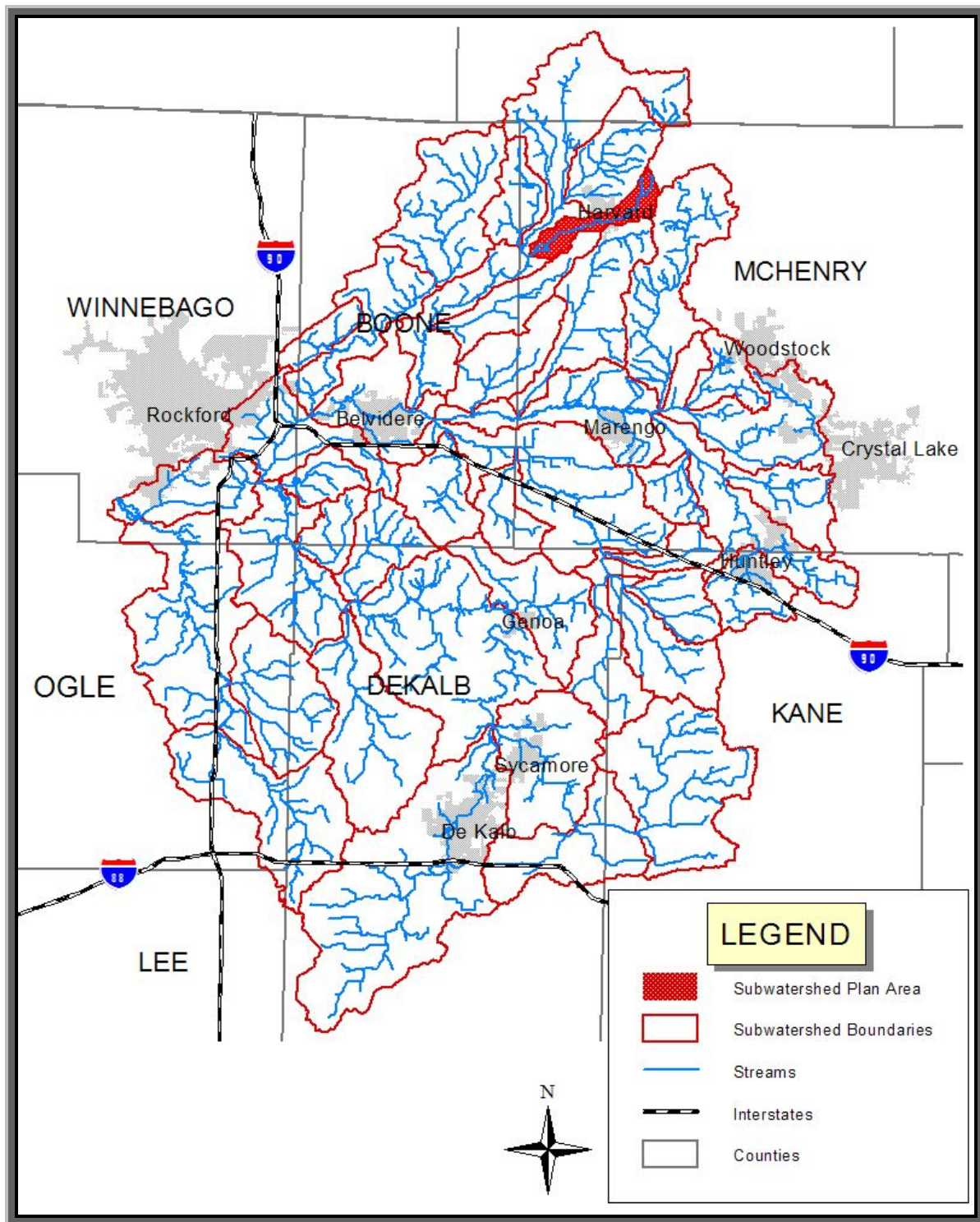


MOKELER CREEK SUBWATERSHED PLAN



May 2005

PREPARED BY THE
KISHWAUKEE RIVER ECOSYSTEM PARTNERSHIP

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Introduction:

This report is intended to serve as an interim report of existing natural resource conditions and concerns within the **Mokeler Creek** subwatershed. It also establishes a framework for identifying strategies and recommendations that should be implemented to protect and enhance those natural resources.

Any protection strategies must be developed and implemented with awareness that agriculture has historically been, and will remain, a dominant land use in the Kishwaukee River Watershed, while at the same time recognizing that the amount of land undergoing urban development is rapidly increasing. In order to develop feasible, cost effective strategies that will be accepted and implemented, it is critical that the concerns and issues affecting all stakeholders in the subwatershed be considered. The recommendations contained in this report are intended to spark interest in watershed protection and promote cooperation amongst stakeholders, whether it is at the federal, state, local, or individual landowner level. Only by working together can we create and implement a plan that will provide a benefit to the entire Kishwaukee River watershed and maintain a high quality of life for those who live, work, or play here.

This natural resource information was obtained from various public sources, as well as from input from those stakeholders participating to date in this planning effort. If during the course of reviewing this information, you should find erroneous or out of date information, please contact the Kishwaukee River Ecosystem Partnership so that the plan can be kept current and relevant. Your local knowledge and participation is key to achieving our goal of protecting the character of the watershed and our way of life.

For more detailed information on the data used to compile this report, please refer to the Kishwaukee River GIS Dataset or website produced by the Kishwaukee River Ecosystem Partnership. <http://krep.bios.niu.edu>



Summary of Subwatershed Features:

Location

The Mokeler Creek Subwatershed is a small, 9.5 square mile subwatershed in northwestern McHenry County. Mokeler Creek has its origins in the crop fields between Crowley and Oak Grove Road, 2.5 miles northeast of Harvard. Mokeler Creek is a tributary to Piskasaw Creek and flows southwest before discharging to Piskasaw Creek about 4.4 miles southwest of Harvard.

Stream and Stream Corridor Characterization

Mokeler Creek is a higher-gradient, 2rd order stream that has been subjected to significant channelization and encroachment by both agricultural and urban pressures over its history. The stream system is divided into three sections. The lower section is a heavily channelized reach passing through land dominated by agriculture. Little to no natural stream corridor remains in this section, however, there are a few short segments of stream that remain natural and several other channelized reaches are showing signs of recovery (remeandering observed on the aerial photos). The middle section of the creek passes through the urban area of Harvard. This segment is mostly channelized and urban development has encroached into the stream corridor. The adjacent land cover in this reach is typically turf grass and nuisance “weedy” vegetation such as Box Elder and Buckthorn. The upper section of Mokeler Creek is also heavily channelized, but the adjacent land is mostly rural grassland (pasture). Much of the stream corridor is dominated by flat, shallow-marsh wetlands. The stream corridor in this section can be as much as 1000 feet wide, whereas downstream of Harvard, agriculture limits the natural buffer to around 50 feet, with a few exceptions. The stream channel is substantially channelized and has little natural stream corridor remaining been heavily modified to provide drainage for the agricultural practices that dominate the adjacent landscape. The stream system is mostly channelized, although there are several short reaches (300 ft – 1 mile) which have retained their natural plan-form. Mokeler Creek has three short tributaries, all of which have been channelized and converted to agricultural drainage ditches. The natural stream corridor along most of the main stream has been converted to a narrow band of unmanaged grasses and nuisance vegetation, varying in width from 10 to 30 feet on either side of the channel.

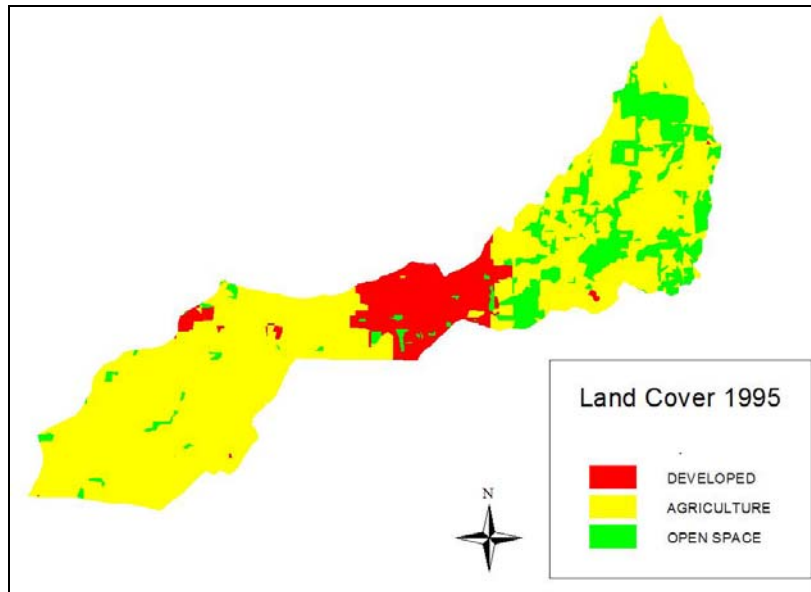
- 73% of all Mokeler Creek stream channels are channelized (Average of all Kishwaukee subwatershed is 72%)
- 74% of the main stem of Mokeler Creek is channelized (compared to the 59% for average of all Kishwaukee subwatershed's)



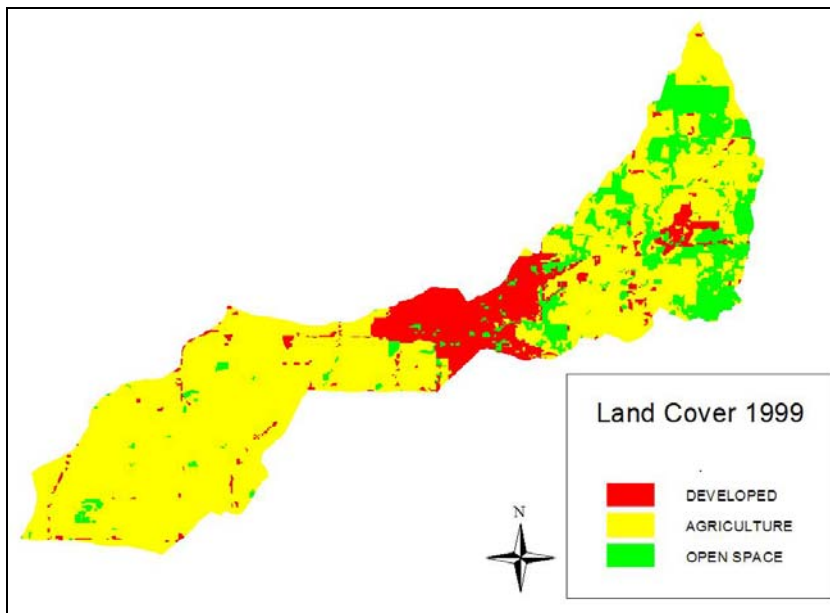
Mokeler Creek @ Pagels Rd

Land Cover

Below are simplified Land Cover maps for the subwatershed according to the 1995 and 1999 Illinois Department of Natural Resources GIS land cover datasets.

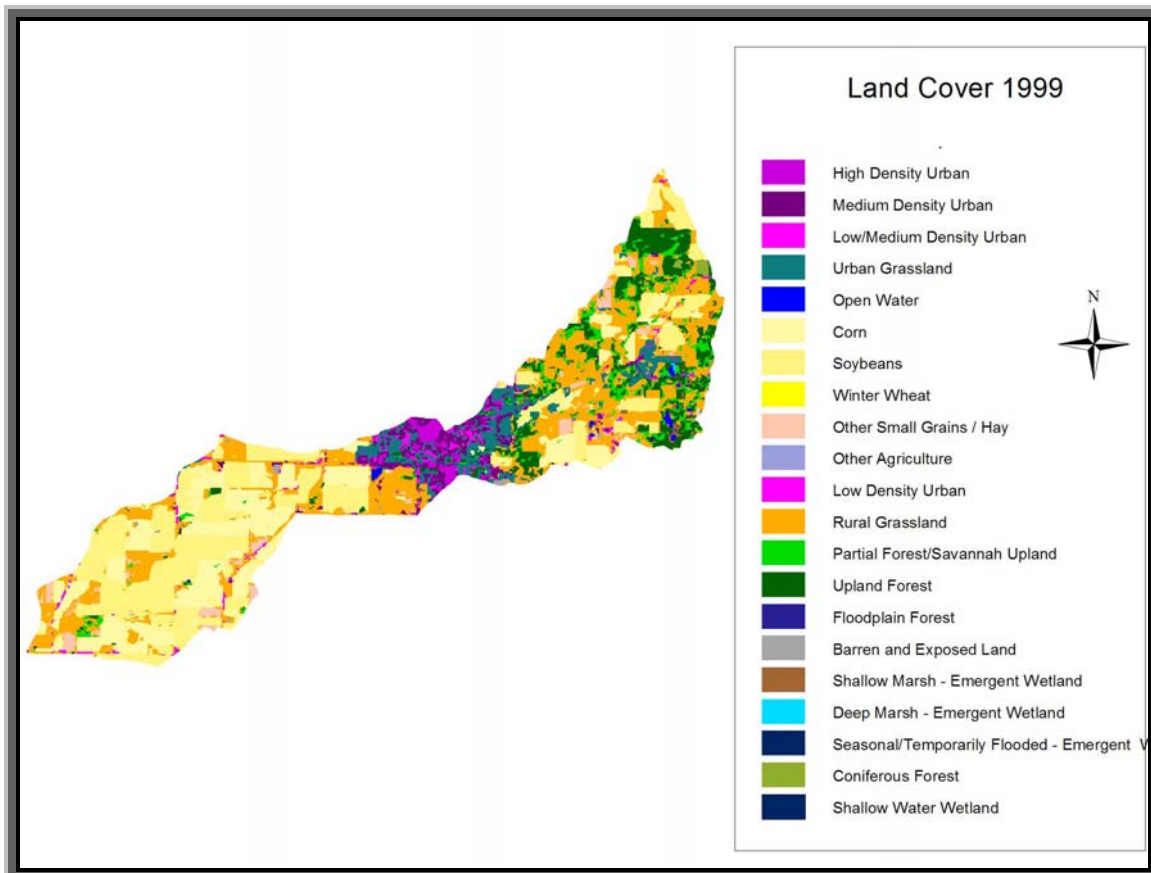


| Basic Land Use | Percentage of Subwatershed |
|--|----------------------------|
| Developed Land (urban areas, subdivisions, etc.) | 11.4% |
| Agricultural Land (row crops, pasture, etc.) | 73.9% |
| Open Space (forests, wetlands, etc.) | 14.7% |



| Basic Land Use | Percentage of Subwatershed |
|--|----------------------------|
| Developed Land (urban areas, subdivisions, etc.) | 13% |
| Agricultural Land (row crops, pasture, etc.) | 73% |
| Open Space (forests, wetlands, etc.) | 14% |

| 1999 Land Cover of the Mokeler Creek Subwatershed | | |
|---|--------------|---------|
| Land Cover Classification | Area (acres) | Percent |
| High Density Urban | 80.2 | 1.33% |
| Medium Density Urban | 220.0 | 3.64% |
| Low/Medium Density Urban | 0.0 | 0.00% |
| Urban Grassland | 342.2 | 5.65% |
| Open Water | 22.6 | 0.37% |
| Corn | 1,125.0 | 18.59% |
| Soybeans | 1,508.7 | 24.92% |
| Winter Wheat | 0.0 | 0.00% |
| Other Small Grains | 168.5 | 2.78% |
| Double Cropped Wheat/Soy | 0.0 | 0.00% |
| Other Agriculture | 0.0 | 0.00% |
| Low Density Urban | 131.6 | 2.17% |
| Rural Grassland | 1,585.4 | 26.19% |
| Partial Forest/Savanna Upland | 261.4 | 4.32% |
| Upland Forest | 518.2 | 8.56% |
| Floodplain Forest | 5.0 | 0.08% |
| Barren and Exposed Land | 17.4 | 0.29% |
| Shallow Marsh/Wet Meadow | 33.3 | 0.55% |
| Deep Marsh | 2.3 | 0.04% |
| Seasonally/ Temp Flooded Wetland | | 0.00% |
| Coniferous Forest | 31.4 | 0.52% |
| Shallow Water Wetland | | 0.00% |
| Swamp | | 0.00% |
| TOTAL | 6,053 | 100.00% |

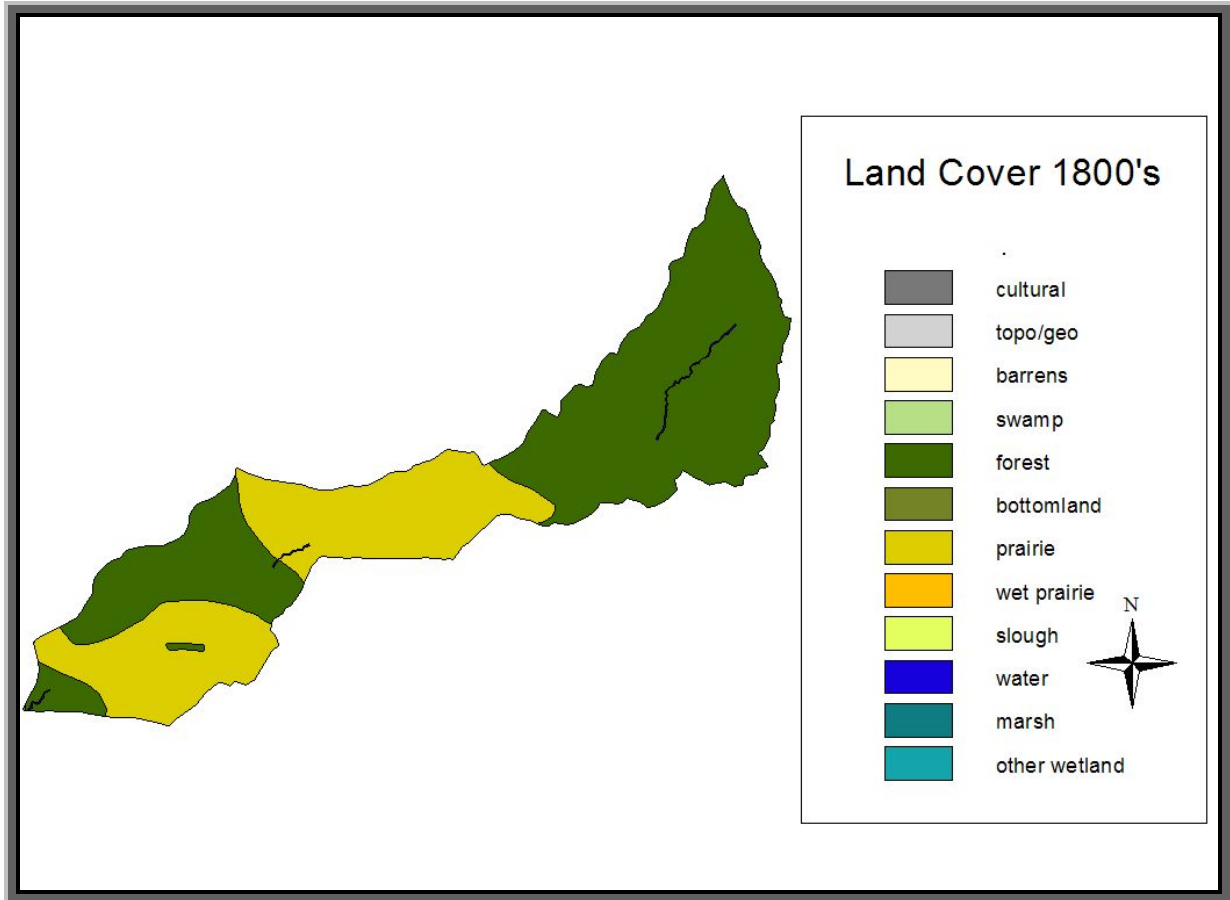


Historic Land Cover

The following is a tabulation of the estimated land cover for the subwatershed in the 1820's.

| Land Cover Type | Acreage | Percentage of Total |
|-----------------------------|---------|---------------------|
| Bottomland | 0.6 | < 0.1% |
| Prairie | 2,237 | 37% |
| Forest / Woodland / Savanna | 3,799 | 62.7% |
| Water | 16.6 | 0.3% |

Source: Illinois Department of Natural Resources



Hydric Soils

Hydric soils are thought to underlie a significant portion of the subwatershed. About 19% of the subwatershed soils are likely hydric in nature (based on analysis of NRCS SURGO data). Even though hydric soils make up about 19% of the subwatershed, wetlands make up less than 5% of the subwatershed. Hydric soils are a key indicator to the existence of pre-settlement wetlands.

Wetlands

The National Wetlands Inventory (NWI) has identified 63 existing wetlands in the subwatershed, ranging in size from 0.07 acres to more than 70 acres. NWI wetlands account for 272 acres, or about 4.5% of the subwatershed's land surface.

| NWI Wetlands in the Mokeler Creek Subwatershed | | |
|---|--------------------|--------------------|
| Wetland Type | Number of Wetlands | Total Area (Acres) |
| Adventive Bottomland Forest | 5 | 16.4 |
| Deep Marsh | 11 | 19.7 |
| Shallow Marsh / Wet Meadow | 20 | 203.6 |
| Open Water Wetlands | 26 | 25.2 |
| Shrub-Scrub Wetlands | 1 | 7.7 |
| Total | 63 | 272 |

However, it should be recognized that the NWI maps are only one means of identifying the presence, location and extent of potential wetland areas. The absence of a NWI wetland designation in a given area does not preclude that area from still having wetlands subject to governmental regulations. It should be also noted that the NWI typically under-represent the amount of wetlands present in the northeastern Illinois landscape.

Biological Resources of the Subwatershed:

There is relatively little biological information available regarding aquatic fauna in the Mokeler Creek subwatershed. KREP was unable to obtain specific documentation on the species of flora and fauna that have been surveyed within the subwatershed. However, the McHenry County ADID Wetland Inventory contains detailed documentation on the species of wetland plants found in the subwatershed.

The McHenry County Conservation District is currently completing an inventory of breeding birds: reptiles and amphibians; and butterflies within the subwatershed. Information on these databases can be obtained from the MCCD by calling (815) 338-6223.

Fish

No fish sampling records available from the Illinois Natural History Survey. Surveys by the USEPA were conducted for Piscasaw Creek and its tributaries in 1997 and included fisheries information, however species information was not available. The report, as of 2003, is still in draft format and not released to the general public.

Mussels

No information available. No known surveys completed for the subwatershed.

Birds

No published information available as of draft date. Contact MCCD for more information.

Reptiles / Amphibians

No published information available as of draft date. Contact MCCD for more information.

Plants

No information available other than T & E Species. No known surveys completed for the subwatershed.

Crustaceans

No information available. No known surveys completed for the subwatershed.

Threatened & Endangered Species

There are no recorded Federal or State threatened and endangered (T&E) species of plants and animals listed for the subwatershed (INHS are the only collections/observations available). However, as additional biotic surveys of the subwatershed are implemented, the potential for undocumented T&E species to be located remains.

Water Quality:

The IEPA publishes water quality reports every other year and the latest report was released in 2002. This report provides general water quality ratings that are derived from the IEPA's Intensive Basin Survey (IBS), which is a survey of the watershed done on a 5-year cycle. The last IBS completed in the Kishwaukee River Watershed was in 1997. Mokeler Creek was listed as impaired on the IEPA 303(d) List, for the following reasons:

| Impairment(s) | Probable Source of Impairment |
|---|--|
| Metals, Nutrients, Phosphorus, Nitrates | Municipal Point Sources, Agriculture, Crop Production, Non irrigated cropland, Urban Runoff/Storm Sewers |

Water quality violations (from 1996-1997 USEPA investigations):

| Violation | Location | Date |
|--|---|--------------------------------------|
| Residual Chlorine > 19 ug/L | Mokeler Cr. @ upstream of Route 173 (PQEA-04) | October 1996, June 1997 |
| Residual Chlorine > 19 ug/L | Mokeler Cr. Just downstream of Route 14 (PQEA-05) | October 1996, June 1997 |
| Residual Chlorine > 19 ug/L | Mokeler Cr. @ Island Road (PQEA-01) | October 1996, June 1997 |
| Fecal Coliform > 400 colonies / 100 mL | Mokeler Cr. @ upstream of Route 173 (PQEA-04) | October 1996, June 1997, August 1997 |
| Fecal Coliform > 400 colonies / 100 mL | Mokeler Cr. Just downstream of Route 14 (PQEA-05) | October 1996, June 1997 |
| Fecal Coliform > 400 colonies / 100 mL | Mokeler Cr. @ Island Road (PQEA-01) | October 1996, June 1997 |

During the USEPA's study of the Piscasaw Creek Watershed in 1996-1997, Mokeler Creek downstream of the Harvard Wastewater Treatment Plant (WWTP) was found to have the highest mean concentration of dissolved phosphorus compared to all other subwatersheds (Piscasaw Creek, Geryune, Lawrence, and Little Beaver Creek). The second highest mean concentration was Piscasaw Creek in the reach downstream of the Fontana-Walworth WWTP.

Index of Biotic Integrity

| STATION | Location | Last Sampling Date | IBI SCORE | IBI RATING |
|---------|--|------------------------------------|-----------|------------|
| PQEA-02 | Mokeler Cr @ Pagles Road | 1997 - for USEPA Piscasaw Cr Study | 38 | C |
| PQEA-03 | Mokeler Cr 3/4 mi. US of Pagles Road | 1997 - for USEPA Piscasaw Cr Study | 40 | C |
| PQEA-01 | Mokeler Cr @ Island Rd 1 mi. South of Chemung T45N R5E SEC 5 | 1997 - for USEPA Piscasaw Cr Study | 40 | C |

Macroinvertebrate Biotic Index

| Location | MBI Score | Condition |
|--|-----------|-----------|
| Mokeler Cr upstream of Harvard | 3.02 | Excellent |
| Mokeler Cr just downstream of Harvard WWTP | 8.94 | Very Poor |
| Mokeler Cr downstream of Harvard near Piscasaw Cr. | 7.36 | Poor |

Source: Piscasaw Creek Draft Condition Report, USEPA, 2000.

MBI Rating

| | |
|--------------|-------------|
| 0.00 - 3.50 | Excellent |
| 3.51 - 4.50 | Very Good |
| 4.51 - 5.50 | Good |
| 5.51 - 6.50 | Fair |
| 6.51 - 7.50 | Fairly Poor |
| 7.51 - 8.50 | Poor |
| 8.51 - 10.00 | Very Poor |

According to the USEPA Draft Report, Mokeler Creek below the Harvard WWTP had the highest mean dissolved phosphorus concentrations of all streams in the Piscasaw Creek Watershed. This reach of Mokeler Creek also showed the highest mean concentration of nitrate+nitrite nitrogen of all streams in the Piscasaw Watershed.

Existing Development in the Subwatershed:

Population Data (2000 Census)

Total Population: 3,010

Population Density: 318 persons per square mile

Municipalities within the subwatershed:

City of Harvard, population in 2000 = 7,996*

* = only a portion of this municipality is within the subwatershed.

Miscellaneous Development Data

Development, defined as non-natural, non-agricultural land cover according to the IDNR 1999 Land cover, accounts for 791 acres, or about 13% of the 6,053 acre subwatershed. There are about 32.5 miles of paved roads in this small subwatershed, which equates to around 3.4 miles (18,000 feet) of roadway for every square mile of subwatershed. There are about 80 wells recorded within the subwatershed, or 8.5 per square mile. Most of the residents in the subwatershed reside within the City of Harvard, which provides 900,000 gallons of water a day to its residents through a municipal well and water distribution system. The few residents of the subwatershed residing outside of the City of Harvard probably obtain their water supply from shallow wells.

Point Source Discharges

There is one known permitted point source discharges within the subwatershed. This is the City of Harvard Wastewater Treatment Plant. This Harvard WWTP discharges an average of 2.32 cfs of effluent directly into Mokeler Creek. The published 7-day, 10 year low flow for the stream at this location is about 0.7 cfs, which means that at low flow periods the entire baseflow of the stream below Harvard is comprised of wastewater effluent. Mokeler Creek has the highest ratio of effluent to natural baseflow of the 26 subwatershed's that receive point-source discharges (332%), even though other subwatershed's may have as many as 5-7 permitted discharges.

Drainage Districts

There are no records of any drainage districts known to have operated in this subwatershed at one time or another.

Dams

There are no known dams on perennial streams in the subwatershed.

Development Growth in the Subwatershed:

The population in the Mokeler Creek subwatershed grew from 2,625 in 1990 to 3,010 in 2000 (U.S. Census Data). This represents a 14.7% increase in population over the last 10 years, which indicates that the population growth was relatively low (average subwatershed growth is 33.5%). The amount of land developed between 1995 and 1999 increased by 98 acres, which is a 14% increase in development since 1995. While a large increase in terms of percentage, this is subwatershed ranked 35th amongst the 42 subwatershed's in terms of total increase in acreage developed land. The subwatershed population change ranked 24th of the 42 subwatershed's.

Currently, Mokeler Creek ranks as the 10th most developed subwatershed within the Kishwaukee River Watershed. Projected future development is not expected to be too rapid in the subwatershed because development trends around Harvard appear to be along the Route 14 corridor. The Mokeler Creek subwatershed encompasses a narrow corridor through the southern "established" part of Harvard and future growth is not expected to increase along the eastern or western boundaries of the city. More development pressure

is expected in the adjacent Rush Creek Subwatershed to the south and Lawrence Creek Subwatershed to the north.

Existing Watershed Restoration and Preservation Efforts:

Protected Open Space

There are no known one publicly owned natural lands within the subwatershed.

Based on available information, there are five parcels enrolled in the Conservation Reserve Program, totaling more than 112 acres. Most of this CRP land is hardwood forest.

There is no formal protection along any segments of Mokeler Creek (conservation easements or otherwise).

The Subwatershed does contain the Harvard East Geologic Area, (IL Natural Areas Inventory Site)

Local Watershed Organizations / Preservation Groups

None are known to exist. Stream management/protection is likely under the direct care of local landowners in rural areas and municipal field crews in the City of Harvard.

Existing Plans / Strategies to Protect the Watershed

There are no formal plans/strategies for watershed protection within the subwatershed at this time (2003).

McHenry County Watershed Development Ordinance.

This stormwater and development ordinance will regulate development within the Mokeler Creek.

Natural Resource Concerns:

Upon inspecting the available watershed data, the Kishwaukee River Ecosystem Partnership has identified the following natural resource concerns:

- On 303(d) List for metals, nutrients, phosphorus, and nitrates. Sources: Municipal Point Sources, Urban runoff, agriculture.
- Existing water quality data or visual observation suggests streams in the subwatershed are receiving excessive amounts of nutrients (phosphorus in particular). There may be a lack of effective nutrient management plans / over application of fertilizers.
- Existing vegetated buffers along stream corridors are too small and/or too degraded to provide significant wildlife habitat or water quality benefits to the receiving stream.
- Most of the subwatershed wetlands have been drained and/or filled in, increasing surface runoff and decreasing infiltration. This has changed both the hydrology and water quality characteristics of the stream system and degrades the ecosystem used by native plants and animals.
- No INHS fish data - Need data from 2000 USEPA Piscasaw Creek report
- No data on mussels

Recommendations:

Below are the Kishwaukee River Ecosystem Partnership's recommendations to protect the subwatershed. These recommendations are intended to provide the local stakeholders with ideas and strategies that they can implement to preserve, protect and enhance the natural resources.

Primary Actions to Needed Protect the Watershed:

- Work with local drainage districts and/or individual property owners to develop and implement stream channel maintenance programs that are cost effective and ecologically sensitive so that water quality and biodiversity can be maintained, or enhanced (invasive species removal, instream habitat installation, woody debris management, etc.).
- Increase landowner cooperation to expand natural stream buffers to at least 100 feet on either side of channel; Converting cropland within 100 feet of the stream channel to filter strips could increase the natural buffer area along the channel and its tributaries by 108 acres. Work with SWCD's and NRCS to encourage landowners to enroll in Conservation Reserve Program (CRP).
- Encourage better water table management techniques to increase infiltration reduce excess storm runoff directly into stream channels.
- **Work with municipal and county development departments to revise development guidelines to mandate innovative land planning and stormwater management techniques which minimize runoff from development and maximize pollutant removal before runoff reaches the stream corridor or existing wetlands. In order to preserve the Kishwaukee Watershed's high-quality resources, *Conservation Development* must be the rule, rather than the exception in all future development.**
- Organize an effort (volunteers or resource agencies) to determine mussel diversity in the subwatershed.
- Review Illinois Environmental Protection Agency NPDES discharge records to insure discharges are not exceeding water quality standards. Engage local decision makers to stress the importance of minimizing discharges to the stream system and exceeding water quality standards, not just meeting them.
- New development will increase instability in stream system and decrease water quality by depleting remaining wetlands and natural storage areas and increasing pollutant-laden urban storm water runoff.
- Work with SWCD, NRCS and local landowners to implement conservation tillage and nutrient management plans.
- Work with City of Harvard to develop plan to remove stream from 303d list
- Protect wetlands just east of Harvard before development
- Coordinate and support the protection of undeveloped parcels that have wetlands, floodplain, perennial or ephemeral streams, woodlands, or other high quality natural resources.