Chapter 2
Nippersink Creek Resource Summary

This chapter provides a summary of watershed characteristics, natural resources, water quality, population, land use, existing watershed impairments, and potential future watershed impairments.

2.1 Natural Resources

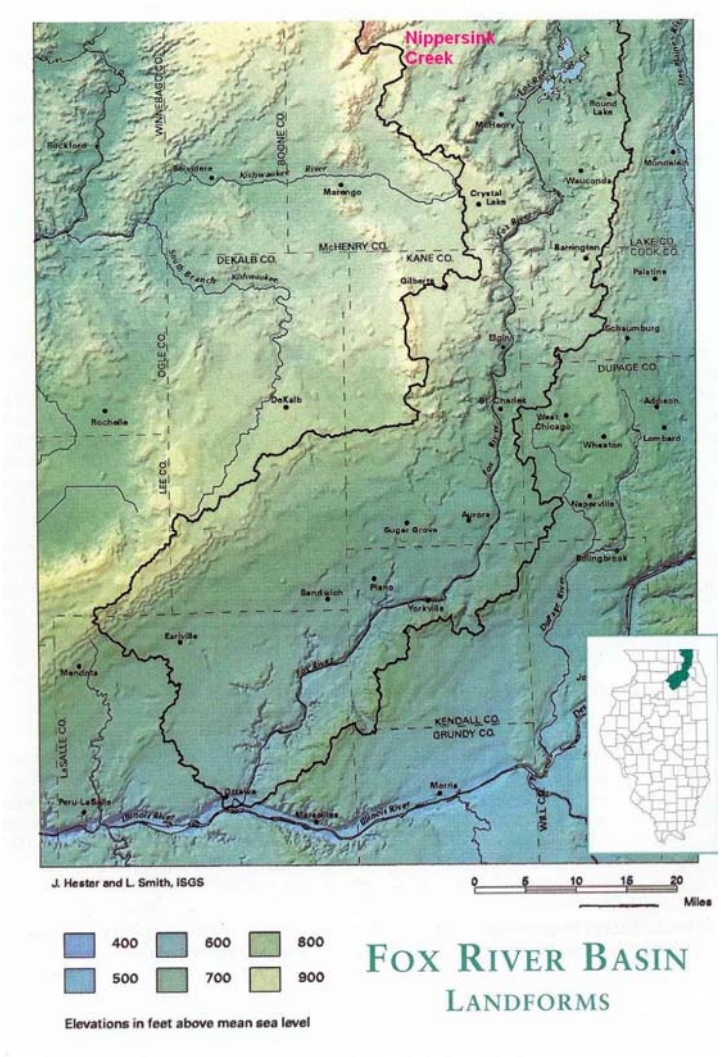
2.1.1 Landscape Resources

The numerous glacial advances across McHenry County shaped the present day topography of the Nippersink Creek Watershed. The moraines created by the glaciers formed the western edge of the Nippersink Creek watershed, as well as the entire Fox River watershed.

This moraine system forms a major watershed divide in the state of Illinois, and contains second highest point in Illinois in the headwaters of Nippersink Creek.

This high point is found in northwestern Alden Township of McHenry County, and crowns the headwaters of Nippersink Creek. From this elevation of 1,189 feet, the Nippersink Creek watershed descends to the east, reaching its low elevation of 736 feet, where the creek flows into Nippersink / Pistakee Lake. This represents a watershed elevation change of 453 feet, one the largest for a stream system in Illinois.

Figure 2.1 Landforms of the Fox River Basin



Source: Critical Trends Assessment Program Report

The two main parent soil materials (the geologic material in which soil forms) in the Nippersink Creek watershed are glacial till and glacial outwash. Other types of parent materials in the watershed include loess or silty material, organic deposits, and alluvial deposits. Glacial till is non-stratified drift transported and deposited directly by glacial ice. The majority of till deposits in McHenry County occur as a series of morainal ridges and till plains that were formed as retreating glaciers moved eastward. Glacial outwash was deposited by running water from the melting glaciers. These deposits range from loamy sediments to sand and gravel. Landforms include outwash plains, stream terraces, kames, and eskers.

Junction of Mainstem Nippersink (L) with North Branch Nippersink (R)

The geologic features of McHenry County are unique, and of interest because of their connection with other natural resource features and educational opportunities. Table 2.1 presents Nippersink Creek watershed information made available by the Geology Department of Northern Illinois University on its website, for educators who want to conduct geological field trips.

Table 2.1 Nippersink Creek Watershed Geological Summary

Geologic History

The recent geological history in McHenry County is best illustrated by its glacially sculpted landscape. The region is a great place to see the profound effects of the perhaps 2,000 feet thick Pleistocene ice sheet. The rising and rolling landscape is a geologic treasure and place of uncommon beauty. Bedrock in the area consists of Silurian dolomite that is underlain by an erosional unconformity at its contact with fossil-rich Ordovician limestone. About 22,000 years ago, the Wisconsin Glacier covered most of McHenry County. The front of the glacier pulsated back and forth for about 10,000 years before retreating from the area. Glacial deposition and erosion left behind overwhelming evidence of this glacial coverage. Glacier artifacts in the county include a series of seven moraines, some of which overrode older moraines and some with knob and kettle topography. This county has it all; outwash plains, till plains, glacial erratics, subglacial valleys, delta kames, kettles and misfit streams, eskers, glacial lakes, and former meltwater channels.

Nippersink Creek Information

Another important aspect of Glacial Park is the ongoing one-mile long dechannelization project in the Nippersink Creek. In 1951, before the park district bought the land, a 1.8-mile long section of the creek was channelized to reduce its floodplain. This allowed excess water to run off the fields so they could be used for agriculture and grazing. The Nippersink Creek is just a trickle of what it once was. This stream, a misfit or underfit stream occupies a contrasting much larger valley that once helped drain surging meltwater from the Wisconsinan Glacier. Its eastward flow is in the opposite direction of what it was during the Pleistocene Epoch. At the time, ice blocked lowlands to the east and caused the Nippersink Creek to flow to the west. Local tributaries did not obtain their present flow orientation until the master river in the region, the Fox, settled on its more eastern valley.

Dechannelization Importance

Dechannelization is important to the environment because water flowing at a quick pace through straightened streams causes more erosion on the sides of the creek bed and increases discharge down stream. This happens because there is less surface area for drag resistance and because discharge increases as a function of (width x depth x velocity). Too much material entering the stream can make it difficult for aquatic life forms to survive. Recreating original stream meanders decreases the stream current and velocity and dissipates the energy of over bank flow. It also helps to create inhabitable pools throughout the length of the stream. Furthermore, in contrast to steep banks that confine upstream floodwater and cause flooding downstream, gently sloped banks allow floodwaters to create temporary wetlands. Restored banks along the Nippersink Creek have been seeded, are watered as needed and are sloped no steeper than 3:1. Boulders have been placed along the curves where erosion is expected to be the greatest.

Stream Rating

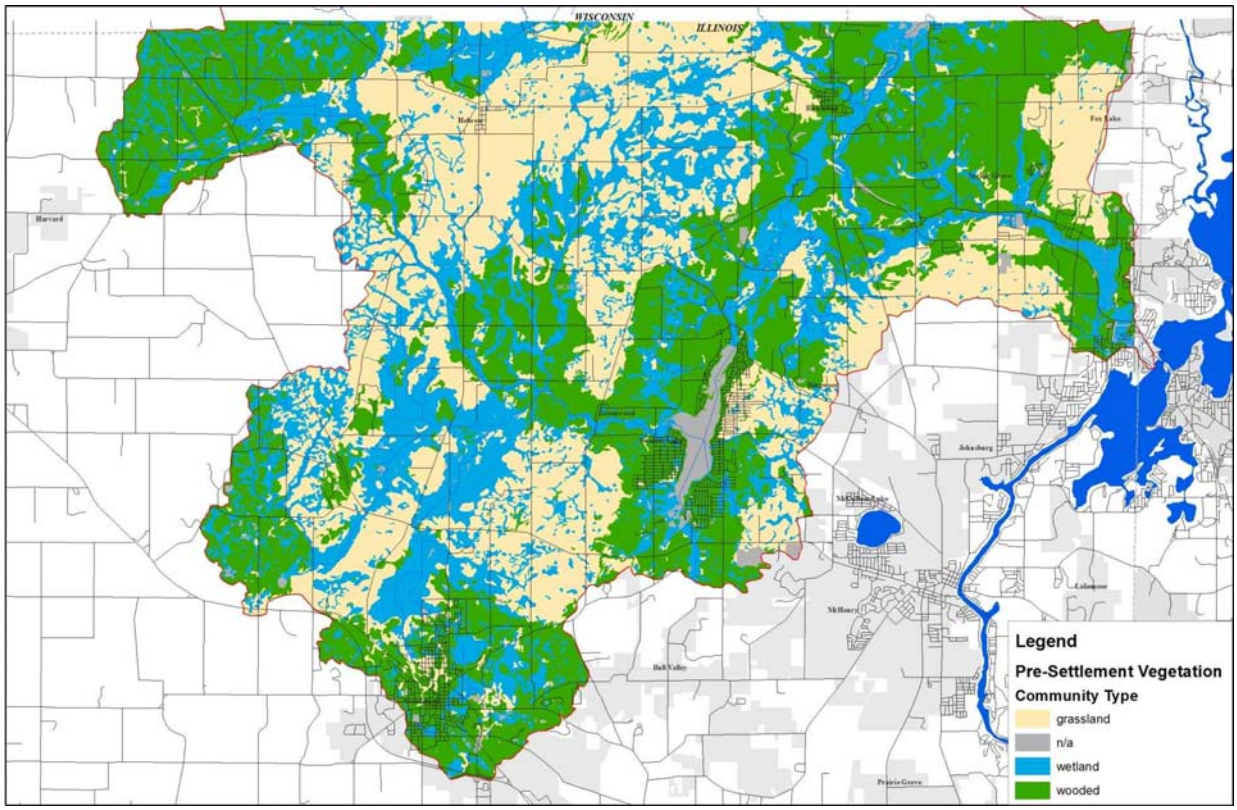
With an overall rating of "B" in 1993, the Nippersink Creek watershed contains one of Illinois' highest quality streams. This watershed is home to many endangered or threatened life forms that are sensitive to habitat change. Therefore, it is increasingly important to restore and maintain native habitat and high stream quality. Stream quality is determined by sampling the stream's fish population. The formula for assigning a stream rating is called an Index of Biotic Integrity. It is based on the number of species, the proportion of diseased fish, and the percentage of fish that are intolerant to pollution. The stream in Glacial Park is good primarily because it is rural and buffered from industrial pollution and from erosion problems, with the exception of the channelized portions that are now being restored. By 1995, the Nippersink Creek had attained an "A" rating. The removing of invasive buckthorn, Siberian Elm, and box elder, none of which have much value to wildlife, brush cutting and the planting of native oaks are done in addition to creating a healthier Nippersink Creek.

Source: **http://jove.geol.niu.edu/faculty/fischer/429_info/429trips/NIF/glacial_park.html#_Recent_History**

The highly glaciated topography of the Nippersink Creek Watershed has also had a profound impact on its historic and present day plant ecosystems. The result was, and in many areas of the watershed still is, a rich mosaic of prairie, wetland, and oak – hickory savanna.

The McHenry County Conservation District (MCCD) has conducted extensive work to determine the composition and distribution native plant communities prior to European settlement of the County. Through a review of the original records of the first surveyors in the County and evaluating the plant communities associated with specific soil types, a highly detailed map has been prepared, which is shown in Figure 2.2. Generally speaking, oak – hickory savanna (shown in green) was dominant on steeper sloped glacial features, prairie (shown in tan) was present in outwash areas between the moraines, and wet prairies or wetlands (shown in blue) occupied the drainageways and low ground.

Figure 2.2 Vegetation of the Nippersink Creek Watershed – Pre-European Settlement



Unfortunately, the agricultural productivity of the deep prairie soils was recognized early in the 18th century, and resulted in the wholesale conversion of prairie to cropland. While large wetland complexes in the flatter portions of the watershed were typically ditched and drained to improve agricultural productivity, the steeper topography found in the headwater tributary areas restricted row cropping. In these steeper portions of the watershed, dairy farming was more common, with cow pastures more prevalent than row cropped fields. While the grazing of dairy cows and cattle within stream corridors can often have detrimental impacts to water quality and habitat, these impacts can rapidly heal once the animals are removed from the stream corridor.

European settlement of McHenry County also significantly impacted the woodlands of the County. A 2007 McHenry County Conservation District study determined that in 1838, when the first surveys of the land that would become McHenry County were conducted, 143,000 acres of oak groves covered the area. Today, only 18,000 of those acres still exist, representing only of 12.6 percent of the original cover. From 1838 to 1872, oak populations plummeted by about 50 percent, from 143,000 acres to 72,000 acres. That number further fell to 26,350 acres in 1939. By 2005, the acreage had dropped to about 18,000, in a county that measures 390,685 acres.

Oak Savannah

However, the resiliency of many of these native plant communities is documented by the numerous ecological assessments that have been conducted within the Nippersink Creek watershed, as well as in the Fox River watershed.

In the mid 1990's, the Illinois Department of Natural Resources (IDNR) and Illinois Natural History Survey (INHS) conducted the Critical Trends Assessment Program (CTAP) to determine the status of ecological resources in the State of Illinois. The Nippersink Creek Watershed is located within the **Chain O'Lakes / Fox River Resource Rich Area (RRA)**, as designated by the Critical Trends Assessment Program (CTAP) of the Illinois Department of Natural Resources. Only thirty RRA sites were identified in Illinois, and two are located within McHenry County. A description of the RRA is presented in Table 2.2.

Table 2.2 Chain O' Lakes - Fox River Resource Rich Area Summary

CHAIN O' LAKES - FOX RIVER RESOURCE RICH AREA

Because of its glacial history, wetlands are particularly concentrated in northeastern Illinois. A variety of wetland types, such as marshes, sedge meadows, fens, and bogs, support a unique and sometimes rare flora and fauna. Bogs in Illinois are limited to glacial depressions in the northeastern part of the state. Acidic conditions created by the lack of drainage and accumulation of layers of peat support uniquely adapted flora, such as leatherleaf, blueberry, cranberry, ferns, orchids, pitcherplant, sundew, poison sumac, and tamarack.

The Chain O' Lakes-Fox River RRA encompasses the area of most recent glaciation in Illinois. Significant natural features in this poorly drained area include glacial landforms, natural lakes, and wetlands. Many wetland types are found in this RRA, such as bogs, fens, seeps, and shallow and deep marshes. Some rare species and community types are limited in their distribution to this area of the state. Urban expansion from the Chicago metropolitan region continues to put severe pressure on the natural resources in this region.

Size: 285,844 acres; 447 square miles

Location: Northeastern Illinois; Lake, McHenry, Cook, and McHenry counties

LANDCOVER - The predominant landcover in this RRA is urban/built-up (30%). This site has the highest urban/built-up acreage and ranks fifth in percentage of urban-built up area. Twenty percent of this site is wooded and 20% is cropland. Chain O' Lakes - Fox River has the most nonforested wetlands acreage (20,839 acres) and ranks first for percentage of nonforested wetlands among the RRAs.

NATURAL AREAS - This site has the second highest number of Natural Areas. The 72 Natural Areas include bogs, fens, seeps, marshes, sedge meadows, natural lakes, glacial features, and prairies.

BIOLOGICALLY SIGNIFICANT STREAMS - The Chain O' Lakes - Fox River RRA has 15 BSS locations, 14 of which are lakes.

HERITAGE SITES - This site has 476 Heritage occurrences, the highest number among the RRAs. There are 23 significant community types, 73 plants species, 23 animal species, and five rookeries in this area.

STATE AND FEDERAL LAND - State land in this RRA consists of two state parks: Chain O' Lakes and McHenry Dam & Lake Defiance. There is no federal land in this site.

NATURE PRESERVES - There are 34 Nature Preserves within this RRA. Principal natural features are bogs, fens, marshes, glacial lakes, sedge meadows, and prairies.

NATURAL DIVISIONS This site is entirely within the Northeastern Morainal Natural Division.

Source: Critical Trends Assessment Phase II - Inventory of Resource Rich Areas in Illinois: An Evaluation of Ecological Resources Illinois Natural History Survey, 1996

The Illinois Nature Preserves Commission has designated six sites in the Nippersink Creek Watershed as Illinois Nature Preserves (INP). These include Barber Fen, Bystricky Prairie, Elizabeth Lake, Glacial Park, Lind Forest, and Spring Grove Fen. These INP sites occur on both private and public lands.

Table 2.3 MCNAI Methodology

In 2005, the McHenry County Conservation District (MCCD) released an updated McHenry County Natural Areas Inventory (MCNAI). This study evaluated the remaining areas in McHenry that would qualify as MCNAI sites, using the assessment methodology presented in Table 2.3.

Based upon this study, the Nippersink Creek Watershed contains 46 of the 169 MCNAI sites in McHenry County, and 42 stream miles ranked as "quality". A total of 13,105 acres of MCNAI sites are found in the Nippersink Creek Watershed.

Methodology

To qualify as a McHenry County natural area, a parcel of land or water must possess at least one of the following criteria:

1. Remnant terrestrial or wetland natural communities professionally rated as possessing moderate quality (grade C) or better. Rating grades are determined by field assessment of native plant diversity, degree of disturbance by human land use practices and the subsequent effects of those impacts on the soil, hydrology and plant composition and distribution within a given natural community type.
2. Provide breeding habitat (animals) or sustainable soil/water conditions (plants) for one or more state endangered or threatened species. Records of endangered or threatened species must be reasonably extant sightings of breeding individuals or populations, or reliable written reports. The Illinois Endangered and Threatened Species List in force as of 2005 is the basis for species status assigned within this report.
3. Receive a stream classification by the Illinois Department of Natural Resources as unique (grade A) or high quality (grade B). Stream ratings are based on an evaluation of fish communities. Field survey data are used to compute an Index of Biotic Integrity (IBI), a numerically based quality system developed by aquatic ecologists at the Illinois Natural History Survey. The point values computed correspond to letter grades. Additional information taken into account for a stream's inclusion in the MCNAI includes fresh water mussel survey data.
4. Be classified as an ecologically unique area which contain natural heritage features recognized by professional geologists as outstanding examples of glacial landforms, or accepted by professional biologists as significant because they buffer or expanded habitat for these features.
5. Areas of open space currently being restored to natural communities or for which owner-approved management plans exist to facilitate and guide such restorations. In nearly all cases sites qualifying under this criteria typically meet other criteria for inclusion in the MCNAI as well, or they provide essential buffer or expanded habitat for these features.

Source: McHenry County Natural Areas Inventory - 2005

For the first time in 2005, the MCNAI study also identified two "Areas of Special Conservation Concern" (ASCC) in McHenry County. This designation identified areas where the efforts of private landowners in protecting and restoring significant ecological resources on their own properties link otherwise unconnected resource areas, which in turn support and enhance the efforts undertaken by MCCD in large-scale ecosystem restoration. One of these ASCC areas, referred to as High Point, is located in the Nippersink Creek Headwaters subwatershed in Alden Township, and contains a significant portion of the Nippersink Creek tributary area above the Alden Sedge Meadow MCNAI site.

In the 2005 MCNAI report summary, the MCCD identified a total of nine ecosystem complexes of particular interest located in the Fox / Nippersink watershed. Of these, five are located within the Nippersink Creek watershed. These critical project areas are described in Table 2.4, and should be considered integral components of this watershed plan.

Table 2.4 2005 MCNAI Report Summary for Fox / Nippersink Watershed RRA

Summary of the 2005 MCNAI

Seven years have passed since the 1998 summary portion of the MCNAI was written. In those seven years McHenry County has experienced unprecedented growth. Family farms have given way to sub-divisions; the county's population has expanded dramatically and the pressure on the natural areas identified in this report, both protected and unprotected has undergone a dramatic increase.

The slogan *wetness is wildness* still holds true for McHenry County's natural heritage and those Resource Rich Areas first identified in the MCNAI process continue to be high priorities for land protection. While much work lies ahead to insure these most important elements of our biological heritage survive into the future, great strides have been made since 1998. In the Fox/ Nippersink RRA numerous important projects have begun or been completed in many of the ecosystem complexes first delineated in the 1998 MCNAI. These include:

1. **Greenwood Fen – Greenwood West Complex**: Protection of large segments of the Greenwood Fen complex and Lind Woods areas as well as protection of a large buffer to Bystricky Prairie.

2. **Alden Sedge Meadow Complex:** Protection of the entire basin of Mud Lake, the headwaters of Nippersink Creek. Acquisition of major portions of the Bailey Woods complex and adjoining areas between the two sites. Large scale efforts by private landowners in restoration/protection of additional lands

3. **Hebron Peat Lands Complex:** Enlargement of the Goose Lake Natural Area to include almost the entire historic basin of the lake.

4. **North Branch of Nippersink Creek Complex:** Protection of much of the Genoa City Wetlands and Barrens site, as well as large segments of the South Richmond Sedge Meadow site.

8. **Glacial Park/Tamarack Farms**: Protection of several small additions to Glacial Park.

Source: McHenry County Natural Areas Inventory - MCCD 2005

The Nippersink Creek Watershed is still considered to be a rural watershed, and has retained many of its unique and irreplaceable natural areas. However, a comparison of the historic extent of Nippersink watershed hydric (wetland) soils (as shaded in green in Figure 2.3) with the present day extent of mapped wetlands (as shaded in yellow in Figure 2.4), reveals a significant loss of wetland acreage.

Figure 2.3 Hydric Soils of the Nippersink Creek Watershed

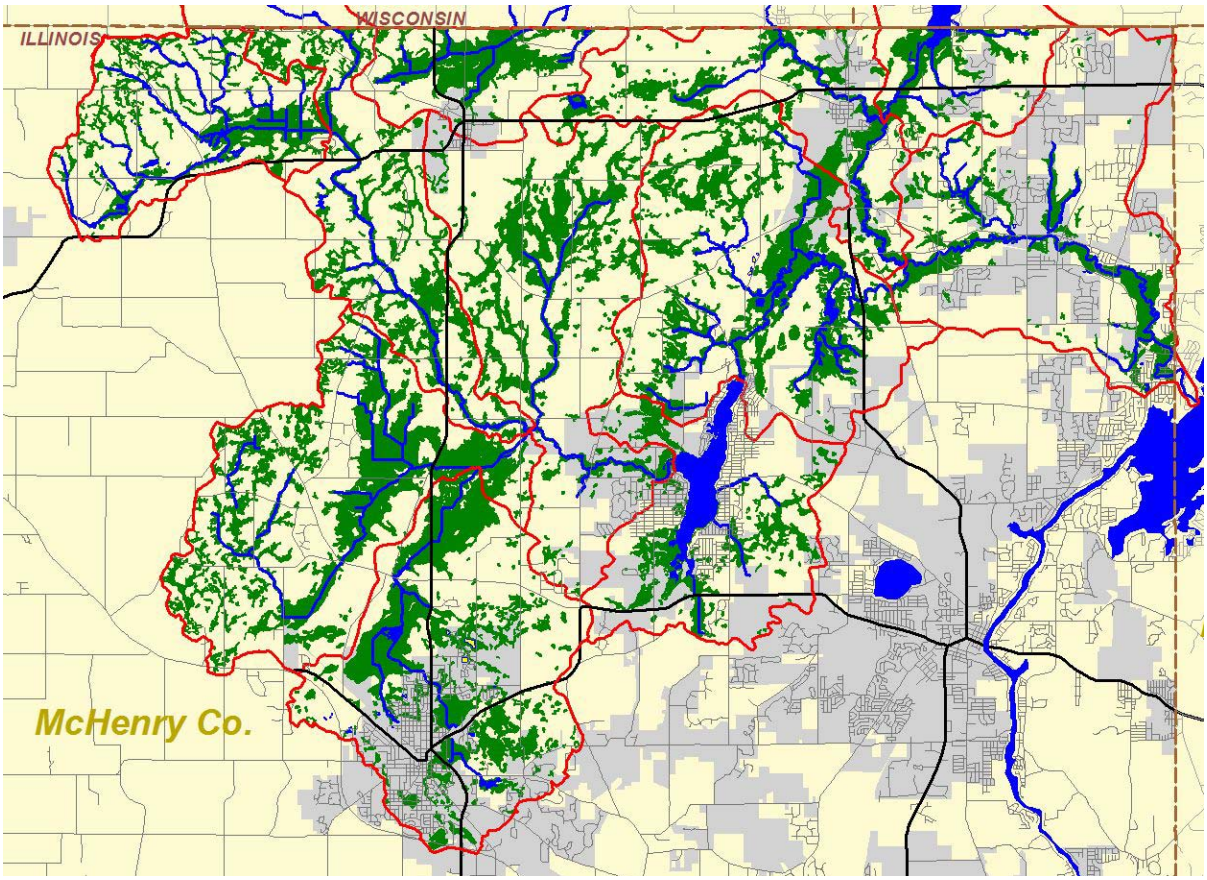
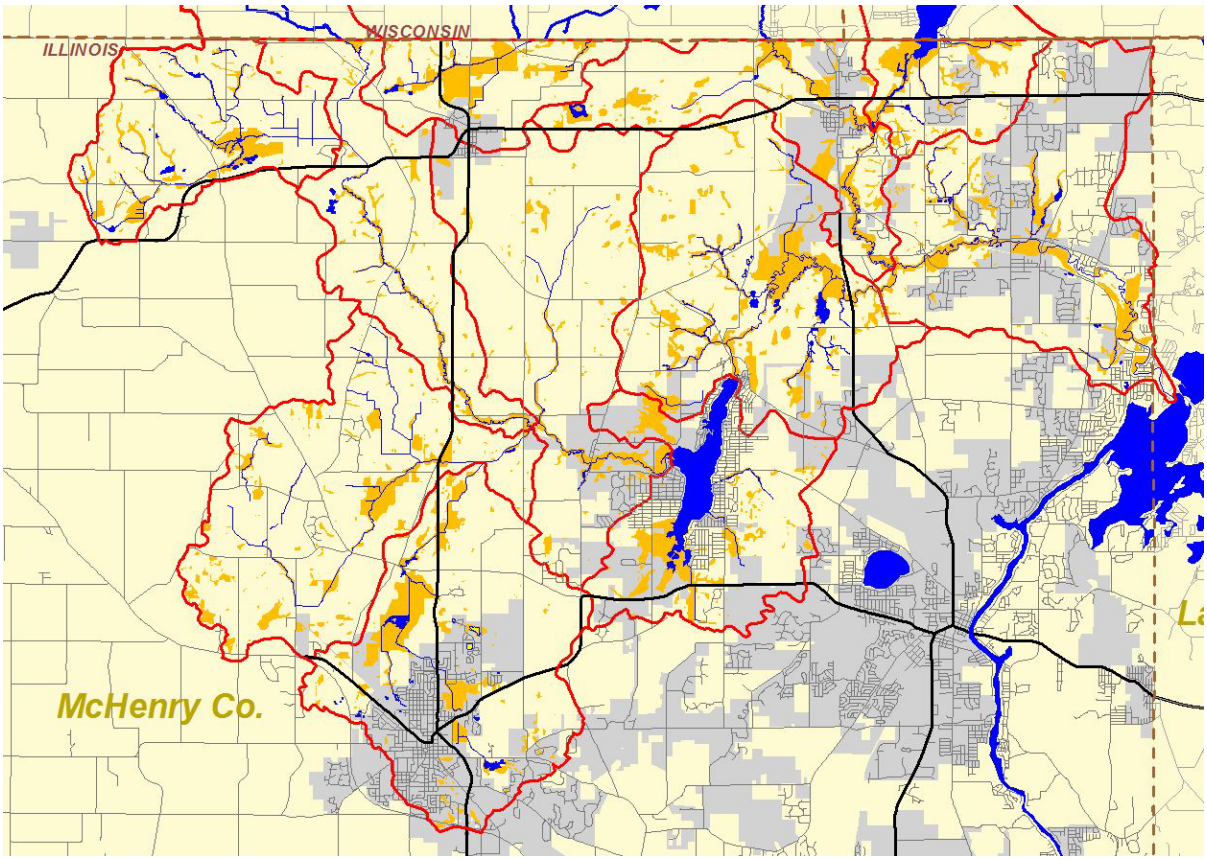


Figure 2.4 Mapped Wetlands of the Nippersink Creek Watershed



Compared to the 23,700 acres of mapped hydric soils which cover 24% of the watershed, the recent Advanced Identification (ADID) Wetland Study of McHenry County identified only 12,150 acres of wetlands in the watershed, which accounts for only 12.6% of the watershed area. This represents a roughly 50% loss in wetland acreage in the watershed.

While most of the remaining wetlands occur on private land, many have been protected through acquisition by public agencies, such as the McHenry County Conservation District, which owns 6,932 acres of watershed land, grouped into 25 managed sites.

However, the potential for large-scale wetland restoration still exists in the Nippersink watershed. This is attributable to the fact that, in contrast to more urbanized areas where most of the wetlands were actually filled to allow urban development, the majority of the lost wetland acreage in the Nippersink watershed can be attributed to wetland drainage, and not filling. In these drained wetlands, the hydric soils (and in many cases a seedbank of native wetland plant material) are still present.

If these drained areas can be placed into conservation programs or acquired, and the drainage restored or modified in a way to not cause off-site impacts, large scale wetland restoration could occur throughout many portions of the watershed.

2.1.2 Biological Resources

Biological monitoring of the Nippersink Creek watershed is done sporadically. The Illinois Department of Natural Resources fishery personnel survey the watersheds of Illinois on a rotating basis, based upon staffing resources. This results in multi-year gaps in available fishery data sets.

As part of a USGS study on Wonder Lake conducted from 1994 – 2001, fish survey work was at the Thompson Road Bridge upstream of Wonder Lake in 1999, 2000, and 2001, as shown in Table 2.5. That survey work revealed the presence of twenty species of fish.

It should be noted that fish sampling conducted downstream of the Wonder Lake Dam has a much better potential for increased fishery diversity, as fish in that reach of the Nippersink can migrate freely down into the Chain O' Lakes, and up into the Wisconsin portion of the Fox River. As a result, the consideration of implementing some type of fish passage structure around the Wonder Lake dam has occurred, and implementation of such an action should be part of the Nippersink Creek Watershed Plan.

Wonder Lake Dam

Table 2.5 1999 – 2001 NAQWA Fish Survey Data

05548105 NIPPERSINK CREEK ABOVE WONDER LAKE, IL THOMPSON ROAD BRIDGE						
		Genus / species	Common Name	Reach A 8/12/1999	Reach A 8/1/2000	Reach A 7/10/2001
Atheriniformes						
	Atherinopsidae					
		Labidesthes sicculus	brook silverside	2		
Cypriniformes						
	Catostomidae					
		Catostomus commersonii	white sucker	33	13	88
		Moxostoma erythrurum	golden redhorse	2	4	
	Cyprinidae					
		Campostoma anomalum	central stoneroller	6	14	1
		Cyprinella spiloptera	spotfin shiner	2	25	14
		Cyprinus carpio	common carp	5	6	17
		Notropis dorsalis	bigmouth shiner	38	26	
		Notropis stramineus	sand shiner		3	
		Pimephales notatus	bluntnose minnow		38	5
		Pimephales promelas	fathead minnow	1	2	5
		Rhinichthys atratulus	blacknose dace	1	1	
		Semotilus atromaculatus	creek chub	4	3	4
Esociformes						
	Umbridae					
		Umbra limi	central mudminnow		1	
Perciformes						
	Centrarchidae					
		Lepomis cyanellus	green sunfish	18	12	6
		Lepomis gibbosus	pumpkinseed		1	
		Lepomis macrochirus	bluegill	26	21	7
		Lepomis sp.	common sunfishes		1	
		Micropterus dolomieu	smallmouth bass	10		5
		Micropterus salmoides	largemouth bass	6	11	1
	Percidae					
		Etheostoma microperca	least darter	1		
		Etheostoma nigrum	johnny darter	3	2	1
		Etheostoma zonale	banded darter	6	13	18
Siluriformes						
	Ictaluridae					
		Ameiurus natalis	yellow bullhead			2
		Ictalurus punctatus	channel catfish	3		10

Source: USGS NAQWA Fish Sampling for 1999-2001

The McHenry County Conservation District (MCCD) conducts stream surveys on their properties, and typically inventory fish, mussel, and benthic invertebrate populations. Table 2.6 presents data from the MCNAI database for MCCD / MCNAI sites.

Table 2.6 Threatened and Endangered Species of the Nippersink Watershed

Common Name	Scientific Name	Type	Status	MCNAI Site
Henslow's Sparrow	Ammodramus henslowii	Bird	State Threatened	RIC06
Upland Sandpiper	Bartramia longicauda	Bird	State Endangered	RIC06
American Bittern	Botaurus lentiginosus	Bird	State Endangered	ALD02, RIC02
Black Tern	Chlidonias niger	Bird	State Endangered	RIC06, HAR08, HEB02, RIC02
Northern Harrier	Circus cyaneus	Bird	State Endangered	RIC06
Common Moorhen	Gallinula chloropus	Bird	State Threatened	RIC06, DOR02, HEB02, HEB05
Sandhill Crane	Grus Canadensis	Bird	State Threatened	RIC06, ALD02, RIC05, HEB02, HEB04, HEB05
Least Bittern	Ixobrychus exilis	Bird	State Threatened	RIC06, RIC02, HEB02
Black-Crowned Night-Heron	Nycticorax nycticorax	Bird	State Endangered	RIC06, RIC02
King Rail	Rallus elegans	Bird	State Endangered	RIC06
Forster's Tern	Stema forsteri	Bird	State Endangered	RIC06, RIC02
Yellow-Headed Blackbird	Xanthocephalus xanthocephalus	Bird	State Endangered	RIC06, DOR02, HAR08, RIC05, HEB02, HEB05
Regal Fritillary	Speyeria idalia	Butterfly	State Threatened	RIC06
Iowa Darter	Etheostoma exile	Fish	State Threatened	RIC02
Banded Killfish	Fundulus diaphanus	Fish	State Threatened	RIC02
River Redhorse	Moxostoma carinatum	Fish	State Threatened	RIC06
Pugnose Shiner	Notropis anogenus	Fish	State Endangered	RIC02
Blackchin Shiner	Notropis heterodon	Fish	State Threatened	RIC02
Blacknose Shiner	Notropis heterolepis	Fish	State Endangered	RIC06, RIC02
Slippershell Mussel	Alasmidonta viridis	Mussel	State Threatened	RIC06, ALD02
Purple Wartyback Mussel	Cyclonaias tuberculata	Mussel	State Threatened	RIC06
Spike Mussel	Elliptio dilatata	Mussel	State Threatened	RIC06
Blanding's Turtle	Emydoidea blandingii	Reptile	St Threatened	RIC06, GRE10, GRE13, HAR08, ALD02, HEB02, RIC02
Grass Pink	Calopogon tuberosus	Plant	State Endangered	ALD02
Two-Seeded Sedge	Carex disperma	Plant	State Endangered	BUR01
White Lady's Slipper	Cypripedium candidum	Plant	State Threatened	RIC06, GRE03
Small Yellow Lady's Slipper	Cypripedium parviflorum makasin	Plant	State Endangered	GRE03
Round-Leaved Sundew	Drosera rotundifolia	Plant	State Endangered	RIC06
Rusty Cotton Grass	Eriophorum virginicum	Plant	State Endangered	RIC06
Tamarack	Larix laricina	Plant	State Threatened	RIC06, HEB03
Pale Vetchling	Lathyrus ochroleucus	Plant	State Threatened	RIC06, BUR03, GRE01
Savanna Pinweed	Lechea intermedia	Plant	State Threatened	RIC06, MCNAI, GRE12
Eastern Prairie Fringed Orchid	Platanthera leucophaea	Plant	St Endangered / Fed Threatened	RIC06, GRE09
False Asphedel	Tofieldia glutinosa	Plant	State Threatened	HEB09
Nodding Trillium	Trillium cernuum	Plant	State Endangered	GRE01 GRE05
Pitcher Plant	Sarracenia purpurea	Plant	St Endangered	ALD02
Common Bog Arrow Grass	Triglochin maritime	Plant	State Threatened	ALD02, HEB03
Large Cranberry	Vaccinium macrocarpon	Plant	St Endangered	RIC06
Dog Violet	Viola conspersa	Plant	State Threatened	RIC06, MCH06

Source: McHenry County Natural Areas Inventory Database, 2005

2.1.3 Water Quality

While Nippersink Creek as a whole is faced with many challenges affecting its water quality and ecosystem health, there are several reaches of the main stem and tributaries classified as highly valued aquatic resources by various local and state agencies.

Canoeing Nippersink Creek

Nippersink Creek watershed is the largest tributary to the Fox River, draining 137 square miles in Illinois, as well as additional 50 square miles located in Walworth County, Wisconsin.

In the Algonquian language, Nippersink means "place of the **small waters**" due to the profusion of small springs feeding the creek. It is among the finest streams in Illinois with the mainstem rating a "B" Biological Stream Characterization score and the North Branch receiving an "A" rating.

2.2 Human Resources: Population and Land Uses

2.2.1 Population

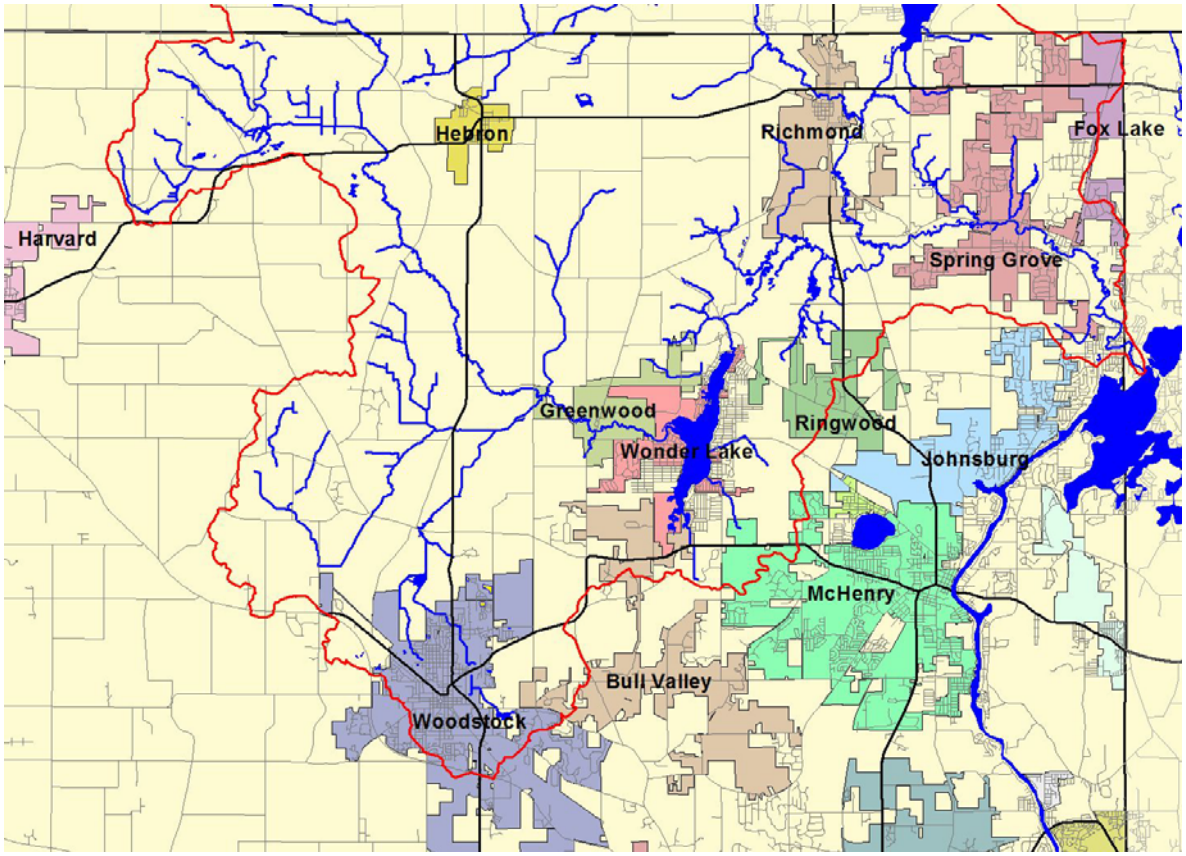
The land use of the Nippersink Watershed, like other areas in the Chicago region, has changed dramatically as more and more people have moved into the watershed. Historically, 33% of the watershed was grassland, 29% of the watershed was made up of wetlands, and 36% of the watershed was covered with woodlands. European-American trappers and traders first entered the watershed in the 1650's, however, the first permanent settlers didn't take up residence until around 1838, in what is now Greenwood Township. In 1990, the watershed's population was estimated at 32,200. That number increased nearly 29%, to a total of 41,425 persons at the last US Census in 2000.

2.2.2 Development Patterns & Land Use Changes

There are now 10 municipalities in the Nippersink Creek watershed. Three of these municipalities have entered the watershed via annexation of new development adjacent to their boundaries (Fox Lake, McHenry, and Bull Valley). Land within municipal boundaries now accounts for about 21,000 acres, or 17% of the land in the Nippersink Watershed.

Urban Growth in McHenry County

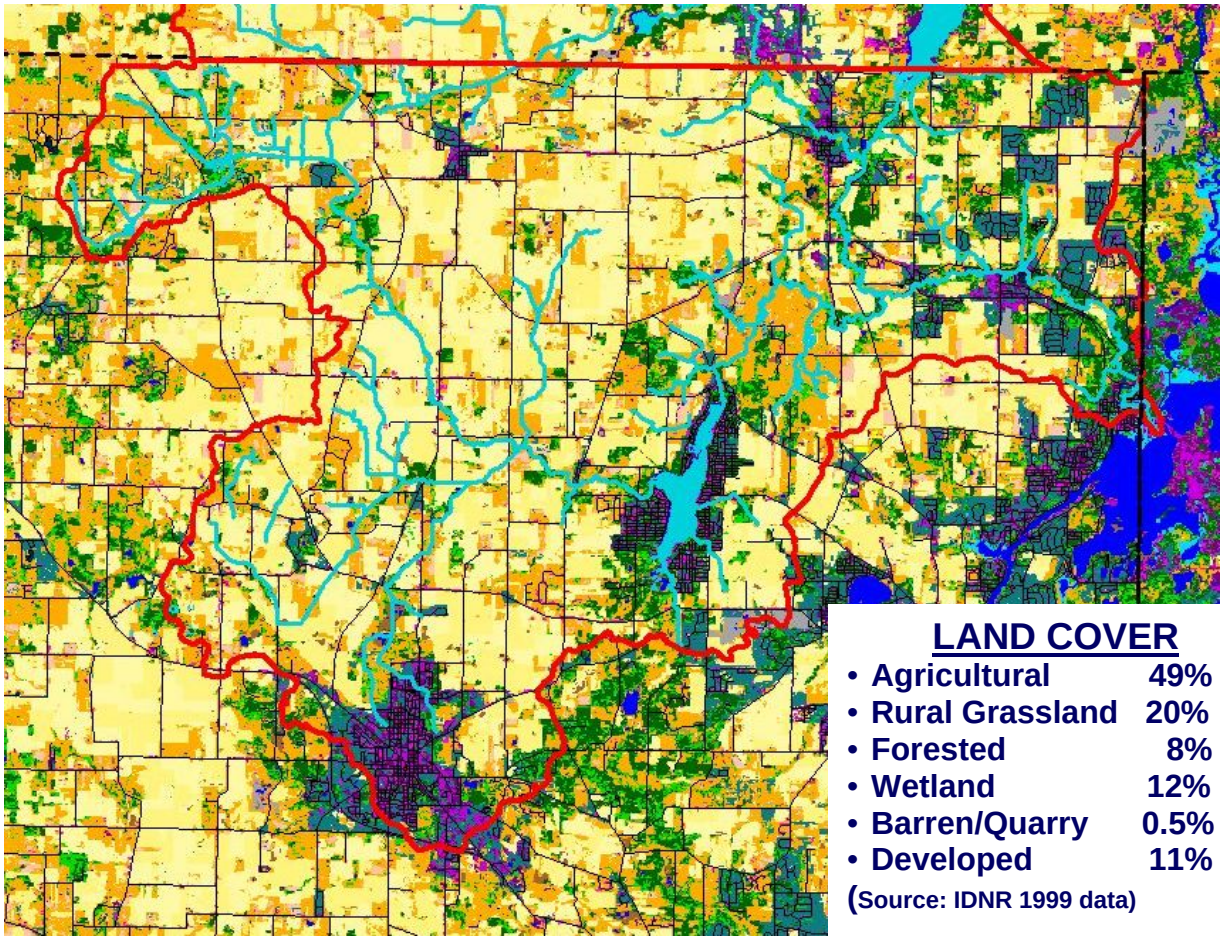
Figure 2.5 Municipalities in the Nippersink Creek Watershed



2.2.3 Land Use

Largely owing to its relative distance from the Chicago metropolitan area, the Nippersink Creek watershed still remains primarily rural and agricultural. Developed areas, shown in purple on Figure 2.6, are still concentrated within or on the fringe of established urban areas. However, significant land development activities have been underway in the southeast half of the watershed, primarily associated with the City of Woodstock, and the Village of Spring Grove. Proposals for new large scale developments are also underway in The Village of Wonder Lake.

Figure 2.6 1999 Land Use Cover in the Nippersink Creek Watershed



There are three IEPA permitted municipal point source discharges (Hebron, Richmond, and Woodstock) which discharge as much as 4 million gallons of treated wastewater effluent each day into the Nippersink Creek or one of its tributaries. There are also three other permitted discharges (Intermatic Inc, Surgipath Medical Industries & Prairie Material Sales Yard 23) which can discharge up to an additional 830,000 gallons of process water each day.

2.3 Watershed Impacts & Impairments

2.3.1 Existing Impacts & Impairments

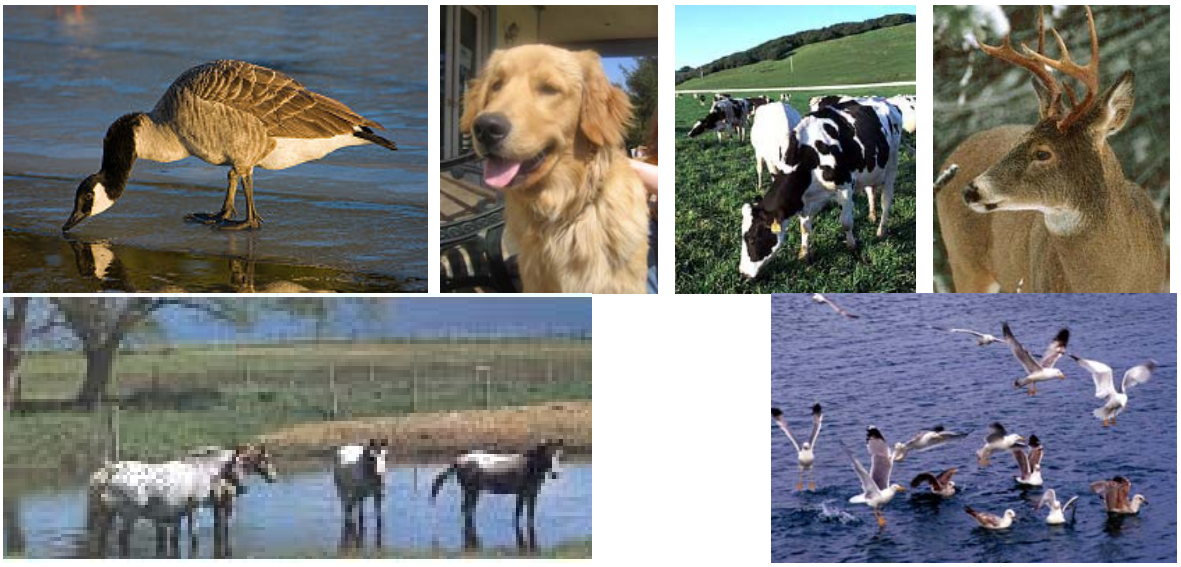
The Nippersink Creek watershed was listed as a Year 2000 high priority area identified through the Illinois EPA's Targeted Watershed Approach. The wellhead protection zones of the Village of Richmond lie entirely in the watershed and the watershed is part of the Northern Regional Groundwater Protection Region.

Upstream of Wonder Lake, Nippersink Creek was listed in the IEPA's 305(b) Report as being in Full Support of its Designated Uses, which are listed as Aquatic Life and Fish Consumption. Downstream of Wonder Lake, Nippersink Creek is listed as impaired by the IEPA due to excessive total fecal coliform bacteria.

The stream was considered in full support for its designated uses of aquatic life and fish consumption, but due to the fecal coliform, it is listed as non-support for a designated use of primary contact. The source of this fecal coliform is listed by the IEPA as "unknown". Failing septic systems serving residential properties would be the most likely source of any human fecal coliform contributions.

Potential sources of fecal coliform bacteria include all warm blooded animals (humans, pets, domesticated livestock, birds, and wildlife). More likely sources include pastures where cattle or horses have access to the stream; flocks of Canada Geese or sea gulls congregating at stream-side parks and golf courses; or even domestic pet waste washed into storm sewers. It should be noted that the Nippersink Creek watershed historically had a large number of dairy farms, but many of these are no longer in operation. The more likely source of fecal coliform in the watershed in the future will be horses, not dairy cows or cattle.

Potential "Unknown" Sources of Fecal Coliform



One of the major difficulties in developing management strategies for waters contaminated by fecal coliform bacteria is that there are numerous potential sources of bacteria, and the degree of contribution from any given source cannot be easily determined, without extensive water quality analysis. Bacterial source tracking (BST) is a recently developed technology for identifying the sources of fecal coliform bacteria and it may be helpful in targeting where water quality Best Management Practices may need to be implemented.

In 2004, the United States Geological Survey released a report *Water Quality of Nippersink Creek and Wonder Lake, McHenry County, Illinois, 1994-2001.* This report discussed the water quality impacts being experienced within Wonder Lake, an 830 acre on-line impoundment, due to the amount of nutrient and sediment entering the lake from its upstream watershed. The sediment and nutrients can cause adverse water quality impacts within the stream, as well as in Wonder Lake, and the Fox River / Chain O'Lakes into which Nippersink Creek flows.

2.3.1.1 Watershed Impairment Causes Not Listed on the IEPA 303(d) List

Although not specifically identified or listed by IEPA for Nippersink Creek, other 303(d) watershed impairment causes often cited in urban / urbanizing watersheds can include:

- Oils and Grease
- Excessive Nutrients
- Chlorides
- Low Dissolved Oxygen
- Sedimentation / Siltation
- Hydromodification

Oils and Grease, Excessive Nutrients, and Chlorides

Generally speaking, Oils and Grease, Excessive Nutrients, and Chlorides can often be associated with urban stormwater runoff, where highly efficient stormwater systems can rapidly deliver materials deposited on streets into the stream system. This potential likely exists in the older, urbanized portions of the watershed, such as Lower Nippersink, Silver Creek or Slough Creek.

Parking Lot without Stormwater BMP's

Unstabilized Streambank

Low Dissolved Oxygen, Sedimentation and Siltation

Low Dissolved Oxygen, Sedimentation and Siltation, and Excessive Nutrients can often be found in channelized stream segments, where sufficient stream gradient does not exist to allow natural re-oxygenation of the water column; eroding streambanks are delivering sediment to the channel; or where nutrients bound up in eroding soil are being washed into the stream. This potential certainly exists in the upper reaches Vander Karr Creek, and the lower reaches of Silver and Slough Creek.

However, the same impairment causes could result from sediment laden storm water discharges from a construction site with poor Soil Erosion and Sediment Control practices. To date, much of the development within the Nippersink Creek watershed has been comprised of single family residences on large lots. Mass grading is not required on these types of development project, particularly since care must be taken to avoid damaging the soil profile of the proposed septic system leachate field. In contrast, most large scale development, served by municipal wastewater treatment systems, tend to "mass grade" their sites, first stripping off the highly absorbent topsoil layer and stockpiling it for sale. Once the site grading of the underlying clay has been conducted and the site infrastructure and building pads are completed, a token amount of topsoil is respread to allow turf grass to be established. In addition to losing the stormwater storage and filtering benefits provided by an undisturbed organic soil horizon, the site is far more prone to erosion and sedimentation during grading.

Mass Grading of a Construction Site

Hydromodification

Cropland With Drain Tiles

Hydromodification is a term used to describe human induced activities that changes the dynamics of surface or subsurface water flow. In the Midwest, the most prevalent hydromodification was the historic channelization of streams to improve agricultural productivity. Early settlers recognized that the soils found in the broad expanses of wetlands and wet prairies were ideal for crop production, provided the excess water could be removed.

Channelized Stream With Drain Tile Outlets

This resulted in the installation of sub-surface drainage tiles to remove the excess groundwater and route it to a point where it could be discharged. In order to have these tiles drain by gravity flow, a receiving drainageway was needed that was at an elevation lower than the drain tile.

To achieve this, the receiving drainageway, often a natural stream channel, would be excavated to a deeper depth. As part of this channelization effort, natural stream channels were typically straightened as well, to facilitate drainage, and to allow fields to be squared off.

By removing this excess water, the areas could be successfully cropped. This gain in agricultural productivity was unfortunately at the expense of large expanses of wetlands, wet prairie, and riparian habitats. The bright side is that in many of these altered areas, if these drainage improvements are modified or removed, those lost habitats can often be restored to some degree of their former function and quality. In the Nippersink Creek watershed, this type of hydromodification occurred primarily in the Vander Karr Creek, Silver Creek, Slough Creek and lower reaches of the Nippersink Headwaters subwatershed.

Another form of hydromodification that occurred in the Nippersink Creek watershed was the filling of wetland and floodplain areas to facilitate development. The losses of these natural flood storage areas forced the receiving waterway to both store and convey the increased stormwater runoff, which became increasingly difficult as the magnitude of the flow event increased. The short-term result of this is overbank flooding; the longer-term impact is the expansion of the stream channel to accommodate the increased flow volume. This channel expansion can cause significant sediment delivery to the stream channel as the channel deepens and widens.

The deepening (incision) of the stream channel into the landscape can cause a further disconnect between the stream and its floodplain, forcing more frequent flow events to remain within the channel, increasing the scour potential. The incision of the stream channel can also cause groundwater elevations in the streambanks to drop, further stressing any remaining wetland / wet prairie plant communities. The loss of the depressional wetland and floodplain areas, and their associated pre-disturbance habitats, also served to adversely impact water quality, as these areas were no longer available to trap streamborne pollutants (suspended sediments, nutrients, etc.).

Curb and Gutter Stormwater Management

The most prevalent current day hydromodification is the result of land development. As the conversion of undeveloped ground to rooftops, pavement, and highly compacted ground, as well as highly efficient storm sewer systems, greatly reduce the potential for precipitation to infiltrate into the ground. Instead of older styled roadside drainage swales, where stormwater runoff had an opportunity to soak in, modern day stormwater management generally favors curb and gutter stormwater management to capture and route stormwater runoff to stormwater detention basins.

Roadside Swale Stormwater Management

Stormwater runoff routed to stormwater detention ponds is detained for a specific period of time (per stormwater ordinances) and is released into the receiving stream. However, the detention times mandated by stormwater ordinances are typically not long enough to allow for any significant water quality benefits to occur within the detention pond.

Typical "Dry Bottom" Stormwater Basin

The use of "dry bottom" stormwater basins, with mowed turfgrass bottoms, also prevents significant water quality benefits from being provided.

While the use of stormwater detention certainly helps reduce the risk of downstream flooding, it still results in a greater volume of water being discharged to the stream (as compared to pre-development conditions), in the period shortly after the storm is over. This is in contrast to the pre-development condition, when the vast majority of precipitation would infiltrate into the ground, and slowly move towards the receiving stream, providing a year-round source of groundwater discharge of cool, filtered water into the stream.

Invasive Species

Although not typically classified as impairment to water quality, a threat to health and diversity of the watershed's natural areas is the rapid spread of invasive species of vegetation into the remaining natural areas, such as wetlands, woodlands, and stream corridors. Nearly every stream corridor, wetland, woodland, prairie, or other natural open space is facing an onslaught of invasive species, including Reed Canary Grass, Phragmites (Common Reed), Garlic Mustard, Honey Suckle, and Buckthorn. These aggressive invaders can out-compete native species, diminishing the floristic quality and wildlife habitat quality.

Excessively Dense Woody Cover

Of particular concern are the woody species, such as Box Elder, Common Buckthorn, and Honeysuckle which can dominate unmanaged stream corridors, and create a dense shady canopy that can prevent soil stabilizing herbaceous (grassy) vegetation from establishing on the streambanks. The lack of groundcover vegetation can make the streambank soil more prone to erosion, and as the streambank erosion progresses, and the trees / brush are undermined, they can slump into the channel, causing debris blockages and flow diversion into other unstabilized streambanks.

Restored Nippersink Creek in Glacial Park

It must be noted that stream shading and woody debris are critical components of a healthy stream system. Shade cast over the surface of the stream can keep water temperatures cooler, which allows more dissolved oxygen to remain in the water column, available for use by aquatic organisms. However, in much of the upper Nippersink Creek watershed, wildfires in pre-settlement times kept much of the stream system brush- and tree-free. The dominant riparian vegetation was dense stands of prairie grasses and forbs that overhung the stream channel, providing shade and cover.

The key to proper stream corridor management is to still provide shade for water temperature moderation, but to provide it from a variety of vegetation sources, at different elevations.

Similarly, woody debris in a stream channel is the base of the food chain of a stream system, and needs to be present to allow a diversity of small aquatic organisms to prosper. Again, moderation is the key in balancing between a debris clogged channel, and one stripped of every last stick or branch.

2.3.2 Future Impacts and Impairments

Without questions, the biggest threat to the health and sustainability of the Nippersink Watershed is the rapid development of agricultural land into suburban land uses. This change in land use continues to be performed using land development methods which do not preserve the interception, infiltration, storage, and slow release of accumulated rainfall to the underlying shallow aquifers and adjacent wetlands and streams.

In early 2008, McHenry County adopted a new Conservation Design Ordinance for unincorporated portions of the County, which will trigger if certain environmental features are present on, or in proximity, to a parcel proposed for development. The City of Woodstock has also adopted Conservation Design Guidelines, as well.

Degraded Waters Quality from Development

Existing stormwater ordinances covering the Nippersink Creek watershed are not designed specifically to mitigate water pollution from development. The required stormwater retention component provides some opportunities for pollutants to settle out or be assimilated, but as the intent of stormwater management is to only store the water as long as necessary to meet detention requirements, the resulting retention times are often insufficient to achieve measurable water quality improvement.

Additional Channel Hydromodification

Current stormwater and subdivision ordinances do an adequate job of preventing an increase in peak stormwater discharges for the larger, infrequent events, such as the 100-year event, but recent studies have shown that the further you go downstream in a watershed, the peak discharges for smaller events that effect stream ecology and stream channel stability increases by as much as 66% (reference: Blackberry Creek Alternative Futures Study, 2003).

Loss of Natural Wetlands & Stream Corridor

Current regulations still allow for remaining farmed or lower quality wetlands to be filled or converted to stormwater basins. Developments are currently allowed to build their stormwater infrastructure right up to the edge of the streambank. This is especially true in upper areas of the watershed where stream corridors have long since been drained and streams ditched and channelized to maximize farmable area. The problem is that when new developments are planned, they are allowed to build up to the edge of the current day stream corridor, which today is reduced to a 30 to 60 foot wide strip. This does not reflect the previous expanse of the historic stream corridor, which was perhaps 3 to 5 times that width, when using hydric soils as an indicator. Development infrastructure this close to the existing channelized stream does not account for the possibility of the stream channel reverting to a more natural, meandering pattern, which can occur (and is desired from an environmental resource point of view) if the stream gradient is sufficient.

Reduced Groundwater Recharge

The cumulative effects of:

- new development (more impervious surfaces),
- loss of remaining wetlands (or conversion of low quality wetlands to detention basins), and
- maintaining the channelized nature of streams in the agricultural areas (which are soon to be converted to new development)

will most certainly result in a net loss of groundwater recharge to the shallow aquifers under the Nippersink Creek Watershed.

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