprising given the age of these systems.

Agricultural Tile Systems

There are likely extensive underground drain tile systems in the northern and western portions of the subwatershed, as these areas are largely agricultural in nature. These systems, installed to increase the productivity of the regions rich soils, were likely installed more than fifty years ago by private property owners and therefore there is little documented information about there size and exact location, although their distribution can be general determined by inspection of a combination of aerial photographs, hydric soils and topography. Based on preliminary observations as part of this subwatershed assessment, it appears that there are several small to medium size agricultural drain tile networks that provide subsurface drainage to many farmed parcels that are adjacent to the tributary streams in the subwatershed.

Identifying agricultural drain tile networks is important in watershed planning because current local flooding and drainage problems can often be linked to damage or age-related failure of drain tile systems. From a watershed preservation / restoration perspective, it is important to identify functional drain tile systems to determine opportunities for their removal or reconfiguration for the purposes of restoring valuable wetland habitat, and water quality benefits. No doubt many of the depressional and low lying areas in the subwatershed that are serviced by drain tiles today for agriculture were once wetland habitats that supported a very diverse ecosystem.

Floodplains

The 100-year Floodplain for Wonder Lake and Nippersink Creek was calculated and mapped during the 1980s. The regulatory floodway has also been determined for the Lake and stream. The floodplain for the four tributary streams (Troy, Merchant, Barber, and Galt) has not been calculated and, therefore, exact floodplain elevations for these streams are unknown.

7.1.6 Population

Population data in watershed planning is critical because there is a direct correlation between the number of people residing in a watershed and the degree of impacts to the quality and quantity of the watershed's natural resources. Using US Census data compiled by the Fox River Study Group for the Nippersink Creek subwatershed, past population data are available for the Wonder Lake Subwatershed. This data indicated that in 1990 about 5,300 people lived in the subwatershed, which equated to 439 persons per square mile. According to the 2000 US Census, the population increased to more than 6,800 people, or about 560 persons per square mile. This represents an increase of about 28% in 10 years. The actual population in the subwatershed in 2007 has likely increased by several hundred residents, as residential development on the east side of the subwatershed has continued at a steady rate since the last population census in 2000.

As an example, the Village of Wonder Lake had a population of 1,345 in the 2000 US Census. A special census, conducted by the Village in 2005, identified a population of 2,725. Another special census of the Village is proposed in 2008, for which a population approaching 4,000 is anticipated. It should be noted that some of this population increase can be attributed to the annexation of unincorporated subdivisions, but some is also attributed to new residential development.

7.1.7 Land Cover

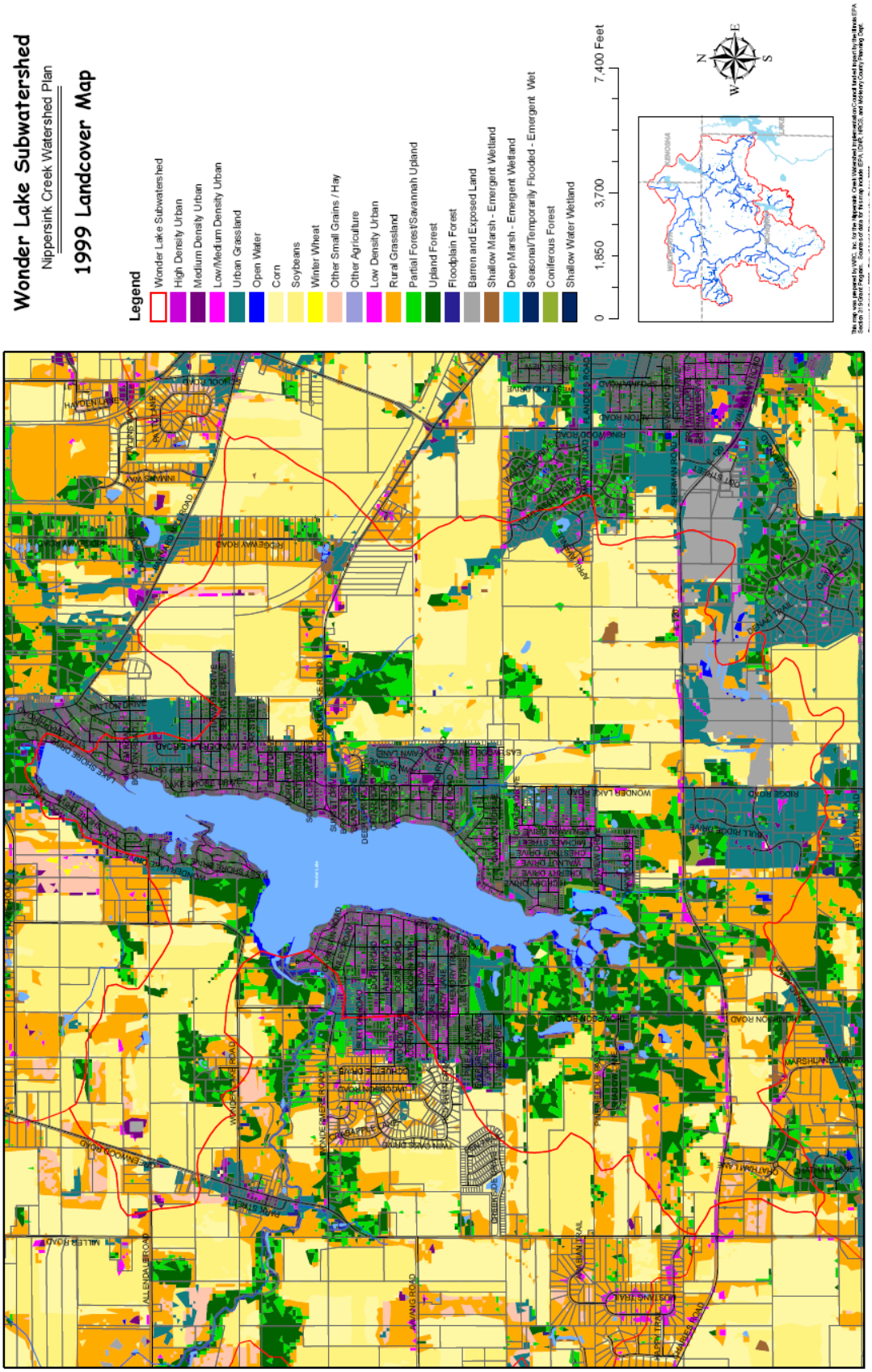
Often, the terms Land Use and Land Cover are used interchangeably. However there are differences. Land use refers to how land is used by humans. On the other hand, Land Cover refers to the vegetation, structures, or other features that cover the land.

Land cover data for the Wonder Lake Subwatershed is available from the Illinois Department of Natural Resources using LANDSAT data collected in 1999. The dominant land cover, according to this data, was row crop agriculture, which accounted for roughly 36% of the subwatershed area. Rural grasslands, including pasture lands and nurseries accounted for another 12% of the subwatershed. These two land cover categories account for 48% of the subwatershed. Developed land (urban & urban grasslands) accounted for 15.5% of the subwatershed area in 1999-2000. New development has occurred since then in the subwatershed, increasing the total amount of developed area at this time to around 20%.

Table 7.2 1999 Land Cover for the Wonder Lake Subwatershed

Land Cover Description	Total Acres	Percent of Subwatershed
Barren & Exposed Land	174.9	2.2%
Corn, Soybeans, Other Small Grains & Hay (row crop)	2,831.0	35.9%
Rural Grassland	973.6	12.4%
Low Density Urban	329.1	4.2%
Medium Density Urban	255.9	3.2%
High Density Urban	11.2	0.1%
Urban Grassland	629.7	8.0%
Shallow Marsh – Emergent Wetland	92.0	1.2%
Partial Forest /Savannah Upland	479.6	6.1%
Upland Forest	1,270.5	16.1%
Floodplain Forest	30.0	0.4%
Coniferous Forest	10.7	0.1%
Deep Marsh / Emergent Wetland	10.9	0.1%
Open Water	781.2	9.9%
TOTAL	**7,880.3**	**100.0%**

Figure 7.6 1999-2000 Land Cover Map for the Wonder Lake Subwatershed



7.1.8 Existing Land Use / Watershed Development

According to the 2005 McHenry County Land Use / Zoning map, 49% of the subwatershed is zoned agriculture, while about 32% is either already developed or zoned for development in the near future. Approximately 10% is classified as open space

Table 7.3 McHenry County 2005 Land Use in the Wonder Lake Subwatershed

Land Use	Total Acres	Percent of Subwatershed
Vacant	2.2	0.0%
Vacant; Zoned Residential	753.0	9.6%
Vacant; Zoned Commercial	8.3	0.1%
Agricultural	3,862.5	49.0%
Single Family Residential	1,646.7	20.9%
Multi-Family Residential	0.16	0.0%
Commercial	77.9	1.0%
Office	0.23	0.0%
Industrial	0.36	0.0%
Mixed Use	0.65	0.0%
Mining	183.7	2.3%
Open Space	793.9	10.1%
Institutional	64.8	0.8%
Right of Way	489.7	6.2%
TOTAL	**7,884.1**	**100.0%**

Source: 2005 McHenry County Land Use Zoning Data

Developed land accounted for about 27% of the subwatershed, consisting mostly of medium density urban lands and adjacent urban grasslands (lawns). To date, municipal expansion and annexation accounts for 50% of the total subwatershed area, although Wonder Lake is in the process of annexing a 1,400+ acre development on the east side of Wonder Lake between Wonder Lake Road, McCullom Lake Road and IL Route 120. This annexation will nearly double the Village of Wonder Lake's boundary area within the subwatershed and increase the total municipally controlled land in the subwatershed to more than 65%.

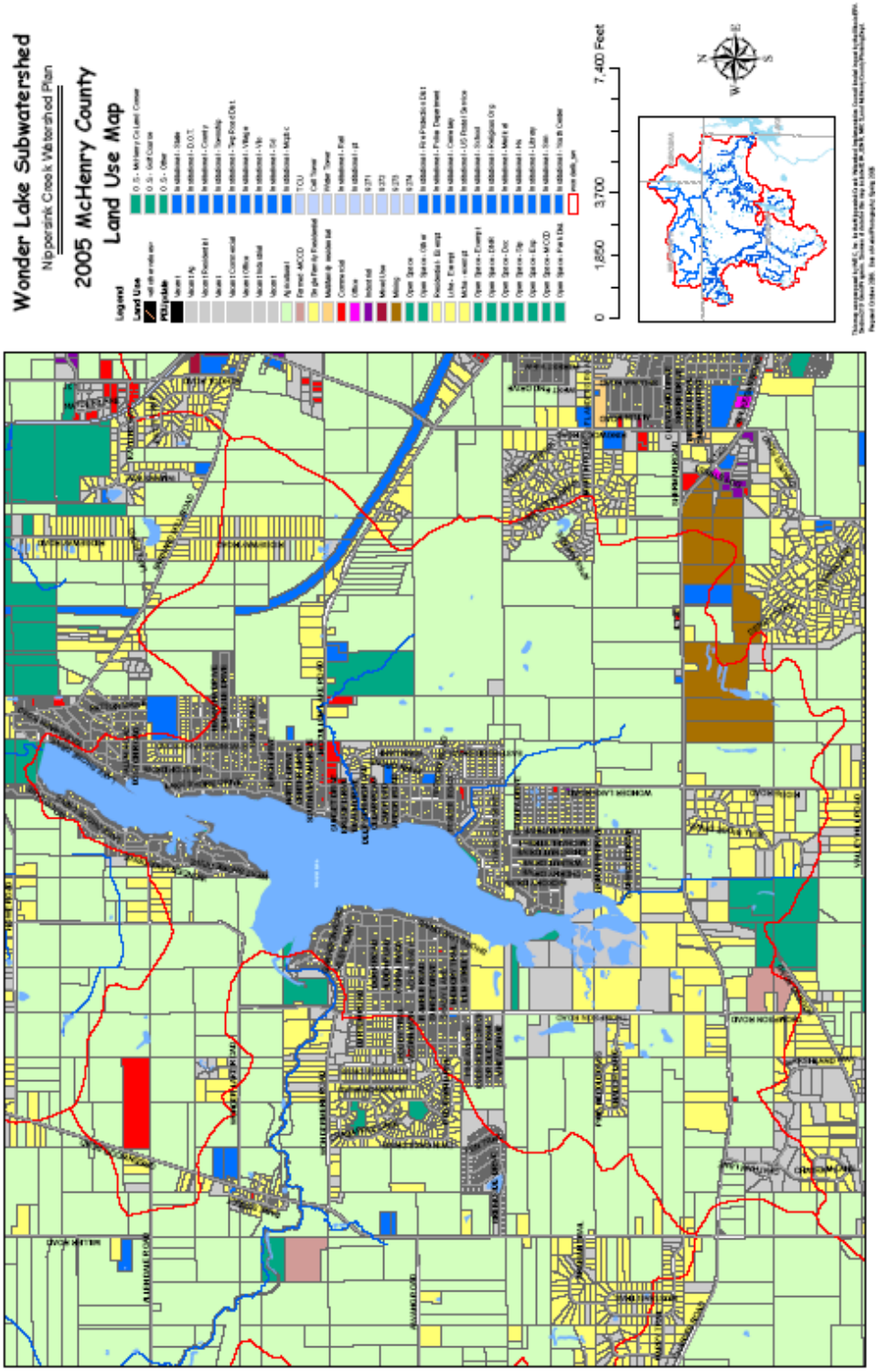
Table 7.4 Municipal Areas in the Wonder Lake Subwatershed

Municipality	Area (acres)	Percent of Subwatershed
Village of Bull Valley	891.3	11.3%
Village of Greenwood	300.3	3.8%
City of McHenry	699.1	8.9%
Village of Ringwood	281.8	3.6%
Village of Wonder Lake	1,769.1	22.4%
Unincorporated	3,942.5	50%

Permit Point Source Discharges There are no permitted discharges in the Wonder Lake Subwatershed, according to the IEPA NPDES database.

Road Network An analysis of GIS roadway data indicates that there are 65.7 miles of roads in the subwatershed. This is approximately 223 acres of pavement.

Figure 7.7 2005 McHenry County Land Use Map for the Wonder Lake Subwatershed



7.1.9 Natural Resources

McHenry County Conservation District Property

The McHenry County Conservation District (MCCD) owns five natural area properties within the Wonder Lake Subwatershed. These properties account for about 2% of the subwatershed area.

Table 7.5 MCCD Properties in the Wonder Lake Subwatershed

Name	Area in Subwatershed (acres)	Total MCCD Site Acreage
Boone Creek	104.5	391.0
Harrison-Benwell	74.8	74.8
Glacial Park	3.4	3,264.2
Total	**182.7**	

McHenry County Natural Areas Inventory

There are eight McHenry County Natural Area Inventory (MCNAI) Sites within the subwatershed, representing nearly 8% of the subwatershed area.

Table 7.6 McHenry County Natural Areas Inventory Sites in the Wonder Lake Subwatershed

MCNAI Site ID #	Name	Area in Subwatershed (acres)	Total NAI Site Acreage
GRE10	South Wonder Lake Wetland	423.3	423.3
GRE13	Wonder Lake Sedge Meadow	48.5	79.0
GRE04	Galt Airport Sedge Meadow	33.1	47.9
GRE11	Thompson Road Meadow	6.8	85.3
GRE12	Wonder Lake Prairie	34.4	34.4
MCH05	Harrison-Benwell Two	33.0	33.0
MCH06	Harrison-Benwell Wetland	13.4	13.4
MCH04	East Wonder Lake Sedge Meadow	25.7	25.7
RIC06	Glacial Park / Tamarack Farms	4.3	4,673.8
	Total	**623.0**	

These natural areas contain several significant natural features, including sedge meadows, a graminoid fen, a dry gravel prairie, and wet silt loam prairie.

Of the 623 acres of identified Natural Area Inventory Sites, only portions of the Harrison-Benwell MCNAI sites are protected through public ownership. These total only 13 acres. These protected properties represent only about 2% of MCNAI sites in the subwatershed.

Wetlands

McHenry County completed an Advanced Identification (ADID) Wetland Study in 1998. This study identified a total of 1,608.3 acres of wetlands, or 20.4% of the subwatershed. Of these wetlands, 620.4 acres (38%) were determined to be of High Quality or High Functional Value, rating an ADID classification.

Table 7.7 Mapped Wetlands in the Wonder Lake Subwatershed

ADID Code	Wetland Type	# of Wetlands	Total Area
FW	Farmed Wetlands	28	172.2
HFVW	High Functional Value Wetlands	8	101.4
HQL	High Quality Lakes	0	0
HQW	High Quality Wetlands	13	519.0
L	Lakes	1	689.9
W	Other Wetlands (lower quality)	49	125.8
	TOTAL	**99**	**1,608.3**

The most significant wetland in the subwatershed is the 603 acre high quality wetland found within the Wonder Lake Marsh Fen NAI site. Currently considered a high-quality wetland complex, this wetland is threatened by invasive species intrusion (reed canary grass, cattails), artificially maintained water levels, siltation, and encroachment by development.

Threatened & Endangered Species

The McHenry County Natural Area Inventory database has identified at least three threatened species of plants and animals that inhabit the remaining natural areas of the subwatershed.

Table 7.8 Threatened and Endangered Species in the Wonder Lake Subwatershed

Common Name	Scientific Name	Type	Status	Source
Savanna Pinweed	Lechea intermedia	Plant	St Threatened	GRE12
Dog Violet	Viola conspersa	Plant	St Threatened	MCH06
Blanding's Turtle	Emydoidea blandingii	Reptile	St Threatened	GRE10

Existing Greenways

There are no formal greenways established in the subwatershed. Wonder Lake is almost completely encircled with residential development up to the lake's shoreline. Barber Creek is protected for about one-third of its length on one side of the stream channel, where the stream borders the Boone Creek MCCD property south of IL Route 120. Merchant Creek is not protected at all over its 1.5 mile stream length. The upper one-third of Troy Creek is protected, as it flows through the Harrison-Benwell MCCD property.

7.2 Watershed Analysis and Problem Identification

7.2.1 Water Quality Data

The Illinois Environmental Protection Agency (IEPA) is tasked with assessing the quality of the surface water resources of Illinois. The IEPA has determined Nippersink Creek's designated uses are:

- Aquatic Life
- Fish Consumption
- Primary Contact
- Secondary Contact
- Aesthetic Quality

Below Wonder Lake, Nippersink Creek is identified as being in Full Support of its Aquatic Life and Fish Consumption Designated Uses, which is notable for a stream in northeastern Illinois. Upstream of Wonder Lake, Nippersink Creek is identified as being in Full Support of its Fish Consumption Designated Use; however, the Aquatic Life Designated Use was not assessed. This information, obtained from the 2006 IEPA 303(d) list, also identifies waterways that are not achieving certain designated uses.

Nippersink Creek, upstream of Wonder Lake, as well as the segment of the Creek that flows through Wonder Lake, was not listed as impaired. However, the reach of Nippersink Creek downstream of Wonder Lake, extending all the way downstream to its confluence with the Fox River, is listed as "impaired" due to fecal coliform entering the stream water from an as yet unidentified source.

The Illinois Environmental Protection Agency does not maintain any water quality sampling stations on Wonder Lake, however, there is water quality monitoring data collected on Nippersink Creek just upstream and downstream of the subwatershed border.

Table 7.9 IEPA Water Quality Sampling Stations near the Wonder Lake Subwatershed

Station	Stream	Location
DTK 06	Nippersink Cr.	Nippersink Creek at Allendale Road
DTK 02	Nippersink Cr.	Nippersink Creek at Barnard Mill Road

The Fox River Watershed Monitoring Network (FRMN), administered by the not-for-profit Friends of the Fox River, also has two monitoring stations immediately upstream and downstream of Wonder Lake The FRMN has not established any volunteer stream monitoring sites on Wonder Lake as of 2006.

In 2004, the United States Geological Survey (USGS), in cooperation with the McHenry County Soil & Water Conservation District, prepared a report on the water quality of Wonder Lake and Nippersink Creek immediately upstream and downstream of Wonder

Lake. The report *Water Quality of Nippersink Creek and Wonder Lake, McHenry County, Illinois, 1994-2001* utilized water quality and sediment data collected above and below the lake from 1994 – 2001. The findings of the report indicated that lake trapped a significant portion (75%) of the incoming sediment load from the upstream watershed area, and that excessive nutrient loading from upstream also creates highly eutrophic conditions in the lake. The result is a decrease in the navigability of the lake by recreational boaters, as well as a decrease in fish diversity attributed to low dissolved oxygen levels and poor water clarity.

7.2.2 Flooding Problems

There are no known flooding problems in the subwatershed. The existing FEMA 100-year Floodplain Map suggests that many of the residents along Wonder Lake may be in the 100-year floodplain, however, the horizontal boundaries shown on the floodplain maps may be inaccurate as the 100-year flood profiles have not been overlaid onto the County 2-foot topographic mapping now available. There is no floodplain mapping for any of the three tributaries in the subwatershed.

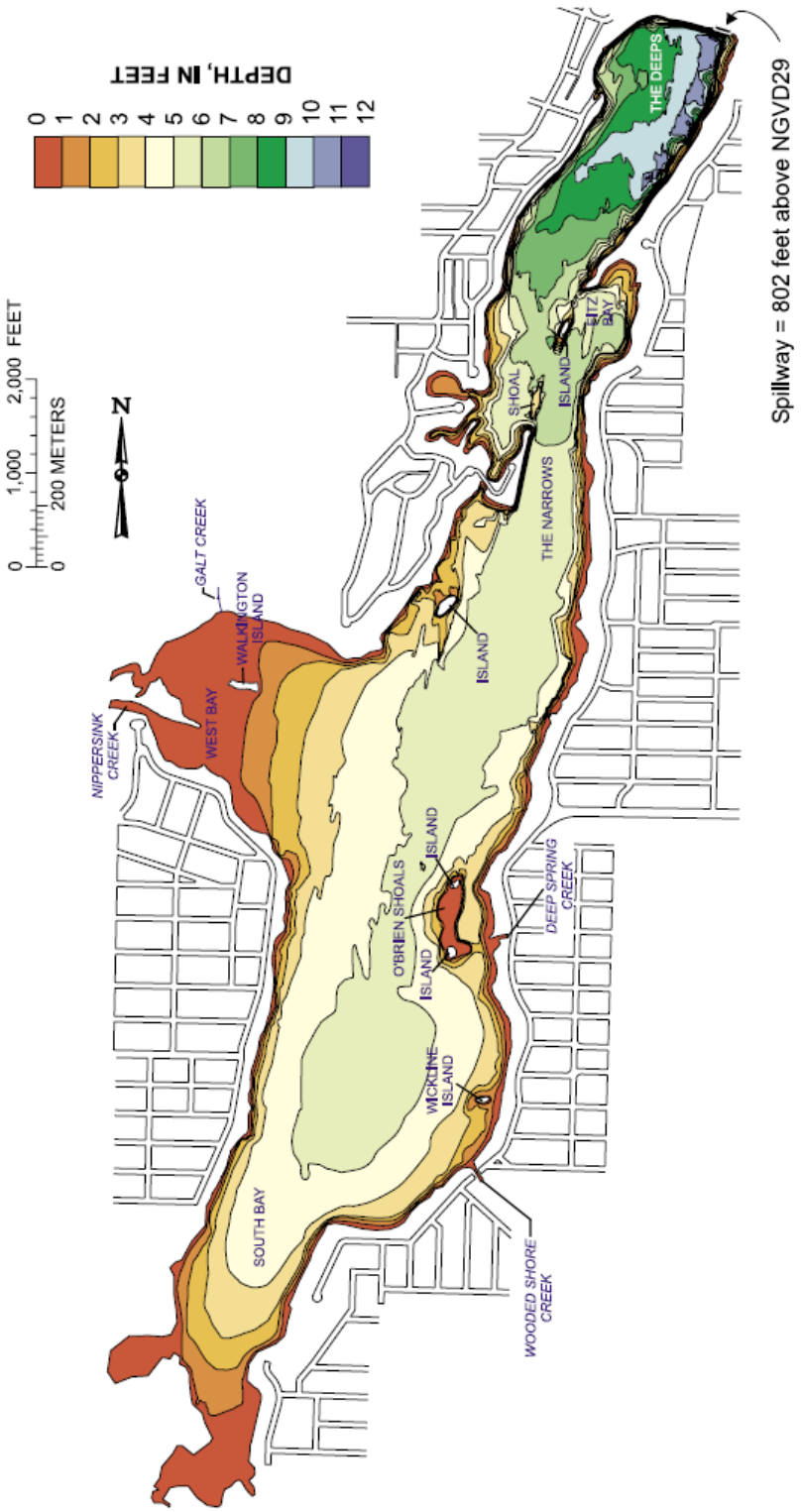
7.2.3 Wonder Lake Sedimentation

Wonder Lake was created in 1929 by constructing a dam across Nippersink Creek, and has accumulated 3 million cubic yards of sediment over that last 78 years. This has significantly reduced the lake water depths, as shown in Figure 7.8. Coming off of a predominantly agricultural watershed, the sediment is large comprised of organic and mineral soils, and in some areas, is 4 to 6 feet thick. However, various government agencies have analyzed the sediment quality over the years, and have found no evidence of hazardous contaminants.

West Bay of Wonder Lake with two foot drawdown (Fall 2007)

Wonder Lake residents recognized the accumulation and adverse impacts of sedimentation, and first started proposing a dredging program in 1964. While wide-scale dredging has not taken place to date, the Wonder Lake community has been actively involved in helping to plan for, and implement, watershed management efforts. As documented by the United States Geological Survey in its 2004 study, ***Water Quality of Nippersink Creek and Wonder Lake, McHenry County, Illinois, 1994-2001,*** watershed planning efforts over the last 15 years have reduced the annual sediment load from Nippersink Creek to Wonder Lake from 33,000 to 12,000 cubic yards. The Wonder Lake Master Property Owners Association (WLMPOA), owner of Wonder Lake, also has been working with a dredging consultant since 1996.

Figure 7.8 Bathymetry of Wonder Lake (1994)



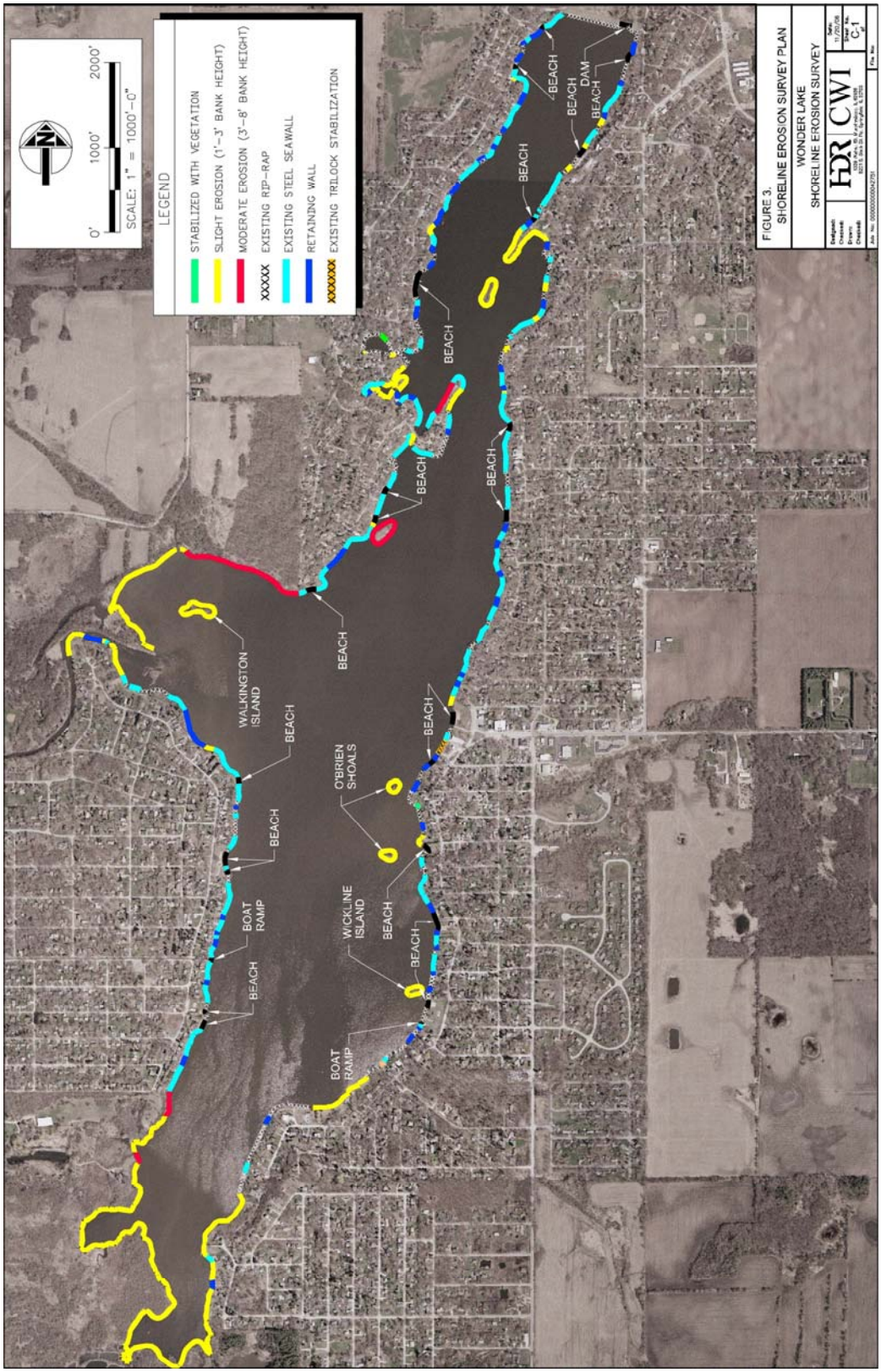
Source: ***Water Quality of Nippersink Creek and Wonder Lake, McHenry County, Illinois, 1994-2001*** **United States Geological Survey**

7.2.4 Shoreline Erosion

As an impoundment lake with heavy recreational boating use, shoreline erosion has been an ongoing problem on Wonder Lake. In 2006, the Wonder Lake Master Property Owners Association (MPOA), the owners of Wonder Lake, commissioned an update to an existing 1996 study *"Wonder Lake Feasibility Study and Restoration Plan"*. The updated study, released in January 2007 also contained a shoreline erosion inventory (Figure 7.9) categorizing shoreline conditions in 2006. This study, conducted by HDR/CWI, first determined that Wonder Lake has a total shoreline perimeter of 52,565 linear feet of shoreline. Of that distance, 31,108 linear feet was classified as protected / non-eroding. Of this distance roughly 8,000 linear feet has been treated with rip-rap; roughly 14,750 linear feet has seawalls; roughly 6,000 linear feet has wood or concrete retaining walls; and 230 linear feet has established vegetation.

Of the 21,457 linear feet of Wonder Lake shoreline classified as eroded and unprotected, 16,600 linear feet was classified as "slight", with 1 to 3 foot bank heights, and 4,797 linear feet was classified as "moderate", with 3 to 8 foot bank heights.

Figure 7.9 Wonder Lake Shoreline Erosion Inventory

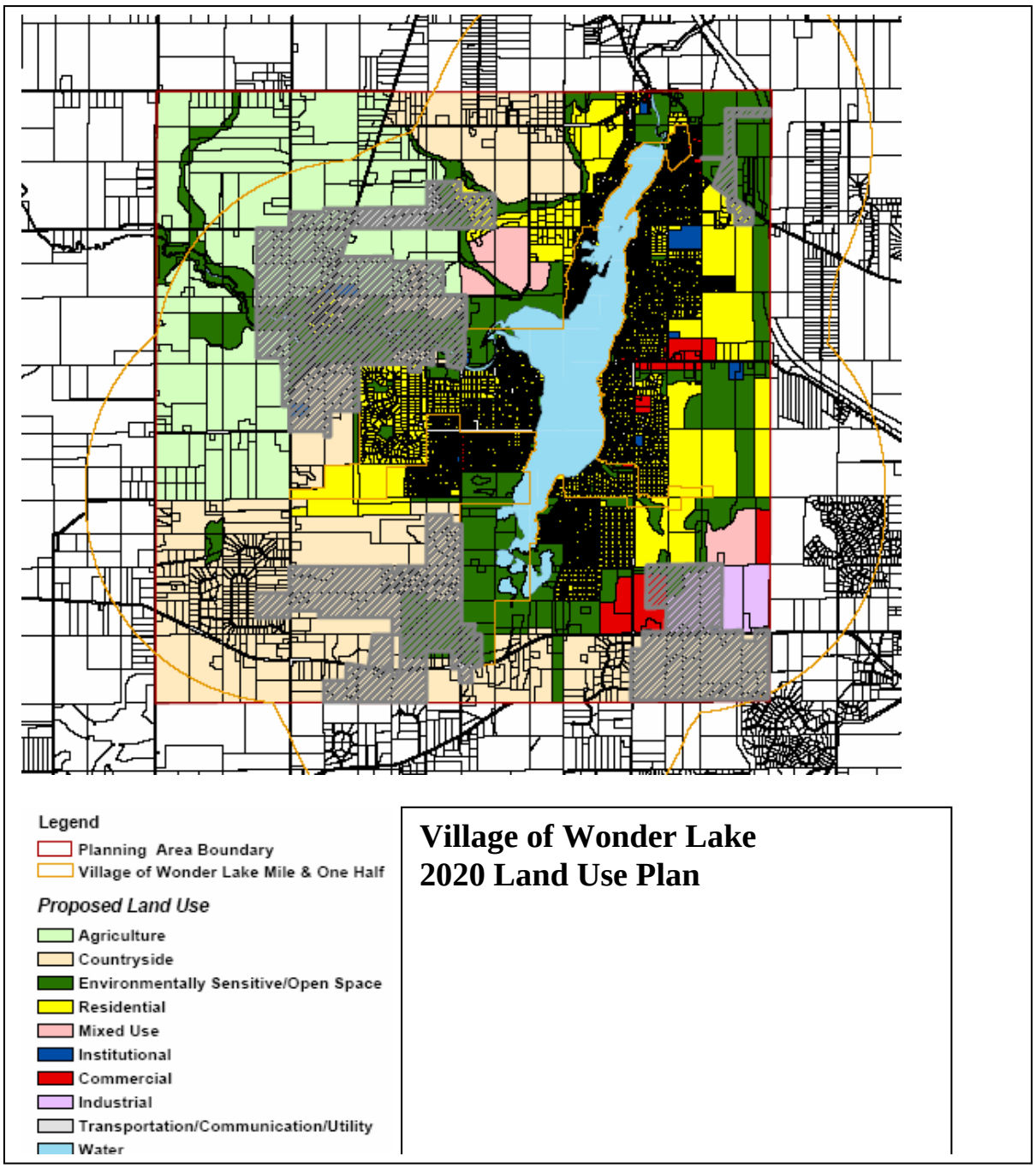


Source: *An Updated Feasibility Study and Restoration Plan for Wonder Lake* **January 2007, HDR-CWI**

7.2.3 Projected Growth & Development

The Village of Wonder Lake has prepared a 2020 Land Use Plan, which anticipates significant residential growth, and lesser amounts of commercial growth. It also designates large areas as environmentally sensitive.

Figure 7.10 Future Development in the Wonder Lake Subwatershed

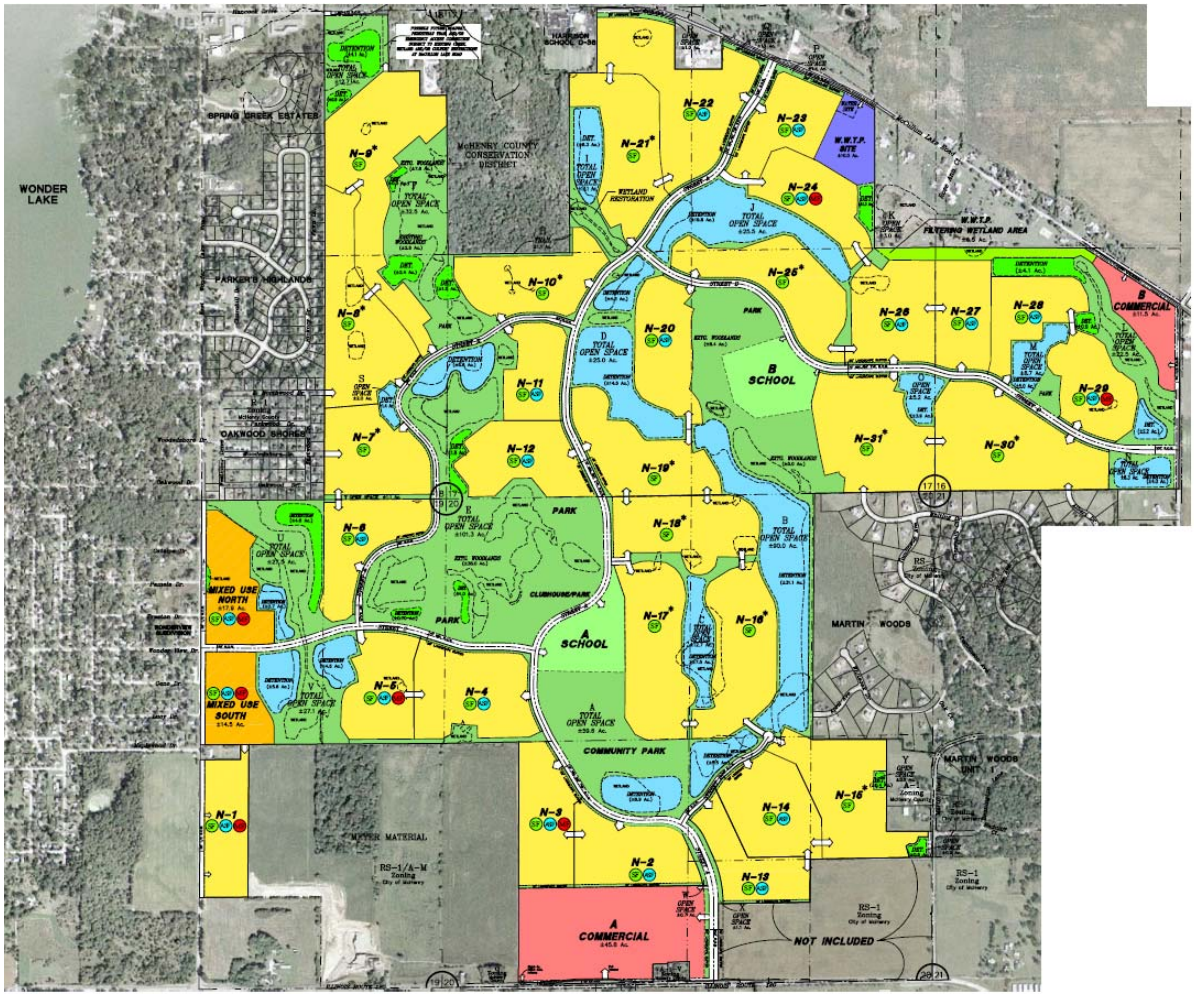


Source: Village of Wonder Lake

Two major residential developments are occurring within the Wonder Lake Subwatershed. The first, The Meadows of West Bay, is already underway on the northwest side of Wonder Lake. This development features over 500 homesites, and is served by a spray irrigation wastewater system. This development is located within the Village of Wonder Lake.

A second development, still in the planning phases, is Thatcher Meadows, located east of Wonder Lake, as shown in Figure 7.11. This development, 1,400 acres in size, will contain a mix of land uses encompassing roughly 3,700 housing units, and will contain approximately 485 acres of open space. Residential areas are shown in yellow, commercial areas in pink, and open space areas in green.

Figure 7.11 Conceptual Site Plan for the Thatcher Meadows Development



Source: NRB Land, LLC

One of the most significant aspects of this project is the planned construction of a Wastewater Treatment Plant (WWTP) to serve the proposed development. The WWTP, which has permitted by the Illinois Environmental Protection Agency (IEPA), will provide one million gallons per day (mgd) of wastewater treatment. This capacity will serve the Thatcher Meadows development, as well as portions of the existing residential subdivisions found along the east shore of Wonder Lake. A second phase, providing an additional one million gallons per day, will be available to serve the balance of the west shore of Wonder Lake, as well as additional future development around Wonder Lake.

The provision of wastewater treatment capacity to the existing residential subdivisions surrounding Wonder Lake is a significant step forward in protecting and enhancing the water quality of Wonder Lake, as well as Nippersink Creek. Much of the existing Wonder Lake community developed as summer cottages in the period after the lake was created in 1929. These cottages, on relatively small lots, featured very small on-site septic system wastewater treatment, sized for seasonal use / loadings. Over the course of time, Wonder Lake became a largely year-round community, which caused the seasonally sized septic systems to handle a year-round waste flow. On most lots, sufficient area does not exist to allow a new septic system to be installed to replace a failed or undersized system. The transition from undersized septic systems to wastewater treatment in a regional WWTP will be a very positive step forward.

The intent is that the Thatcher Meadows development will be annexed into the Village of Wonder Lake, which would potentially take over operation of the proposed WWTP. At the request of the Thatcher Meadows developer, the IEPA permit is written to be more restrictive for nitrogen and phosphorus than current IEPA standards. Also, plant will discharge into a six acre constructed wetland to further treat the water prior to reaching the headwaters of Dutch Creek.

Another benefit of this proposed Thatcher Meadows development is the stated interest of the developer to allow a portion of their development site to be used for up to 10 years as sediment storage basins for the proposed dredging of Wonder Lake. This is a critical element to the rehabilitation of Wonder Lake, as the dredging needs to occur while undeveloped sediment storage areas are still available in a rapidly developing area.

Finally, the developer has had discussions with the McHenry County Conservation District on having them manage Thatcher Meadow open space areas that are directly contiguous to the MCCD Harrison- Benwell site.

7.2.4 Natural Area Protection / Preservation Issues

McHenry County Natural Area Inventory Sites

The South Wonder Lake Wetland (MCNAI GRE10) is identified as suffering from siltation, water table alterations, brush encroachment, and invasive species (Cattails, Reed Canary Grass, Purple Loosestrife).

The Galt Airport Sedge Meadow (MCNAI GRE04) is documented as being threatened by water table alteration and brush encroachment.

The Wonder Lake Sedge Meadow (MCNAI GRE13) located north of Wonder Lake Road near the intersection with Thompson road, has been identified as being impacted by water table alterations and invasive species (Reed Canary Grass).

The Harrison-Benwell Two (MCNAI MCH05) site, located along Troy Creek near McCullom Lake Road, has been identified as being impacted by water table alterations, brush encroachment, aquatic invasive species, and terrestrial invasive species (Reed Canary Grass).

The Harrison-Benwell (MCNAI MCH06) site, located partially on the Harrison-Benwell MCCD property, south of McCullom Lake Road, has been identified as being threatened by brush encroachment, new development (either encroachment or discharge of poor quality runoff) and invasive species (Reed Canary Grass).

Wetlands

Wetlands are complex ecosystems that provide many ecological functions that are valued by society. The valuable ecological functions of wetlands and the open space they provide help to enhance the quality of life for local residents and visitors to the watershed. When discussing the importance of wetlands, the terms wetland functions and wetland values are often used. Wetland functions, such as sediment control and flood storage, are natural processes that continue regardless of their perceived value. Society does not necessarily attach value to all wetland functions. Value is usually associated with goods and services that wetlands provide. For this reason, wetland values, such as water quality maintenance and flood protection, are the goods and services that wetlands provide.

Excluding Wonder Lake, there are about 900 acres of wetlands remaining in the subwatershed, compared to 1,200 acres of hydric soils. This means that about 75% of the historic wetlands are still present, although most are significantly degraded compared to their quality prior to settlement in the subwatershed.

There are four High Habitat Quality wetland complexes in the Wonder Lake subwatershed, ranging in size from 24 acres to more than 380 acres.

ADID Wetland N757 is an isolated 24 acre high-quality wetland that contains a remnant sedge meadow which is currently degraded due to siltation and agricultural runoff. This wetland is located on parcels slated for development after a recent annexation by the Village of Wonder Lake.

ADID Wetland #N668, located partially on the MCCD Harrison-Benwell property, is only partially protected and not managed to allow it to reach its full ecological potential. The wetland is being overrun with Reed Canary Grass.

ADID Wetland #N741, located within the South Wonder Lake Wetland NAI site, is a 381 acre high-quality wetland containing sedge meadow and fen remnants. This wetland is being degraded by invasive species (shrubs & Purple Loosestrife) and by conversion to a marsh community brought about by influence of the water table created by Wonder Lake.

7.3 Current Subwatershed Level Water Quality Planning Efforts

As previously mentioned in Section 7.2.3, the Wonder Lake Master Property Owners Association (MPOA) Directors authorized their consultant to review and revise an existing 1996 Wonder Lake Dredging Feasibility Study. The intent of updating the 1996 study was to reflect current lake restoration needs and costs, as well as to recommend activities that will protect and enhance Wonder Lake.

In January, 2007, the MPOA Lake Maintenance Commission received the updated recommendation plan from our consultant, and began a review process. The consultant estimated that a complete lake restoration option would require the removal 2.0 to 2.5 million cubic yards of accumulated sediment, at an estimated total cost of $ 12,960,000. Given site constraints, and desire to minimize impacts on recreational use of the lake, it was determined that hydraulic dredging would be the most cost-effective means of removing the sediment.

Recognizing that the potential burden a $ 12,960,000 project could place on the MPOA membership, the MPOA Lake Maintenance and Finance Commissions worked over the next several months to identify potential ways to reduce the cost, and to develop a "more affordable" plan. To obtain community input, the Commissions and the Directors conducted meetings with subdivisions and the owner of potential sediment storage sites, organized "open house" presentations, and conducted a summer Lake Fest, featuring a number of speakers on lake restoration, water quality, and shoreline stabilization.

During these meetings, MPOA members were provided several opportunities to participate in the planning process and to voice their concerns over the cost of lake restoration, lake access problems and thoughts on enhancement and protection activities. Incorporating that input, the MPOA has continuously been working on developing the more affordable plan, primarily by focusing on reducing the amount of sediment removal from 2.5 million to

about 1 million cubic yards, and concentrating on the most significantly impacted portions of the lake.

After months of review, meetings with consultants and land owners, crunching numbers and reviewing sediment depths, the MPOA presented the community with a $ 5.9 million lake restoration plan. This plan would target specific areas of Wonder Lake most impacted by sedimentation, as shown in Figure 7.12, and work to restore eroded islands within the lake. For the purposes of this update, potential sediment storage sites located east of East Wonder Lake Road and north of Route 120 were identified (Figure 7.13).

In July 2007, the Wonder Lake MPOA hired its first professional lake manager. The MPOA Board of Directors and the lake manager are currently working with the Village of Wonder Lake and McHenry County to create a Special Service Area (SSA) taxing district to fund the first phase of lake restoration efforts. Any parcel contiguous to, or that has lake access / lake rights, is proposed to be in included in this SSA district. A decision as to the success of this effort will likely be known by the Spring of 2008.

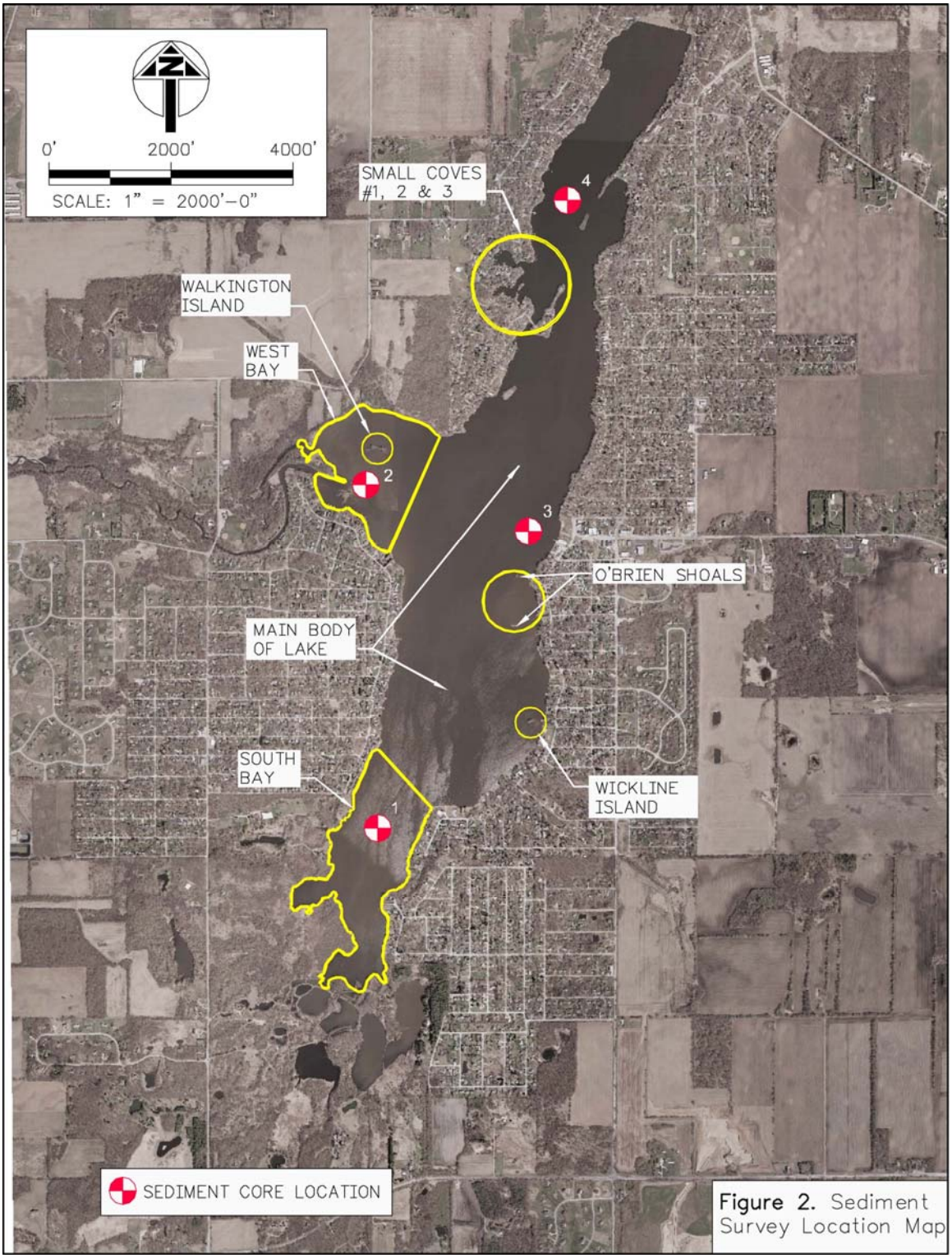
One of the critical aspects of this proposed Phase One lake restoration effort, to be funded by the proposed SSA, is the nature of the sediments to be dredged from Wonder Lake. Testing has determined that the in-lake sediment is composed of highly organic material, with a very high degree of fertility. Sediment samples have been tested by the University of Illinois to help determine the potential marketability of the dried dredged sediments. It is hoped that if a resale market can be established, the revenue proceeds from these sales could be used to fund future phases of lake dredging.

One of the other goals of the MPOA and the lake manager is to develop a large scale shoreline stabilization effort for those waterfront landowners with unprotected shorelines, or those with failing stabilization practices. Educational outreach will be performed to encourage landowners to consider more environmentally friendly shoreline stabilization practices, shoreline buffers, and other residential scale stormwater Best Management Practices.

However, given the wind and wave action that can occur with an 830 acre lake, coupled with the heavy recreational boating traffic, it is recognized that strictly biological / vegetative shoreline stabilization practices may not be sufficient. Instead, a combination of structural and vegetative practices will likely be required.

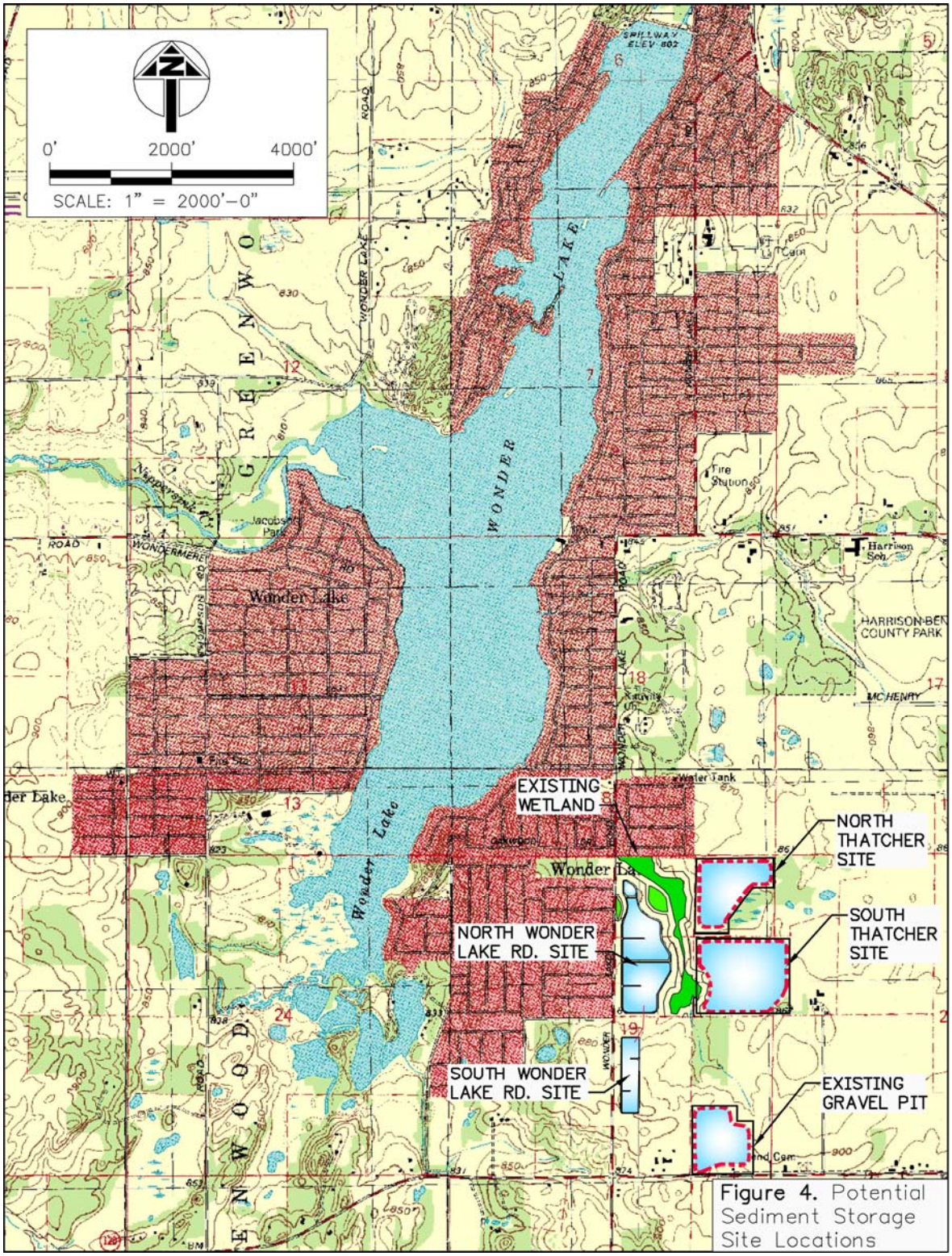
It is hoped that by finding a means to help cost-share the installation of environmentally friendly shoreline practices; encouraging enough landowners participate to generate a financial "economy of scale", and by providing technical assistance in applying for regulatory permits, the MPOA will be able to encourage many Wonder Lake shoreline owners to participate in this effort.

Figure 7.12 Conceptual Phase One Plan for Dredging Wonder Lake



Source: ***An Updated Feasibility Study and Restoration Plan for Wonder Lake*** **January 2007, HDR-CWI**

Figure 7.13 Evaluation of Potential Dredging Sediment De-Watering Sites



Source: ***An Updated Feasibility Study and Restoration Plan for Wonder Lake*** **January 2007, HDR-CWI**

7.4 Subwatershed-Specific Recommendations to Protect Water Resources

The following section discusses the Best Management Practices (BMP's) identified for this subwatershed that should be implemented to address existing or potential water quality impairments. The location of each recommended BMP project is presented in Figure 7.14

Pollutant Loading Modeling, as discussed in Chapter 3, identified current and future pollutant loadings, based upon land use, soils, slopes, etc., and quantified these loadings. The results of this Pollutant Loading modeling were then used to identify the types of BMP's that should be implemented to create a loading reduction of those pollutants. Table 7.10 presents a summary of the recommended BMP projects, as well as the expected pollutant loading reductions expected if the BMP's are implemented, and function as intended.

Table 7.11 presents detailed cost and logistical information on each of the recommended BMP projects. Below is a summary list of recommendations for the subwatershed to help stakeholders and decision makers meet the Goals and Objectives set forth for Nippersink Creek. Background information regarding how each type of recommendation addresses watershed concerns and/or impairments (existing or future) can be found in Chapter 4.

Type:	Education / Outreach; Regulatory; Site Restoration; Monitoring; Permanent Habitat Protection, Water Quality
Target Goals:	Which watershed plan goals the recommendation is intended to address.
Initial Implementation Cost:	The initial cost, in 2007 dollars to initiate the recommended action, if applicable.
Initial Outreach Cost:	The initial cost, in 2007 dollars to initiate the recommended action, if applicable.
Annual Cost:	The long term expected annual cost (in 2007 dollars) to successfully implementation of the recommendation
Responsible Party:	Identifies the LEAD agency, entity, or landowner who will ultimately have to execute the recommendation. SUPPORTING parties, such as government agencies, grant sources, etc. may also be identified here.
Priority:	A ranking of the BMP recommendations, based upon the nature / urgency of the existing / potential impairment; the availability of willing landowners)/ partners; short-term vs. long-term development pressure; and whether the project is a new effort, or a retrofit of an existing practice.

The project cost estimates contained in this report should be considered preliminary, and are only presented to identify the potential magnitude of cost, from a watershed scale perspective. No site-specific investigation, analysis, or design of any recommended project, from which accurate cost information could be obtained, was completed as part of the preparation of the 2008 Nippersink Creek Watershed Plan.

If a watershed stakeholder decides to apply for grant funding assistance to implement any of the recommended projects presented in this report, they should first undertake any additional studies / research needed to determine an updated / accurate project cost. They should not solely rely on the cost estimates presented in the NCWP report as the basis for their grant request.

Note: The following acronyms for responsible parties identified in Table 7.11 are presented below:

NCWPC	Nippersink Creek Watershed Planning Committee
NRCS	Natural Resource Conservation Service
SWCD	McHenry County Soil and Water Conservation District
MCCD	McHenry County Water Conservation District
TLC	The Land Conservancy of McHenry County
IDOT	Illinois Department of Transportation
IEPA	Illinois Environmental Protection Agency
MCDOT	McHenry County Department of Transportation
MCDEF	McHenry County Defenders
MPOA	Wonder Lake Master Property Owners Association
NRB LAND	NRB Land LLC (Private Developer)
HOA	Homeowners Association

Figure 7.14 Wonder Lake Subwatershed Site Recommendations Map

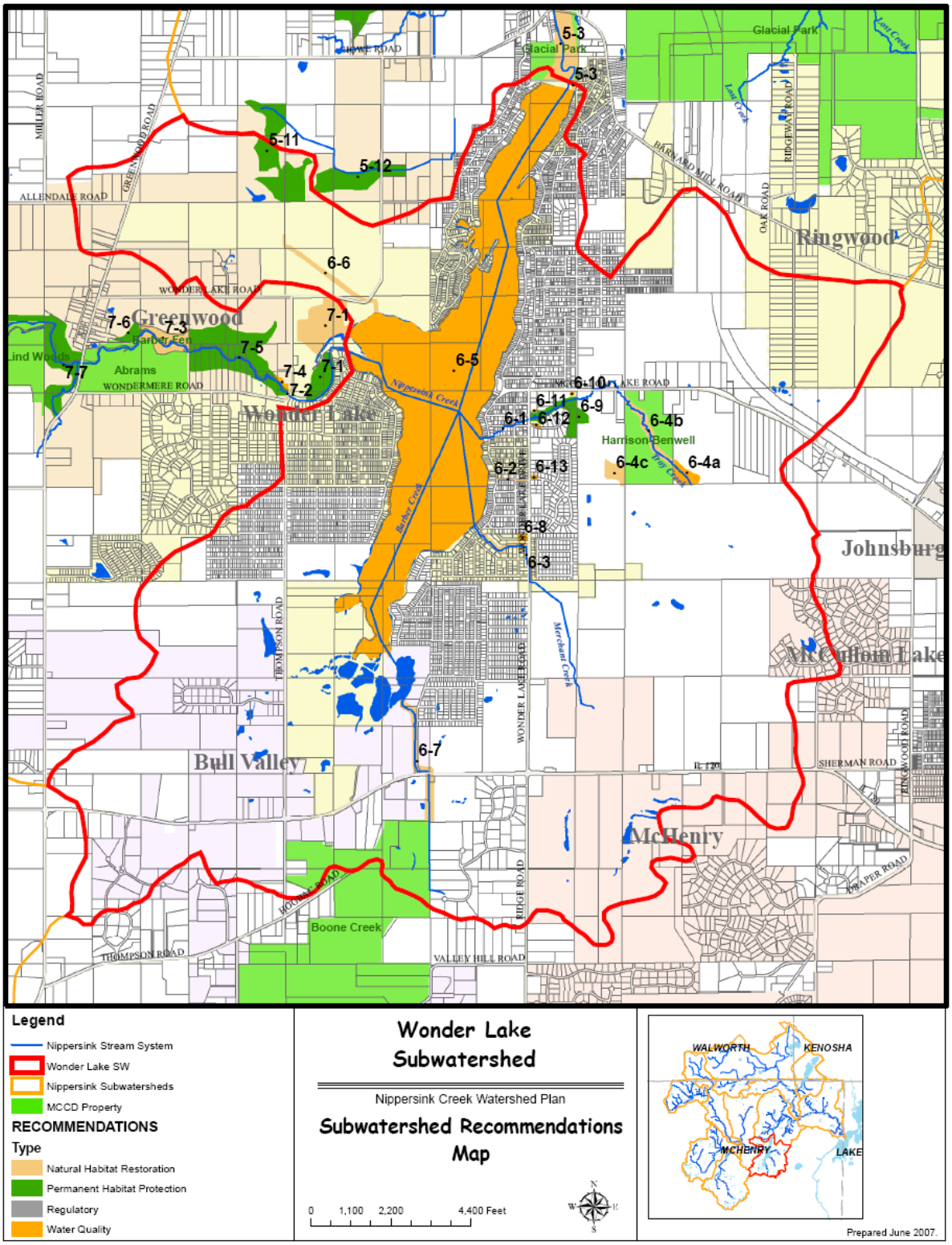


Table 7.10 BMP Selection & Associated Pollutant Load Reduction for the Wonder Lake Subwatershed

BMP	Type of BMP	Project Locations**	BMP		Removal Efficiency***			(lbs/year)****			Percentage Reduction		
			Size	Unit	TN	TP	TSS	TN	TP	TSS	TN	TP	TSS
Natural Habitat Protection	Site-specific	6-1, 6-2, 6-3, 6-4 b&c, 6-6, 6-7	47	acres	30%	35%	60%	196	19	21	0.9	1	1.8
Stream Corridor Restoration	Site-specific	6-1, 6-2, 6-3, 6-4b, 6-6, 6-7, 6-9	711	acres	53%	51%	88%	5,244	283	474	23.9	15.8	39.7
Wetland Restoration	Site-specific	6-4a & c	20	acres	53%	51%	88%	148	8	13	0.7	0.4	1.1
Detention Basin Retrofit	Site-specific	6-10, 6-11, 6-12, 6-13	9	acres	32%	55%	68%	40	4	5	0.2	0.2	0.4
Point Source Control/Monitoring	Site-specific	6-8	1	lump sum	0%	0%	0%	0	0	0	0	0	0
Nutrient Management	Watershed-specific	Subwatershed wide	788	acres	70%	28%	-	7,676	313	24	35	17.5	2
Regulatory*	Watershed-Specific	Subwatershed	1	Water-shed	5%	5%	5%	1,097	90	60	5	5	5
Shoreline Stabilization	Site-specific	6-5	21,457	linear feet	65%	78%	76%	2,138	210	136	9.8	11.7	11.4
Wonder Lake Dredging *****	Site-specific	6-5	1	lump sum	1.10%	1.10%	1.10%	250	20	14	1.1	1.1	1.1
Total								17,227	982	770	78.5	54.8	64.5

*Regulatory programs are assumed to have nominal pollutant reduction rates of 5%.

** Project locations and details are described in the corresponding chapter.

*** TN = total Nitrogen; TP = total Phosphate; TSS = total suspended solids or Sediment.

**** The unit of "TSS" is "Tons/year".

***** This BMP contributes to the entire watershed pollutant load reductions. In terms of the sediment load trapped within Wonder Lake (Source: USGS 2004. Water quality of Nippersink Creek and Wonder Lake, McHenry County, Illinois, 1994-2001. Scientific Investigation Report 2004-5085".), this BMP can annually reduce 6800 tons sediments load (assuming a 75% trapping-rate of the annual total loads of 9,145 tons,). For this subwatershed, the pollutant load reductions by this BMP are assumed to be 1.1% of the total subwatershed pollutant loads.

Table 7.11 Recommended Projects in the Wonder Lake Subwatershed

SUB WATERSHED	RECOMMENDATION #	TARGET GOAL	DESCRIPTION	RESPONSIBLE PARTY	ACRES	UNIT COST	INITIAL IMPLEMENTATION COST	INITIAL OUTREACH COST	ANNUAL MAINTENANCE COST	PRIORITY
Wonder Lake	6-1	Natural Habitat Restoration	Landowner / Government Outreach to develop and implement a Stream Corridor Enhancement project along Troy Creek between Wonder Lake and Wonder Lake Drive	NCWPC / MPOA / VILLAGE OF WONDER LAKE / TLC	1.7	$50,000	$83,300	$1,000	$4,165	D
Wonder Lake	6-2	Natural Habitat Restoration	Landowner / Government Outreach to develop and implement a Stream Corridor Enhancement project along unnamed tributary to Wonder Lake along Hickory Road - 1000 LF	NCWPC / MPOA / VILLAGE OF WONDER LAKE / TLC	1.3	$50,000	$63,600	$1,000	$3,180	D
Wonder Lake	6-3	Natural Habitat Restoration	Landowner / Government Outreach to develop and implement a Stream Corridor Enhancement project along Merchant Creek from Wonder Lake to east side of Wonder Lake Road; establish Conservation Easements; monitor for possible e-coli; illegal dump site	NCWPC / MPOA / VILLAGE OF WONDER LAKE / TLC	8.5	$50,000	$423,450	$1,500	$21,173	D
Wonder Lake	6-4a	Water Quality	Landowner Outreach developer to implement a 5-6 acre constructed wetland Stormwater BMP to filter runoff from future development	NCWPC / VILLAGE OF WONDER LAKE / NRB LAND	7.1	$3,000	$21,324	$500	$178	D
Wonder Lake	6-4b	Natural Habitat Restoration	**MCCD Harrison Benwell** - Stream Corridor Enhancement - Brush Clearing - Grade Control - Streambank Stabilization	MCCD	10.8	$15,000	$162,225			A
Wonder Lake	6-4c	Natural Habitat Restoration	Landowner / Government Outreach landowner to restore wetland on southwest end of Harrison-Benwell MCNAI Site	NCWPC / VILLAGE OF WONDER LAKE / NRB LAND	6.3	$3,000	$19,032	$500	$952	D
Wonder Lake	6-5	Water Quality	Implement Wonder Lake Dredging Project (1 million CY dredging);	MPOA			$5,900,000			A

Table 7.11 Recommended Projects in the Wonder Lake Subwatershed

SUB WATERSHED	RECOMMENDATION #	TARGET GOAL	DESCRIPTION	RESPONSIBLE PARTY	ACRES	UNIT COST	INITIAL IMPLEMENTATION COST	INITIAL OUTREACH COST	ANNUAL MAINTENANCE COST	PRIORITY
Wonder Lake	6-5	Natural Habitat Restoration	Establish Cost-Share Program for Wonder Lake shoreline stabilization projects (25,000 LF)	MPOA			$675,000		$33,750	A
Wonder Lake	6-5	Natural Habitat Restoration	Implement Wonder Lake shoreline demonstration project	MPOA			$50,000		$2,500	A
Wonder Lake	6-6	Natural Habitat Restoration	Landowner / Government Outreach to develop and implement a Stream Corridor Enhancement project along Galt Creek; 4000 LF; parcel planned for future development	NCWPC / MPOA / VILLAGE OF WONDER LAKE / TLC	9.8	$50,000	$488,350	$1,000	$24,418	D
Wonder Lake	6-7	Natural Habitat Restoration	Landowner / Government Outreach to develop and implement a Stream Corridor Enhancement project along Barber Creek; first 4000 LF upstream of Wonder Lake	NCWPC / VILLAGE OF WONDER LAKE / VILLAGE OF BULL VALLEY	18.3	$50,000	$914,750	$1,000	$45,738	D
Wonder Lake	6-8	Water Quality	Agency Outreach to investigate possible pollution source to Merchant Creek from auto repair facility at Wonder Lake Road and Beaver Road	VILLAGE OF WONDER LAKE / MCHENRY COUNTY HEALTH DEPARTMENT / IEPA			$2,500	$500		F
Wonder Lake	6-9	Permanent Habitat Protection	Landowner Outreach to protect high quality Harrison-Benwell Two MCNAI Site; stream restoration 1700 LF	NCWPC / TLC / MCDEF	15.3	$50,000	$763,400	$500	$38,170	D

Table 7.11 Recommended Projects in the Wonder Lake Subwatershed

SUB WATERSHED	RECOMMENDATION #	TARGET GOAL	DESCRIPTION	RESPONSIBLE PARTY	ACRES	UNIT COST	INITIAL IMPLEMENTATION COST	INITIAL OUTREACH COST	ANNUAL MAINTENANCE COST	PRIORITY
Wonder Lake	6-10	Water Quality	Landowner / Government Outreach to retrofit dry bottom turf grass detention basin; commercial development SW corner of McCullom Lake Road and E. Wonder Lake Road	NCWPC			$15,000	$750	$1,125	E
Wonder Lake	6-11	Water Quality	Landowner / Government Outreach to retrofit dry bottom turf grass detention basin; commercial development east side of Wonder Lake Drive between Brook Drive and Sunset Drive	NCWPC			$15,000	$750	$1,125	E
Wonder Lake	6-12	Water Quality	Landowner / Government Outreach to retrofit dry bottom turf grass detention basin; residential subdivision east side of Wonder Lake Drive at Beach Court	NCWPC / HOA			$15,000	$750	$1,125	E
Wonder Lake	6-13	Water Quality	Landowner / Government Outreach to retrofit existing dry bottom detention basin at Hickory Road and Wonder Lake Drive with native vegetation and minor regrading to increase pollutant removal	NCWPC / HOA			$15,000	$750	$1,125	E
				SW TOTALS	**79.0**		**$9,626,931**	**$10,500**	**$178,722**	

PRIORITY

- **A Projects that have cooperating partners, can move to implementation quickly. Implementation Timeframe 1 to 3 years**
- **B Projects subject to imminent development pressure, Implementation Timeframe 1 to 2 years**
- **C Projects needed to protect sensitive areas. Timeframe 1 to 2 years**
- **D Restoration projects, Timeframe 1 to 5 years**
- **E Retrofit Projects, Timeframe 1 to 5 years**
- **F Existing Pollution Potential, Timeframe 1 to 2 years**
- **G Policy / Opportunity Review Project, Timeframe 1 to 3 years**