

Subgoal 12

What is the Status of Lake Michigan Subwatersheds?

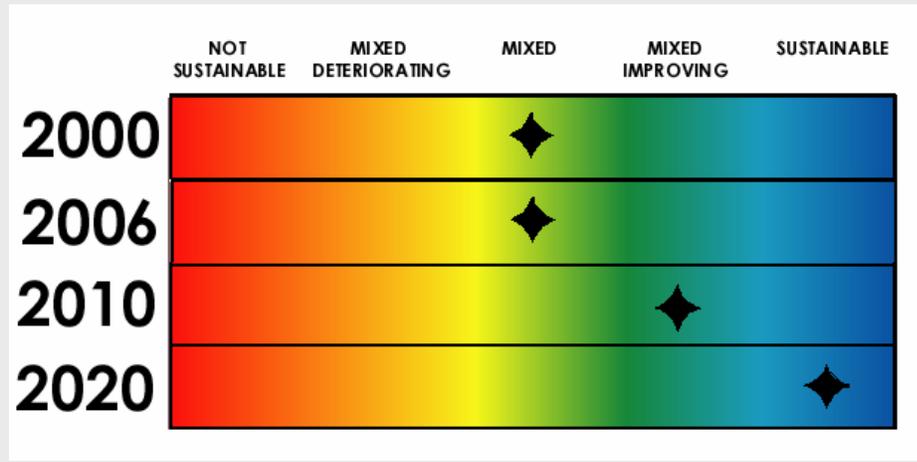
Status

While possessing globally significant biodiversity resources, all but three have some river and stream reaches listed as impaired.

Indicators (State of the Lakes Ecosystem Indicators by Number)

- 7002 - Land Cover - Land Conversion
- 8163 - The Nature Conservancy Biodiversity Areas and Species Protected
- Stream Reaches Listed as Impaired
- Number of Total Maximum Daily Load Models Completed
- Number of projects supported through the 319 grants program with successful follow through

Lake Michigan Target Dates for Sustainability



Challenges

- Watershed literacy and involvement

Next Steps

- Make watershed fact sheets available
- Utilize information to develop restoration targets for each watershed

Watershed Fact Sheets

All but three of the 33 watershed have some water reaches listed as impaired, none of the 10 Areas of Concern have been delisted, many of the globally significant biodiversity areas and high quality farmland are in peril of being lost to development.

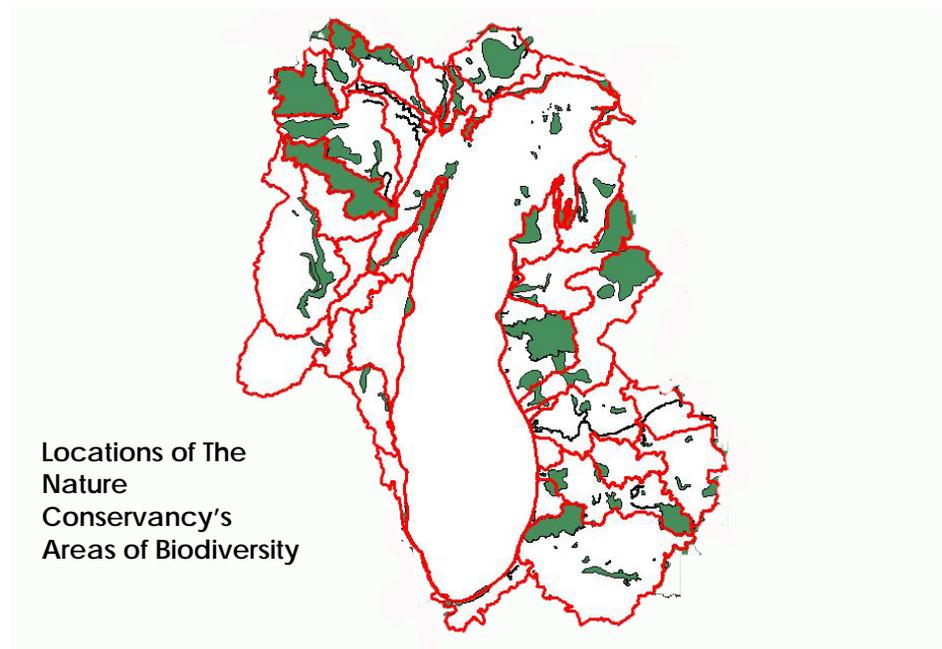
Linking LaMP Goals to Effective Implementation: The Watershed Scale

The development of the LaMP holds great promise for achieving environmental improvement in the Lake Michigan basin, but it also offers significant challenges in terms of practicing environmental restoration and protection on this scale. One of the most significant of these challenges is the need for cross-program and cross-jurisdictional coordination. This includes coordination among the U.S. and Canada, between federal agencies, and among states, provinces, and tribes, as well as coordination across a variety of statutory authorities. Because of this, EPA has taken the approach of using existing tools, as well as developing new and innovative ones, in concert with federal, tribal, state, and local partners to achieve environmental results that are relevant to a given place. To simplify the myriad of statutes, regulations, and resources affecting the management of Lake Michigan, Chapter 9 of LaMP 2006 presents a listing of the major governmental units, regulatory agencies, and other significant stakeholders that are responsible for managing the Lake Michigan ecosystem. Each watershed fact sheet in this chapter also lists groups involved in watershed management.

Lake Michigan's 33 Tributary Watersheds

The first step in advancing work watershed by watershed is to provide the available data in that format. Lake Michigan has 33 tributary watersheds at the 8-digit hydrologic unit code (HUC)* as defined by the U.S. Geological Survey (USGS). Wisconsin manages its watersheds through watershed management units that do not always correspond with USGS HUCs. In stead they follow a combination of watershed and political boundaries. Michigan's watershed management boundaries also differ and generally use smaller watersheds.

Although a decade of effort has resulted in a general awareness of the watershed approach within EPA, recent evaluations show substantial gaps in implementation. The watershed approach should not be seen as merely a special initiative targeted at just a selected set of places or involving a relatively small group of EPA or state staff. Rather, it should be the fulcrum of our restoration and protection efforts, and those of our many stakeholders, private and public. Failure to fully incorporate the watershed approach into program implementation will result in failure to achieve our environmental objectives in many of our nation's waters.



* The Geographic Information Retrieval and Analysis System (GIRAS) was developed in the mid 1970s to put into digital form a number of data layers which were of interest to the USGS. One of these data layers was the Hydrologic Units. The map is based on the Hydrologic Unit Maps published by the USGS Office of Water Data Coordination, together with the list descriptions and name of region, subregion, accounting units, and cataloging unit. The hydrologic units are encoded with an eight- digit number that indicates the hydrologic region (first two digits), hydrologic subregion (second two digits), accounting unit (third two digits), and cataloging unit (fourth two digits).

The HUC that represents a geographic area representing part or all of a surface drainage basin, a combination of drainage basins, or a distinct hydrologic feature

Following are overviews of the 33 Lake Michigan tributary sub-watersheds as well as an overview of the Chicago Waterways system. They provide a picture of Lake Michigan divided into watersheds, showing the special and important elements present in the watershed as well as the impairments that currently exist. Also provided is an overview of the planning underway and the groups involved. We seek comments on these fact sheets as to their content and usefulness. For additional information, see the Lake Michigan Watershed Academy description in Chapter 9, the EPA NPDES watershed permit discussions in Chapter 9, and the area of concern charts in Chapter 7.

They are intended to be updated on an as needed basis, and published with each LaMP update.

Information from The Nature Conservancy

The fact sheets also provide information from the Nature Conservancy from their just released the "Conservation Blueprint for the Great Lakes". Jointly funded by GLNPO, the Ontario Ministry of Natural Resources, the Gund Foundation, the Charles Stewart Mott Foundation, the Richard Ivey Foundation, and the Living Legacy Trust, the blueprint was a binational, collaborative effort to identify areas of biodiversity significance throughout the Great Lakes basin.

A total of 501 places were identified, mapped, and inventoried, and an analysis of threats to each place conducted by more than 200 scientists from federal and state/provincial agencies and private organizations. The results are impressive: the basin contains 46 species found nowhere else in the world and 279 globally rare plants, animals and natural communities in a region of boreal, mixed and deciduous forests, tallgrass prairies, wetlands, sand dunes, alvars and islands. The areas are critical to the preservation of biodiversity and represent the best

opportunities to preserve species, natural communities and ecological systems. For each area, the blueprint contains information about Great Lakes species, natural communities and ecological systems; maps of where conservation is underway; summaries of current projects and strategies; information on threats to biodiversity; and, detailed descriptions of plans. The blueprint also offers actions that can be taken to protect these areas.

The Nature Conservancy is making this information available to the Great Lakes Regional Collaboration for use in Great Lakes indicator and habitat protection and restoration work. The Conservation Blueprint is available online at: http://nature.org/wherewework/northamerica/greatlakes/files/conservation_blprnt_final.pdf.

Lake Michigan Overview

- Lake Michigan, the second largest Great Lake by volume with just under 1,180 cubic miles of water, is the only Great Lake entirely within the United States.
- Approximately 118 miles wide and 307 miles long, Lake Michigan has more than 1,600 miles of shoreline.
- Averaging 279 feet in depth, the lake reaches 925 feet at its deepest point.
- It has a water surface area of 22,300. The drainage basin, approximately twice as large as the 22,300 square miles of surface water, includes portions of Illinois, Indiana, Michigan and Wisconsin.
- On average, a molecule of water will spend 100 years in Lake Michigan before exiting to Lake Huron at the Straits of Mackinac.
- The lake's northern tier is in the colder, less developed upper Great Lakes region, while its more temperate southern basin contains the Milwaukee and Chicago metropolitan areas.

Additional Lake Michigan overview information on the following pages is an excerpt from the State of the Lakes Ecosystem Report. This is followed by the fact sheets on the individual subwatersheds.



3.6 Lake Michigan

Assessment: The physical integrity of the Lake Michigan ecosystem is mixed.

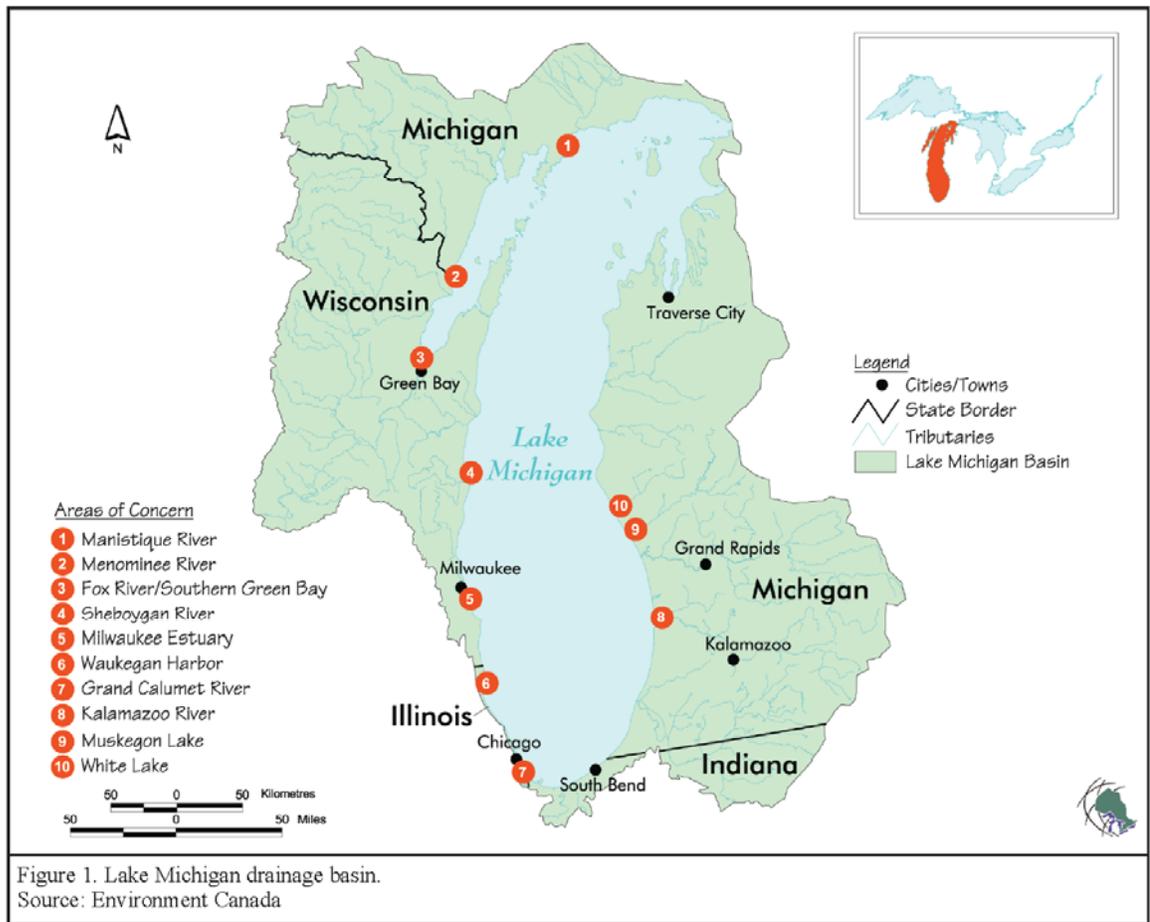
“Lake Michigan is an outstanding natural resource of global significance, under stress and in need of special attention” (Lake Michigan LaMP 2000). Since the original 2000 assessment, there has been both positive and negative change in the Lake Michigan basin. Positive work includes sediment clean ups, the purchasing of large land parcels for preservation purposes, and the rebounding of terrestrial species. Some negative changes include continued pressure from invasive species on the aquatic food web and land development in the near coastal areas.

Background Summary

Lake Michigan is one of the most complex ecosystems of the

Great Lakes due to its length of 307 miles (494 km). It varies from north woods forest to southern dune and swale environments. The largest collection of fresh water sand dunes in the world is a prominent feature, as are Lake Michigan’s islands which are grouped into two northern archipelagoes of 19 Grand Traverse Islands and Beaver Islands. Many of the islands have suffered a loss of natural habitat due to development and are moderately degraded. Several of the Beaver Islands are part of the Michigan Islands National Wildlife Refuge providing 235 acres (95 ha) of habitat for migratory and colonial nesting birds and federally threatened plants like dwarf iris and Pitcher’s thistle. There are three islands totalling 29 acres (12 ha) in the Green Bay National Wildlife Refuge that offers similar habitats. Underwater reefs in both the nearshore and offshore are thought to play an important role in Lake Michigan spawning.

Lake Michigan is the second largest Great Lake by volume and



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contains over 20% of the Great Lakes' coastal wetlands which are responsible for the quantity and diversity of aquatic life seen in the lake. Protection and enhancement of these areas are key to the future sustainability of the coastal ecosystem.

Lake Michigan is uniquely positioned with a direct connection to the Mississippi River System through the Chicago Diversion, and as such, has become a transfer point for many non-native species which threaten the biological integrity of all the Great Lakes and the Mississippi River.

Lake Michigan has 33 8-digit hydrologic unit code (HUC) tributary watersheds, with all but three listed as impaired and 10 estuaries designated as Areas of Concern (Figure 1). Many Michigan and Wisconsin tributaries have been dammed in the past, but recent dam removals in southeastern Wisconsin have resulted in improved fish habitat, water quality and diversity of species including the appearance of the rare greater redhorse in the Milwaukee River.

Over 10 million people are dependent on Lake Michigan for high quality drinking water and recreation. Since the passing of the U.S. Beaches Environmental Assessment and Coastal Health (BEACH) Act in 2000, the four Lake Michigan states are on track for implementing these provisions with an average of 50% more monitoring using enhanced water quality standards. The results have led to increased advisories and the need for studies to determine contamination sources and management options.

Groundwater Flow

Groundwater beneath the Great Lakes has a different and changeable divide than the Great Lakes surface/watershed divide. In the Great Lakes basin, most shallow flow discharges to local streams; the Great Lakes watershed divide (i.e. the

sub-continental divide) also serves as a groundwater divide for shallow flow. Most deep flow discharges are to regional sinks with the deep aquifer divide being distant from the surface watershed divide (Figure 2).

Groundwater divides move in response to pumping. Studies from the western Lake Michigan groundwater basin report that the 1950 pre-development divide and the year 2000 divide for the deep bedrock aquifer, show a pattern of movement. The western basin groundwater that once flowed east toward Lake Michigan is now intercepted by pumping and diverted west under the surface-water divide.

Groundwater, once used, can be discharged to surface water bodies in a different basin. Since the late 1940s, development on the Mississippi basin side of the sub-continental divide has reversed deep flow patterns between west of the divide and the Milwaukee area. The groundwater levels are low enough that Lake Michigan can migrate into the groundwater, a reversal of the normal flow (U.S. Geological Survey 1998).

Groundwater's Role in the Health of the Lake Michigan Ecosystem

The Great Lakes are in a topographically low setting that, under natural flow conditions, causes them to function as discharge areas or "sinks" for the groundwater-flow system. Most groundwater that discharges directly into the lakes is believed to take place near the shore (Grannemann and Weaver 1999). Of all the Great Lakes, Lake Michigan has the largest amount of direct groundwater discharge (2,700 ft³/s or 76 m³/s) because it has more sand and gravel aquifers near the shore than any of the other Great Lakes (Grannemann and Weaver, 1999). Although this is a relatively low inflow compared to the total stream flow into the lake from land areas (41,200 ft³/s or 1167 m³/s) (Croley and Hunter 1994), it is nearly equal to the amount of water diverted from Lake Michigan through the Chicago Ship and Sanitary Canal (Table 1) (Oberg and Schmidt 1994).

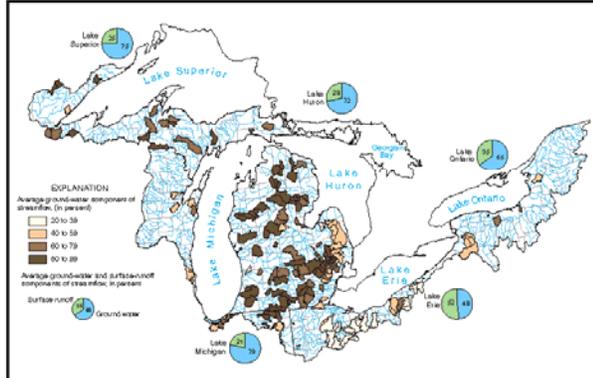


Figure 2. Average groundwater and surface runoff components of selected watersheds in the U.S. portion of the Great Lakes basin. Source: Holtschlag and Nicholas, 1998

Lake	Overlake Precipitation (percent)	Surface-Runoff (percent)	Indirect groundwater discharge (percent)
Superior	56.3	11.0	32.7
Michigan	56.2	9.3	34.5
Huron	42.2	16.3	41.5
Erie	53.5	24.3	22.2
Ontario	34.8	22.8	42.4

Table 1. Basin water supply for the Great Lakes. Source: U.S. Geological Survey, 1998. Water Supply Paper

Groundwater Provides Refuge for Aquatic Organisms

Groundwater discharge to streams may help provide important habitat for aquatic organisms, including fish. In addition, because groundwater temperatures are nearly constant throughout the year, stream reaches with relatively large amounts of groundwater discharge can provide refuge to organisms from heat in summer and from cold in winter. For example, some stream reaches in the region remain unfrozen even though air



temperatures are well below 32 degrees Fahrenheit (0 degrees Celsius). Other possible benefits to the survival of aquatic organisms related to groundwater discharge to streams include increasing concentrations of dissolved oxygen, adding small amounts of nutrients that are essential to the health of organisms, providing cold pockets of water in summer, and maintaining stream flow during dry periods.

Lake Levels

Lake Michigan's water level was measured at 2 feet (61 cm) below the long-term average in 2001, having dropped more than 40 inches (102 cm) since 1997 when it was at near record highs. Levels increased for 2002, but were still below average. The decrease in precipitation over the last five years resulted in Lake Michigan being at its lowest point since 1966. Lake levels rose between the mid-1960s and the late 1990s.

The lower lake level has caused problems for the shipping and boating industry. Cargo ships were forced to lighten their loads, and many boat ramps became inaccessible. According to the U.S. Great Lakes Shipping Association, for every inch (2.5 cm) of water that Lake Michigan loses, a cargo ship must reduce its load by 90 to 115 metric tons, leading to losses of between \$22,000 and \$28,000 U.S. per trip.

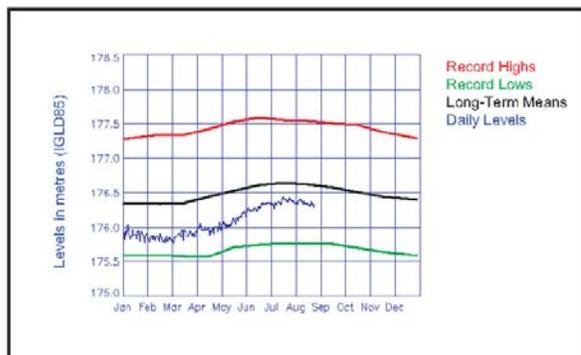


Figure 3. Lake Michigan-Huron water levels.
Source: Great Lakes Environmental Research Laboratory-National Oceanic and Atmospheric Administration

Early reports for 2004 indicated that the lake level was at an average depth due to increased rainfall early in the year. The lake measured one foot higher (30.5 cm) in the summer of 2004 than 2003 with the mean average of 579 feet or 176 metres. This fluctuation may be part of a 30-year cycle that deserves continued monitoring (Figure 3). (U.S. ACE, Detroit District)

Beaches

Lake Michigan contains the world's largest collection of fresh-

water sand dunes and associated beaches, particularly along its eastern shore. Of a total of 3,100 acres (1,255 ha) along the coast, 1,200 acres (486 ha) are publicly owned and available for use, while another 1,200 acres (486 ha) are privately owned and have significant potential for public use. In addition to swimming advisories due to poor water quality, there has been a resurgence of the macro algae *Cladophora* along the coast. *Cladophora* blooms result in reduced water quality and beach use. Causes of this problem may be attributed to multiple factors, such as lower lake levels, increased water temperature, nearshore nutrients and zebra mussel activity (Great Lakes Water Institute, University of Wisconsin at Milwaukee).

Aquatic Food Web

The Lake Michigan aquatic food web is threatened due to invasive species competing for food and changing the physical environment (Figure 4). Zebra mussels have the ability to filter water allowing sunlight to penetrate to greater depths, possibly causing algae blooms. The invertebrate *Diporeia* is decreasing rapidly in Lake Michigan thus removing a foundation component of the food web (Figure 5). The yellow perch population remains low and zebra mussels, first introduced in 1989, have shown a decline in certain areas. Sea Lamprey populations have increased in abundance and are now higher than in Lakes Superior or Huron. Lake Trout are stocked and have not recovered to the point of natural reproduction in the lake.

Lake Sturgeon survive in the Great Lakes only in scattered remnants, even though large scale commercial fishing for them ended a century ago. There were remnant populations known to spawn in the waters of 8 tributaries with connections to Lake Michigan. In 2003, enhanced stocking was undertaken with the hopes that the stocked sturgeon would flourish, but not genetically impact the small remnant native population. There are currently 16 agencies and institutions involved with Lake Sturgeon monitoring and investigations are coordinated by the U.S. Fish and Wildlife Service Great Lakes Basin Ecosystem Team.

The most dramatic threat to Lake Michigan is from the Asian carp species which is working its way up the Illinois waterway system from the Mississippi River. The Asian carp was reported to have escaped from aquaculture ponds adjacent to the Mississippi River in the 1980s and the 1990s. An experimental electrical barrier is currently in place. Improvements to this barrier as well as an additional barrier are planned. This large carp species weighs up to 90 pounds (41 kg) and is considered a major threat to the Great Lakes food web.

Other Species

Land-based species are faring better. The grey wolf is now listed as a recovered species and bald eagles have nested in the area of the Little Calumet River for the first time in 100 years.

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Kirtland's warbler, piping plover, Hine's emerald dragonfly and the Karner blue butterfly all have recovery plans in place. An aggressive program to train whooping cranes to migrate and return to Wisconsin's wetlands (west of Lake Michigan) for future nesting is underway.

this system faces extreme pressure as it is a sand product for industry. This area also has development pressures in the coastal communities.

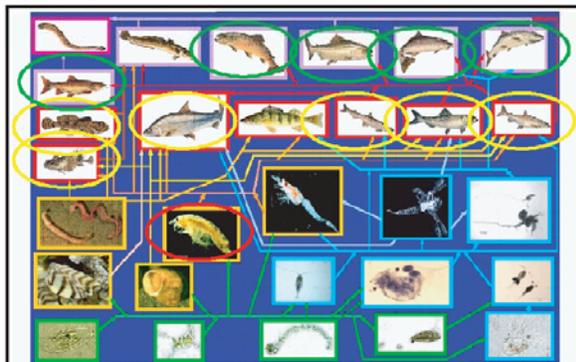


Figure 4. Lake Michigan foodweb. *Diporeia*, central in the diagram, was historically an important food for the fish on the second line of the figure (species in the red squares). *Diporeia* are the prey for the large predator fish like salmon and lake trout at the top of the chart and foodweb (species in the purple squares). Non-native species are competing with, and possibly replacing the *Diporeia* in the Lake Michigan ecosystem. The loss of *Diporeia* threatens the species that feed upon it and the whole foodweb.
Source: Mason, Krause and Ulanowicz, 2002

Wetlands, which naturally help control runoff from urban areas by storing flood and surface water and slowly release and filter it, have been destroyed in the Lake Michigan basin states to a greater degree than elsewhere in the country. An estimated 21.9 million acres (8.9 million ha) of wetlands or 62.9% have been lost. An estimated 12.9 million acres (5.2 million ha) of wetlands remain in the four Lake Michigan states, equivalent to approximately 12.3% of the wetland area in the lower 48 states. While this percentage is for the U.S. states not just the Lake Michigan basin, it is indicative of the pressure on the wetland systems. Wetland status in the Lake Michigan basin is therefore mixed (Dahl 1990).

Forest status in the basin is good due to revisions to national forest plans (September 2003 U.S. Federal Register Notice) and the continued practice of sustainability forestry management by the Menominee Tribal Enterprises. The new forest plans address old growth management issues. The Menominee Reservation 235,000 acres (95,102 ha) of forest land represent 150 years of sustainable forest practice in the Wisconsin portion of the Lake Michigan basin.

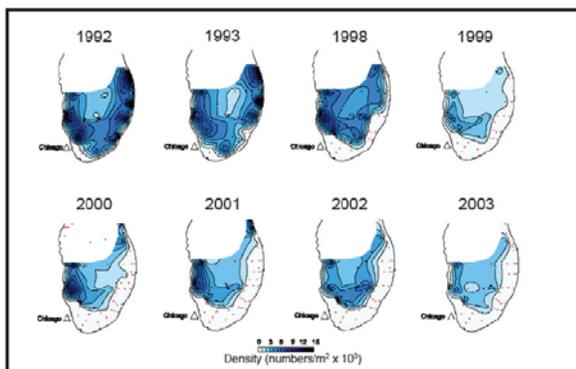


Figure 5. *Diporeia* density.
Source: Great Lakes Environmental Research Laboratory-National Oceanic and Atmospheric Administration

Lakeplain system of prairies and savannas found in the southern part of the basin are two of the most imperiled ecological communities in North America. Alvares, open areas of thin soils over bedrock found in the northern basin, provide habitat for a number of rare plants and animals. Both of these systems are facing fragmentation and destruction due to land use development.

Pressures on the System

The 10 Areas of Concern in the Lake Michigan basin have contaminated sediment problems and either combined sewer overflows (CSO) and/or storm water problems. All 10 AOCs had some remedial sediment work completed with much more remediation still required. For most of the sediment sites and CSOs there are plans in place but implementation is often forecasted for the year 2020 or beyond. PCBs are the main contaminant in sediment and fish consumption advisories are in place around the lake thus keeping the assessment for fish communities in the Lake Michigan basin as mixed.

Natural Areas

The dune and swale systems of the eastern lakeshore are a dominant feature of Lake Michigan and provide unique habitat that foster biodiversity. While afforded some protection under law,

The urbanized land area in the United States has quadrupled since 1954. To compound the problem, populations in coastal areas, which contain some of the most sensitive ecosystems, have been increasing even faster than in the rest of the country. From 1982 to 1996, the population in the Chicago-Northwest Indiana area grew by 10.9% but consumed 44.2% of the land (Urban Roadway Congestion: Annual Report 1998). The



Northeastern Illinois Planning Commission's portion of the area is estimated to grow by 21% from 2000 to 2030. This growth pattern is similar to other growth areas around the lake and will further tax water infrastructure and resources.

USEPA's Office of Environmental Information states "the construction of impervious surfaces such as roads and rooftops leads to the degradation of water quality by increasing runoff volume, altering regular stream flow and watershed hydrology, reducing groundwater recharge, and increasing stream sedimentation and water acidity." A one acre (0.4 ha) parking lot produces a runoff volume 16 times as large as that produced by an undeveloped meadow. Many impervious construction materials have higher surface temperatures that may cause ambient air temperatures to rise. When combined with a decrease in natural vegetation, areas are subject to the "urban heat island" phenomenon, which may increase utility bills, cause health problems associated with heat stress, and accelerate the formation of harmful smog. Clearly the effect of urban development on our communities and environment is a cross-cutting issue.

Both the urban and agricultural uses of the land impact the lake. The Lake Michigan Mass Balance Study has modelled the pesticide atrazine in the basin and a draft report and models have determined the need for over a 50% annual reduction in loadings from agriculture lands and the air in order to keep this pesticide at a steady state in the lake. While nutrient levels are increasing in the nearshore areas due to urban runoff, these levels are not at concentrations of concern in the open lake.

Management Actions

For a lake the size and complexity of Lake Michigan, it is not surprising that there are some measures of improving conditions as well as measures of deteriorating conditions. As some issues approach resolution, other new issues are developing such as chemicals of emerging concern and new invasive species. Since the overall status of the lake involves the interactions of chemical, physical and biological changes, it is necessary to understand the interactions of how improvements in one of these categories will affect the other conditions in the lake.

There are many research and reporting needs required for Lake Michigan which include:

- determining the groundwater status, mapping and groundwater and surface water interactions;
- identifying sources of *Cladophora* and *E. Coli* including the interactions between physical and biological forces which affect the health of Lake Michigan beaches;
- tracking invasive species and their impact on the food web and natural areas;
- identifying protected natural areas, ground areas below flyways, unique features and wetlands and educating the public

Lake Michigan Statistics	
Elevation^a	
feet	577
metres	176
Length	
miles	307
kilometres	494
Breadth	
miles	118
kilometres	190
Average Depth^a	
feet	279
metres	85
Maximum Depth^a	
feet	925
metres	282
Volume^a	
cu.mi.	1,180
km ³	4,920
Water Area	
sq.mi.	22,300
km ²	57,800
Land Drainage Area	
sq.mi.	45,600
km ²	118,000
Total Area	
sq.mi.	67,900
km ²	175,800
Shoreline Length^b	
miles	1,638
kilometres	2,633
Retention Time	
years	99
Population: USA (2000)^c	15,351,202
Totals	15,351,202
Outlet	Straits of Mackinac
^a measured at low water datum ^b including islands ^c 2000 population census data were calculated based on the total population of each county, either completely or partially, located within the watershed.	
Sources: The Great Lakes: An Environmental Atlas and Resource Book Statistics Canada, Environment Accounts and Statistics Division, Spatial Environmental Information System and Censuses of Population 2001. U.S. Census Bureau: State and County QuickFacts. Data derived from Population Estimates, 2000 Census of Population and Housing, 1990 Census of Population and Housing	

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about these areas and;

- modelling and GIS training for local officials to assist with land use decision making.

Acknowledgments/Sources of Information

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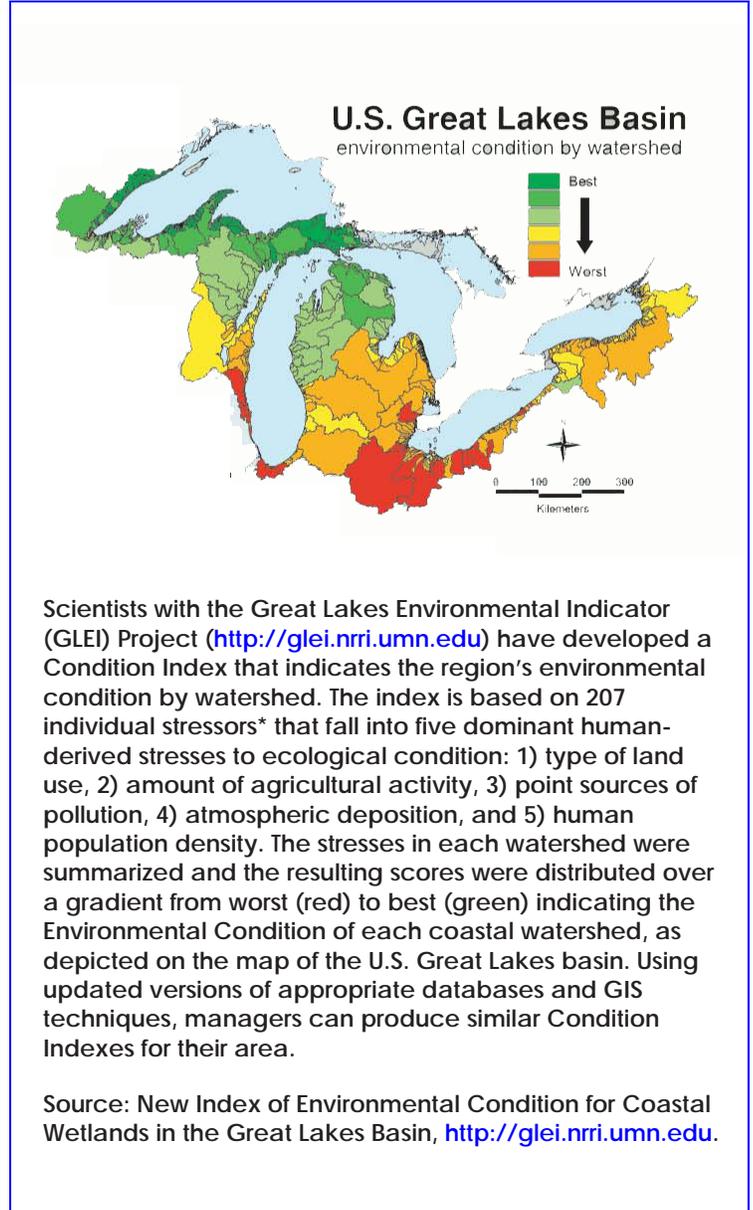
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Lake Michigan 8-Digit HUC Watersheds

Watershed	HUC Code
Betsie-Platte	04060104
Black-Macatawa	04050002
Boardman-Charlevoix	04060105
Brevoort-Millecoquins	04060107
Brule	04030106
Cedar Ford	04030109
Chicago Area Waterway System	
Door-Kewaunee	04030102
Duck-Pensaukee	04030103
Ecsanaba	04030110
Fishdam-Sturgeon	04030112
Lower Fox (AOC)	04030204
Upper Fox	04030201
Lower Grand	04050006
Upper Grand	04050004
Kalamazoo (AOC)	04050003
Little Calumet-Galien (AOC)	04040001
Manistee	04060103
Manistique (AOC)	04060106
Manitowoc-Sheboygan (AOC)	04030101
Maple	04050005
Menominee (AOC)	04030108
Michigamme	04030107
Milwaukee (AOC)	04040003
Muskegon (AOC)	04060102
Oconto	04030104
Pere-Marquette-White (AOC)	04060101
Peshigo	04030105
Pike-Root (Waukegan) (AOC)	04040002
St. Joseph	04050001
Tacoosh-Whitefish	04030111
Thornapple	04050007
Lake Winnebago	04030203
Wolf	04030202



Betsie-Platte Watershed

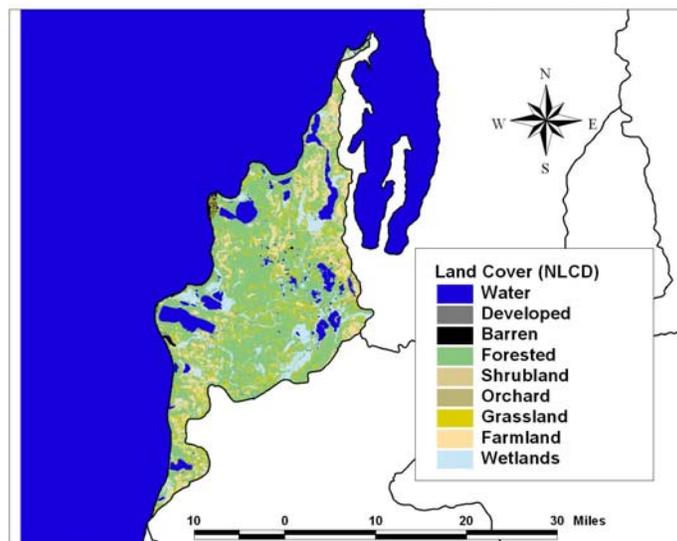
Hydrologic Unit Code: 04060104

For more information, see the USEPA "Surf Your Watershed" website at

http://cfpub.epa.gov/surf/huc.cfm?huc_code=04060104
contact the Michigan Department of Environmental Quality at 517-335-6969 to request a copy of report number MDEQ/SWQ-99/135, "A Biological Survey of the Betsie and Little Betsie Rivers and Dair Creek, Benzie County, Michigan, October 1999" and report number MI/DEQ/SWQ-99/083, "A Biological Survey of the Platte River System, Benzie County, 1998".

Watershed Groups

- Conservation Resource Alliance — www.rivercare.org
- The Leelanau Conservancy — www.theconservancy.com
- Glen Lake Association — www.glenlakeassociation.com
- Grand Traverse Regional Land Conservancy — www.gtrlc.org
- Crystal Lake & Watershed Association — www.clwa.us
- Northwest Michigan Council of Governments — www.nwm.org



Watershed Management Plans

- Betsie River — Conservation Resource Alliance
- Glen Lake/Crystal River — Glen Lake Association
- Lake Leelanau — Conservation Resource Alliance
- Platte River — Benzie Conservation District

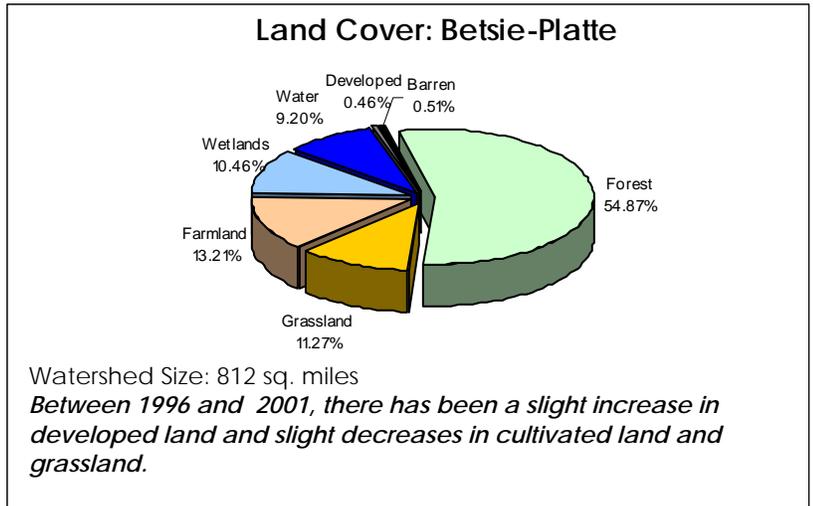
Watershed Overview / Ecology / Biodiversity

- The watershed saw significant logging activities in the late 1800s and early 1900s.
- The area is known for orchards and vineyards.
- Attempts at crop farming the cut over land proved largely unsuccessful due to meager soils. This further limited settlement expansion in the watershed.
- The watershed remained relatively undeveloped during the past century, however, deep sand deposits in the River and creeks are legacies of the impact logging and road building has had. Increasing weed growth in many lakes is further indication of the changes that have occurred since the area was first settled.
- Much of the agricultural land reverted back to State ownership and additional land was acquired in succeeding decades to create the vast State forest and Federal parklands existing today.
- Native plant species in the area range from the extremely drought tolerant species Bearberry (*Arctostaphylos uvaursi*) and Stiff Coreopsis (*Coreopsis palmata*) to the wetland species of Blue Flag Iris (*Iris versicolor*) and Buttonbush (*Cephalanthus occidentalis*). More unusual species include the Red Milkweed or Swamp Milkweed (*Asclepias incarnata*), desired by the Monarch Butterfly as the favorite food source for the larvae.
- Critical habitat identified by the Nature Conservancy include: Great Lakes Hemlock - Beech - Hardwood Forest, Great Lakes Beachgrass Dune, Great Lakes Shoreline Cattail - Bulrush Marsh, Great Lakes Dune Pine Forest, Great Lakes Beachgrass Dune, Interdunal Wetland.
- Critical species identified by the Nature Conservancy and other partners include Prairie moonwort, prairie dunewort, Piping Plover, Pitcher's thistle, and Michigan monkey-flower.

Watershed Activities / Concerns / Priorities

- The Conservation Resource Alliance (CRA) was awarded grants totaling \$474,309 from the State's Clean Michigan Initiative (CMI) and \$104,260 from the Michigan Department of Transportation's Enhancement Program to improve water quality and control erosion in the Betsie River Watershed. The Benzie County Road Commission and Betsie River Watershed Restoration Committee is repairing up to 5 eroding road/stream crossings on the Little Betsie and Dair Creeks, and finishing streambank stabilization at 12 sites on the mainstream up to Homestead Dam.
- Identified Platte River impairments include fertilizers; human and animal waste; oils, toxic chemicals, and salt; sediment; heated runoff; altered stream; pesticides; bacteria; and channel flow.

- The Benzie County Erosion and Sedimentation Reduction Initiative has been granted \$56,342 under the 2005 Great Lakes Basin Program for Soil Erosion and Sediment Control to extend work that began in 2000 to reduce soil erosion and sedimentation problems in three Lake Michigan drainage basins in Benzie County. This work is based on the watershed management plans for the Platte River Watershed, Betsie River Watershed, and Herring Lakes Watersheds.
- Under the 2004 Great Lakes Basin Program for Soil Erosion and Sediment Control, the Grand Traverse Regional Land Conservancy was granted \$30,000 to conduct the Trapp Farm Wetland Rehabilitation/ Sediment Control Project, to remove manmade drainage features on former farm land to reduce excess storm water runoff. By restoring a rich conifer swamp and shrub-scrub wetlands in areas where they previously existed, it is anticipated that 80 percent of the runoff will be stored to increase residence time, clean the water and remove nutrients from the North Branch of Cold Creek and Crystal Lake.
- In 2004, The Leelanau Conservancy purchased an easement on a hillside near Glen Lake that is the birthplace of skiing in Leelanau County, Michigan. It also purchased the 80 acre Solon Swamp for potential future sale to the state of Michigan for inclusion in the Pere Marquette State Forest. The Solon Swamp area is the most extensive tract of intact wetlands in Leelanau County.
- In 2004, The Leelanau Conservancy launched a "Lake Leelanau Watershed Initiative," an all-out effort to protect the long-term health of the Lake. The effort is a partnership between the Conservancy, the Lake Association, the Leelanau Conservation District and a committee of business owners such as Fountain Point resort and citizens concerned about the lake's future. It will focus on protecting ecologically sensitive areas like wetlands and their associated forests as well as undeveloped shoreline.
- Federal funds were appropriated for the Crystal River's transfer into the Sleeping Bear Dunes National Lakeshore. 104 acres and 6,300 feet of river frontage--is now under the administration of the National Park Service (NPS). The majority of the land and its accompanying river frontage being protected is sensitive "dune and swale" topography. The area is recognized by the U.S. Fish and Wildlife Service as "globally rare habitat."
- The Michigan Natural Resources Trust Fund granted \$632,000 to the Leelanau Conservancy to help purchase 640 feet of Lake Michigan shoreline at the tip of the peninsula. The 42-acre property the Conservancy has dubbed "Lighthouse West" provides critical stopover habitat for migrating birds. The land is near the Grand Traverse Lighthouse and the Leelanau State Park as well as other private lands already protected by the Conservancy.
- The Nature Conservancy received funding from the Fish and Wildlife Service to remove invasive species and restore dunes in the Greater Point Betsie landscape. The project facilitates activity at the greater Pt. Betsie landscape to remove invasives and restore dunes to benefit the rare natural communities, including Pitcher's thistle, a threatened species.
- The Coastal program of the Fish and Wildlife Service partnered with The Grand Traverse Regional Land Conservancy at Green Point Dunes to (1) install a wooden stairway structure at the lowest point of the bluff to provide favorable access at Green Point and a whole-log cedar fence along the north property boundary to protect native plants and dune habitat.; (2) provide training to all workers on the project to avoid trampling or other negative effects to the sensitive plants in the locality, including Pitcher's thistle (3) provide a completion report of the activities conducted under the agreement.
- The Sleeping Bear Dunes' predator control program on North Manitou Island is focusing on control of the American crow . Crow control continued until none were observed within an identified predator-free zone or the Great Lakes Piping plover chicks had fledged. The primary goal of this project was to increase the piping plover chick fledging success on the North Manitou Island portion of the National Lakeshore by improving our management efforts and techniques.



Impaired (303d) Waters

Waterbody	Impairment
Bass Lake	Mercury (Fish Tissue)
Crystal Lake	PCB Fish Consumption Advisory
Glen Lake	Chlordane Fish Consumption Advisory, Mercury (Fish Tissue), PCB Fish Consumption Advisory
Green Lake	Mercury (Fish Tissue)
Lake Ann	Mercury (Fish Tissue)
Portage Lake	PCB Fish Consumption Advisory
Unnamed Tributary to Platte Lake	Bacterial Slimes, Macroinvertebrate Community Rated Poor, Organic Enrichment

Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

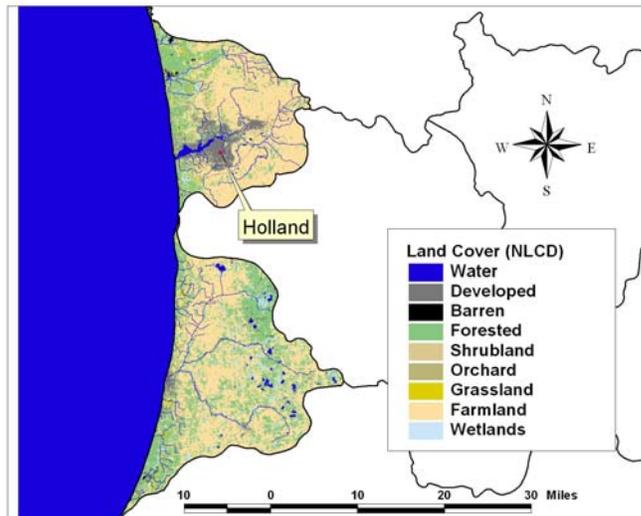
Black-Macatawa Watershed

Hydrologic Unit Code: 04050002

For more information, see the USEPA "Surf Your Watershed" website at

http://cfpub.epa.gov/surf/huc.cfm?huc_code=04050002

or contact the Michigan Department of Environmental Quality at 517-335-6969 to request a copy of report number MI/DEQ/SWQ-99/023, "Biological Surveys in the Black River Watershed Allegan and Van Buren Counties, August 1997" and report number MI/DNR/SWQ-95/044, "A Biological Survey of the Macatawa River, Its Tributaries and Pine Creek, a tributary to Lake Macatawa, Ottawa and Allegan Counties, Michigan, July 90".



Watershed Management Plans

- Pigeon River - Timberland RC&D Council
- Lake Macatawa Watershed Management Plan - Macatawa Area Coordinating Council

Watershed Groups

- Macatawa Greenway Partnership — www.macatawagreenway.org
- Macatawa Watershed Project — www.macatawa.org/~macc/Macatawa_Watershed/macatawa_watershed.htm
- Silver Lake Improvement Association — www.mlsa.org/slia-930



Watershed Overview / Ecology / Biodiversity

- 151 miles of the rivers and streams flow year round.
- The majority of the Black River Watershed system can be described as a low gradient system. Elevational changes between the headwaters and confluence generally do not exceed five feet per linear mile.
- Soil associations in the Black River watershed are generally fine sandy to sandy loam, poor to somewhat poorly drained glacial outwash on flat to undulating topography. Headwater portions of the watershed tend to have more permeable soil types while the middle and lower portions have poorer drainage due to finer grained soil materials.
- Most of the areas sampled in the black River basin by MDEQ shows habitat loss due to sedimentation. In some sections, channelization from historic dredging has removed channel diversity, reduced bank stability, and generally contributed to conditions that reduce the quality and quantity of stream biota.
- The Macatawa watershed is located in the Southern Michigan Northern Indiana Till Plains (SMNITP) ecoregion and has two major tributaries: the Macatawa River and Pine Creek. The lake and all its tributaries in the Macatawa watershed are protected as designated warmwater systems.
- Soil erosion and sedimentation is a major problem throughout the Macatawa River watershed due to agricultural land use and urbanization. The urbanization has modified drainage patterns, increased direct surface runoff and erosion to area streams and increased stream crossings that adversely affect stream quality.
- The Black-Macatawa watershed has eight listed impaired waters
- Holland and Benton Harbor, Michigan are the two urban areas in the watershed.
- The counties located in the watershed have a population of over 594,000.
- 96 of the 151 miles of impaired waterways (or 64%) have been assessed
- Two and a half million visitors visit Holland, Michigan each year
- Saugatuck Dunes State Park offers 14 miles of hiking and cross-country ski trails. The park's 900-acre natural area contains a coastal dune system, as well as three endangered plant species and beautiful Lake Michigan waterfront.
- Ottawa County is rated as Michigan's most diverse agricultural county. Products grown include apples, asparagus, strawberries, cherries, annuals, perennials, pumpkins, squash, among others.
- TMDLs for phosphorus caused by algal blooms and nutrients in Lake Macatawa were approved in 2000.

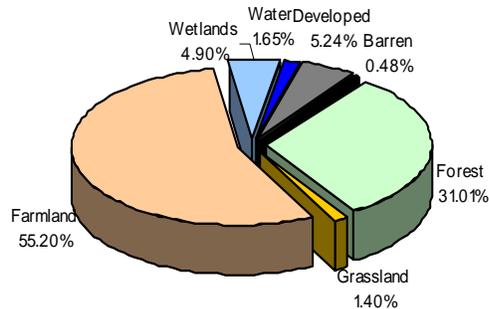
Watershed Activities / Concerns / Priorities

- The Lake Macatawa Watershed includes all the land that drains to Lake Macatawa. Laketown, Fillmore, Overisel, Holland, Park, Zeeland, Port Sheldon, Olive, and Blendon Townships. All have some land in the Macatawa Watershed, as well as the cities of Holland and Zeeland. There is excess sedimentation due to nonpoint sources, mainly agricultural, in the Macatawa watershed and its tributaries. The Noordeloos Creek Sedimentation Project is focused on a creek that is comprised largely of agricultural land. This project will reduce sedimentation by constructing a five-acre treatment wetland, a .25-acre sediment forebay and 30-foot buffer strips. The soil erosion goal is to prevent stream bank cutting by reducing stream flow, and the wetland and buffer strips will retain overflow from high water events. There will also be community outreach and education on water quality issues.
- The Macatawa Area Coordinating Council received \$249,818 from the State of Michigan CMI Nonpoint Pollution Control program in 2001 to implement restoration activities to help meet phosphorus reduction goals
- The Black River Watershed Project was awarded \$104,000 with \$54,000 in matching funds between 2002 and 2005 to create a Watershed Management Plan to guide efforts to protect and improve water quality in the lakes and streams of the Black River Watershed. This included public education and outreach, completing a watershed inventory, identifying pollutant sources and causes, identifying critical areas, and gathering information about the watershed from preexisting sources, as well as gathering attitudes and opinions from watershed residents through surveys and one-on-one conversations.

Impaired (303d) Waters

Waterbody	State Impairment
Great Bear Lake	Phosphorus Algal Growth/Chlorophyll A
Lake Macatawa (Macatawa River Mouth)	Chlordane Fish Consumption Advisory PCB Fish Consumption Advisory
Lake Michigan (Grand Haven Beach)	Pathogens
Lake Michigan	Chlordane Fish Consumption Advisory DDT Fish Consumption Advisory Dioxin Fish Consumption Advisory PCB Fish Consumption Advisory Mercury (Fish Tissue)
Pigeon River	Phosphorus Algal Growth/Chlorophyll A Fish community rated poor Macroinvertebrate community poor

Land Cover: Black-Macatawa Watershed



Watershed Size: 608 sq. miles

Between 1996 and 2001, there has been a slight increase in developed land and slight decreases in cultivated land, forest, and grassland.

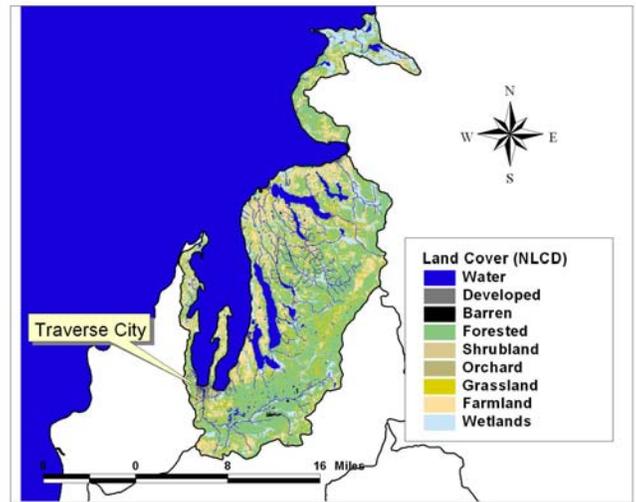
Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

Boardman-Charlevoix Watershed

Hydrologic Unit Code: 04060105

For more information, see the USEPA "Surf Your Watershed" website at

http://cfpub.epa.gov/surf/huc.cfm?huc_code=04060105 or contact the Michigan Department of Environmental Quality at 517-335-6969 to request a copy of report number MI/DEQ/SWQ-01/135, "A Biological Survey of the Upper Boardman River and Selected Tributaries to the Boardman River" and report number MI/DEQ/SWQ-02/016, "A Biological Survey of Charlevoix County Streams, Charlevoix County, Michigan, 1998".



Watershed Management Plans

- Boardman River — Grand Traverse Conservation District
- Elk River Chain of Lakes — Antrim Conservation District
- Long Lake — Grand Traverse County Drain Commission
- Mitchell Creek — Grand Traverse County Drain Commission
- Grand Traverse Bay—Watershed Center Grand Traverse Bay
- Lake Charlevoix, Charlevoix Conservation District and Tip of the Mitt Watershed Council
- Elk River Chain of Lakes Watershed — Antrim Conservation District, Tip of the Mitt Watershed Council, Conservation Resource Alliance
- Little Traverse Bay — Tip of the Mitt Watershed Council, Ann Baughman

Watershed Groups

- Boardman River Project — www.boardmanriver.org
- Grand Traverse Conservation District — www.gtcd.org
- Grand Traverse County Drain Commission — www.grandtraverse.org
- Antrim Conservation District — www.antrimcd.org
- Charlevoix Conservation District — www.charlevoixcounty.org/cd.asp
- Tip of the Mitt Watershed Council — www.watershedcouncil.org
- Conservation Resource Alliance — www.rivercare.org
- Watershed Center Grand Traverse Bay — www.gtbay.org
- Northwest Michigan Council of Governments — www.nwm.org
- Grand Traverse Band of Ottawa and Chippewa Indians — www.gtb.nsn.us
- Little Traverse Bay Bands of Odawa Indians — www.ltbodawa-nsn.gov

Watershed Overview / Ecology / Biodiversity

- The Grand Traverse Bay watershed is one of the premier tourist and outdoor recreation regions in the State of Michigan.
- The watershed has over 217 miles of Lake Michigan shoreline.
- Over 529 miles of streams and rivers flow year-round.
- The Grand Traverse Bay region is currently experiencing tremendous population growth and development pressure, with a predicted 40% increase in population by 2020.
- Sediment and excessive nutrient loading are two of the highest priority pollutants. Other pollutants that threaten the watershed's designated uses include thermal pollution, toxins, changes in hydrologic flow, invasive species, pathogens, and loss of habitat.
- Stormwater inputs are a primary concern throughout the watershed.
- Two of the three fastest growing counties in the state, Grand Traverse and Leelanau, are located within the watershed's boundaries.

- Major waterways in the basin include the Elk River, the Boardman River, Lake Charlevoix, Little Traverse Bay, and the Carp River.

- The Boardman River is the largest tributary to Grand Traverse Bay.
- The majority of the Boardman River is in the North Central Hardwood Forest ecoregion. The uppermost reach (about 7-8 miles) of the North Branch Boardman River is in the Northern Lakes and Forest ecoregion.

- The Boardman's well drained soils result in ample cold groundwater inputs to the streams and provide for the stable stream flow regimes in this watershed.

- As a trout stream, the Boardman River ranks among Michigan's top 10 streams. It contains excellent populations of brook and brown trout, particularly above Boardman Dam. The Boardman River is a high quality, "blue ribbon" trout stream and is a designated coldwater system with the exception of Boardman.

- Traditional uses of watershed resources have included agriculture, tourism and recreation. Cherries and other fruit crops dominate agricultural production in the region, and are harvested for the global market.

- The watershed is home to species of black bear, deer, great blue heron, lady slippers and trillium.

- The watershed boasts scenic bluffs, forests, nearly a hundred inland lakes, several hundred miles of stream (including 55 miles of blue ribbon trout streams), intact wetland systems and globally rare ecosystems.

- The Boardman River watershed contains Great Lakes Beachgrass Dune, Great Lakes Dune Pine Forest, Great Lakes Shallow Marsh, Great Lakes Shoreline Cattail - Bulrush Marsh, Interdunal Wetland, and White Cedar - Boreal Conifer Mesic Forest.

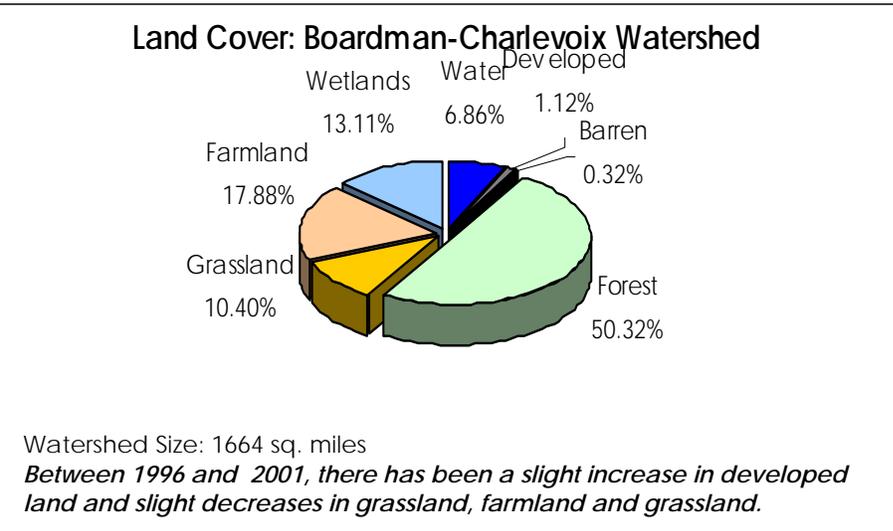
- The watershed has medium-sized, moderate to high groundwater streams entering Lake Charlevoix, Grand Traverse Bay/Chain of Lakes, and/or Little Traverse Bay.

- Grand Traverse Bay has pinched off bays of Great Lakes, bedrock (resistant) with bedrock (resistant) nearshore, sandy beach/dunes with sand nearshore, sandy beach/dunes with bedrock (resistant) nearshore, baymouth/barrier beaches with bedrock nearshore, and sandy beach/dunes with sand and gravel lag over clay nearshore.

- Waugoshance has baymouth/barrier beaches with bedrock nearshore, sandy beach/dunes with bedrock (resistant) nearshore, sandy beach/dunes with sand and gravel lag over clay nearshore, and sandy beach/dunes with sand/gravel nearshore.

- Waugoshance is an important Landbird stopover site, Raptor stopover site, Shorebird stopover site, and Waterfowl stopover site.

- Waugoshance is home to Bald Eagle, Black Tern, Blackburnian Warbler, Black-throated Blue Warbler, Black-throated Green Warbler, Blue-winged Warbler, Chestnut-sided Warbler, Eastern Wood-Pewee, Least Flycatcher, Mourning Warbler, Nashville Warbler, Piping Plover, Prairie Warbler, Purple Finch, Rose-breasted Grosbeak, Ruffed Grouse, Veery, Wood Duck, Wood Thrush, Dwarf lake iris, Houghton's goldenrod, and Pitcher's thistle.



Impaired (303d) Waters

Waterbody Name	Impairment
Arbutus Lake	Mercury (Fish Tissue)
Boyne River	PCBS Fish Consumption Advisory
Elk Lake	Mercury (Fish Tissue) PCBS Fish Consumption Advisory
Ellsworth Lake	Mercury (Fish Tissue)
Grand Traverse Bay— State Park Beach	Pathogens
Grand Traverse Bay— Milliken Beach	Pathogens
Intermediate Lake	Mercury (Fish Tissue)
Kids Creek	Macroinvertebrate Community Rated Poor
Lake Bellaire	Mercury (Fish Tissue)
Lake Charlevoix	PCBS Fish Consumption Advisory
Torch Lake	Chlordane Fish Consumption Advisory PCB Fish Consumption Advisory Dioxin Fish Consumption Advisory Mercury (Fish Tissue)

Watershed Activities / Concerns / Priorities

- Eroded Boardman River banks, road crossings, utility line crossings, and other sources of sediment have been stabilized through the Boardman River Project. These projects prevented over 3,000 tons of sediment annually from entering the Boardman.
- The Grand Traverse Bay Watershed Protection Plan was created with a \$249,710 grant with an \$87, 173 match. The plan includes a comprehensive field survey of Grand Traverse Bay shoreline, an identification of ecologically significant shoreline parcels for water quality protection in Boardman River and Leelanau County.
- The Grand Traverse Band of Ottawa and Chippewa Indians tribe has a water quality protection program for the adjacent waters to the reservation in Leelanau County.
- A grant from the Frey Foundation focuses on streambank stabilization, bridge projects and other road/stream crossing improvements, woody debris installation for fish habitat, sand traps, and wildlife corridor work for the Bear River, Boyne River, Maple River, Jordan River, Carp River, and St. Clair Lake/Six Mile Lake Watersheds.
- The Boardman River Project and the Grand Traverse Conservation District have restored 77 erosion sites using a Clean Michigan Initiative grant.
- Restoration of three road stream crossings on Ogletree Creek, a 2005 Great Lakes Basin Program Project, were undertaken in order to apply BMP construction techniques to road stream crossings. The project aims to stabilize the banks of the stream with nonwoven geotextile and field stone, plant 25 feet of linear shoreline on both sides of the banks and culverts with native deep rooted shrubs, and educate local township officials on the importance of sediment control at road stream crossings.
- The Lake Charlevoix Watershed Project was funded by 319 grants between 2001 and 2005 for \$ 302,500 to implement management nonpoint plan priority recommendations. Projects focused on reducing stormwater runoff and pollution from shoreline properties; improving road/stream crossings; providing educational materials to the agricultural community; land stewardship and protection, forest management, and land use planning and management.
- A constructed wetland stormwater treatment and shore restoration demonstration project for Suttons Bay, MI addresses current runoff problems on the Inland Seas Education Association's shore and vicinity by constructing a wetland on its waterfront property in order to correct these problems and protect native shoreline and bay habitat.
- Fish passage into the Green River, a premier trout stream, is blocked less than one mile upstream from the river's confluence with the Jordan. In a partnership between the landowners, Fisheries Division, Friends of the Jordan River, Nestle Corporation and Conservation Resource Alliance, the engineering review portion of a dam removal is under way, but funding, however, is still short. Benefits of the project will ultimately involve removing a barrier from a cold water stream capable of producing additional salmonids.

Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

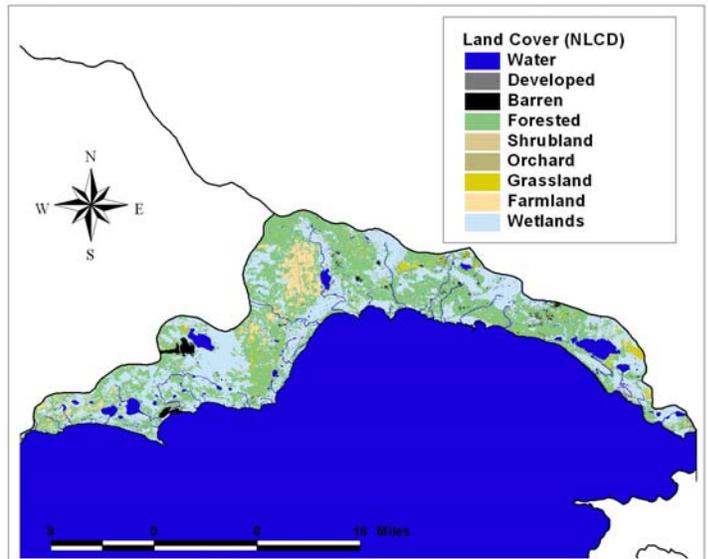
Brevort-Millecoquins Watershed

Hydrologic Unit Code: 04060107

For more information, see the USEPA "Surf Your Watershed" website at http://cfpub.epa.gov/surf/huc.cfm?huc_code=04060107

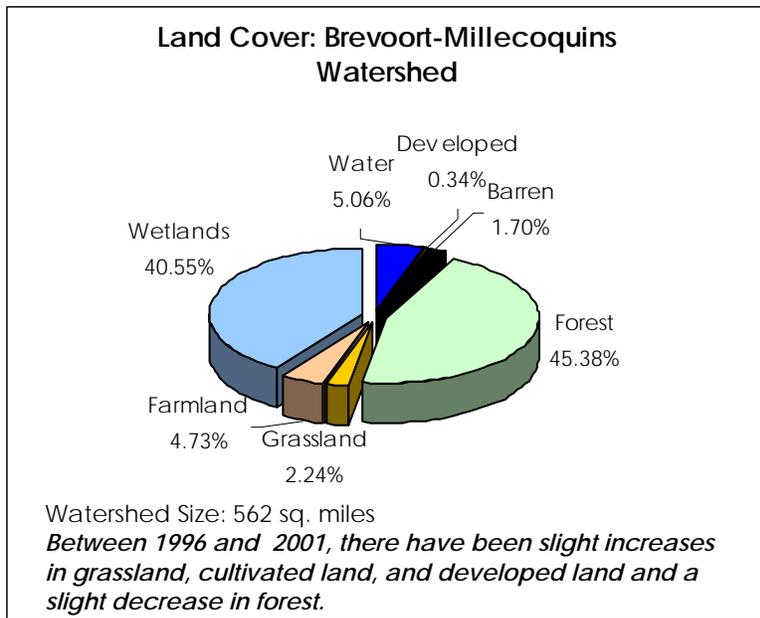
Watershed Overview

- The watershed is located at the southeastern portion of Michigan's Upper Peninsula
- The watershed covers 561.57 square miles. With 102.53 miles of Lake Michigan shoreline
- It has 19 square miles of inland lakes
- It has two listed impaired waters.
- Of the 248 river miles, 206 miles, or 83 percent have been assessed.
- The Hiawatha National Forest makes up a significant portion of the watershed.
- The watershed has many minerals and aggregates and limestone quarries.
- The Brevort River watershed is home to Pitcher's thistle and Dwarf lake iris.



Impaired (303d) Waters

Water Body	Impairment
Millecoquins Lake	Mercury (Fish Tissue)
Guliver Lake	Mercury (Fish Tissue)
Milakokia Lake	Mercury (Fish Tissue)



Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

Brule River Watershed

Hydrologic Unit Code: 04030106

For more information, see the USEPA "Surf Your Watershed" website at

http://cfpub.epa.gov/surf/huc.cfm?huc_code=04030106 or contact the Michigan Department of Environmental Quality at 517-335-6969 to request a copy of report number MI/DEQ/WD-03/032, "A Biological Survey of the Brule, Paint, and Michigamme River Watersheds, Iron and Marquette Counties, 2002".

Watershed Management Plans

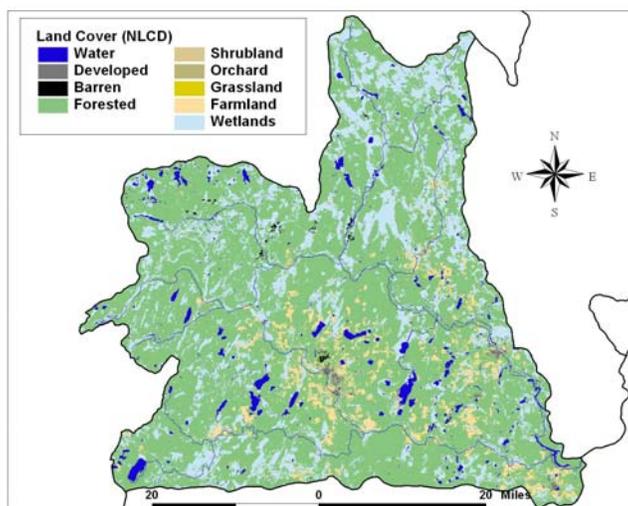
- Iron River Watershed — Iron Conservation District

Watershed Groups

- Iron River Conservation District — www.iron.org/edc/gov-conservation.php
- Iron River Watershed Project & Council — www.ironriverwatershed.org

Watershed Overview / Ecology / Biodiversity

- Prior to the logging area, the watershed was extensively managed by Native Americans using fire to stimulate wildlife use. The name "Brule" (originally "Brulee") comes from the early French explorers means "burned woodlands."
- The predominant vegetation in the hilly uplands are sugar maple, basswood, and yellow birch while the lowland vegetation is dominated by american elm, black ash, trembling aspen, and red maple. The vegetation of drier outwash sand plains include balsam fir, white pine, red pine, and paper birch.
- Extensive logging occurred in the watershed from the late 1800s to the early 1900s. Large scale agriculture did not follow due to the soil types and colder climate.
- The federal government purchased much of the abandoned stump land and makes up the 1.7 million acre Ottawa National Forest. Much of the Brule watershed is part of this national forest.
- The watershed topography is characterized by sandy hills and elliptical ridges. These sandy deposits have high infiltration rates, can be up to 200 feet thick, and are a major source of cold groundwater to the rivers.
- The Brule River watershed covers 1057 square miles.
- It does not have any Lake Michigan shoreline and is upstream of the Menominee River watershed.
- The Brule watershed has 9 listed impaired waters.
- The Iron River in the watershed supports a naturally reproducing brook trout populations in the upper peninsula and is the source for brood stock for the Michigan Department of Natural Resources brook trout hatchery program.
- Of the approximately 40 miles of streams that constitute the Iron River watershed, 12 1/2 are classified as blue-ribbon trout water. Forty percent of Michigan's "blue ribbon" trout streams are found in the Brule, Michigamme, and paint River systems.
- Forestry, wood products, and tourism are the dominant industries. Other major activities include winter sports, fishing, hunting, camping, boating, fall color tours, and sightseeing.
- The Iron River Conservation District received \$432,995 from the State of Michigan CMI Nonpoint Pollution Control program in 2001 to stabilize one road, five livestock access sites, two banks and three storm drain outlets.
- The Iron, Brule, and Paint Rivers have large, moderate groundwater small to medium-sized streams on outwash and coarse ground/end moraine, and moderate groundwater small to medium-sized streams on outwash and coarse ground/end moraine (drumlins common).



Watershed Activities / Concerns / Priorities

- The Iron County Conservation District was awarded a 319 planning grant in 1999 to develop a management plan for the Iron River Watershed. With the Watershed Council acting as a steering committee, an inventory of the watershed was conducted, an information and awareness campaign begun, and strategies to address sources of non-point pollution were developed. The initial planning grant resulted in the successful award of two subsequent grants which will fund implementation of activities through 2004.
- The Iron River Conservation District received \$432,995 from the State of Michigan CMI Nonpoint Pollution Control program in 2001 to stabilize one road, five livestock access sites, two banks and three storm drain outlets.

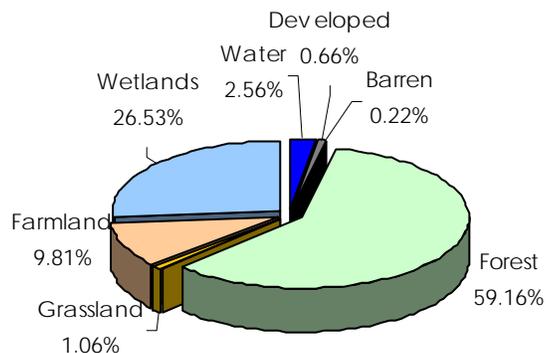
- The Iron River Watershed Project received a grant develop an information and education campaign designed to reduce nonpoint source pollution and restore or sustain habitat and water quality. This included newsletters and articles, radio and television appearances, public presentations, training workshops, road signs, interpretive signs, a website, storm drain markers, and a comprehensive brochure.
- A limited number of point source discharges exist in the area. This includes the West iron County Sewer Authority Wastewater treatment Plant and the National Steel-Dober pit site in Caspian, and Wastewater Sewage Lagoons at Crystal Falls and Alpha.
- A \$318,000 fine for acid mine drainage from the Dober and Buck mines was assessed on the Hanna Mining Co. This money was to be administered by the state, but managed by the newly formed watershed council. The award was earmarked specifically for activities to repair, enhance, or protect the Iron River, as well provide for increased public use.
- All but one of the MDEQ watershed sampling sites had an excellent habitat rating. The one that did not had a good rating.
- Macroinvertebrate community status was assessed at 6 different sites within the Brule River watershed. Two of the 6 stations received macroinvertebrate community ratings of "excellent," while 4 stations rated acceptable.

Impaired (303d) Waters

Waterbody Name	Impairment
Cable Lake (MI)	Mercury (Fish Tissue)
Chicagon Lake (MI)	Mercury (Fish Tissue)
Fortune Lake (Second Lake) (MI)	Mercury (Fish Tissue)
Lake Emily (MI)	Mercury Mercury (Fish Tissue)
Net River (MI)	Mercury (Fish Tissue)
Ottawa Lake (MI)	Mercury (Fish Tissue)
Runkle Lake	Mercury (Fish Tissue)
Paint River (MI)	Pathogens
Kentuck Lake (WI)	Mercury Fish Consumption Advisories
Sunset Lake (MI)	Mercury (Fish Tissue)
Brule River Flowage (WI)	Mercury Fish Consumption Advisories

Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

Land Cover: Brule River Watershed



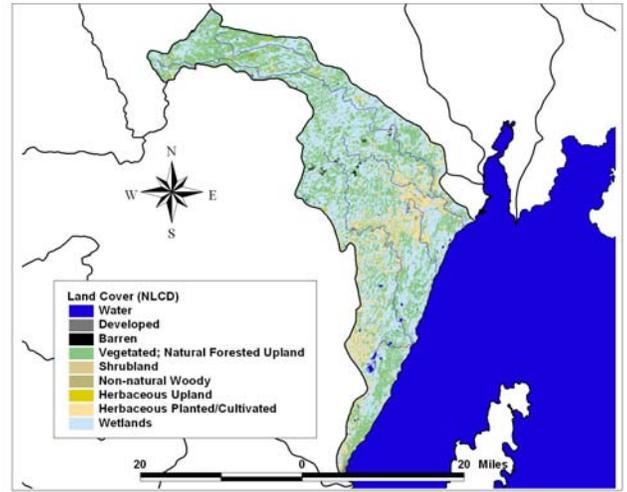
Watershed Size: 1057 sq. miles

Between 1996 and 2001, there has been a slight increase in developed land, grassland, and cultivated land and a slight decreases in forest.

Cedar Ford Watershed

Hydrologic Unit Code: 04030109

For more information, see the USEPA "Surf Your Watershed" website at http://cfpub.epa.gov/surf/huc.cfm?huc_code=04030109 or contact the Michigan Department of Environmental Quality at 517-335-6969 to request a copy of report number MI/DEQ/WB-05/038, "A Biological Survey of the Big Cedar, Bark, and Ford River Watersheds Located in Delta and Menominee Counties, 2000".



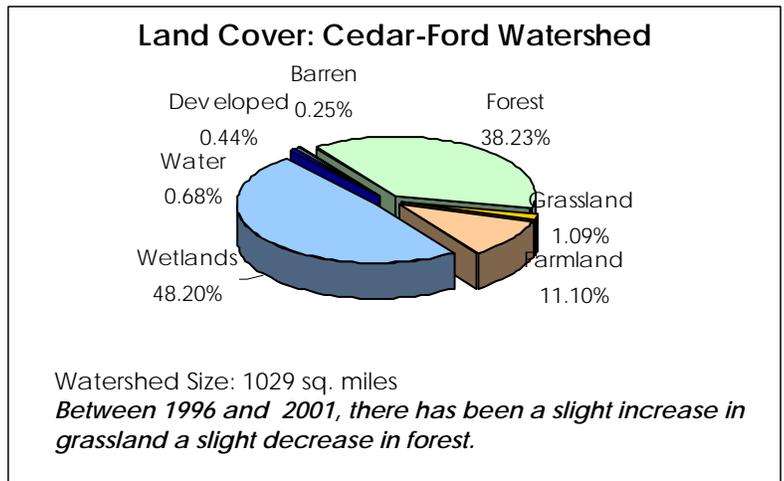
Watershed Groups

- Friends of the Cedar River
- Central Lake Superior Watershed Partnership — www.superiorwatersheds.org/shed.ford.asp
- The Bear Creek Watershed Project, Annis Water Resources Institute — www.gvsu.edu/wri/isc/bear

Watershed Overview / Ecology / Biodiversity



- The Cedar-Ford watershed covers 1029.1 square miles with almost 53 miles of Lake Michigan shoreline.
- There are just over 2 square miles of inland lakes.
- The Ford River is the longest free flowing river in Michigan.
- The watershed is an historic area for pine/hardwood logging with numerous structures still present.
- There are many large, privately held hunting camps and industrial/state forest land.
- Fishing recreation, deer and grouse hunting, snow mobile touring, and cross country skiing are some of the important basin recreational activities.
- The Bark River has medium-sized coastal streams on till and lake plain identified as identified by the nature Conservancy.
- The Ford River has ecologically important large coastal streams on till plain entering western Green Bay with extensive wetlands, and small to medium-sized till plain streams with extensive wetlands as identified by the Nature Conservancy.
- The Ford River has the important species Riverine clubtail.



Watershed Activities/ Concerns/ Priorities

- Cedar River Road Crossing Project (Clare Conservation District/Clean Michigan Grant)
 - Used bituminous pavement and water turnouts on approaches to the river to stabilize 5 road-stream crossings
 - Stabilized roadside ditches using erosion control fabric, riprap, and check dams.

Impaired 303(d) Waters

Waterbody Name	Impairment
Green Bay	Dioxins Fish Consumption Advisory PCBs Fish Consumption Advisory Mercury (Fish Tissue)

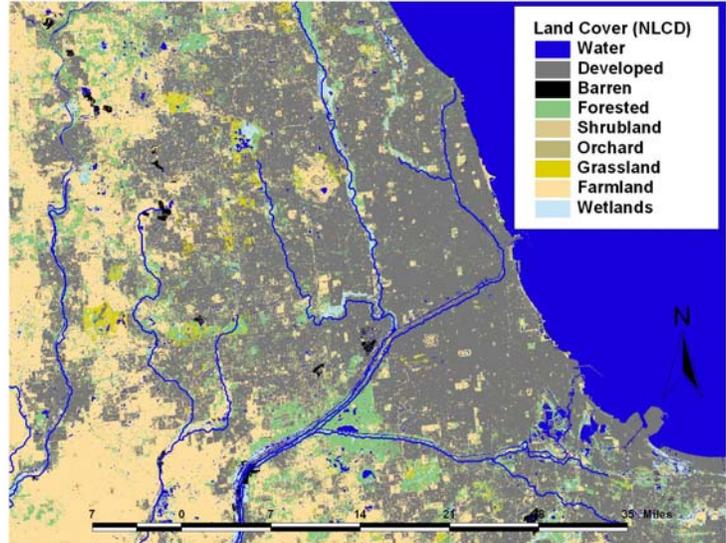
Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

Chicago Area Waterway System

For more information, see the Chicago Waterways website at <http://www.chicagoareawaterways.org/>.

Water System Overview

- The Chicago River once flowed into Lake Michigan. To facilitate a reversal of the flow of the Chicago River to divert water from Lake Michigan to the Chicago Area Waterway System (CAWS), the Chicago Sanitary and Ship Canal, the Calumet-Sag Channel and the North Shore Channel were constructed over 100 years ago. The diversion and the artificial waterways facilitated navigation and protected the drinking water intakes in Lake Michigan from Chicago wastes. The Little Calumet River North Leg, the Chicago River, the South Branch of the Chicago River and North Branch of the Chicago River downstream from its confluence with the North Shore Channel are natural rivers that have been modified through channelization and widened and deepened.
- The CAWS includes the Calumet River and Chicago River basin water bodies that are generally classified as Secondary Contact Recreation and Indigenous Aquatic Life. The CAWS also includes Lake Calumet and a variety of tributaries designated as General Use.
- Land use within the CAWS basin is generally urban with extensive industrial development. Basin stakeholders include the City of Chicago and 31 suburban municipalities. Flow in the CAWS is dominated by treated wastewater from 5 million residents and an additional industrial load of approximately 4.5 million population equivalents.
- Chicago's wastewater system was developed with a combined sewer system that accepted both stormwater and sanitary waste. After rainstorms, the capacity of the sewer system became overwhelmed on a regular basis and combined sewer overflows (CSO) occurred. These CSOs are discharged into the CAWS and frequently from the river into Lake Michigan. To address this problem, the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) developed the Tunnel and Reservoir project (TARP), which included the construction of the Deep Tunnel project. The Deep Tunnel is a series of tunnels that lie 250 to 300 feet below the Chicago River and are located parallel to it. The first phase of the TARP project or "Deep Tunnel" project has been completed. During periods of heavy rainfall, the TARP project directs combined sanitary waste and infiltrating rainwater into massive tunnels and collection reservoirs where it can be withdrawn for treatment after the rain subsides.
- A comprehensive multi-year evaluation of current conditions in the Chicago Waterway System, and its potential for expanded uses, has been launched by the Illinois EPA. This evaluation, also called a Use Attainability Analysis (UAA), will be the first in-depth look at the system in nearly three decades. In mid-February, the Illinois Environmental Protection Agency announced plans for the project that involves the Chicago River, its two main branches (North Branch and South Branch), the Cal-Sag Channel, the Chicago Sanitary and Ship Canal, and tributaries in an area extending from the metropolitan Chicago area to the Lockport vicinity. The Chicago Waterway System makes up the surface drainage network serving the majority of the Greater Chicago metropolitan area. The system receives discharge from three of the largest municipal wastewater treatment plants in the nation as well as releases from more than 100 individual combined sewer outfalls.
- Since passage of the Clean Water Act in 1972, there have been major upgrades of treatment facilities along the Chicago Waterway. Under IEPA oversight, extensive pretreatment programs have begun, as well as treatment of industrial wastes before discharge. The first phase of the Tunnel and Reservoir (TARP) project or "Deep Tunnel" project has been completed.
- Recreational boating and other sports are on the rise within the system and improved fish populations and species diversity now support a modest recreational fishing use. These benefits indicate that the current use classification is outdated, making the planned study a timely undertaking. Jointly, these efforts have significantly improved conditions and public interest in the waterway, resulting in increased efforts to restore abandoned areas and provide public open spaces along the banks. As part of the study, a stakeholders advisory group will be created and involved through the review process and the completed review will be posted for Internet viewing.



Watershed Activities

- Chicago's shoreline habitats provide stopover sites for migratory birds and support rare plants. The dune restoration area at Loyola Beach currently supports State of Illinois endangered species. In addition the federally listed piping plover has stopped at this location. The project supports measures called for in the Service's Urban Bird Conservation Treaty by implementing dune enhancement and expansion of restoration beyond the existing dune area through invasive species control, planting native species, species inventory and education projects. The outcome of the project will be a restored dune area providing a tangible resource for rare coastal bird and plant species.

Impaired (303d) Waters

Waterbody Name	Designated Uses	Fish Consumption	Secondary Contact and Indigenous Aquatic Life
N. Shore Channel	Full support	Nonsupport	Full support
N. Shore Channel	Full support	Nonsupport	Full support
N. Shore Channel	Full support	Nonsupport	Full support
S. Br. Chicago	Full support	Nonsupport	Full support
N. Br. Chicago	Partial support	Nonsupport	Partial support
Chicago San. &	Partial support	Nonsupport	Full support
Chicago San. &	Full support	Nonsupport	Full support
Chicago San. &	Full support	Nonsupport	Full support
Chicago San. &	Full support	Nonsupport	Full support
Chicago San. &	Full support	Nonsupport	Full support
Cal-Sag Channel	Partial support	Nonsupport	Partial support

Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

Door-Kewaunee Watershed

Hydrologic Unit Code: 04030102

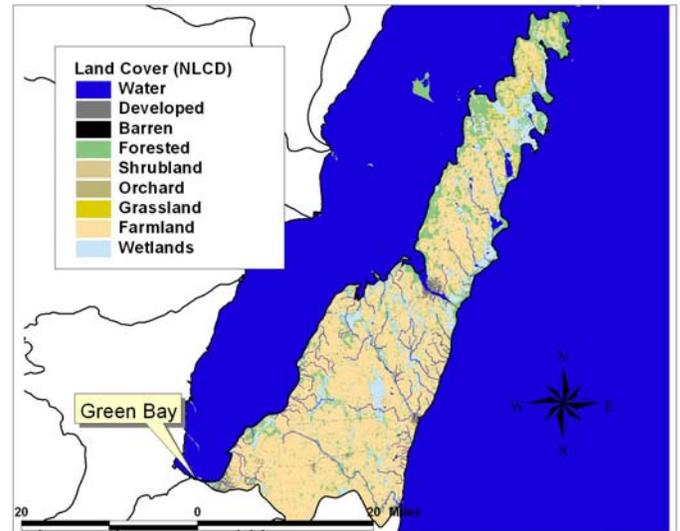
For more information, see the USEPA "Surf Your Watershed" website at

http://cfpub.epa.gov/surf/huc.cfm?huc_code=04030102

The Door-Kewaunee Watershed as defined by the USGS is part of the WDNR's Lakeshore Basin Management Area. For more information, see the Wisconsin Department of Natural Resources' "Wisconsin's Basins" website at <http://dnr.wi.gov/org/gmu/gmu.html>.

Watershed Groups

- 1000 Friends of Wisconsin — www.1kfriends.org
- Door County Environmental Council — www.doorcountycompass.com/dcec
- Door County Land Trust — www.doorcountylandtrust.org
- River Alliance of Wisconsin — www.wisconsinrivers.org
- Clean Wisconsin — www.cleanwisconsin.org
- Lakeshore Natural Resource Partnership — www.lnrp.org
- Charles Verhoeven, Regional Water Program Leader – Charles.Verhoeven@dnr.state.wi.us



Watershed Overview / Ecology / Biodiversity

- Maple- basswood is the most common forest type, and the tree species with the greatest volume in the Lakeshore basin is ash followed by soft maple, aspen, basswood and beech.
- Recreational highlights include: hiking, birding, camping, rafting, canoeing, hunting, fishing, and boating on Lake Michigan and Green Bay.
- The diversity of islands, forests, wetlands, sand dunes, and ridge and swale topography provide habitat to an abundance of rare, threatened and endangered plants and animals.
- The Basin includes the Northern Lake Michigan Coastal and Southeast Glacial Plains Ecological Landscapes In the Northern Lake Michigan Coastal area, low sand dunes and beach ridges along the shoreline support unique plant species.
- Vegetation is maple- basswood- beach forests and wetlands. In the Southeast Glacial Plains area, former savanna (now farmed) and wetlands are predominant, along with kettle lakes and the Kettle Moraine landscape feature. This area's wetlands are highly productive for plants, insects, and invertebrates.
- Surface waters are a mix of lakes and cold and warm water streams with smallmouth bass, walleye, northern pike, panfish and trout. Great Lakes fisheries provide lake trout, lake whitefish, salmon and yellow perch.
- The basin's groundwater in Door County is underlain by Niagara Dolomite, or Karst (fractured limestone), which allows pollutants such as bacteria to move quickly and which makes this resource highly susceptible to contamination.
- Wildlife include white- tailed deer, turkey, ring- necked pheasant, ruffed grouse, waterfowl, geese, beaver, mink, otter, colonial waterbirds, trumpeter swans, eagle, osprey, northern goshawk, shorebirds
- Grasslands, which support over 105 bird species, are promoted through prescribed burns and mowing.
- Cat Island in Green Bay has a critical migratory shorebird stopover site.
- Critical habitat communities on the Door Peninsula identified by the Nature Conservancy include the Great Lakes Beach, Midwest Calcareous Floating Mat, Juniper Alvar Shrubland, and Midwest Mixed Emergent Deep Marsh.
- Other important habitat include Alkaline Moist Bluff – Cliff, Beech - Maple - Northern Hardwoods Forest, Black Ash - Mixed Hardwood Swamp, Black Spruce / Labrador Tea Poor Swamp, Boreal Sedge Rich Fen, Great Lakes Alkaline Cobble/Gravel Shore, Great Lakes Alkaline Open Bluff – Cliff, Great Lakes Beach, Great Lakes Beachgrass Dune, Great Lakes Dune Pine Forest, Great Lakes Hemlock - Beech - Hardwood Forest, Great Lakes Limestone Bedrock Lakeshore, Great Lakes Shallow Marsh, Great Lakes Shoreline Cattail - Bulrush Marsh, Great Lakes White Pine - Hemlock Forest,

Interdunal Wetland, Jack Pine / Prairie Forbs Barrens, Maple-Ash-Elm Swamp Forest, Midwest Calcareous Floating Mat, Red Oak - Sugar Maple Forest, Tussock Sedge Wet Meadow, White Cedar - (Mixed Conifer) / Alder Swamp, White Cedar - Black Ash Swamp, White Cedar - Boreal Conifer Mesic Forest, White Pine - Red Oak Forest, and Wooded Dune and Swale Complex.

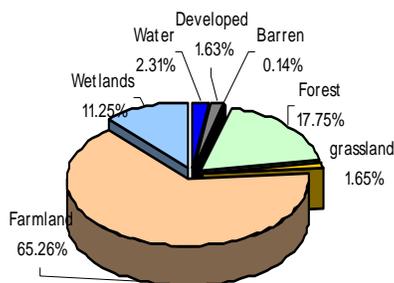
- Critical ecological systems on the Door Peninsula include bedrock shoreline with semi-protected and open wetlands with sand nearshore; large, spring-fed lakes; shallow dune lakes; and small coastal streams on thin till over bedrock and lacustrine sand
- Critical species on the Door Peninsula include the American Bittern, Willow Flycatcher, Hooded Merganser, Red-headed Woodpecker, American White Pelican, Forster's Tern, Common Tern, Warbling Vireo, Wood Duck, Ruffed Grouse, Spoon-leaf, moonwort, Whip-poor-will, Black Tern, Pitcher's thistle, Marsh Wren, Sedge Wren, Black-billed Cuckoo, Eastern Wood-Pewee, Yellow Rail, Ram's head lady's slipper, Black-throated Blue Warbler, Blackburnian Warbler, Chestnut-sided Warbler, Black-throated Green Warbler, Least Flycatcher, Bald Eagle, Wood Thrush, Baltimore Oriole, Dwarf lake iris, Black-and-white Warbler, Mourning Warbler, Rose-breasted Grosbeak, Hines emerald dragonfly, Field Sparrow, Nashville Warbler, and the Canada Warbler.
- Other important species include Crested vertigo, Deep-throat vertigo, Dwarf lake iris, Hines emerald dragonfly, Hubricht's vertigo, Iowa Pleistocene vertigo, Lake Huron locust, Multi-rib vallonina, Pleistocene catinella, Ram's head lady's slipper, Six-whorl vertigo, and Tapered vertigo.

Basin Priorities

In 2000 the Lakeshore Basin Partnership Team, which includes the Door-Kewaunee watershed, developed the following prioritized list of the most pressing issues impacting natural resources in the watershed management area.

1. Loss of riparian (stream and lakeside) buffers (streamside habitat)
2. Inadequate identification and protection of wetlands, wetland corridors, and groundwater recharge areas
3. Need for better land use Planning & improved local zoning
4. Inadequate management & protection of woodlots
5. Absence of stewardship ethic
6. Loss of small farms and/ or Conversion to large farms
7. Contamination of drinking water
8. Illegal dumping of toxins
9. Loss of biodiversity
10. Loss of shoreline habitat

Land Cover: Door-Kewaunee Watershed



Watershed size: 767 sq. miles

Between 1996 and 2001, there has been a slight increase in developed land, grassland, and barren land and slight decreases in farmland.

Impaired (303d) Waters

Waterbody Name	Impairment
Ahnapee River	PCB Fish Consumption Advisories
Clark Lake	PCB Fish Consumption Advisories
East Alaska Lake	Mercury Fish Consumption Advisories
Green Bay—South of Marinette and its Tribs	Mercury Fish Consumption Advisories
Kewaunee Harbor	Metals Aquatic Toxicity Fish Consumption Advisory
Kewaunee Marsh	Metals Aquatic Toxicity Wildlife
Kewaunee River	PCB Fish Consumption Advisories
Mackaysee Lake	Mercury Fish Consumption Advisories
Stony Creek	Degraded Habitat Sediment

Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

Basin Social Concerns

- Limit of aquatic habitat and open land to development, pollution threats to surface waters and contamination of drinking and groundwater.
- Address water quality problems from in- place pollutants, dams, urban and agricultural runoff.
- Preserve biodiversity and protect endangered and threatened species.
- Protect of large contiguous blocks of forestland, grassland and wetland that serve as habitat for mammals, birds, and amphibians, as well as providing a large self- sustaining forest ecosystem for all to enjoy.
- Exotic nuisance species, stocking issues, declining fishing opportunities, inadequate boat access.
- Monitoring of wildlife populations, water quality, and ecosystem function are needed to understand the status and trends of resources in the basin.

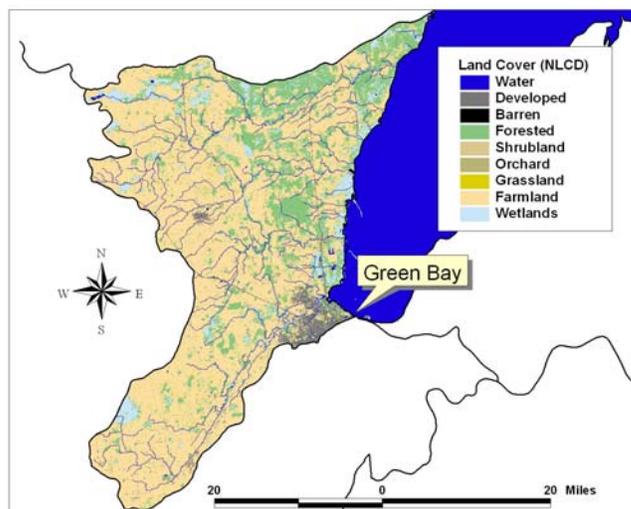
Duck-Pensaukee Watershed

Hydrologic Unit Code: 04030103

For more information, see the USEPA “Surf Your Watershed” website at

http://cfpub.epa.gov/surf/huc.cfm?huc_code=04030103

The Wisconsin Department of Natural Resources manages the Duck-Pensaukee watershed in two integrated management areas. The northern portion is managed as part of the Upper Green Bay Basin and the southern portion as part of a larger Lower Fox River basin. For more information, see the Wisconsin Department of Natural Resources’ “Wisconsin’s Basins” website at <http://dnr.wi.gov/org/gmu/gmu.html>.



Watershed Groups

- Duck Creek Watershed Priority Project, Outagamie County Land Conservation Department — www.co.outagamie.wi.us/landcons/DAA.html
- Wisconsin Land & Water Conservation Association, Inc. — www.wlwca.org
- Pensaukee River Priority Watershed Project — www.co.shawano.wi.us/subwebs/pnd/plan_dev/Land%20Conserv/Pensaukee/pensaukee_home.htm
- Oconto County Conservation Department — www.co.oconto.wi.us/departments.asp?d_id=2043



Watershed Overview / Ecology / Biodiversity

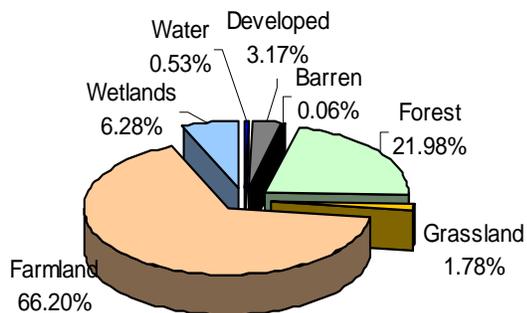
- The Duck-Pensaukee watershed covers approximately 490 square miles.
- There are approximately 35 miles of Lake Michigan shoreline.
- Green Bay is the sole urbanized area in the watershed.
- The watershed flows into the Green Bay.
- Just over 66 percent of the watershed is agricultural.
- Wildlife include black bear, white-tailed deer, turkey, ring-necked pheasant, ruffed grouse, waterfowl, geese, beaver, mink, otter, timber wolves, elk, colonial waterbirds, trumpeter swans, eagle, osprey, northern goshawk, shorebirds.
- Maple-basswood is the most common forest type and the tree species with the greatest volume in the basin is hard maple followed by aspen, white and red pine, soft maple and balsam fir.
- Coastal wetlands are an important feature of the watershed.
- Groundwater is the source of potable water for most residents within the Duck-Pensaukee watershed.
- Groundwater levels have dropped, causing suburban areas to seek direct withdrawals from Lake Michigan.

Watershed Activities / Concerns / Priorities

The following are objectives for the Upper Green Bay management Basin, which includes a significant portion of the Duck-Pensaukee watershed:

- Target the West Shore of Green Bay as a high priority for habitat protection
- Implement the DNR’s 50 year Land Legacy Study, an acquisition plan for the state
- Protect shoreland habitat and water quality through water regulation and zoning
- Work with local communities in developing “smart growth” plans & promoting wise land use and zoning
- Complete a comprehensive fisheries plan for the basin, focusing on the Oconto, Menominee, and Peshtigo Rivers and Lake Michigan, including addressing invasive exotic species
- Complete the Master Plan for the Governor Tommy G. Thompson Centennial State Park
- Encourage sound forestry practices on public and private land and identify and manage terrestrial invasive exotic species
- Enhance educational activities for forestry, water quality, wildlife management, healthy ecosystem.
- The Oneida are leaders in the Duck Creek watershed, which runs through the reservation.

Land Cover: Duck-Pensaukee Watershed



Watershed Size: 490 sq. miles

Between 1996 and 2001, there has been a slight increase in developed land and slight decreases in grassland, and forest.

Impaired (303d) Waters

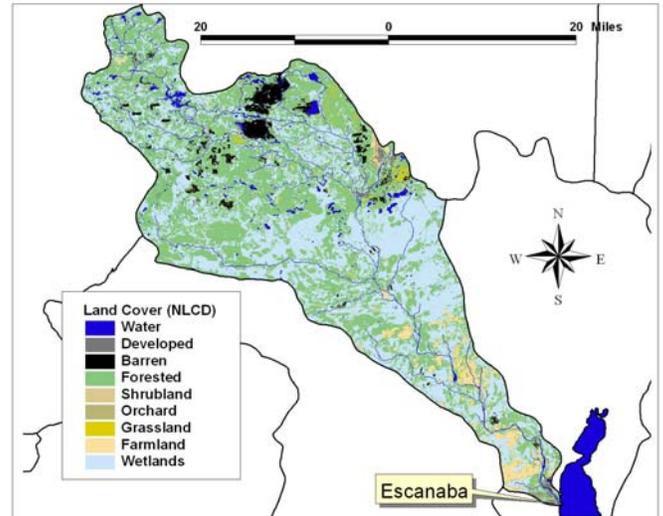
Waterbody Name	Impairment
Duck Creek * (1)	Nutrients PCB Fish Consumption Advisory Flow Alteration(s) Loss Of Instream Habitat Organic Enrichment/Low Dissolved Oxygen Sediment
Green Bay - South Of Marinette And Its Tribs Including The Menominee, Oconto, Fox & Peshigo Rivers From Their Mouths To The First Dam	PCB Fish Consumption Advisory
GREEN BAY AOC (INNER BAY) (1)	Phosphorus Dissolved Oxygen PCB Fish Consumption Advisory
Trout Creek (2)	Nutrients PCB Fish Consumption Advisory Flow Alteration(s) Loss Of Instream Habitat Organic Enrichment/Low Dissolved Oxygen Sediment

Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

Escanaba River Watershed

Hydrologic Unit Code: 04030110

For more information, see the USEPA "Surf Your Watershed" website at http://cfpub.epa.gov/surf/huc.cfm?huc_code=04030110 or contact the Michigan Department of Environmental Quality at 517-335-6969 to request a copy of report number MI/DEQ/SWQ-01/010, "A Biological Survey of the Escanaba River Watershed, Marquette, Dickinson, and Delta Counties, August 2000".



Watershed Group

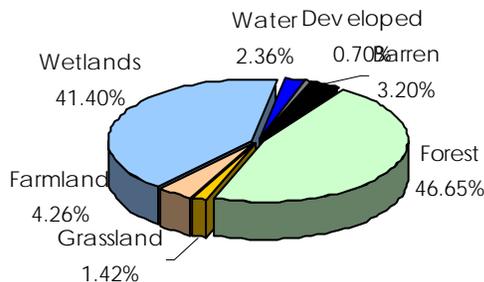
- Central Lake Superior Watershed Partnership — www.superiorwatersheds.org/wsescanaba.asp

Watershed Overview / Ecology / Biodiversity

- Over 508 miles of the streams flow year-round.
- The Escanaba River Watershed is one of the Upper Peninsula's largest watersheds.
- The Escanaba River provides ample opportunity for the outdoor enthusiast including canoeing, fishing, swimming, public campsites and hiking to name a few.
- Much of the Escanaba system in Marquette County is open for public use including a large tract on the lower East Branch owned by Marquette County.
- The Escanaba River supports brook, brown and some rainbow trout throughout along with warm water species in the impoundments.
- The upper Escanaba has three major dams on it, the Greenwood Dam, Schweitzer Dam and the Cataract Dam.
- The East Branch and the Middle Branch of the Escanaba converge in the town of Gwinn to form the Main Branch. The stretch from this convergence south to the Delta County line is mostly wide and smooth, ideal for a canoe trip. From the Delta County line, the river runs south to its discharge point at Lake Michigan, just outside of the City of Escanaba.
- The Escanaba River watershed is one of the watersheds within which the Sault Ste. Marie Tribe of Chippewa Indians live.
- The Escanaba River has critical Tufted Hairgrass Wet Alvar Grassland ecological systems as identified by the Nature Conservancy.
- The Nature Conservancy identified Little Lake's Algae-like pondweed as a critical species in the watershed.



Land Cover: Escanaba River Watershed



Watershed size: 924 sq. miles

Between 1996 and 2001, there has been a slight increase in developed land, and grassland, and a slight decrease in forest, cultivated land, and water.

Impaired Waters

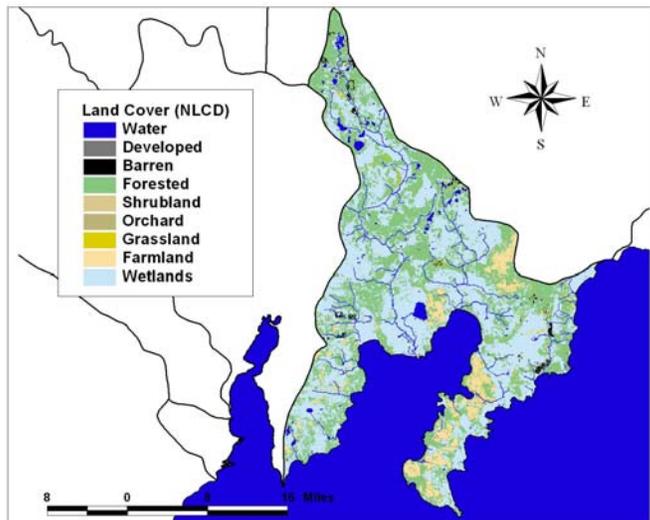
Waterbody Name	Impairment
Escanaba River	PCBS, Mercury, Mercury (Fish Tissue)
Goose Lake	Phosphorus, Algal Blooms PCBS Fish Consumption Advisory
Greenwood Reservoir	Mercury (Fish Tissue)
Round Lake	Mercury (Fish Tissue)
Schweitzer Reservoir	Mercury (Fish Tissue)
Shag Lake	Mercury (Fish Tissue)

Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

Fishdam-Sturgeon Watershed

Hydrologic Unit Code: 04030112

For more information, see the USEPA "Surf Your Watershed" website at http://cfpub.epa.gov/surf/huc.cfm?huc_code=04030112 or contact the Michigan Department of Environmental Quality at 517-335-6969 to request a copy of report number MI/DEQ/SWQ-01/112, "A Biological Survey of the Sturgeon River Watershed and nine Other Lake Superior Coastal Watersheds in Baraga County, July 2001".



Watershed Group

- Sturgeon/Otter River Watershed Council

Watershed Overview / Ecology / Biodiversity

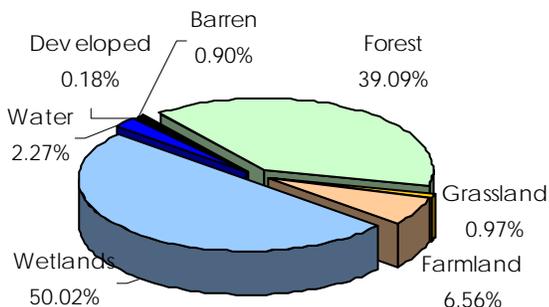
- The Fishdam-Sturgeon watershed is located in the upper peninsula of Michigan and covers approximately 559 square miles.
- The watershed has approximately 123 miles of Lake Michigan shoreline.
- Most of the wetlands in the watershed are characterized as coastal wetlands.
- The watershed has 260 miles of rivers and streams.
- The watershed now includes two identified impaired waters.
- The Nature Conservancy identified the Garden Peninsula's Spruce-Cedar Wet Alvar Woodland and Dwarf lake iris as critical species in the watershed.



Impaired (303d) Waters

Waterbody Name	Impairment
Round Lake	Mercury (Fish Tissue)
Sturgeon River	Mercury

Land Cover: Fishdam-Sturgeon Watershed



Watershed Size: 559 sq. miles
Between 1996 and 2001, there has been a slight increase in developed land, grassland, bare land, and farmland, and a slight decrease in forest and wetland.

Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

Lower Fox River Watershed

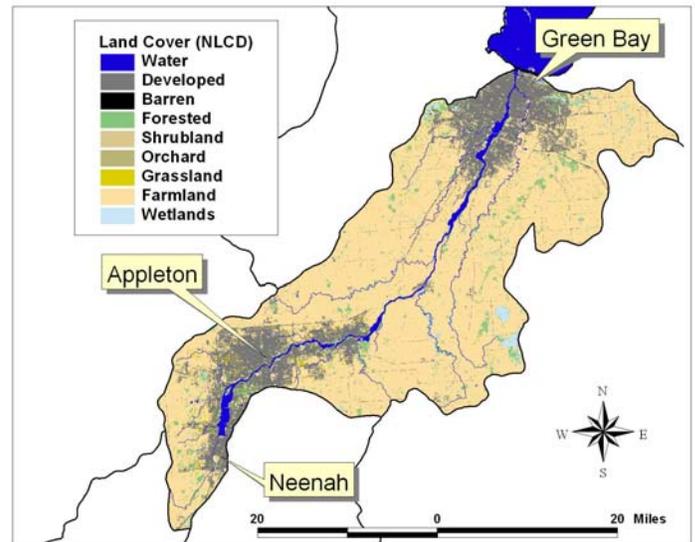
Hydrologic Unit Code: 04030204

More information is available at the USEPA "Surf Your Watershed" website at http://cfpub.epa.gov/surf/huc.cfm?huc_code=04030204

The Wisconsin Department of Natural Resources manages the watershed as part of the Lower Fox River management area that also includes a portion of the Duck-Pensaukee watershed. For more information, see the Wisconsin Department of Natural Resources' "Wisconsin's Basins" website at <http://dnr.wi.gov/org/gmu/gmu.html>

Watershed Groups

- Fox River Watch — www.foxriverwatch.com
- Fox-Wolf Basins, The University of Wisconsin-Extension — basineducation.uwex.edu/foxwolf
- The Lower Fox River Watershed Monitoring Program — www.uwgb.edu/watershed
- Fox Wolf Watershed Alliance — www.fwwa.org
- Lake Michigan Forum — www.lkmichiganforum.org/
- Rivers Alliance of Wisconsin — www.wisconsinrivers.org
- Bob Behrens, the Lower Fox River Water Basin Team Leader — behrer@dnr.state.wi.us

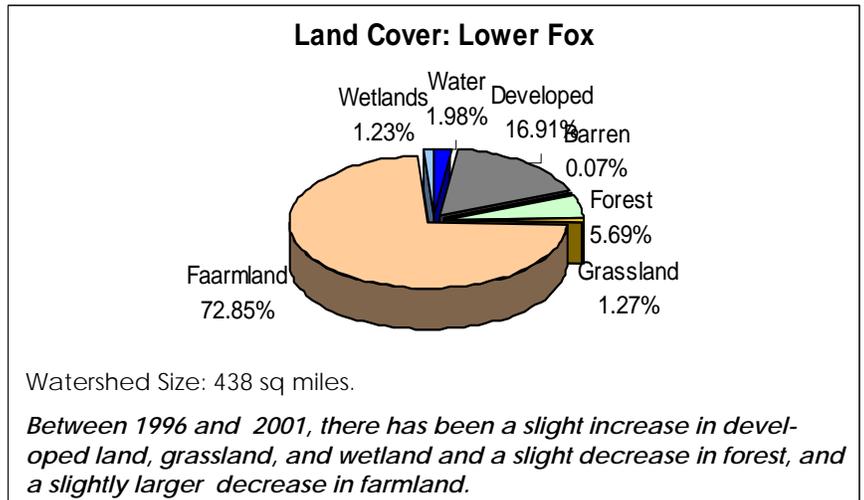


Watershed Overview / Ecology / Biodiversity

- Recreational highlights include wildlife watching, hiking, fishing, hunting, bicycling, horseback riding, snowmobiling, skiing, camping, picnicking, and water sports.
- The Lower Fox River originates at the outlet of Lake Winnebago and flows northeast for 39 miles where it empties into the bay of Green Bay. The Lower Green Bay and Fox River Area of Concern (AOC) consists of the lower 11.2 km of the Fox River below DePere Dam and a 55 km² area of southern Green Bay out to Point au Sable and Long Tail Point.
- The Lower Fox River has the most paper mills of any river in the world.
- Much of the drinking water in the basin is derived from groundwater. However, the City of Green Bay receives its drinking water from Lake Michigan. More communities are now building pipelines from the Lake.
- The main stem of the Fox River in the Lower Fox River Basin is fragmented by a series of 17 locks and 12 dams that were built in the mid 1800's to aid navigation or produce power.
- The Oneida Reservation, established by an 1838 Treaty, is in the basin. It is participating in the State's priority watershed program and the WTCAC.
- The Lower Fox River Basin encompasses three of the state's ecological landscapes: Northern Lake Michigan Coastal, Southeast Glacial Plains, and Northeast Plains.
- Open land consists of cropland, orchards, pastures, and meadows, and comprises the largest type of habitat within 0.5 mile of the Lower Fox River. Woodland habitat includes hardwood and conifer forest land and wooded lots with an associated understory of shrubs, grasses, legumes, and herbaceous plants.
- Wildlife diversity and populations are affected by the variability of habitats within the basin. The two main terrestrial habitats within the basin are open land and woodland. Aquatic habitats within the area are wetland, riverine, and lacustrine (lakes or lake-like).
- Numerous endangered, threatened and otherwise rare species exist in the basin, including the endangered Barn Owl and the threatened Small White Lady's Slipper.
- Wildlife include songbirds, white-tailed deer, rabbits, red fox, coyote, pheasant, Hungarian partridge, squirrel, skunk, raccoon, upland game birds, waterfowl, bats, small mammals and invertebrates, reptiles, amphibians and many others.
- The Greenleaf Escarpment has Alkaline Moist Bluff – Cliff and North-Central Maple - Basswood Forest
- The multi-rib vallonias are an important species in the Greenleaf Escarpment area.

Watershed Activities / Concerns / Priorities

- A Wisconsin Great Lakes Protection Fund grant enabled Brown County Land Conservation Department to secure commitments from willing landowners that cut the soil, fertilizer, manure and other pollutants carried into the stream. Participating landowners signed contracts agreeing to maintain for perpetuity a 35-foot wide strip, or "buffer," next to Baird Creek where they won't plant crops, plow or engage in any agricultural activities.
- Hydraulic dredging of PCB-contaminated sediment started in the Lower Fox River at Little Lake Butte des Morts. Over the next decade as much as 7.25 million cubic yards of contaminated sediment will be removed from a 39-mile stretch of the Lower Fox River. On the Sheboygan River, the cleanup of a 14-mile stretch of the river, as well as adjacent soil and groundwater, is expected to take seven years.
- Environmental concerns include habitat loss, deterioration and fragmentation from rapid development and conversion of rural lands; water quality problems from contaminated sediment, runoff in urban and agricultural areas, floodplain development and overuse of groundwater supplies (with groundwater quality implications); heavy recreational use of resources, such as lakes and shorelines; exotic species are a continuing emerging problem. Plant species such as reed canary grass, purple loosestrife, buckthorn, garlic mustard and Eurasian water milfoil quickly out-compete native species and affect ecosystem balance. Zebra mussels and rusty crayfish are spreading, disrupting stream and lake ecology; monitoring of wildlife populations, water quality, and ecosystem function are needed to understand the status and trends of resources.
- The main priorities identified in the integrated management plan include: Increase and protect critical habitats and habitat integrity; sustain a diverse, balanced and healthy ecosystem; Improve surface water and groundwater quality and identify water conservation opportunities; establish a self-sustaining, balanced, and diversified edible fish community; manage resources for multiple users; strengthen program support and enforcement initiatives; and Improve educational programs.



Impaired (303d) Waters

Waterbody Name	Impairment
Apple Creek *	Phosphorus, Degraded Habitats, Organic Enrichment/Low Dissolved Oxygen, Sediment, Temperature
Apple Creek *	Phosphorus, Degraded Habitats, Organic Enrichment/Low Dissolved Oxygen, Sediment, Temperature
Duck Creek	Phosphorus, Dissolved Oxygen, Sediment
Dutchman Creek	Nutrients, Ammonia
East River * *	Metals, Phosphorus, Aquatic Toxicity, Degraded Habitat, Dissolved Oxygen, Sediment
East River **	Metals, Phosphorus, Aquatic Toxicity, Degraded Habitat, Dissolved Oxygen, Sediment
Fox River (Seg. 1)	Phosphorus, Dissolved Oxygen, Fish Consumption Advisories (PCBs)
Fox River (Seg. 2 lower)	Phosphorus, Dissolved Oxygen, Fish Consumption Advisories (PCBs)
Fox River (Seg. 3 Lower)	Phosphorus, Dissolved Oxygen, Fish Consumption Advisories (PCBs)
Kankapot Creek	Loss Of Instream Habitat
Mud Creek	Loss Of Instream Habitat
Neenah Slough	Fish Consumption Advisories (PCBs), Organic Enrichment/Low Dissolved Oxygen
Plum Creek	Loss Of Instream Habitat, Temperature
Tributary to East River	PCBs, Aquatic Toxicity

Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

Lower Fox River/ Green Bay Area of Concern Activities

Location

- The lower 40 miles of the Fox River and Green Bay

AOC Primary Contaminants

- PCBs
- Phosphorus
- Suspended solids
- Mercury

AOC Stressors

- Urban and rural runoff
- Sediments
- Aquatic exotic species
- Wetland loss
- Habitat alteration

AOC Relevant Programs

- Clean Water Act
- Superfund
- Natural Resource Trustee's Damage Assessment

AOC Clean-up Actions

- Watershed NPS abatement
- Remedial investigation completed remedial action nearly ongoing. Dredging and PCB removal (Deposit in 7,200 cubic yards of sediment removed and Deposit 56/57: 50,000 cubic yards of sediment removed)
- Dissolved oxygen wasteload
- Deposit N, 56, 57
- Cumulative sediments remediated from 1997-2002 – 87,500 cubic yards

AOC Key Activities Needed

- Dredging
- Pollution Prevention
- Stream buffers
- Habitat protection and restoration

AOC Challenges

- Rapid land development
- Contaminated material disposal
- Seeing through completion of cleanup for OUs 2-5
- Coordination with RAP program for AOC delisting purposes

AOC Next Steps

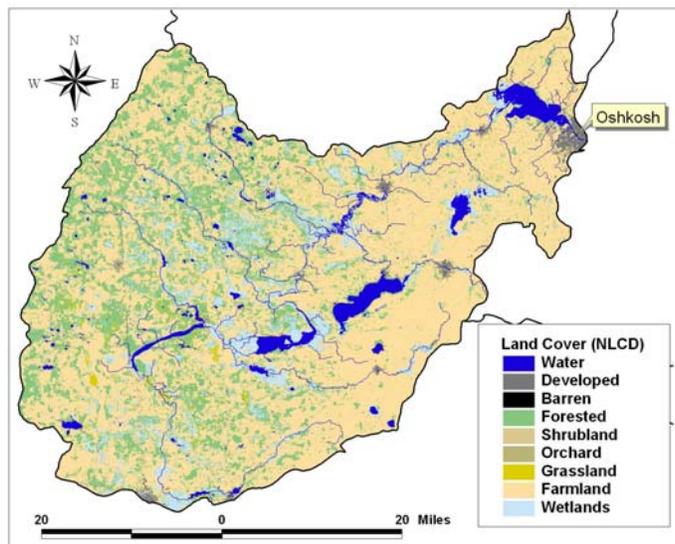
- Formal agency decision (Comment period ended January 21, 2002)
- Removal of 10 million cubic yards of sediment.
- Completed dredging and implementation of cleanup plan for OU 1, expected to take 3-6 years
- OUs 2-5 final cleanup plan implementation, expected to take 15 years

Upper Fox River Watershed

Hydrologic Unit Code: 04030201

For more information, see USEPA "Surf Your Watershed" website at http://cfpub.epa.gov/surf/huc.cfm?huc_code=04030201

The Upper Fox River basin is part of the Wisconsin DNR's Upper Fox River basin management area, which also includes the Lake Winnebago watershed. For more information, see the Wisconsin Department of Natural Resources' "Wisconsin's Basins" website at <http://dnr.wi.gov/org/gmu/gmu.html>.



Watershed Groups

- Fox River Watch — www.foxriverwatch.com
- Fox-Wolf Basins, The University of Wisconsin-Extension basineducation.uwex.edu/foxwolf
- Fox Wolf Watershed Alliance — www.fwwa.org
- Lake Michigan Forum — www.lkmichiganforum.org/
- Rivers Alliance of Wisconsin — www.wisconsinrivers.org
- Rob McLennan, the Upper Fox River Water Basin Team Leader — Robin.McLennan@dnr.state.wi.us



Watershed Overview / Ecology / Biodiversity

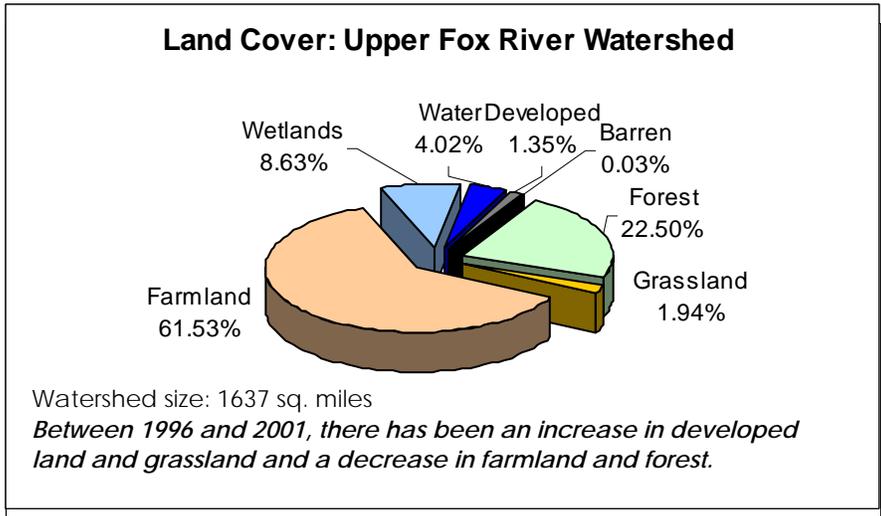
- Numerous endangered, threatened and otherwise rare species exist in the basin, including the threatened White Lady's Slipper, a species that needs fens and calcareous wet prairies, and Forster's Tern, which needs large marshes, estuaries and lake islands.
- Over 10% of the basin area is wetland greater than 40 acres in size, accounting for 145,428 acres. The total wetland area is actually much greater, as mapping identifies wetlands as small as 2 acres in size.
- There are over 55,678 acres of major public lands in the Upper Fox management basin including 51,311 acres of state wildlife, fisheries and park lands (not including the 11 state natural areas in the basin) and 4,367 acres of U.S. Fish and Wildlife Service wildlife refuge and waterfowl production acres.
- The Basin includes the Central Sand Ridges, Southeast Glacial Plains, and a small portion of the Central Sand Plains Ecological Landscapes.
- Most of the basin's cold water trout streams are located in the western portion of the basin near the Sandy Ridges ecosystem. Warm water rivers, streams and lakes support various game and non- game species including large and small mouth bass, walleye, northern pike, catfish and sturgeon.
- Common woodland wildlife include white- tailed deer, turkey, ruffed grouse; upland/ grassland wildlife includes ring-necked pheasant, non- game songbirds (vesper sparrow, bobolink (right), meadowlark); grassland nesting waterfowl include mallards and blue- winged teal. Wetland species include various waterfowl, amphibians and reptiles.
- Oak- hickory is the most common forest type and the tree species with the greatest volume in the Upper Fox Basin is white oak followed by black and pin oak, white and red pine, aspen and soft maple.
- The Nature Conservancy identified Eightmile-Waukau Creek as a critical ecological system for the Fox tributary rivers.

Watershed Activities / Concerns / Priorities

- There are a large number of dams on the Upper Fox River system. Several have been removed, including 2 on the Baraboo River. Data collected from the removal demonstrate that historical fish species have returned, and the population of exotic species declined.
- The Upper Fox watershed is home to the state's largest Wetland Reserve Restoration Program (WRP). Duffy's Marsh is a 1,732 acre wetland restoration project in Marquette County. There are over 60 WRP contracts in the larger Upper Fox River management area (which also includes the Lake Winnebago watershed).

The Upper Fox Basin Partnership held a workshop to identify concerns and issues facing natural resources in the basin. The three priorities listed below are not ranked against each other, but rather, they rose to the top when compared to all of the other stressors affecting the natural resources of the basin and the uses of those resources by the public.

- Wetland filling/ loss
- Habitat loss and fragmentation
- Nutrient loading/ Nonpoint Source Pollution
- Other environmental concerns include:
 - Water quality problems from contaminated sediments, runoff in urban and agricultural areas, floodplain development and overuse of groundwater supplies.
 - Riparian/wetland, woodland, and grassland habitat loss, deterioration, and fragmentation from rapid development and conversion of rural lands. Protection and maintenance of habitat is important for maintaining spatial and temporal ecosystem diversity critical for wildlife.
 - Grassland restoration is a major initiative, with virtually the entire historic prairie, sedge meadows and oak savannas having been converted to agriculture due to their flat topography and rich soils.
 - Exotic species are a continuing and emerging problem. Plant species such as reed canary grass, purple loosestrife, buckthorn, garlic mustard, and Eurasian water milfoil can quickly out-compete native species and wreak havoc on ecosystem balance. Zebra mussels and rusty crayfish are spreading to basin waterways, disrupting stream and lake ecology.
 - Monitoring of wildlife populations, water quality, and ecosystem function are needed understand the status and trends of resources.
- The Oneida Tribe has a water quality protection plan for the reservation and has participated in the State priority watershed Program. It is participating in sediment and phosphorus study for assessment and modeling for the Wisconsin Lower Fox Basin. It is also participating in the Wisconsin NRCS WI Tribal Conservation Advisory Council.



Impaired 303(d) Waters

Waterbody Name	Impairment
Big Green Lake	PCB Fish Consumption Advisory
Buffalo Lake	Mercury Fish Consumption Advisory
Butte Des Morts Lake	PCB Fish Consumption Advisory Organic Enrichment/Low Dissolved Oxygen Sediment Nutrients Mercury Fish Consumption Advisory
Fox River (From Portage North To, But Not Including Buffalo Lake)	PCB Fish Consumption Advisory
Fox River (Swan Lake Downstream to Portage)	PCB Fish Consumption Advisory
Fox River At Buffalo Lake	PCB Fish Consumption Advisory
Fox River, Oshkosh	Aquatic Toxicity
Hill Creek	Degraded Habitat Sediment
Mason Lake	Nutrients Organic Enrichment/Low Dissolved Oxygen
Peppermill Creek	Loss Of Instream Habitat Sediment Temperature
Silver Creek (2)	Contaminated Sediments Loss Of Instream Habitat Temperature
Roy Creek (All)	Degraded Habitat Sediment
Silver Lake (Big)	Aquatic Toxicity
Un. Trib To Mason Lake (T14nr7e S25)	Loss Of Instream Habitat Sediment
Wurch Creek	Loss Of Instream Habitat Sediment

Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

Lower Grand River Watershed

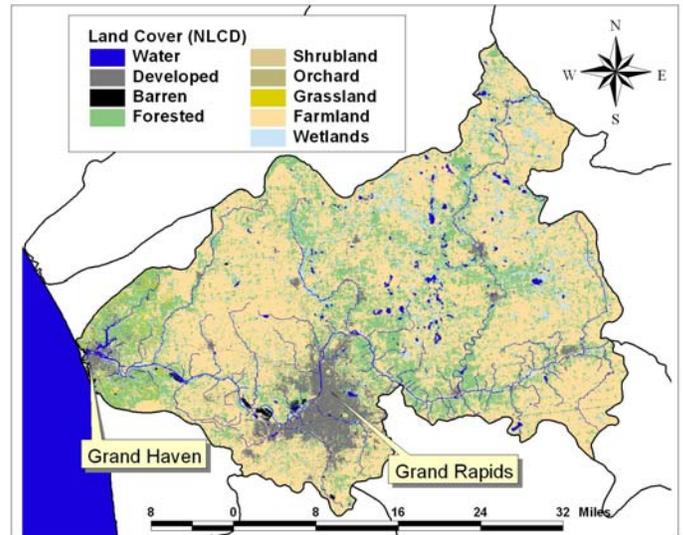
Hydrologic Unit Code: 04050006

For more information, see the USEPA "Surf Your Watershed" website at:

http://cfpub.epa.gov/surf/huc.cfm?huc_code=04050006 or contact the Michigan Department of Environmental Quality at 517-335-6969 to request a copy of report number MI/DEQ/WB-05/097.

Watershed Management Plans

- Hager Creek — Ottawa County Parks & Recreation Commission
- Lake Macatawa — Macatawa Area Coordinating Council
- Plaster Creek — Kent County Drain Commission
- Schoolhouse Creek — Kent County Drain Commission
- Spring Lake — Spring Lake Lake Board
- Bear Creek — Cannon Township and Grand Valley State University/Annis Water resources Institute (GVSU/AWRI)
- Buck Creek — Grand Valley Metro Council
- Crockery Creek — Muskegon Conservation District
- Rogue River — Grand Valley Metro Council and GVSU/AWRI
- Sand Creek — Grand Valley Metro Council and GVSU/AWRI
- York Creek - Alpine Township and GVSU/AWRI

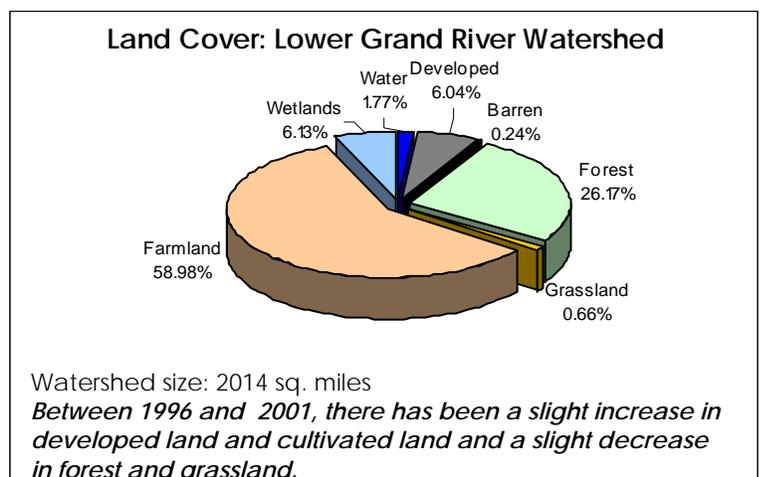


Watershed Groups

- Ottawa County Parks & Recreation Commission — www.co.ottawa.mi.us/parks
- Kent County Drain Commission — www.accesskent.com/YourGovernment/DrainCommisioner/drain_index.htm
- West Michigan Environmental Action Council — www.wmeac.org
- The Lower Grand River 319 Project, Grand Valley State University Annis Water Resources Institute — www.gvsu.edu/wri/isc/lowgrand

Watershed Overview / Ecology / Biodiversity

- Almost 60 percent of the land use is agricultural
- Grand Rapids and Grand Haven are the major urban areas in the watershed
- The Grand River Watershed is the largest watershed in the State of Michigan. The watershed has been divided into two parts, the Lower Grand River Watershed and the Upper Grand River Watershed. The Lower Grand River Watershed covers ten counties.
- The Nature Conservancy identified the following critical ecological resources in the watershed:
 - The Rogue River has White Oak - Red Oak / Early Meadow-Rue Forest
 - The Saul Lake Bog is a Leatherleaf Bog
 - Zeigenfuss Lake/Greenville has White Pine - White Oak Forest
 - The Rogue River has small to medium-sized tributary streams in end moraine and outwash



Watershed Activities / Concerns / Priorities

- A Section 319 Watershed Management Planning Grant was awarded by the Michigan Department of Environmental Quality (MDEQ) to facilitate the development of a watershed management plan for the Lower Grand River Watershed. The grant was awarded to the Grand Valley Metro Council. The Grand Valley Metro Council contracted with the Annis Water Resources Institute and Fishbeck, Thompson, Carr & Huber, Inc. to complete the management plan. Many communities participated in the development of this plan. Counties, cities, and townships are currently involved by matching funds or in kind services. The project has been completed.
- Ottawa County Parks is working to reduce erosion and to restore the Hager Creek area to its natural condition. To achieve this goal, the Hager Creek Watershed Management Plan was developed. This plan, which has been approved by the Michigan Department of Environmental Quality, looks at the entire length of Hager Creek as well as the surrounding land including properties west of 28th Avenue.
- Along Nash Creek, an increased magnitude and frequency of storm runoff events and altered morphology are causing excess sedimentation. Grant funds from the 2005 Great Lakes Basin Program will be used to address this problem through the development and refinement of methods for planning regional wetland detention areas along the Creek. The project will also develop and implement a model for reducing sedimentation and erosion, which will be applicable to other streams and drains with similar issues.
- The City of Grand Rapids received a \$73,000 grant with a \$28,000 match to investigate illicit connections to its storm sewer system. This project encompassed a visual inspection of 495 stormwater outfalls, and water quality samples collected at 250 outfalls with measurable flow. As a result of the sampling, nine sites became the focus of additional follow-up and investigation. The sources of the nine illicit sanitary sewer connections to the City's Stormwater Drainage System were identified and actions were initiated to eliminate the connection. Building on this project, three objectives were identified: continue to assess all outfalls within the City of Grand Rapids on a regular basis for any illicit discharges determined to be impacting designated uses of waters by area residents; ensure rapid remediation of the illicit connection by interacting with the responsible party or parties to eliminate the source as soon as possible; and continue routine water quality assessments to document improvements and future urban impacts.

Waterbody Name	Impairment
Reeds Lake	Fish Consumption Advisories PCBs Fish Tissue (Mercury)
Bass River	Pathogens Fish Community Rated Poor Macroinvertebrate Community Rated Poor
Buck Creek	Pathogens
Deer Creek (Watershed)	Nutrients Pathogens Dissolved Oxygen Fish Community Rated Poor Fish Kills Macroinvertebrate Community Rated Poor
Bills Lake	Mercury (Fish Tissue)
Grand River	PCBs Fish Consumption Advisory PCBs
Grand River Grand River	Mercury Pathogens
Plaster Creek	Pathogens Fish Community Rated Poor Macroinvertebrate Community Rated Poor
Rainbow Lake	Mercury
Rio Grande Creek	Pathogens
Sand Creek	Fish Community Rated Poor
Strawberry Creek	Fish Community Rated Poor
Unnamed Tributary To Grand River	Fish Community Rated Poor
Wabasis Lake	Mercury
York Creek	Fish Community Rated Poor

Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

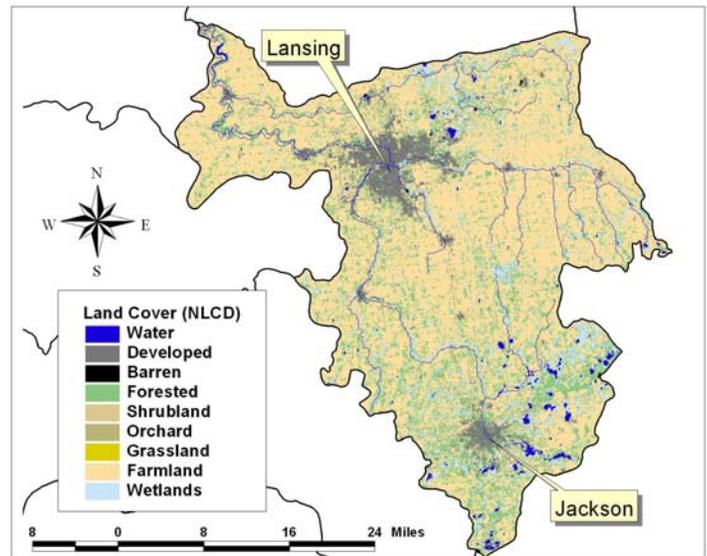
Upper Grand River Watershed

Hydrologic Unit Code: 04050004

For more information, see the USEPA website at http://cfpub.epa.gov/surf/huc.cfm?huc_code=04050004 or contact the Michigan Department of Environmental Quality at 517-335-6969 to request a copy of report number MI/DEQ/WD-03/049, "A Biological Survey of the Upper Grand River, Jackson, Ingham, Eaton, and Ionia Counties, Michigan, 2001".

Watershed Organizations

- Carrier Creek Stormwater Management and Restoration Project — www.carriercreek.com
- Eaton County Drain Commission — <http://www.eatoncounty.org/Drain/Drain.htm>
- The Upper Grand River Watershed Council — www.uppergrandriver.org



Watershed Management Plans

- Carrier Creek — Eaton County Drain Commission
- Upper Grand River — Grand Valley State University Annis Water Resources Institute

Watershed Overview / Ecology / Biodiversity

- The Upper Grand River watershed is almost 1750 square miles.
- Almost three quarters of the land is in agricultural use.
- There are three urban areas in the watershed: Lansing, East Lansing, and Jackson, Michigan.
- The watershed has 10 listed impaired waters.
- There are 958 miles of river and streams in the watershed.
- The Upper Grand watershed flows into the Lower Grand River watershed, where it then flows into Lake Michigan

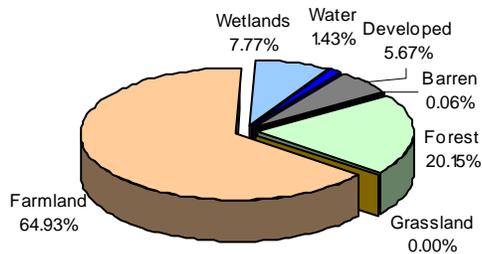
Watershed Activities / Concerns / Priorities

- A 319 grant was awarded to the Annis Water Resources Institute to develop an Upper Grand River watershed management plan.
- The Dahlem Nature Center was awarded \$12,000 in grant funds to assess the benthic macroinvertebrate community, stream habitat, and water chemistry in the Upper Grand River Watershed.
- Development in Delta and Windsor townships over the last several years has significantly changed the landscape around Carrier Creek:
 - An increase in the amount of impervious surface area (i.e., rooftops and parking lots) has caused an increase in the amount of rainwater draining into Carrier Creek.
 - Water levels are flashy, fluctuating from just a few inches to nearly four feet after heavy rains.
 - Because of past dredging activities, natural floodplains have been separated from the creek and are no longer available for water storage.
- The Carrier Creek Stormwater Management and Restoration Project was developed to address these challenges. Without improvement, the increased water volume entering the creek will cause increased flooding, further erosion, and increased flashiness.
 - South of I-496 (upstream), efforts will focus on creating an effective drainage system and reducing flashy hydrology to the downstream portions of the drain.
 - North of I-496 (downstream), work will focus on creek restoration.

Impaired (303d) Waters

Waterbody Name	Impairment
Albrow Creek	Untreated sewage discharges, pathogens
Grand River	Pathogens
Grand River	Mercury
Grand River And Portage River	PCB Fish Consumption Advisory PCBS
Grand River and Red Cedar River#	Pathogens Dissolved Oxygen Fish Kills
Moose Park Impoundment (Grand River)	Mercury (Fish Tissue)
Portage Lake	Mercury (Fish Tissue)
Red Cedar River	Pathogens Fish Community Rated Poor Macroinvertebrate Community Rate Poor
Sycamore Creek (Watershed)	Dissolved Oxygen
Vandercook Lake	Mercury (Fish Tissue)
Vermillion Creek	Pathogens

Land Cover: Upper Grand River Watershed



Watershed size: 1750 sq. miles

Between 1996 and 2001, there has been a slight increase in developed land, wetlands, and farmland and a slightly larger decrease in grassland.

Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

Kalamazoo River Watershed

Hydrologic Unit Code: 04050003

For more information, see the USEPA "Surf Your Watershed" website at

http://cfpub.epa.gov/surf/huc.cfm?huc_code=04050003 or contact the Michigan Department of Environmental Quality at 517-335-6969 to request a copy of report number MI/DEQ/W-05/067, "A Biological Survey of Sites in the North and South Branches of the Kalamazoo River Watershed, Calhoun, Hillsdale, and Jackson Counties, Michigan, August 2004" and report number MI/DEQ/WB-05/066, "A Biological Survey of Sites in the Upper Kalamazoo River, Calhoun and Jackson Counties, Michigan, 2004".

Watershed Management Plans

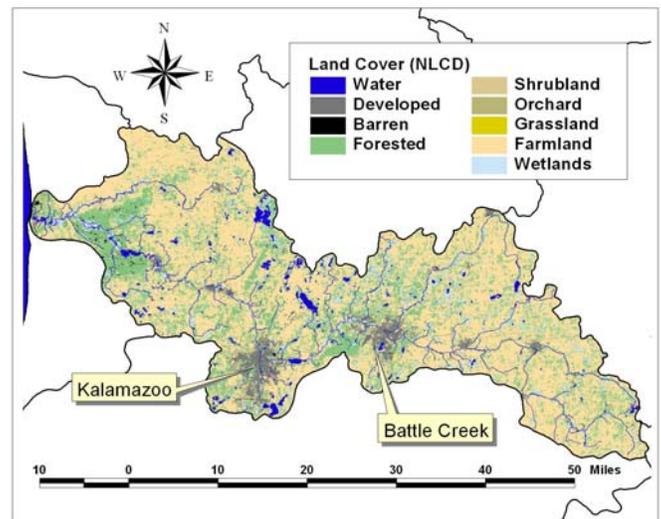
- Davis, Gourdneck and Portage Creeks — Forum for Greater Kalamazoo
- Four Townships Area — Four Townships Water Resources Council
- Greater Battle Creek Area — Calhoun Conservation District
- Little Rabbit River — Allegan Conservation District
- Portage and Arcadia Creek — Forum of Greater Kalamazoo
- Rice Creek — Calhoun Conservation District
- Upper Rabbit River — Allegan Conservation District
- Battle Creek River

Watershed Groups

- Kalamazoo River Network — www.kalamazooriver.net
- The Forum of Greater Kalamazoo — www.theforum.org
- Four Townships Water Resources Council — www.kbs.msu.edu/ftwrc
- Calhoun Conservation District — www.calhouncd.org
- Allegan Conservation District — www.allegancd.org
- Match-e-be-nash-she-wish Band of Pottawatomi (Gun Lake Band)

Watershed Overview / Ecology / Biodiversity

- The Kalamazoo basin watershed covers 2029 square miles.
- The Kalamazoo River Watershed drains eight counties in Southwest Lower Michigan and empties into Lake Michigan at Saugatuck, Michigan.
- The Kalamazoo River is an Area of Concern due to PCB contamination. The upstream boundary is Morrow Dam, which forms Morrow Pond and extends downstream to Lake Michigan, a distance of approximately eighty miles. The Kalamazoo River has been identified as a site of environmental contamination pursuant to the Michigan Natural Resources and Environmental Protection Act 451 and is included in the Superfund National Priorities List. Kalamazoo River priorities include remediation of PCB contaminated sediments in the river and landfills in the watershed, nonpoint source pollution control (including Phosphorus control in the watershed), and habitat restoration.
- The Nature Conservancy identified the following important ecological areas, species, and resources in the watershed:
 - Allegan Barrens have Lakeplain Wet-Mesic Prairie, Inland Coastal Plain Marsh, Lakeplain Wet Prairie, Central Water Lily Aquatic Wetland, and Interdunal Wetland.
 - Allegan Barrens is home to Eastern Massasauga, Ottoe's skipper, Karner blue butterfly, Sprague's pygarcctic, Hall's bulrush, and, Reticulated or netted nutrush.
 - Fort Custer has Blanchard's Cricket Frog, Blanding's Turtle, and Eastern Massasauga.
 - Headwaters have Leatherleaf Bog, interlobate headwater streams (Lake Michigan drainage), kettle moraine lakes, large rivers in southwest Michigan till plains (not coastal reach), and tributary streams in medium textured moraines (southern Ionia moraines).
 - Fort Custer has Central Mesic Tallgrass Prairie, Cinquefoil - Sedge Prairie Fen, Red Maple - Ash - (Elm) Swamp Forest, White Oak - Red Oak / Early Meadow-Rue Forest, Silver Maple - Elm - (Cottonwood) Forest, and White Oak - Red Oak Dry-Mesic Forest.

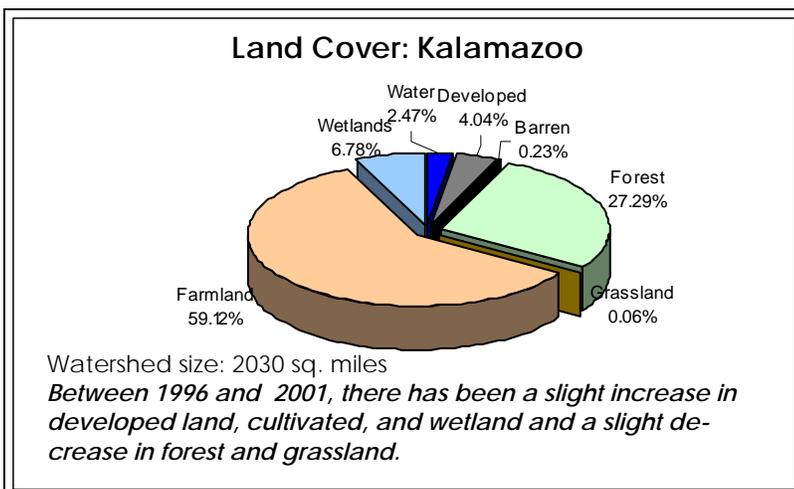


- Fort Custer has important large, deep, stream-connected lakes.
- The Spring Brook-Kalamazoo Nature Center has the endangered Mitchell's satyr (which is found in small numbers in locations in Michigan, Indiana, Ohio, and Maryland).
- Upper Kalamazoo tributaries have kettle moraine lakes, interlobate headwater streams (Lake Michigan drainage), and large rivers in southwest Michigan till plains (not coastal reach).

Watershed Activities / Concerns / Priorities

- In 2002 the Four Township Water Resources Council completed a 3 year program to protect surface water quality under Section 319 of the federal Clean Water Act. The Michigan DEQ and U.S. EPA have awarded the Council a second grant of \$210,000 for 2 years. The Council will provide an additional \$70,000 in local contributions towards the project. The Battle Creek River Watershed Project is an effort by landowners, residents, conservation groups, and local, state, and federal agencies to protect the quality of water for drinking, agriculture, recreation, wildlife, and fisheries. A \$237,000 319 grant was awarded to develop a Battle Creek River watershed management plan. The main source of sediment was found to be stream bank erosion resulting from historic dredging. Berms created from the widening, deepening, and straightening of the channel have disconnected the river from its floodplain. The Gun River watershed project is working to improve water quality and aquatic habitat. The objectives are to locate sources of pollution in the watershed, to prioritize critical areas, and to build and retain a high level of stakeholder awareness and participation. The project is designed to complement current Kalamazoo River/Lake TMDL efforts.
- Rice Creek houses a unique southern Michigan trout fishery that relies on access to critical life history spawning grounds, stable channel flow/function, and temperature and sediment controls, all of which are compromised by a mill race dam located near the City of Marshall. A project funded by the 2005 Great Lakes Basin Program restored a 0.8 mile mill race and historic channel at Ketchum Park in Marshall. The overall goal is to reduce sedimentation and enhance the inland fishery and other aquatic resources.
- The Community Foundation for Muskegon County received a \$100,000 environmental grant from the Charles Stewart Mott Foundation to support a comprehensive, two-year assessment of the Mona Lake Watershed. The objectives of the Mona Lake Watershed Project are to conduct a preliminary assessment of the aquatic and terrestrial habitats and contamination sites present in the watershed and to identify areas of significant change and degradation.
- A 2004 Great Lakes Basin Program Project, the Kalamazoo River Education Initiative was awarded \$29,833 to provide teachers with the knowledge, experience and tools to enable them to better instruct their students on stream ecology concepts surrounding land use, water quality issues and watershed science.

Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)



Impaired (303d) Waters

Waterbody Name	Impairment
Austin Lake	Mercury (Fish Tissue)
Battle Creek River	Fish Consumption Advisories (PCBs)
Brickyard Creek	Macroinvertebrate Community Rated Poor
Crooked Creek	Macroinvertebrate Community Rated Poor
Davis Creek	Oil
Fenner Lake	Phosphorus Fish Consumption Advisories (PCBS) Mercury (Fish Tissue) Nuisance Plant Growths
Fish Lake	Mercury (Fish Tissue)
Gull Lake	Mercury Fish Consumption Advisories (PCBS)
Gun Lake Beaches	Pathogens
Gun River	Macroinvertebrate Community Rated Poor
Kalamazoo River	Mercury
Kalamazoo River (Includes Lakes and Impoundments)	Fish Consumption Advisories (PCBs)
Wannadoga Creek	Macroinvertebrate Community Rated Poor
Pine Lake	Mercury
Rice Creek	Macroinvertebrate Community Rated Poor
Selkirk Lake	Mercury (Fish Tissue)

- Five acres of Battle Creek River riparian corridor were donated to the Calhoun Conservation District and 22 more acres within the watershed are in the process of being donated.
- A long-term geomorphic assessment study is being conducted on the Battle Creek River to determine stream stability, and stream bank and bed erosion.
- Two dams on the Battle Creek River have been identified for removal. The cost of these removals is approximately \$150,000.
- A Watershed Management Plan was developed with a 319 grant for Portage Creek and Arcadia Creek in the south central portion of the Kalamazoo River Watershed. Nonpoint source loads rank the two project tributaries as the first (Portage Creek) and sixth (Arcadia Creek) largest contributors of phosphorus to the river. This project has improved the water quality by significantly decreasing the amounts of PCBs and phosphorus from its watershed.
- The Allegan Conservation District received a \$116,400 grant with a \$15,100 match to develop a watershed plan. Water quality impairments include degraded indigenous aquatic habitat and biotic diversity, reduced fish populations, excessive nutrients and high flow.
- The W.K. Kellogg Biological Station Extension Land & Water Program at Michigan State University received a \$249,000 grant with an \$85,100 match to support supported coordination, communication and education efforts for multi-faceted implementation activities of the Kalamazoo River/Lake Allegan phosphorus Total Maximum Daily Load (TMDL) that was approved in 2001.
- The City of Portage, Michigan was awarded a grant to implement best management practices (BMPs) in a developing area to improve Consolidated Drain Number 1, enhance a trailways area, and educate the public on water quality issues. The project resulted in annual load reductions of 40 tons of sediment, 256 pounds of phosphorous, and 680 pounds of nitrogen.

Kalamazoo River Area of Concern Activities

Location

- From Morrow Dam, which forms Morrow Pond and extends 80 miles downstream to Lake Michigan.

AOC Primary Contaminants

- PCBs
- Phosphorus
- Sediments

AOC Stressors

- Nonpoint pollution
- Sediments
- Contaminated sediment landfills

AOC Relevant Programs

- Superfund
- Clean Water Act
- Brownfields
- Natural Resource Trustee's Damage Assessment

AOC Clean-up Actions

- Superfund removal of 150,000 cubic yards of PCB-contaminated sediments from Bryant Mill Pond
- Nonpoint pollution projects Erosion control programs, and stormwater management projects
- A phosphorus TMDL for Lake Allegan and the river upstream has been established; measures are being implemented to reduce phosphorus pollution from point and nonpoint sources
- Remedial action at several Operable Units (OUs) along the river
- Watershed management projects in several sub-basins reduce pollutant inputs and develop beneficial land use measures

AOC Key Activities Needed

- Dredging/ Excavation
- Superfund site cleanup decision action
- Stream buffers
- Dam removal

AOC Challenges

- PRP court case
- Local funding match for federal projects
- Decisions on the remediation of this Superfund Site have effectively been on hold for the past several years

AOC Next Steps

- Continue NRDA assessment
- Finish remedial investigation/ remedial action
- Investigate strategy and determine action
- RAP to be revised in 2006
- Kalamazoo River/Lake Allegan TMDL (Total Maximum Daily Load) program pursuing water-quality data collection

Little Calumet – Galien Watershed

Hydrologic Unit Code: 04040001

For more information, see the USEPA “Surf Your Watershed” website at

http://cfpub.epa.gov/surf/huc.cfm?huc_code=04040001 or contact the Michigan Department of Environmental Quality at 517-335-6969 to request a copy of report number MI/DEQ/WD-03/054, “A Biological Survey Sites in the Galien River Watershed, Berrien County, Michigan, July 2002”.

Watershed Management Plans

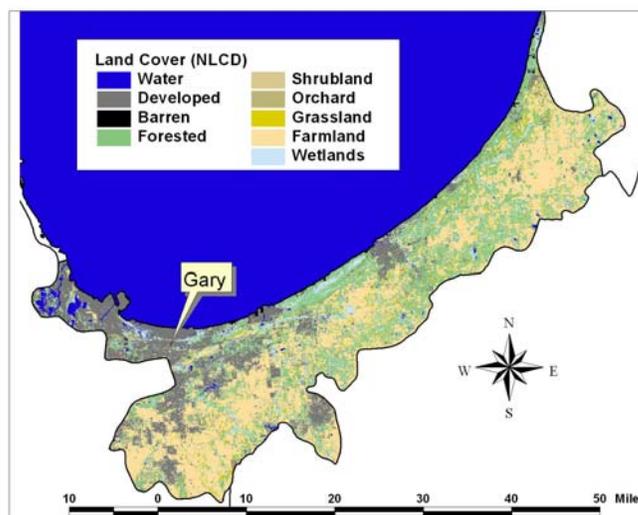
- Galien River — The Conservation Fund — www.chikamingopenlands.org
- Berrien County Drain Commissioner — www.berriencounty.org

Watershed Groups

- Grand Cal Task Force
- Save the Dunes Council — www.savedunes.org
- Chicago Wilderness — www.chicagowilderness.org
- Chikaming Open Lands — www.chikamingopenlands.org
- Great Lakes Center for Environmental and Molecular Sciences (GLEAMS) — gleams.altarum.org
- Northwestern Indiana Regional Planning Commission — www.nirpc.org
- Northeastern Illinois Planning Commission — www.nipc.org/environment

Watershed Overview / Ecology / Biodiversity

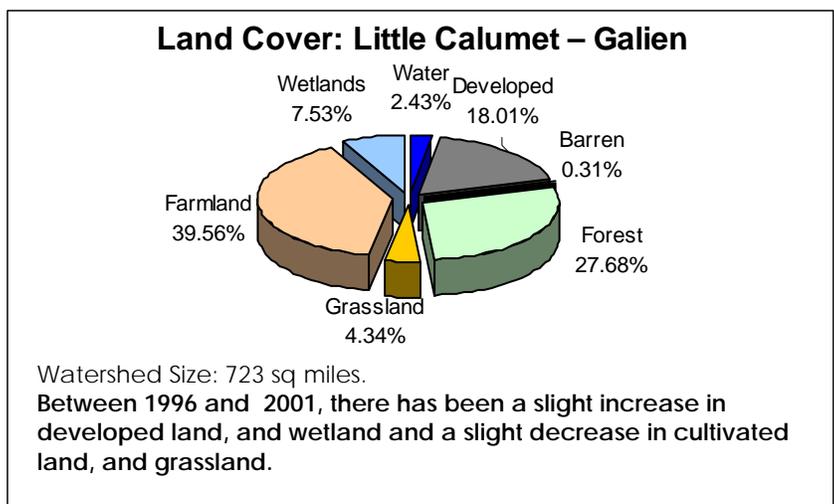
- Urban areas include Chicago, Gary, Michigan City, and Valparaiso.
- Most coastal wetlands and nearshore aquatic habitats have been eliminated or degraded. Presettlement northwest Indiana was continuous wetland. As of 1979, less than 5 percent of the original wetland cover remained. This exists primarily as narrow strips of intact habitat. Industry filled or drained the wetlands and leveled the dunes and used steel slag to fill low areas and the lakefront. The region is one of the most industrialized in the Lake Michigan basin.
- The watershed includes a Great Lakes Area of Concern. Problems in the AOC include contamination from polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PAHs) and heavy metals, such as mercury, cadmium, chromium and lead. Additional problems include high fecal coliform bacteria levels, biochemical oxygen demand (BOD) and suspended solids, oil and grease. Nonpoint sources include contaminated sediment, industrial waste site runoff, CERCLA sites, hazardous waste sites under RCRA, underground storage tanks (USTs), atmospheric deposition, urban runoff, and contaminated groundwater. Point sources of contaminants include industrial and municipal wastewater discharges and combined sewer overflows (CSOs).
- The AOC begins 15 miles (24 km) south of downtown Chicago and includes the east branch of the river, a small segment of the west branch and the Indiana Harbor and Ship Canal. Today, 90% of the river's flow originates as municipal and industrial effluent, cooling and process water and storm water overflows. Although discharges have been reduced, a number of contaminants continue to impair the AOC.
- The Indiana Dunes National Lakeshore has more plant species (including exotics) than all but two other national parks, and at 16,000 acres is much smaller than most other national parks.
- Warren Dunes State Park provides 1,950 acres of recreational opportunities along the beautiful shore of Lake Michigan in southwestern Michigan. The rugged dune formation rises 240 feet above the lake. The park has more than two miles of shoreline, six miles of hiking trails and is open year-round.
- The Indiana Dunes contains Mesic Sand Tallgrass Prairie and Black Oak / Lupine Barrens, sandy beach/dunes with sand and gravel lag over clay nearshore, sandy beach/dunes with sand/gravel nearshore, and sandy coastal dune streams. Other important communities at the Indiana Dunes include Black Oak / Lupine Barrens, Cottonwood Dune, Great Lakes Beach, Great Lakes Beachgrass Dune, Great Lakes Dune Pine Forest, Great Lakes Pine Barrens, Inland Coastal Plain Marsh, Interdunal Wetland, Lakeplain Wet Prairie, Lakeplain Wet-Mesic Prairie, Mesic Sand Tallgrass Prairie, Midwest Acid Seep, Midwest Cattail Deep Marsh, Midwest Dry Sand Prairie, Midwest Dry-Mesic Sand Prairie, Midwest Sand Barrens, Northern (Great Lakes) Flatwoods, Sand Cherry Dune Shrubland, and White Pine - Red Oak Forest.



- The Indiana Dunes is an important migratory bird stopover site and raptor stopover site. The Indiana Dunes is home to critical species including the Upland Sandpiper, American Bittern, Chuck-wills-widow, Whip-poor-will, Black Tern, Northern Harrier, Pitcher's thistle, Marsh Wren, Sedge Wren, Prairie Warbler, Chestnut-sided Warbler, Peregrine Falcon, Karner blue butterfly, Red-headed Woodpecker, Bog bluegrass, Prothonotary Warbler, Reticulated or netted nutrush, Louisiana Waterthrush, Caspian Tern, Prairie fame-flower, Golden-winged Warbler, Blue-winged Warbler, Canada Warbler, and Hooded Warbler.
- Indiana Tolleston in Lake County is home to Pale false foxglove, Karner blue butterfly, Blanding's Turtle, Byssus skipper, Great Plains ladies' tresses, Hill's thistle, and Ottoe's skipper. Important plant communities at Indiana Tolleston include Black Oak / Lupine Barrens, Bulrush - Cattail - Burreed Shallow Marsh, Central Cordgrass Wet Sand Prairie, Hardhack Shrub Prairie, Interdunal Wetland, Lakeplain Wet Prairie, Lakeplain Wet-Mesic Prairie, Mesic Sand Tallgrass Prairie, Midwest Cattail Deep Marsh, Midwest Dry Sand Prairie, Midwest Dry-Mesic Sand Prairie, Midwest Mixed Emergent Deep Marsh, Midwest Sand Barrens, Northern (Great Lakes) Flatwoods, Northern Buttonbush Swamp, Temporary Herbaceous Pond, and Tussock Sedge Wet Meadow.
- The Hoosier Prairie in Lake County, Indiana is home to the Pale false foxglove, identified by the Nature Conservancy as a critical species in the Great Lakes basin.
- Important Hoosier Prairie plant communities include Black Oak - White Oak / Blueberry Forest, Black Oak / Lupine Barrens, Central Cordgrass Wet Sand Prairie, Lakeplain Wet Prairie, Lakeplain Wet-Mesic Prairie, Mesic Sand Tallgrass Prairie, Midwest Dry Sand Prairie, Midwest Dry-Mesic Prairie, Midwest Dry-Mesic Sand Prairie, Midwest Mixed Emergent Deep Marsh, Midwest Sand Barrens, Northern (Great Lakes) Flatwoods, Northern Buttonbush Swamp, and Twigrush Wet Meadow. Important species at Hoosier Prairie include Blanding's Turtle, Blue-spotted Salamander, Earleaf foxglove, Henslow's Sparrow, Karner blue butterfly, Byssus skipper, Eastern Massasauga, Eastern massasauga, Hall's bulrush, Karner blue butterfly, Pitcher's thistle, Prairie fame-flower, and Reticulated or netted nutrush, and Northern Leopard Frog.
- The Nature Conservancy identified the following critical environmental resources in the watershed.
 - The Galien River has Great Lakes Shoreline Cattail Marsh
 - The Warren Dunes-Grand Mere has a land bird stopover site
 - The Warren Dunes-Grand Mere has Acadian Flycatcher, American Woodcock, Baltimore Oriole, Black-billed Cuckoo, Blue-winged Warbler, Canada Warbler, Cerulean Warbler, Chimney Swift, Eastern Wood-Pewee, Field Sparrow, Hooded Warbler, Least Flycatcher, Louisiana Waterthrush, Marsh Wren, Prairie Warbler, Prothonotary Warbler, Red-headed Woodpecker, Rose-breasted Grosbeak, Veery
 - Warbling Vireo, Willow Flycatcher, Wood Duck, Wood Thrush, Worm-eating Warbler, Yellow-billed Cuckoo, Yellow-throated Warbler, and Pitcher's thistle.

Watershed Activities / Concerns / Priorities

- The US Army Corps of Engineers (USACE) is in process of dredging the sediments from the Indiana Harbor and Ship Canal in order to continue its use as a navigable waterway.
- The Galien River Watershed Project is focused on decreasing drainage and flooding problems along the river and the streams flowing into it. The focus of a 319 grant is flood prevention and improved water quality in the system. Beneficiaries will be local farmers and those interested in fishing and other recreational activities.
- Save the Dunes Conservation Fund developing a watershed plan for the Dunes Creek watershed. Also included in the project will be a study to assess the efficacy of a pilot wetland restoration site along a section of Dunes Creek. study results will be included in the final written summary project report. Public outreach activities will include outreach brochures, news releases about the project, and quarterly newsletters, e-mail, or website articles.



Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

Impaired (303d) Waters

Waterbody Name	Impairment
Galien River, MI	Chlordane Fish Consumption Advisory, PCB Fish Consumption Advisory
Lake Michigan — Warren Dunes State Park Beach, MI	Pathogens
Sawyer Creek, MI	Oil
Burns Ditch, IN	E. Coli, Mercury Fish Consumption Advisory PCB Fish Consumption Advisory
Clark Ditch and Other Tribs, IN	E. Coli
Coffee Creek Basin, IN	E. Coli
Damon Run –Swanson Lamporte Ditch, IN	E. Coli
Damon Run and Trib, IN	E. Coli, Impaired Biotic Communities
Deep River, IN	E. Coli
Deep River, IN	Impaired Biotic Communities, Siltation
Deep River US30, IN	E. Coli
Main Beaver Dam Ditch Above Niles Ditch, IN	Impaired Biotic Communities
Main Beaver Dam Ditch Above Crown Point WWTP, IN	Impaired Biotic Communities
Marquette Park Lagoons (East and West), IN	PCB Fish Consumption Advisory
Munson Ditch, IN	E. Coli, Impaired Biotic Communities
Niles Ditch, IN	Impaired Biotic Communities
Potage Burns Waterway, IN	E. Coli, PCB Fish Consumption Advisory Mercury Fish Consumption Advisory
Rice Lake Tribs and Outlet, IN	E. Coli
Salt Creek, IN (Five Locations)	E. Coli, Impaired Biotic Communities
Trail Creek	E. Coli, PCB Fish Consumption Advisory, Mercury Fish Consumption Advisory
Trail Creek Trib. Basin, IN	Impaired Biotic Communities
Trail Creek—Merrillville, IN	E. Coli, Impaired Biotic Communities
Turkey Creek, IN	E. Coli, Impaired Biotic Communities
West Branch Trail Creek and other Tribs, IN	E. Coli
West Branch Trail Creek— Waterford Creek, IN	E. Coli
Wolf Lake, IN	PCB Fish Consumption Advisory
Calumet, IL	PCBS
Calumet River, IL	PCBS, Flow Alteration, Habitat Alterations
Calumet River, IL	PCBS, Organic Enrichment/Low Dissolved Oxygen, Habitat Alterations
Wolf, IL	PCBS

Grand Calumet River Area of Concern Activities

Location

- Grand Calumet River: Lagoon, East Branch and West Branch Indiana Harbor and Ship Canal, The Lake George Branch of the Canal, Wolf Lake, George Lake and Nearshore Lake Michigan.

AOC Primary Contaminants

- PCBs
- PAHs
- Mercury
- Cadmium
- Chromium
- Lead
- Pathogens
- Biochemical oxygen demand
- Suspended solids
- Oil and grease

AOC Stressors

- Contaminated Sediments
- Combined Sewer Overflows
- Contaminated groundwater
- Contaminated land sites
- Habitat Fragmentation
- Fire Suppression
- ANS

AOC Relevant Programs

- Superfund
- RCRA
- Clean Water Act
- WRDA
- Navigational Dredging
- Natural Resource Trustee's Damage Assessment

AOC Clean-up Actions

- USX dredging
- West Branch Remediation – 14,200 cubic yards of sediment remediated
- U.S. Steel Gary Works dredging of 5 river miles on the East Branch complete.
- GSD Sed. Remediation
- Navigational dredging
- LTV cleanup
- U.S. Lead - 19,000 cubic yards of sediment have been remediated
- A total of 700,000 cubic yards of sediment have been remediated
- IDEM is including additional CSO requirements in discharge permits as they are renewed in the basin pursuant to a state CSO Strategy.

AOC Key Activities Needed

- Dredging
- CSO Long Term Control Plans
- Issue NPDES Permits
- BUI Indicator Monitoring
- TMDL underway
- West Branch assessment
- Coordination with RAP program for AOC delisting purposes

AOC Challenges

- Public concern regarding location of contaminated material disposal
- Local funding and match for federal projects
- Legal concerns
- Permitting
- Monitoring resources
- The draft Water Quality Component of Stage Two includes some provisions being implemented through indirect methods; direct resources for implementation have been limited.

AOC Next Steps

- Dredging at USX complete
- NRDA- Complete PRP negotiations.
- ACOE- WRDA Diagnostic Feasibility Study
- USX-Build Corrective Action Management Unit
- GSD-Site Characterization
- TMDL-Resolve modeling issues
- Monitor BUI Indicators
- ECI slurry wall
- The RAP process has developed and obtained funds for a Toxic Pollution Prevention (TPP) Program.

Manistee River Watershed

Hydrologic Unit Code: 04060103

For more information, see the USEPA "Surf Your Watershed" website at

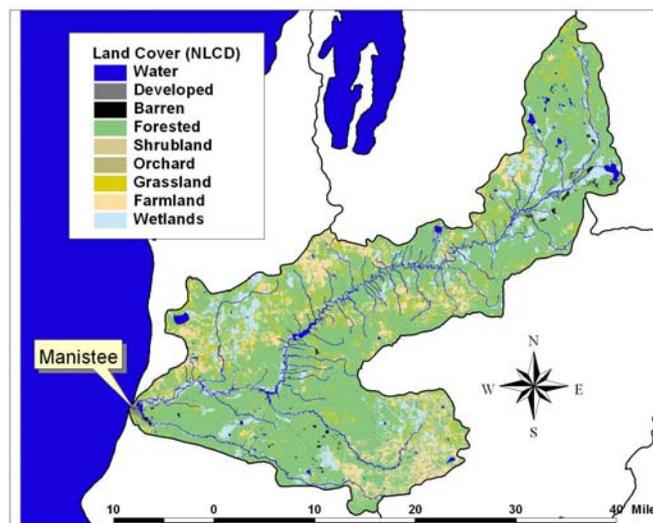
http://cfpub.epa.gov/surf/huc.cfm?huc_code=04060103

Watershed Management Plans

- Little Manistee River — Conservation Resource Alliance
- Manistee River — Conservation Resource Alliance

Watershed Organizations

- Upper Manistee River Association
- Conservation Resource Alliance — www.rivercare.org
- Little River Band of Ottawa Indians — www.itcml.org/thehistorytribal7.html
- Huron Pines Resource Conservation & Development Council — www.huronpines.org
- Northwest Michigan Council of Governments — www.nwm.org
- Little Manistee Watershed Conservation Council - www.lmwcc.org



Watershed Overview / Ecology / Biodiversity

- The Manistee River watershed covers 1904.04 square miles, with less than half of mile of Lake Michigan shoreline.
- Its predominant land use is forest.
- The watershed has just over 15 square miles of inland lakes
- It has 833 miles of waterways, 93 percent of which have been assessed.
- Two waterways are TMDL listed waterways. One is listed for one contaminant and one is listed for three contaminants.
- The Manistee is one of the most stable, high-quality, coldwater streams in the country. It is a groundwater-driven stream.
- Excessive sediment is a primary problem in the watershed, affecting fish reproduction, alters channel morphology, and impairs aquatic invertebrates. The primary sources are erosion from degraded streambanks and poorly designed stream crossings.
- The Nature Conservancy identified the following critical ecological resources in the watershed:
- The Little Manistee River has Great Lakes Leatherleaf Intermittent Wetland.
- Critical communities of the Lower Manistee River include Great Lakes Hemlock - Beech - Hardwood Forest.
- Critical ecological systems of the Lower Manistee River include the lower reaches of Au Sable, Manistee, Muskegon Rivers, and the mainstems of Au Sable, Manistee, and Muskegon Rivers.
- Eastern Massasauga is found on the Manistee River.

Watershed Activities / Concerns / Priorities

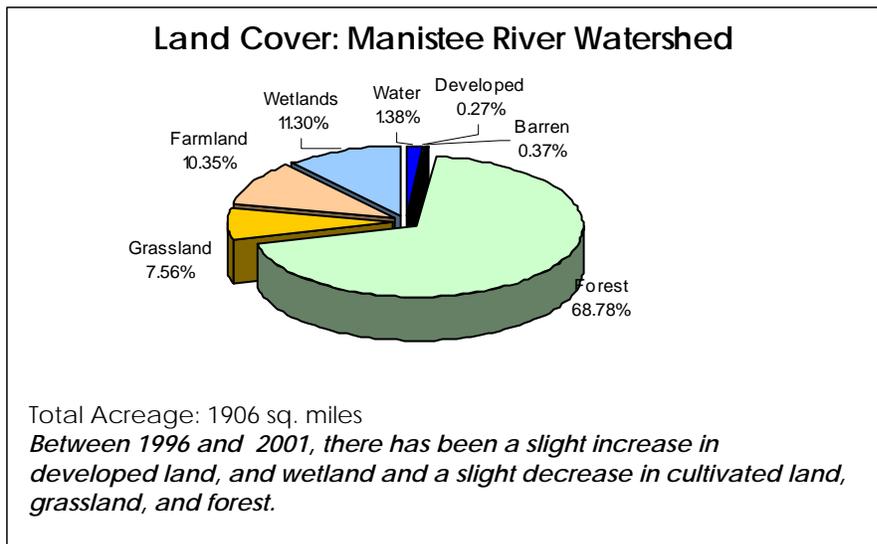
- Watershed Restoration work on the Manistee River is carried out by a diverse group of partners organized as members of the Upper Manistee River Restoration Committee. This committee is administered by Huron Pines RC&D and has actively worked on stabilizing streambanks, restoring access sites, and creating aquatic habitat.
- The river is designated as a natural river.
- The Little River Band of Ottawa Indians received a 319 grant to address four road-stream crossings that are failing, improve access to the river's edge, and reclaim a lake sturgeon spawning ground.
- The Little River Band of Ottawa Indians received one of the first 20 national watershed grants to support their efforts to restore and monitor the water quality of the Manistee River.

- The Conservation Resource Alliance (CRA) was awarded a Clean Michigan Initiative Grant for the Manistee River Watershed, including Bear Creek, for \$696,691, utilizing \$263,228 in local match, over a three-year period. Under this grant approximately 6 streambanks and 3 road/stream crossings within the Bear Creek Watershed will be repaired. Additionally, the CRA was awarded \$80,000 in Ten Percent Funds from the U. S. Forest Service to repair 5 road/stream crossings in the watershed. CRA was also awarded a TEA 21 Grant from the Michigan Department of Transportation that includes money to address eroding road/stream crossings on Bear Creek.

- Three county Road Commissions are working cooperatively in the Pine River subwatershed to address traffic safety and water quality concerns simultaneously. With Phase 1 completed, Phase 2 has been granted \$225,000 by the Michigan Department of Transportation to fix failing road/stream crossings in the Pine and Little Manistee watersheds.
- In 2002, two stream bank sites were restored by the Little Manistee River Watershed Partnership using 319 funds.
- Two stream bank sites were restored through the Pine River Watershed Restoration Project in 2002 for the Big Manistee River watershed. Design work began on three Osceola County road crossing sites to be implemented in 2003 or 2004. Site planning work on one additional streambank on the Pine is in progress, with implementation planned for 2004.
- A three year 319 project on the Manistee River was finished in 2002 by the Manistee River Watershed Partnership Project. The final project, a timber bridge over the north branch near Sharon was completed at a cost of over \$320,000. The project was responsible for four large stream banks, and three large road crossings. In addition, the partnership was formed and signed by approximately 35 partners.
- In accordance with the Upper Manistee River Restoration Committee’s scientific evaluation and proposed solutions, the Kalkaska Conservation District will repair eleven critical sites along Big Cannon Creek. This project was supported as a 2004 Great Lakes Basin Program Project.

Impaired (303d) Waters

Waterbody	Impairment
Lake Margrethie	Mercury (Fish Tissue)
Manistee Lake	Pathogens PCBS Fish Consumption Advisory
Pine Lake	Mercury (Fish Tissue)



Data Sources: Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

Manistique River Watershed

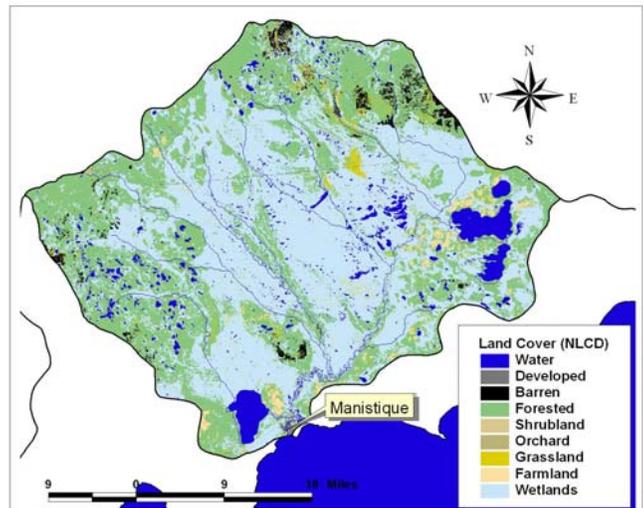
Hydrologic Unit Code: 04060106

For more information, see the USEPA "Surf Your Watershed" website at

http://cfpub.epa.gov/surf/huc.cfm?huc_code=04060106 or contact the Michigan Department of Environmental Quality at 517-335-6969 to request a copy of report number MI/DEQ/WB-05/106, "A Biological Survey of Manistique River Watershed, Luce, Mackinac, Alger, Schoolcraft, and Delta Counties, Michigan".

Watershed Groups

- Manistique River Chapter of the Michigan Statewide Public Advisory Council; Merilee Blowers, chair — www.glc.org/spac/spacmemb.html
- Manistique River Area of Concern — www.epa.gov/glnpo/aoc/manistique.html



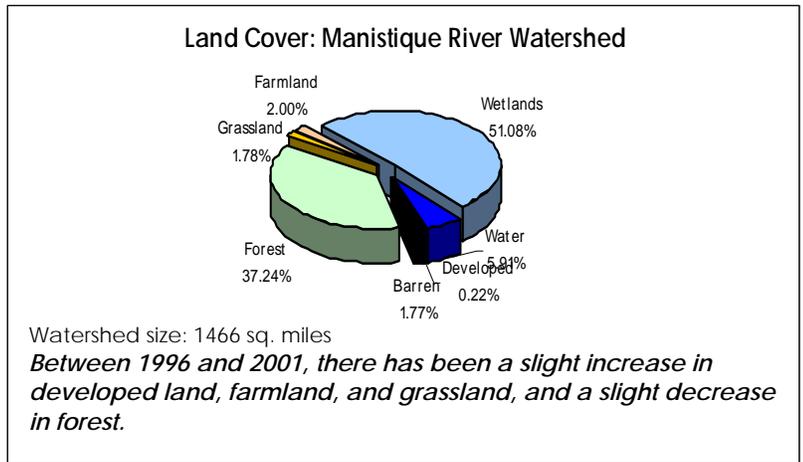
Watershed Overview / Ecology / Biodiversity

- The last 1.7 miles of the Manistique River from the dam to the mouth of the harbor at Lake Michigan is listed as an Area of Concern (AOC).
- Historical uses of Manistique River waters in the AOC include receiving wastes from sawmills, a paper mill, small industries, the municipal waste water treatment plant, plus navigation for shipping, ferrying, recreational boating and commercial fishing. Current uses include receiving the wastewater discharges from Manistique Papers, Inc. and the City of Manistique Wastewater Treatment Plant. Recreational uses are mainly boating, sightseeing, and fishing.
- Approximately 111,000 cubic yards of PCB contaminated sediments have been removed from the river and harbor from 1994-2000.
- The dredging of contaminated sediments was completed at the end of 2000. Final dredging was done by divers with hydraulic hoses to minimize resuspension of PCBs and to ensure a clean substrate when completed.
- Contractors working under EPA supervision will soon begin taking water and sediment samples in the harbor and in the river up to the first bridge. EPA will use the results of this sampling project to develop ecological and health risk assessments. These, in turn, will be used to prepare a long-term plan for monitoring the river and the harbor, and ensure the effectiveness of the harbor cleanup.
- The Seney National Wildlife Refuge is upriver of Manistique. The refuge is 95,455 acres of field and secondary growth forest. Almost two-thirds of the refuge is comprised of varying types of wetlands that provide habitat for threatened and endangered species and a variety of wildlife. The refuge is home to 26 fish species, 50 mammalian species, and 200 bird species, including eagles, loons, and trumpeter swans.
- Historically, a majority of forestland in the Manistique headwaters was logged and subsequent fires burned over the land leaving behind many white pine stump fields. Relic white pine stumps are slowly being overcome by forest again.
- The Nature Conservancy identified the following critical ecological resources in the watershed:
 - Seney Fens and East Branch Fox River have White Pine / Blueberry Dry-Mesic Forest
 - Critical ecological systems include the lower reaches of Taquamenon and Manistique Rivers and
 - Seney sand lake plain streams
 - Critical specie at the Seney Fens and East Branch Fox River - Auricled twayblade

Watershed Activities / Concerns / Priorities

- Restrictions on fish and wildlife consumption that include an advisory recommending no consumption of carp from the Manistique River below M-94/Old U.S. 2 and an advisory for consumptions on channel catfish (below M-94/Old U.S. 2) for women and children, and consumption restrictions on northern pike (upstream from dam at Manistique) for all persons.
- There are beach closings and restrictions on recreational access due to the presence of PCBs at the site and the combined sewer overflow (CSO) pipe located within the AOC that can discharge sewage during storms and during the spring runoff. The AOC is on the list of Michigan Sites of Environmental Contamination identified under Public Act 307. It is one of the highest ranking sites in the state.

- The Manistique River RAP found that the main problem contributing to fishery use impairment was PCBs. Aquatic nuisance species also threaten the fishery productivity. The presence of sawdust in the water and in the sediments severely degrades plant and animal habitat. The dam at the head of the old flume restricts fish passage but effectively blocks lamprey from the upper river.
- There are plans to phase out combined sewer systems by 2020.
- A study conducted in 1994 showed 115 erosion sites covering 10,821 feet of stream bank that contributes an estimated 3,000 tons of sediment each year to the Driggs River, which is a tributary to the Manistique River. The Clean Michigan Initiative and federal 319 Grant program contributed funds to support a project whose goal was to stabilize four of the most severely eroding stream banks on the Driggs River to reduce sediment loading. This project resulted in the stabilization of 1,273 linear feet of stream bank.



Manistique River Area of Concern Activities

Location

- The last 1.7 miles of the river to the mouth of the harbor at Lake Michigan

AOC Primary Contaminants

- PCBs
- Heavy metals
- Pathogens

AOC Stressors

- Combined sewer overflow
- Sediments
- PCB-contaminated sawdust
- Wastewater discharges

AOC Relevant Programs

- Superfund

AOC Clean-up Actions

- Dredging of contaminated sediments completed in 2001 (141,000 cubic yards)
- Manistique Wastewater Treatment Plant made improvements to its system toward elimination of CSOs.

AOC Key Activities Needed

- Sampling and monitoring

AOC Challenges

- Navigational dredging
- CSO to be closed by 2020
- Coordination with RAP program for AOC delisting purposes

AOC Next Steps

- Sampling and monitoring continuing as part of delisting process

Impaired (303d) Waters

Waterbody Name	Impairment
Manistique River	Mercury, Mercury (Fish Tissue), Pathogens
North Manistique Lake	Mercury (Fish Tissue)
West Branch Lakes	Mercury (Fish Tissue)

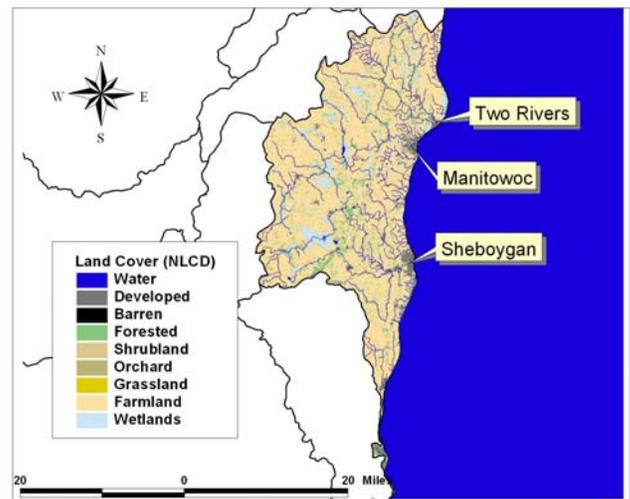
Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

Manitowoc-Sheboygan Watershed

Hydrologic Unit Code: 04030101

For more information, see the USEPA website at http://cfpub.epa.gov/surf/huc.cfm?huc_code=04030101

- The Wisconsin DNR divides the Sheboygan-Manitowoc watershed (as defined by the USGS) between the Sheboygan basin management area and the Lakeshore basin management area. For more information, see the Wisconsin Department of Natural Resources' "Wisconsin's Basins" website at <http://dnr.wi.gov/org/gmu/gmu.html>.



Watershed Groups

- Sheboygan River Basin Partnership — www.sheboyganrivers.org
- Lakeshore Basin Website — basineducation.uwex.edu/lakeshore
- Lakeshore Natural Resource Partnership — www.lnrp.org
- Sheboygan River Basin DNR Team — www.dnr.state.wi.us/org/gmu/sheboygan
- Vic Pappas, Sheboygan River Basin Water Team Leader — Victor.Pappas@dnr.state.wi.us
- Deb Beyer, UW Extension Basin Educator, Lakeshore & Sheboygan Basins — deb.beyer@ces.uwex.edu



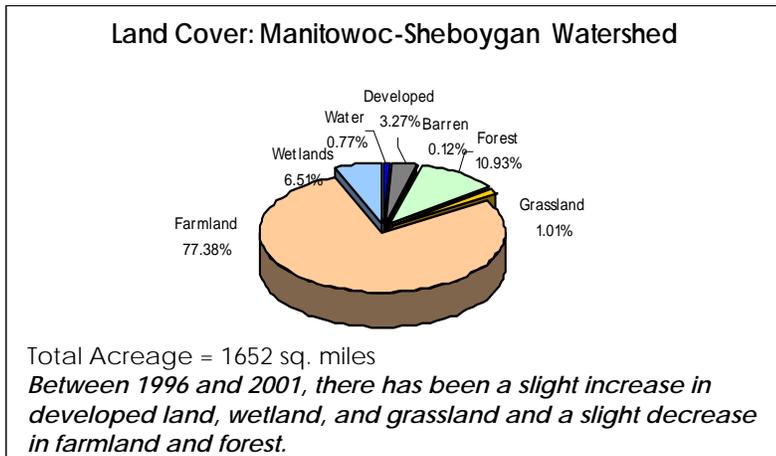
Watershed Overview

- The major tributaries of the watershed include the Branch River, the North and South branches of the Manitowoc River, the Lower Manitowoc River, Sevenmile and Silver Creeks, (all in the Manitowoc sub-watershed) Sauk and Sucker Creeks, the Black River, the Sheboygan River, the Onion River, the Mullet River, and the Pigeon River (in the Sheboygan River subwatershed).
- Predominant land uses are agricultural or rural and include pasture land, cropland and vacant fields. Natural Areas, including open water, woodlands, wetlands, parklands and undisturbed non- agricultural lands are the second most abundant land use.
- The Natural Heritage Inventory has documented 10 endangered, 20 threatened and 37 special concern plant and animal species, and 24 rare aquatic and terrestrial communities within the Sheboygan River basin.
- Runoff from specific and diffuse sources, contaminated sediment, habitat modifications (such as channelization and dams) have degraded water quality throughout the Basin.
- Recreational highlights include wildlife watching, hiking, fishing, birding, bicycling, golf, horseback riding, snowmobiling, skiing, camping, picnicking and water sports.
- State facilities such as the Kettle Moraine State Forest, Kohler- Andrae State Parks, Harrington Beach State Park, various state wildlife areas, and the Ice Age National Scenic Trail provide both satisfying and unique recreational experiences.
- The Basin includes the Southeast Glacial Plains and Northern Lake Michigan Ecological Landscapes.
- Some streams have the ability to support trout populations. Others have spring and fall runs of stocked steelhead and salmon. Fishing opportunities exist in rivers and harbors for northern pike, small mouth bass, and yellow perch.
- Wildlife include white- tailed deer, ring- necked pheasant, waterfowl, geese, gray and flying squirrels, raccoons, woodcock, a variety of hawks, songbirds, and shorebirds.
- Grasslands and barrens are promoted through prescribed burns and mowing.
- The Nature Conservancy identified critical habitats of Black Ash - Mixed Hardwood Swamp, Great Lakes Dune Pine Forest, Great Lakes Hemlock - Beech - Hardwood Forest, Great Lakes Beachgrass Dune and Great Lakes Beach as well as baymouth/barrier beaches with sand nearshore at Point Beach State Park.
- The Nature Conservancy identified Pitcher's thistle and the piping plover as critical species at Point Beach State Park.
- The Sheboygan River Area of Concern (AOC) encompasses the lower Sheboygan River downstream from the Sheboygan Falls Dam, including the entire harbor and nearshore waters of Lake Michigan . The AOC serves as a sink

for pollutants carried from three watersheds: the Sheboygan River, Mullet River and Onion River. Pollutants of concern, both conventional and toxic, have been identified as: suspended solids, fecal coliform bacteria, phosphorus, nitrogen, PCBs, PAHs and heavy metals.

Watershed Priorities

- Identified Environmental concerns for the Sheboygan River management area include:
 - Water quality problems are from in- place pollutants, runoff in urban areas, floodplain development, and agricultural practices.
 - Preservation of biodiversity and protection of endangered and threatened species, this is done by preserving their habitat.
 - A need for comprehensive approach to wetlands protection and restoration.
 - Educate people to help prevent the spread of exotic nuisance species, which can wreak havoc on ecosystem balance.
 - Monitoring of wildlife populations, water quality, and ecosystem function are needed to understand the status and trends of resources in the basin.
- Partnership priorities for the Sheboygan River Basin include:
 - Educate members and the public about the ecology of the Sheboygan River Basin and threats to its health.
 - Promote sustainable use and recreation in the Sheboygan River Basin and its watersheds.
 - Increase public awareness and membership.
 - Promote sound decision-making when issues affect the health of the basin's rivers and watersheds.
 - Support the protection and improvement of the Sheboygan River Basin and its watersheds for the benefit of the general public.
 - Develop a working relationship with local officials and collaborate with conservation organizations.
 - Promote improved health of the rivers and watersheds through conservation projects and education.
 - Purchase or promote the purchase of land or easements for conservation purposes.



Impaired (303d) Waters

Waterbody Name	Impairment
Big Elkhart Lake	Mercury Fish Consumption Advisories
Branch River in Manitowoc Co.	PCB Fish Consumption Advisories
Bullhead Lake	Mercury Fish Consumption Advisories
Crystal Lake	Mercury Fish Consumption Advisories
East Twin River Upstream To First Dam	PCB Fish Consumption Advisories
Grandma Creek	Phosphorus, Degraded Habitat, Organic Enrichment/Low Dissolved Oxygen, Sediment
Jordan Creek	PCB Fish Consumption Advisories
Lake Michigan	Mercury Fish Consumption Advisories PCB Fish Consumption Advisories
Manitowoc River	Aquatic Toxicity, PAHS
Manitowoc River (Mouth to N. Branch)	PCB Fish Consumption Advisories
Manitowoc River (N. Branch to Chilton)	PCB Fish Consumption Advisories
Manitowoc N. Branch	Phosphorus, Degraded Habitat, Organic Enrichment/Low Dissolved Oxygen, Sediment
Otter Creek	Bacteria
Pigeon Lake	Mercury Fish Consumption Advisories
Pine Creek	PCB Fish Consumption Advisories
Pine Creek	PCB Fish Consumption Advisories
Sheboygan River	PCB Fish Consumption Advisories
Sheboygan R. Below Franklin Downstream To Sheboygan Falls	PCB Fish Consumption Advisories
Two Rivers Harbor	Aquatic Toxicity
Unnamed Trib (Osman Trib) to Meeme River	Phosphorus, Degraded Habitat, Organic Enrichment/Low Dissolved Oxygen, Sediment
Unnamed Trib to Onion River in Waldo Impoundment	Degraded Habitat, Sediment
Unnamed Trib, to S. Br. Manitowoc (T18N, R19E, Sec 24	Degraded Habitat, Sediment
West Twin River	Phosphorus, Organic Enrichment/Low Dissolved Oxygen

Restoration Activities

- The Upper River Segment, Sheboygan River Superfund Clean-up Project was remediated
- The Willow Creek Watershed Project
- The Upper Onion River Trout Restoration Project
- Otter Creek--Impaired Water Priority/Barnyard Relocation Project
- As a 2004 Great Lakes Basin Program Project, the town of Centerville will work with landowners along the Fischer and Point creeks to construct four miles of 70-foot harvestable buffers to educate landowners about the benefits of buffers using a brochure and a public harvest demonstration.
- The Manitowoc County Circuit Court ruled that Wisconsin's Department of Natural Resources did not adequately review the potential air and water pollution caused by the proposed expansion of Maple Leaf Dairy from 2800 to 9000 cows. It is believed that the expansion will aggravate existing water pollution in Fischer Creek and Point Creek and contribute to Lake Michigan beach closings in the area.
- In 2005, Pollution Risk Services (PRS) completed Phase I of the Sheboygan Superfund Site clean up of the Upper River. All PCB hot spots on the upland portion of the river bank at the former Tecumseh plant site have been remediated and a trench has been dug to intercept and test groundwater exiting the site. Phase II, including the removal, dewatering, and disposal of 35,000 cubic yards of soft sediment and armored materials from the Upper River, is planned for 2006.
- The Sheboygan River Basin Partnership (SRBP) has embarked with WDNR on an information and education effort for Willow Creek, a small tributary to the Sheboygan River that has its confluence in the AOC. The creek receives annual runs of trout and salmon from Lake Michigan, and recent fish surveys discovered the presence of young brook trout and salmon, which seemed to indicate at least some amount of natural reproduction. It appears that stream improvements are possible in some of the degraded sections and SRBP has been meeting with landowners and local municipal officials to discuss projects in the watershed. In addition, the SRBP is seeking grant funds to conduct additional stream studies.
- Numerous actions have been completed or are underway to restore the headwaters of the Onion River, a tributary to the Sheboygan River, which is a trout stream. The improvements are part of an overall strategic plan spearheaded by the Lakeshore Chapter of Trout Unlimited and numerous other partners. Some of the improvements include public land acquisition, removal of ponds and small dams, installation of lunger structures and farm runoff management practices. Recent trout surveys indicate that a newly instituted fishing regulation change on the river has protected many fish from harvest. The hope is that more adult trout will be available to boost natural reproduction of trout in the system.
- In 2005, WDNR and the Sheboygan County Land and Water Conservation Department worked with a local farmer to relocate a barnyard and grazing area along the banks of Otter Creek. Otter Creek is a tributary to the Sheboygan River and is listed as a 303d impaired waterway primarily due to bacteria contamination. Grant dollars for the state portion came from Wisconsin's Environmental Damages Compensation Fund. The county and the landowner also shared in the cost of the project.

Sheboygan River Area of Concern Activities

Location

- The lower Sheboygan River downstream from the Sheboygan Falls Dam, including the entire harbor and nearshore waters

AOC Primary Contaminants

- Suspended Solids
- PCBs
- PAHs
- Heavy Metals
- Pathogens
- Phosphorus

AOC Stressors

- Industrial & agricultural runoff
- Habitat restoration on streambanks and wetland areas

AOC Relevant Programs

- Superfund
- Clean Water Act #319

AOC Clean-up Actions

- Partial removal of PCB-contaminated sediments
- Agency decision (2001)
- 2004 Municipal stormwater permits for the Village of Kohler, Town of Sheboygan and Town of Wilson.

AOC Key Activities Needed

- Completion of PCB remediation
- Completion of PAH remediation at Camp Marina coal gasification site
- Control buffers
- Habitat protection
- NPS controls for urban and rural pollution

AOC Next Steps

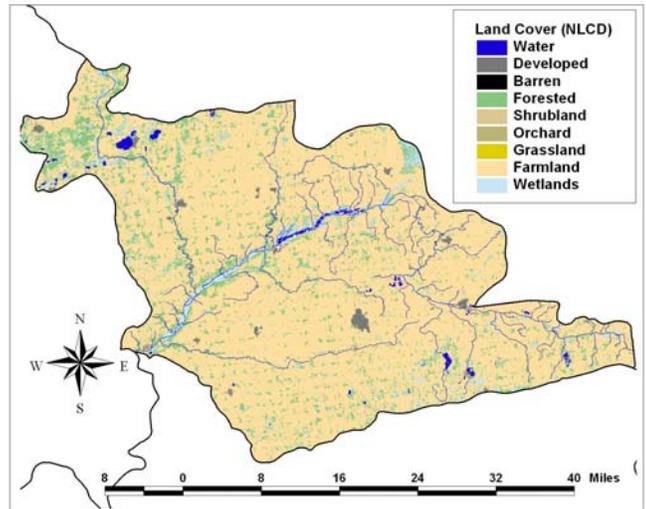
- Complete dredging started in 2004
- Complete site clean-up and removal of preferential pathways
- Groundwater monitoring

Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

Maple River Watershed

Hydrologic Unit Code: 04050005

For more information see the USEPA website at http://cfpub.epa.gov/surf/huc.cfm?huc_code=04050005 or contact the Michigan Department of Environmental Quality at 517-335-6969 to request a copy of report number MI/DEQ/WD-03/017, "A Biological Survey of the Maple River Watershed and Selected Tributaries, Shiawassee, Clinton, Montcalm, Gratiot, and Ionia Counties, Michigan, August 2002".



Watershed Groups

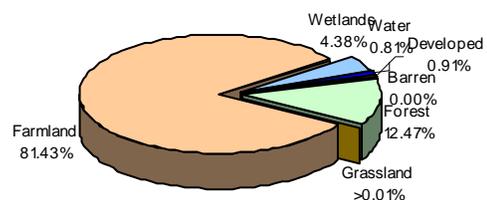
- Maple River Improvement Project, Conservation Resource Alliance — www.rivercare.org/aboutcra/projects/projects.php

Watershed Overview / Ecology / Biodiversity

- The Maple River watershed covers over 937 square miles.
- The watershed has 404 miles of waterways that flow year round.
- The watershed is over 81 percent agricultural.
- The Maple River watershed feeds into the Lower Grand River.
- According to the "Hungerford's Crawling Water Beetle Draft Recovery Plan," U.S. Fish and Wildlife Service, August 2004, excessive erosion and sedimentation at degraded road crossings is a potential threat to the beetle's habitat in the Maple River. The West Branch of the Maple is known to support the best trout fishery and coldest water within the watershed. The current crossing is a system of 5 culverts which are critically failing to the extent that they are blocking fish passage. The undersized and failing culverts are causing flooding and consequent warming of upstream waters. The project involves replacing the existing culverts with a free-span structure which will accommodate the natural flow of the river. In addition, the embankments will be stabilized, and road runoff managed to reduce or eliminate sedimentation at the crossing.
- The Nature Conservancy identified the Maple River as a network of important medium-sized, lowland river with extensive riparian wetlands.



Land Cover: Maple River Watershed



Total Acreage: 937 sq. miles

Between 1996 and 2001, there has been a slight increase in developed land, farmland, forest and wetland, and a slight decrease in grassland.

Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

Impaired (303d) Waters

Waterbody Name	Impairment
Alder Creek	Phosphorus, Nuisance Plant Growths
Lost Creek	Phosphorus, Algal Growths, Bacterial Slimes Fish Community Rated Poor, Macroinvertebrate Community Rated Poor
Maple River	Phosphorus, Nuisance Plant Growths
Peet Creek	Phosphorus, Nuisance Plant Growths

Menominee River Watershed

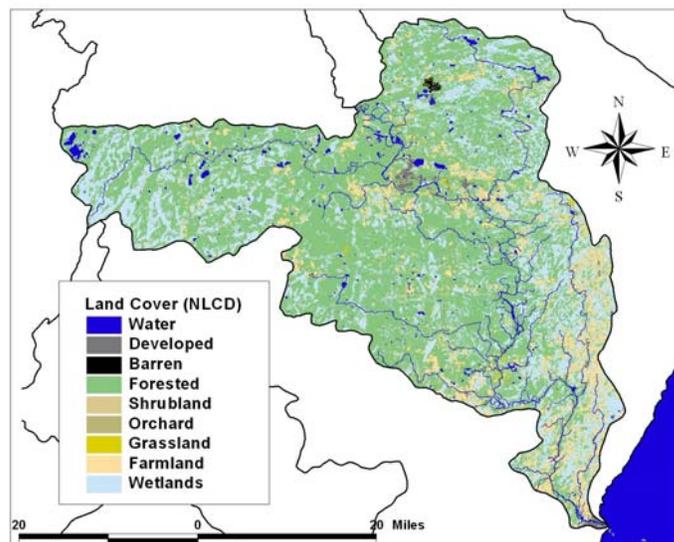
Hydrologic Unit Code: 04030108

For more information, see the USEPA "Surf Your Watershed" website at

http://cfpub.epa.gov/surf/huc.cfm?huc_code=04030108 or contact the Michigan Department of Environmental Quality at 517-335-6969 to request a copy of report number MI/DEQ/WD-03/039, "A Biological Survey of selected Streams in the Menominee River Watershed, Dickinson County, 2002".

Watershed Management Plans

- Fumee Creek — Dickinson Conservation District — www.dickinsoncd.org
- Hamilton Creek — Dickinson Conservation District
- Pine Creek (Dickinson Co) — Dickinson Conservation District



Watershed Groups

- Dickinson Conservation District — www.dickinsoncd.org
- Hamilton, Fumee, and Pine Creek Watershed Projects — www.dickinsoncd.org/hamiltoncreek;
- www.dickinsoncd.org/fumeecreek; www.dickinsoncd.org/pinecreek
- Menominee River Area of Concern — www.epa.gov/glnpo/aoc/menominee.html
- Menominee River RAP, Great Lakes Commission — www.glc.org/spac/rapdocs.html

Watershed Overview / Ecology / Biodiversity

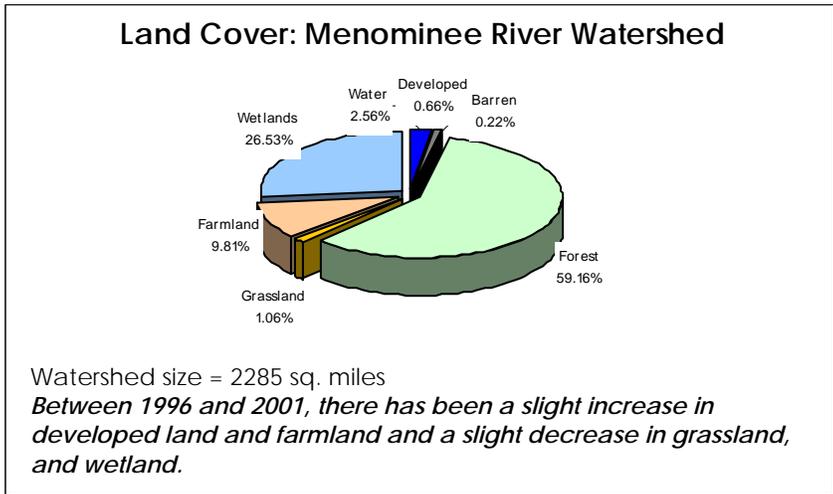
- The Menominee River forms the boundary between Wisconsin and the Upper Peninsula of Michigan in Marinette, Florence, Forest, Villias, Menominee, Dickinson, and Iron counties before draining its contents into Lake Michigan.
- Historic iron mining in Menominee was a catalyst for growth in the watershed.
- Piers Gorge whitewater area is located in the watershed. It is often done as a big-water, carry-up park-and-play whitewater rafting area.
- The Menominee system is comprised of a number of large and small tributaries, the major tributaries being the Michigamme, Brule, Pine, Paint, Iron and Sturgeon Rivers. The Menominee originates at the confluence of the Michigamme and Brule Rivers and flows approximately 115 miles to the east towards the waters of Green Bay.
- The total basin covers approximately 4,070 square miles with 2,618 square miles located in Michigan and 1,452 square miles located in Wisconsin.
- The topography in the Menominee River basin was formed and heavily altered by periodic glaciation, the most recent of which was the Wisconsin period- 10,000-20,000 years ago.
- The region is characterized by lakes, glacial plains, end moraines, and poorly integrated east to west drainage. Bedrock outcrops and moraine deposits in the northern river basin create a more rugged terrain with a maximum elevation of 1300 feet, giving the basin a gradient of approximately five feet per mile. The Menominee basin consists mostly of sand and gravel called outwash which is underlain by dolomite.
- The Menominee River Area of Concern (AOC) includes the lower 4.8 km of the river from the Upper Scott Paper Company (Wisconsin) Dam to the river's mouth and approximately 5 km north and south of the mouth along the adjacent shoreline of Green Bay. The AOC also includes the cities of Marinette and Menominee, as well as the adjacent nearshore area of Green Bay, Wisconsin, extending three miles north and south of the river mouth.
- Active natural resource exploitation and land use changes occurred throughout the watershed in the mid-1800's. Iron ore deposits were discovered in the 1850's on the western edge of the Menominee Iron Range and numerous mines opened shortly thereafter particularly in the Iron Mountain, Michigan area.
- The logging era impacted water quality and physical habitat conditions in the . The rivers and streams were used extensively for log drives during the 1880's and 1890's.
- Some of the developed areas are constructed on man-made soils that were deposited during the lumbering boom around the turn of the century. These man-made soils are composed of sawdust and waste wood that was discarded and

then overlay with sand or topsoil as the building surface. These unstable soils have subjected many structures with excessive settling and alignment shifting.

- Two large impoundments are located on the Sturgeon River including Genes Pond and the Hardwood Reservoir. These impoundments modify river temperatures and influence downstream fish and macroinvertebrate communities. Warmwater fish species such as walleye, black crappie, and yellow perch are now common in the Sturgeon River downstream of these impoundments.
- Consistent with the Wilderness Shores Settlement (WSS), the Wisconsin Electric Power Company is required to remove a 65-foot dam located on the Sturgeon River near Loretto, Michigan. This dam removal project is scheduled to be complete by 2007.
- The major economic activities are logging, paper making, tourism, and potato farming.
- The Menominee is a sturgeon spawning area.
- The Nature Conservancy identified the Pine-Popple River as having a critical large, moderate groundwater small to medium-sized streams on outwash and coarse ground/end moraine.
- The Nature Conservancy identified the Lower Menominee River as a critical ecological system with riverine coastal marsh, Lake sturgeon, and Skillet clubtail.

Watershed Activities / Concerns / Priorities

- The Wisconsin portion of the watershed is part of the Wisconsin DNR's Upper Green Bay basin management area.
- The Pine Creek Watershed Project is an ongoing effort to address non-point source pollution throughout the 48,000 acre watershed in south central Dickinson County, Michigan. The watershed received a Clean Michigan Initiative Grant targeting sediment and nutrient pollution caused by road crossings, forest harvest practices, agriculture, cropland erosion, ORV trail crossing, and eroding streambanks. The watershed has also received funding from an EPA Section 319 grant to promote education about Best Management Practices and non-point source pollution control.
- The Fumee Creek Watershed Project was awarded a two 319 grant and officially began the planning phase of the watershed project in October 2000. The goal of the Project is to protect and restore the creek and the lakes and streams within the watershed from further degradation due to non-point sources of pollution.
- The Hamilton Creek Watershed plan was funded by a 319 grant to reduce runoff in the watershed, reducing sediment, nutrients and heavy metals associated with this process; reduce erosion in the watershed, reducing sediment, nutrients and heavy metals associated with these processes; improve natural habitat for fish and wildlife within the watershed; and to promote stewardship activities in the watershed. The project is



Impaired (303d) Waters

Waterbody Name	State Impairment
Chalk Hills Impoundment (Menominee River), MI	Mercury (Fish Tissue)
Fumee Lake, MI	Mercury (Fish Tissue)
Hamilton Lake, MI	Mercury (Fish Tissue)
Menominee River, MI	Fish consumption advisory (PCBS) Mercury (Fish Tissue)
Unnamed Tributary to Porterfield Creek, MI	Phosphorus Algal Growth
Emily Lake, WI	Fish consumption advisory (Mercury)
Lower Menominee AOC, MI	Arsenic Fish Consumption Advisory (Mercury), PAHs
Menominee River (Pier's Gorge to Lower Scott Flowage), MI	Fish consumption advisory (Mercury) Fish consumption advisory (PCBs)
Menominee River in Marinette County, WI	Fish consumption advisory (Mercury) Fish consumption advisory (PCBs)
Sand Lake T38 R18E S21, WI	Fish consumption advisory (Mercury)
Sea Lion Lake, WI	Fish consumption advisory (Mercury)
Van Zile Lake, WI	Fish consumption advisory (Mercury)

Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

planting native plants surrounding Lake Mary, surveying frog population, monitoring water quality, and mapping aquatic plants.

- Hannahville Indian Community has a water quality protection program for its reservation.

Menominee River Area of Concern Activities

Location

- Lower 4.8 km of river to the mouth and 5 km north and south of the mouth along the bay shore

AOC Primary Contaminants

- Arsenic
- Mercury
- PCBs
- Oil and grease
- Pathogens

AOC Stressors

- Sediments
- Coastal wetlands habitat loss
- Nonpoint pollution
- Historic shoreline developments to support harbor activities

AOC Relevant Programs

- RCRA Corrective Action
- Superfund

AOC Clean-up Actions

- Arsenic remediation (33,000 cubic yards)
- Combined sewer overflow project

AOC Key Activities Needed

- Dredging
- Protect riparian and coastal habitat
- Pollution prevention

AOC Challenges

- Woody debris is present at the WPSC Marinette MGP Site, which may have hindered accurate determination of the sediment thickness
- Coordination with RAP program for AOC delisting purposes; bi-state coordination issues

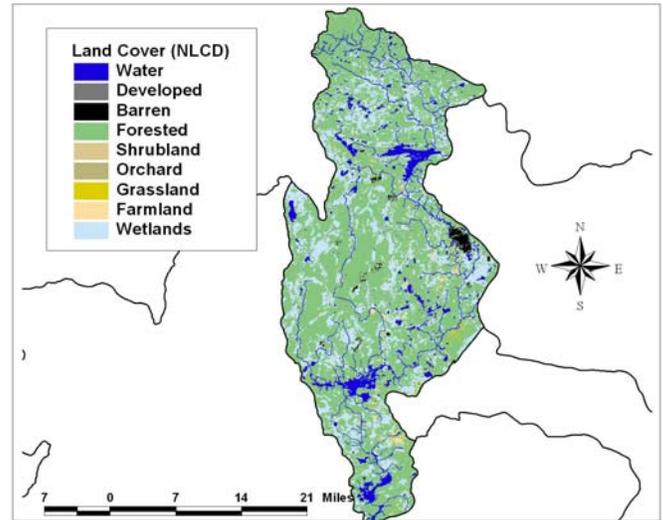
AOC Next Steps

- Arsenic dredging completed
- Paint sludge deposit cleanup above river mouth

Michigamme River Watershed

Hydrologic Unit Code: 04030107

For more information, see the USEPA "Surf Your Watershed" website at http://cfpub.epa.gov/surf/huc.cfm?huc_code=04030107 or contact the Michigan Department of Environmental Quality at 517-335-6969 to request a copy of report number MI/DEQ/WD-03/032, "A Biological Survey of the Brule, Paint, and Michigamme River Watersheds, Iron and Marquette Counties, 2002".



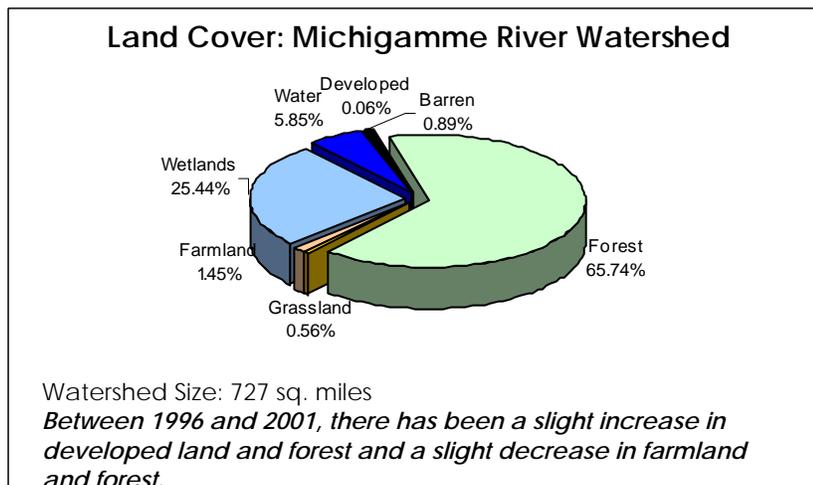
Watershed Groups

- Michigamme Highlands Project, The Upper Peninsula Conservation Program of The Nature Conservancy — www.nature.org
- Central Lake Superior Land Conservancy — www.cslc.org/projects.htm



Watershed Overview / Ecology / Biodiversity

- The Michigamme River watershed covers approximately 727 square miles.
- There are 465 miles of rivers and streams in the watershed.
- The Michigamme River system flows into the Menominee River watershed.
- Approximately 82 percent of the watershed is forested. The predominant vegetation in the hilly uplands are sugar maple, basswood, and yellow birch while the lowland vegetation is dominated by american elm, black ash, trembling aspen, and red maple. The vegetation of drier outwash sand plains include balsam fir, white pine, red pine, and paper birch.
- Forty percent of Michigan's "blue ribbon" trout streams are found in the Brule, Michigamme, and paint River systems.
- Most of the forested lands in the Michigamme watershed is owned by private forest product companies.
- Forestry, wood products, and tourism are the dominant industries. Other major activities include winter sports, fishing, hunting, camping, boating, fall color tours, and sightseeing
- The watershed topography is characterized by sandy hills and elliptical ridges. These sandy deposits have high infiltration rates, can be up to 200 feet thick, and are a major source of cold groundwater to the rivers.
- The lower Michigamme River watershed has a large area of pitted and flat glacial outwash plains. Most of the streams originate in sedge and forested wetlands or sallow kettle lakes, which causes the water to appear strained from the presence of decaying plant material.
- Bedrock outcrops are common.
- Many abandoned mines can be found in the watershed.
- Most waters are heavily stained with tannins from wetland drainages.
- There are five listed impaired waters.
- Macroinvertebrate community status was assessed at 10 different sites within the Michigamme River watershed. Half received macroinvertebrate community ratings of "excellent," while the other half rated acceptable.



Impaired (303d) Waters

Waterbody Name	Impairment	Anticipated TMDL Submittal
Beaufort Lake	Mercury (Fish Tissue)	2011
Craig Lake	Mercury (Fish Tissue)	2011
Lake Michigamme (Michigamme River)	Mercury (Fish Tissue)	2011
Michigamm Reservoir (Michigamme River Imp.)	Mercury (Fish Tissue)	2011
Michigamme River	Mercury (Fish Tissue)	2011
Peavy Pond	Mercury (Fish Tissue)	2011
Perch Lake	Mercury (Fish Tissue)	2011
Runkle Lake	Mercury (Fish Tissue)	2011
Unnamed Lake	Mercury (Fish Tissue)	2011

Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

Milwaukee River Watershed

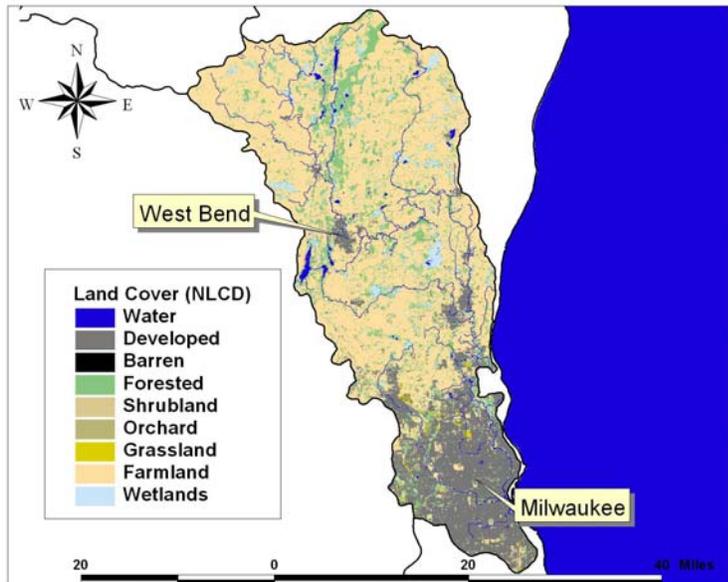
Hydrologic Unit Code: 04040003

the USEPA "Surf Your Watershed" website at http://cfpub.epa.gov/surf/huc.cfm?huc_code=04040003

The Milwaukee River basin is part of the Wisconsin DNR's Milwaukee River basin management area. For more information, see the Wisconsin Department of Natural Resources' "Wisconsin's Basins" website at <http://dnr.wi.gov/org/gmu/gmu.html>.

Watershed Groups

- Friends of Milwaukee's Rivers — www.mkeriverkeeper.org
- Milwaukee Metropolitan Sewerage District — www.mmsd.com
- Milwaukee River Basin Partnership — basineducation.uwex.edu/milwaukee
- River Revitalization Foundation — www.riverrevitalizationfoundation.org



Watershed Overview / Ecology / Biodiversity

- The Milwaukee River Basin encompasses almost 900 square miles of land in portions of Dodge, Fond du Lac, Milwaukee, Ozaukee, Sheboygan, Washington, and Waukesha counties.
- The southern quarter of the basin is the most densely populated area in the state, holding 90% of the basin's population, which is approximately 1.3 million people.
- The Basin includes 6 watersheds, 3 of the watersheds (Milwaukee River North, Milwaukee River East- West, Milwaukee River South) contain the Milwaukee River from start to finish. The other three watersheds (Cedar Creek, Menomonee River and Kinnickinnic River) are named after the major rivers they contain.
- Collectively the six watersheds contain about 500 miles of perennial streams, over 400 miles of intermittent streams, 35 miles of Lake Michigan shoreline, 57 named lakes and many small lakes and ponds.
- The Natural Heritage Inventory has documented 16 endangered, 26 threatened and 65 special concern plant and animal species, and 30 rare aquatic and terrestrial communities within the Basin.
- The Milwaukee Estuary Area of Concern (AOC) includes: the lower 5 km of the Milwaukee River downstream of North Avenue Dam; the lower 4.8 km of the Menomonee River downstream of 35th Street; the lower 4 km of the Kinnickinnic River downstream of Chase Avenue; the inner and outer Harbor and the nearshore waters of Lake Michigan, bounded by a line extending north from Sheridan Park to the city of Milwaukee's Linnwood water intake.
- The AOC encompasses 57.5 km² or 2.6 % of the entire basin, including lands that drain directly to the AOC via storm sewers and combined sewer systems. This relatively small drainage area contributes disproportionately large amounts of pollutants associated with urban runoff.
- Runoff from specific and diffuse sources, contaminated sediment, habitat modifications (such as channelization and dams) have degraded water quality throughout the Basin.
- Recreational highlights include wildlife watching, hiking, fishing, hunting, bicycling, horseback riding, snowmobiling, skiing, camping, picnicking, and water sports.
- The Basin includes the Southeast Glacial Plains, Southeast Lake Michigan Coastal and Northern Lake Michigan Ecological Landscapes.
- Some streams have the ability to support some trout populations. Others have spring and fall runs of stocked trout and salmon. Fishing opportunities also exist in the rivers and harbors for northern pike, small mouth bass, and walleye.
- Wildlife include white- tailed deer, ring- necked pheasant, waterfowl, geese, gray and flying squirrels, raccoons, woodchucks, great horned owls, a variety of hawks, songbirds, and shorebirds.
- Grasslands are promoted through prescribed burns & mowing.
- Maple- basswood is the most common forest type and the tree species with the greatest volume in the Basin is ash followed by hard maple, basswood, soft maple and red oak.
- The Nature Conservancy identified the East Branch of the Milwaukee River and the Kettle Moraine Lakes as having important groundwater/wetland fed headwater streams in ice contact and end moraine and critical kettle moraine lakes.

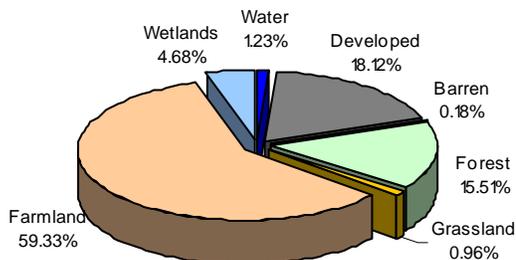
- The Milwaukee River Mainstem has critical moderate groundwater mainstems on till/lake plain; headwaters in ice contact/end moraine as identified by the Nature Conservancy.

Watershed Activities

- Water quality problems are from in- place pollutants, runoff in urban areas, floodplain development, and agricultural practices. As people move to the more rural areas of the basin, groundwater quantity and quality issues will become very important.
- Preservation of biodiversity and protection of endangered and threatened species, this is done by preserving their habitat.
- A comprehensive approach to the protection and restoration of wetlands is needed.
- Educate people to help prevent the spread of exotic nuisance species, which can wreak havoc on ecosystem balance.
- Monitoring of wildlife populations, water quality, and ecosystem function are needed to understand the status and trends of resources.
- Milwaukee County Parks plans to stabilize and reconstruct approximately 0.25 miles of trail and vernal streambank; remove invasive exotic plant species; install erosion control geotextile; plant trees and shrubs and herbaceous plugs; and hold two single-day volunteer events per year to educate residents on the issues of erosion, invasive species and native plantings.
- The Milwaukee Metropolitan Sewerage District is leading a number of watershed-based projects to reduce the number and frequency of combined sewer overflows

Waterbody Name	Impairment
Adell Tributary	Degraded Habitat, Sediment
Beaver Creek	Aquatic Toxicity
Cedar Creek	PCB Fish Consumption Advisories
Evergreen Creek(T11n R19e Sec 36 Sw Se)	Degraded Habitat, Sediment
Forest Lake	Mercury Fish Consumption Advisory
Indian Creek	Metals, Phosphorus, Aquatic Toxicity, Degraded Habitat, Organic Enrichment/Low Dissolved Oxygen, Sediment, Temperature
Jackson Park Pond	PCB Fish Consumption Advisory
Lehner Creek	Degraded Habitat, Sediment, Temperature
Lincoln Creek	Metals, Phosphorus, Aquatic Toxicity, Degraded Habitat, Organic Enrichment/Low Dissolved Oxygen, PAHS, Sediment, Temperature
Little Menomonee R.	Aquatic Toxicity, Creosote
Long Lake	Mercury Fish Consumption Advisory
Mauthe Lake	Mercury Fish Consumption Advisory
Milwaukee R. Estuary AOC (Outer Harbor to LM)	Metals, Aquatic Toxicity, Bacteria, PCB Fish Consumption Advisory
Milwaukee R. Estuary AOC (Menomonee River)	Metals, Phosphorus, Aquatic Toxicity, Bacteria Organic Enrichment/Low Dissolved Oxygen, PCB Fish Consumption Advisory
Milwaukee R. Estuary AOC (Kinnickinnic River)	Metals, Phosphorus, Aquatic Toxicity, Bacteria, Organic Enrichment/Low Dissolved Oxygen, PCB Fish Consumption Advisory
Milwaukee R. Estuary AOC (Milwaukee River)	Metals, Phosphorus, Aquatic Toxicity, Bacteria, Organic Enrichment/Low Dissolved Oxygen, PCB Fish Consumption Advisory
Milwaukee River	Bacteria PCB Fish Consumption Advisory
Milwaukee River — Lime Kiln Dam Upstream	PCB Fish Consumption Advisory
Natural Channel Reaches	Degraded Habitat Sediment
Unnamed Trib to Cedar Cr.	Degraded Habitat Sediment
Zeunert Pond	Mercury Fish Consumption Advisory

Land Cover: Milwaukee River Watershed



Watershed size: 865 sq. miles
Between 1996 and 2001, there has been a slight increase in developed land, farmland, forest, and bare land and a slight decrease in grassland and wetland.

Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

Milwaukee Estuary Area of Concern Activities

Location

The lower 5 km of the Milwaukee River ; the lower 4.8 km of the Menominee River; the lower 4 km of the Kinnickinnic River; the inner and outer Harbor and the nearshore waters

AOC Primary Contaminants

- Phosphorus
- Pathogens
- PCBs
- Metals
- PAHs

AOC Stressors

- Urban and rural runoff
- Wastewater discharges
- Sediments
- Habitat loss
- Dams

AOC Relevant Programs

- Clean Water Act
- Clean Air Act
- Superfund
- Brownfields
- Navigational dredging

AOC Clean-up Actions

- Water pollution abatement
- Pollution prevention education begun
- Dam removal
- 7,000 cubic yards remediated

AOC Key Activities Needed

- Dredging
- Nonpoint source pollution control
- Stream buffers
- Pathogen source research

AOC Challenges

- High urban density and rapid development
- Historic developed sites which could be restored to improve floodplain functions and wetland function

AOC Next Steps

- Complete assessment for Kinnickinnic River
- Estabrook Impoundment remediation needed
- Research into pathogen sources
- Watershed analysis to assess water quality impacts and options for restoration

Muskegon River Watershed

Hydrologic Unit Code: 04060102

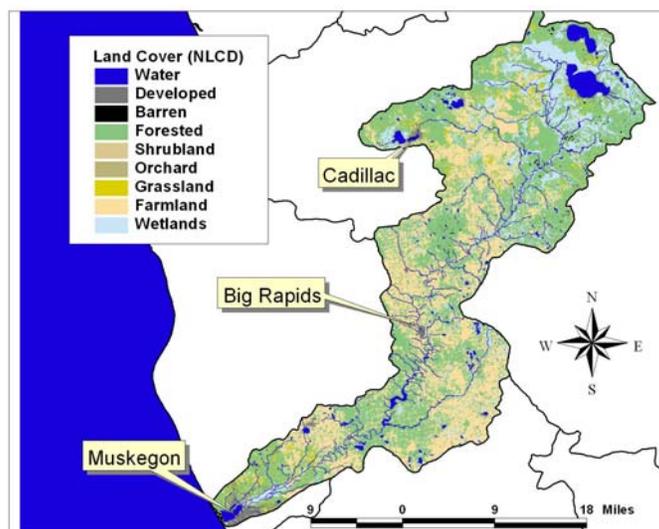
For more information see the USEPA "Surf Your Watershed" website at http://cfpub.epa.gov/surf/huc.cfm?huc_code=04060102 or contact the Michigan Department of Environmental Quality at 517-335-6969 to request a copy of report number MI/DEQ/WB-05/070, "A Biological Survey of the Middle Muskegon River Watershed, Clare, Mecosta, Newaygo, and Osceola Counties, Michigan, 2001" and report number MI/DEQ/WB-05/071, "A Biological Survey of the Upper Muskegon River Watershed, Clare, Missaukee, Osceola, and Roscommon Counties, Michigan, 2001".

Watershed Management Plans

- Higgins Lake — Huron Pines RC&D Council
- Muskegon River — Grand Valley State University Annis Water Resources Institute
- Upper Clam River — City of Cadillac
- Bear Creek
- Bear Lake

Watershed Groups

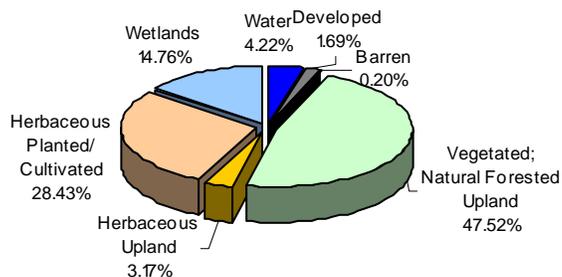
- Muskegon River Watershed Assembly — www.mrwa.org
- Huron Pines RC&D Council — www.huronpines.org
- Muskegon River Watershed Project, Annis Water Resources Institute — www.gvsu.edu/wri/isc/muskegon
- Muskegon River Watershed River Initiative Assessment — www.muskegonriver.org
- Muskegon Watershed Research Partnership — www.mwrp.net
- City of Cadillac — www.cadillac-mi.net/



Watershed Overview / Ecology / Biodiversity

- The Muskegon River Watershed drains approximately 2,723 square miles of land and is located in north-central Michigan.
- The River is approximately 219 miles long from its start at Houghton and Higgins Lakes down to its mouth at Muskegon Lake and, eventually, Lake Michigan.
- The Muskegon River Watershed is one of the of the largest watersheds in the State of Michigan and spans across the better part of nine counties: Wexford, Missaukee, Roscommon, Osceola, Clare, Mecosta, Montcalm, Newaygo, and Muskegon.
- Muskegon Lake, a 4,149 acre inland coastal lake located in Muskegon County along the east shoreline of Lake Michigan is an Area of Concern (AOC). The AOC includes the entire lake with the lake being separated from Lake Michigan by sand dunes. The Muskegon River flows through the lake before emptying into Lake Michigan. The immediate inland area is primarily residential and industrial, with chemical and petrochemical companies, foundries, a pulp and paper mill, and other industries located on the lake or within its immediate watershed.
- The Muskegon River and many of its streams and creeks are considered cool water fisheries. They can support both cold-water fish, such as trout and salmon, and warm water fish, such as northern pike and smallmouth bass.
- The sportfishery is worth an estimated \$5 million per year.
- Impairments are excessive nutrient loading, sedimentation, hydrologic flow, invasive species and toxic substances.
- The river faces significant thermal pollution, which raises water temperature, from dams hydroelectric facilities, stormwater runoff, and a lack of streamside canopy. When temperature rises, available oxygen decreases, making it difficult for aquatic life to survive.

Land Cover: Muskegon River Watershed



Watershed size: 2738 sq. miles

Between 1996 and 2001, there has been a slight increase in developed land, grassland, and wetland and a slight decrease in farmland, and forest.

Watershed Activities

- The Annis Water Resources Institute (AWRI) from Grand Valley State University received a Section 319 grant to support the development of the since approved watershed management plan. The project currently has funds to do several structural practices in the watershed along with public education.
- The Great Lakes Fishery Trust (GLFT) selected the Muskegon River watershed as the focus of their "River Initiative," involving multi-million dollar, annual funding support for the next three to five years.
- The Hersey River Restoration Project is working to clean up contaminated sediments and development of an agreeable plan between the village of Hersey and the MDNR for the removal of dilapidated dam structures on the Hersey River.
- The Marion Millpond/Middle Branch River project will remove the Marion Dam, retain the millpond by constructing a bermed dike between it and the River, and construct a covered bridge.
- The Village of Marion, in Osceola County, together with the MDNR Fisheries Division have agreed on a plan to restore both the Middle Branch River and the Marion Millpond including the removal of the Marion Dam.
- The Muskegon Lake & Estuary Emergent Vegetation Restoration Demonstration Project is working to re-establish native wild rice stands, soft stem bulrush and other aquatic vegetation for fish and wildlife habitat in the Muskegon Lake Area of Concern (AOC) and the lower river (estuary) located at the river mouth and within the Muskegon State Game Area.
- Using funds from the Michigan Department of Environmental Quality and the Wege Foundation, the Muskegon River Watershed Assembly (MRWA) and Grand Valley State University's Annis Water Resources Institute (GVSU-AWRI) are implementing projects that: updates the existing Muskegon River Watershed Management Plan to meet EPA's newest criteria.
- Funded by the Great Lakes Fisheries Trust as part of the Muskegon River Initiative, the Mega Model project will build upon existing models, data, and management tools, the project will produce a system-wide model that will be used to perform risk assessment in the Muskegon River Watershed.
- Through funds from the Wege Foundation and the Fremont Area Foundation, the Sustainable Futures for the Muskegon River Watershed project developed a geographical information system (GIS) outreach tool, which will be disseminated to the public through an integrated information and education program.
- The Annis Water Resources Institute (AWRI) is conducted an environmental analysis of well water in Mecosta County with funding from the Ice Mountain Stewardship Fund of the Fremont Area Community Foundation. The study provided critical information on health hazards in the County and groundwater supplies.
- AWRI has established a research fund for long-term monitoring of Muskegon Lake.
- The Muskegon Lake AOC Urban Sediment Project, a 2004 Great Lakes Basin Program Project, aims to correct the effects of urban runoff, soil erosion and sedimentation at three highly visible sites within AOC. The project will implement corrective measures and transfer information on three distinct BMP systems sites.
- The Nature conservancy identified the following critical ecological resources in the watershed:
 - The Muskegon Dunes holds Hemlock - Yellow Birch Wet-Mesic Forest, Great Lakes Beachgrass Dune, and Interdunal Wetlands.
 - The Muskegon and White Rivers include Great Lakes Hemlock - Beech - Hardwood Forest, Inland Coastal Plain Marsh, Mesic Sand Tallgrass Prairie, and White Pine - White Oak Barrens
 - Houghton Lake, Higgins Lake, and the Upper Muskegon River include very large, deep, inland lakes, very large, wetland-connected inland lakes, and wetland-connected headwater streams on outwash plain, ice contact and end moraine
 - The White and Muskegon Rivers have cold,

Impaired (303d) Waters	
Waterbody Name	Impairment
Bear Lake	Phosphorus Algal Blooms, PCBS Fish Consumption Advisories
Croton Pond	Mercury (Fish Tissue)
Hess Lake	PCBS Fish Consumption Advisories
Higgins Lake	Chlordane Fish Consumption Advisories PCBs Fish Consumption Advisories Mercury (Fish Tissue)
Houghton Lake	PCBs Fish Consumption Advisories
Lake Mitchell	Mercury (Fish Tissue)
Lily Lake	Mercury (Fish Tissue)
Muskegon Lake And Muskegon River#	Mercury PCBs Fish Consumption Advisories Mercury (Fish Tissue), PCBS
Ruddiman Creek	Pathogens, Fish Community Rated Poor, Macroinvertebrate Community Rated Poor
Ruddiman Creek (Wetlands)	PCBs Fish Consumption Advisories
Ryerson Creek	Fish Community Rated Poor Macroinvertebrate Community Rated Poor
Todd Lake	Mercury (Fish Tissue)

Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

groundwater-fed stream on sandy lake plain

- The White and Muskegon Rivers are Waterfowl and Shorebird stopover sites
- Houghton Lake, Higgins Lake, and the Upper Muskegon River are home to the Eastern Massasauga, Secretive locust, and Hill's thistle
- The White and Muskegon Rivers are home to the Black Tern, Kirtland's Snake, Hill-prairie spittlebug, Karner blue butterfly, Sprague's pygarcctic, and the Hill's thistle.

Muskegon Lake Area of Concern Activities

Location

- The entire 4149 acre lake and several tributaries.

AOC Primary Contaminants

- PCBs
- Mercury

AOC Stressors

- Sediments
- Nonpoint pollution

AOC Relevant Programs

- Brownfields
- Navigational dredging
- Great Lakes Legacy Act

AOC Clean-up Actions

- Wastewater treatment upgraded
- Some tributary remedial actions underway
- Removal of about 80,000 cubic yards of contaminated sediment in Ruddiman Creek

AOC Key Activities Needed

- Dredging
- Stream buffers
- More assessment

AOC Challenges

- PCB disposal
- Local funding match for federal projects

AOC Next Steps

- Remediation of brownfields and sediments
- Complete assessment of contaminated sediment in Ryerson Creek and in Muskegon Lake at the Division Street Outfall.

Oconto River Watershed

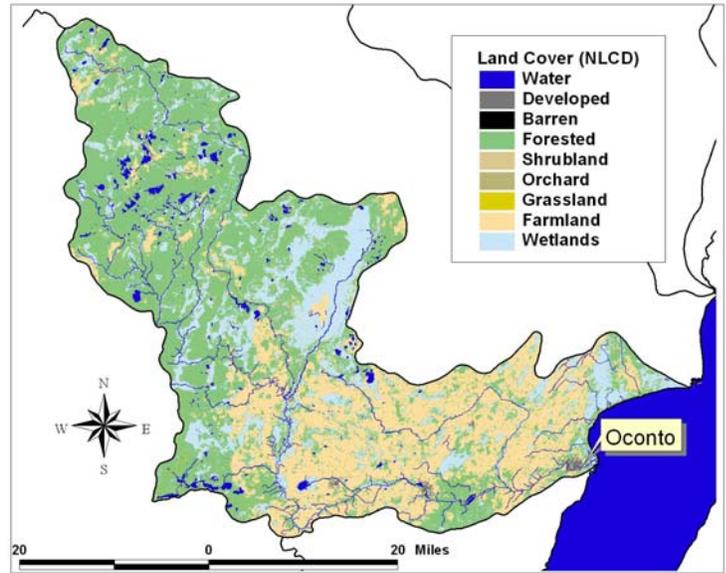
Hydrologic Unit Code: 04030104

For more information, see the USEPA "Surf Your Watershed" website at http://cfpub.epa.gov/surf/huc.cfm?huc_code=04030104

The Oconto River Watershed is part of WDNR's Upper Green Bay management Basin. For more information, see the Wisconsin Department of Natural Resources' "Wisconsin's Basins" website at <http://dnr.wi.gov/org/gmu/gmu.html>

Watershed Groups

- River Alliance of Wisconsin — www.wisconsinrivers.org
- Upper Green Bay Basin DNR Management Area — www.dnr.state.wi.us/org/gmu/upgb
- Upper Green Bay Basin Partnership — basineducation.uwex.edu/uppergb
- Great Lakes Basin Program for Soil Erosion and Sediment Control — www.glc.org/basin



Watershed Overview / Ecology / Biodiversity

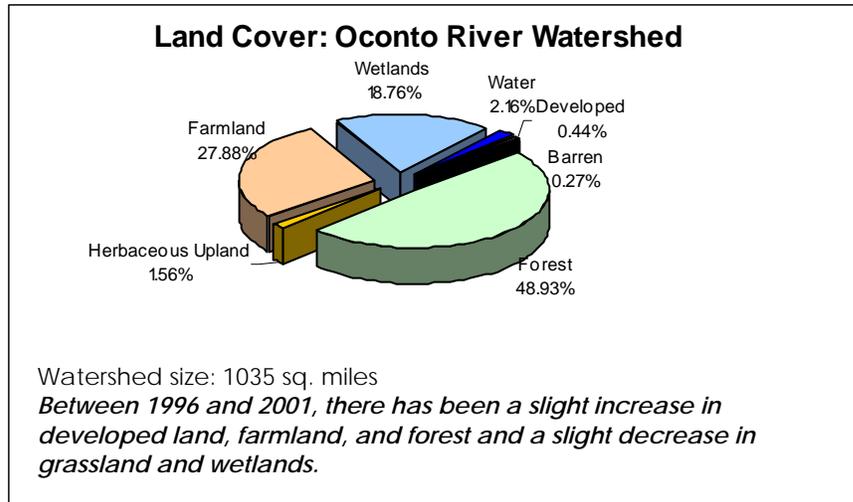
- The Oconto watershed covers over 1035 square miles and has over 560 miles of streams.
- The major waterways include the Oconto River, the Lower Oconto River, the Little River, the Lower North Branch Oconto River, and the South Branch of the Oconto River.
- Most of the watershed is part of the Upper Green Bay basin management area as identified by Wisconsin DNR.
- Wildlife include black bear, white-tailed deer, turkey, ring-necked pheasant, ruffed grouse, waterfowl, geese, beaver, mink, otter, timber wolves, elk, colonial waterbirds, trumpeter swans, eagle, osprey, northern goshawk, shorebirds.
- Maple-basswood is the most common forest type and the tree species with the greatest volume in the basin is hard maple followed by aspen, white and red pine, soft maple and balsam fir.
- Coastal wetlands are an important feature of the watershed.
- Groundwater is plentiful and clean and is used for drinking water
- Oconto is the primary urbanized area in the watershed.

Watershed Activities / Concerns / Priorities

The following are objectives for the Upper Green Bay management Basin, which includes the Oconto River watershed:

- Target the West Shore of Green Bay as a high priority for habitat protection
- Implement the DNR's 50 year Land Legacy Study, an acquisition plan for the state
- Protect shoreland habitat and water quality through water regulation and zoning
- Work with local communities in developing "smart growth" plans & promoting wise land use and zoning
- Complete a comprehensive fisheries plan for the basin, focusing on the Oconto, Menominee, and Peshtigo Rivers and Lake Michigan, including addressing invasive exotic species
- Encourage sound forestry practices on public and private land and identify and manage terrestrial invasive exotic species
- Enhance educational activities for forestry, water quality, wildlife management, healthy ecosystem

Impaired (303d) Waters		
Waterbody Name	Impairment	TMDL Submittal
Green Bay – S. of Marinette & Tribs to the first dam	PCB Fish Consumption Advisory	NA
Maiden Lake	Mercury Fish Consumption Advisory	NA
Oconto River Machinckanee	Mercury Fish Consumption Advisory	New
Reservoir Pond	Mercury Fish Consumption Advisory	NA



Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

Pere Marquette-White Watershed

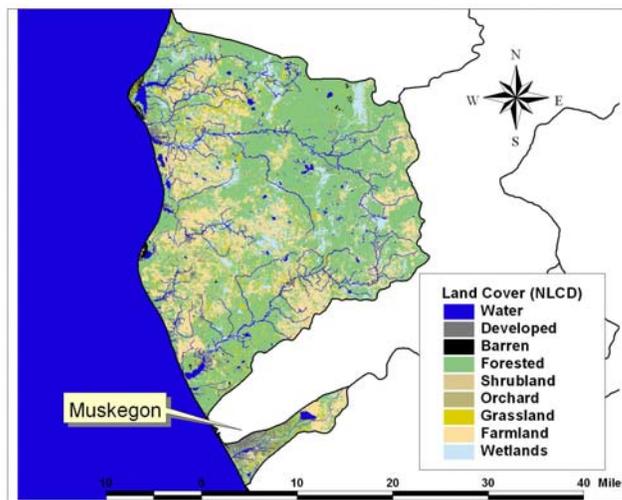
Hydrologic Unit Code: 04060101

For more information, see the USEPA "Surf Your Watershed" website at

http://cfpub.epa.gov/surf/huc.cfm?huc_code=04060101

Watershed Groups

- White River Watershed Partnership — www.wrwp.org
- Oceana Conservation District — www.oceanaconservation.org
- Conservation Resource Alliance — www.rivercare.org
- Pere Marquette Watershed Council — www.peremarquette.org
- The Mona Lake Watershed Council — www.monashores.net/monalakewatershed/Design1/home.htm



Watershed Management Plans

- Pere Marquette — Conservation Resource Alliance
- South Branch, Pentwater River — Oceana Conservation District
- Hamlin Lake/Big Sable — Conservation Resource Alliance

Watershed Overview / Ecology / Biodiversity

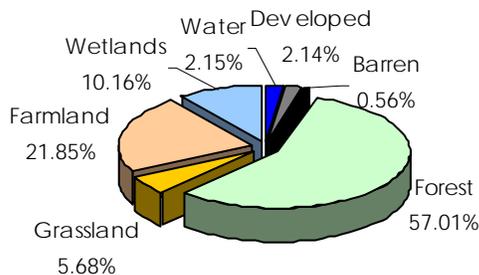
- The Pere Marquette watershed covers over 2100 square miles.
- The watershed has over 90 miles of Lake Michigan shoreline.
- The watershed is primarily forested and is near Muskegon, Michigan.
- Recreational uses include fishing, wildlife viewing, boating, canoeing, kayaking, camping, and hiking.
- The White River is a State designated natural river.

Watershed Activities / Concerns / Priorities

- The White River Watershed partnership, formed in 2003, has a mission to protect the unique characteristics and the natural resources of the White River watershed by promoting education, conservation, restoration, and preservation activities.
- The primary goals of the Pentwater River Watershed Program are to protect and enhance the high quality waters of the South Branch of the Pentwater River by implementing Best Management Practices (BMPs) within the watershed. BMPs are defined as any structural, vegetative, or managerial practice to treat, prevent, or reduce water pollution.
- The Pere Marquette River Restoration Committee is building on the original 10-year, \$1.5 million restoration project with a 319 Nonpoint Source Pollution grant for \$373,646. A Pere Marquette Watershed Management Plan has been completed with this grant and 9 road/stream crossing sites have been formally selected for repair with four County Road Commissions. CRA has also applied for a \$720,000 grant to complete streambank stabilization, road/stream crossing improvements, and livestock and agricultural projects throughout the watershed.
- Three County Road Commissions have been working together and with CRA to complete reconstruction at 23 road stream crossings over a 7-year period. Phase 1 funding was for \$102,800, Phase 2 funding for \$109,287 and Phase 3 for \$103,450 with project partners providing one-to-one match. CRA is responsible for public education of the project and site plan reviews for Best Management Practices to preserve water quality.
- Using funding from the Orvis Company Foundation and other supporters and landowners, the Conservation Resource Alliance worked with Kanouse Outdoor Restoration to repair erosion at five steep, sandy eroding streambanks along the Baldwin River. In addition, a combination of woody debris and fish habitat platform structures were placed at all of the sites to provide hiding and resting cover for fish, aquatic insects and a variety of wildlife. The Mason County Road Commission, using a grant from the Great Lakes Commission, recently completed improvements at the Stephens Road bridge crossing of the Big Sable River in Free Soil Township to decrease excessive sedimentation in the river.
- In 2003, the Lake Michigan Forum conducted an assessment of environmental stewardship in Michigan's Mona Lake watershed. The assessment process was aimed at identifying opportunities for creating a permanent ethic of environmental stewardship among leaders and the general public in the local watershed. The Forum gathered existing environmental information and interviewed individuals living and working in the Mona Lake watershed. Using the resulting information, the Forum characterized existing stewardship activities in the watershed and compared these against a set of elements that, if in place, would represent a "best-case stewardship scenario" for any watershed.

- The Mona Lake Watershed Council is working on projects to support the health of the watershed. First, the Council has partnered with the Lake Michigan Federation to educate residents about health concerns from contaminated sediment in Little Black Creek. The Council is also working with other partners to explore clean-up options for the creek. In addition, the Watershed Council received a grant from the Michigan Department of Environmental Quality to develop a Watershed Management Plan. The Council is also working with the Muskegon County Stormwater Committee to promote stormwater pollution prevention programs.

Land Cover: Pere Marquette-White Watershed



Watershed size: 2105 sq. miles

Between 1996 and 2001, there has been a slight increase in developed land, farmland, and forest and a slight decrease in grassland and wetlands.

- The Pere Marquette Headwaters Erosion Control Project, a 2005 Great Lakes Basin Program Project, plans to install appropriate BMPs including a combination of fieldstone, log terracing, seedling planting and brush/mulching at six severely eroded streambanks on the Baldwin River. This project aims to stabilize the banks and upper slopes, reducing the amount of sedimentation in the River.
- The Big Sable Watershed Restoration Phase I was funded by a \$142,000 grant from the Clean Michigan Initiative with a \$48,000 match. The Big Sable River includes 24 miles of mainstream and a number of tributaries that flow through Lake and Mason counties and empty into Hamlin Lake. The river's headwaters and upstream are recognized for both brook and brown trout, while downstream to Hamlin Lake is noted mostly for brown trout. Hamlin Lake is recognized as one of west Michigan's best fishing spots. The goal of this project was to reduce several of the larger contributors of sediment into Hamlin Lake.
- The White Lake AOC includes White Lake and a one-quarter mile wide zone around the lake. Most of the land around the AOC is wooded or grassy, with some sand dunes located along Lake Michigan. Land use in the AOC is primarily recreational and agricultural, and to a lesser extent residential and industrial. White Lake priorities include contaminated sediment remediation, eutrophication control, remediation of groundwater and former industrial site contamination, and habitat restoration.
- The Nature Conservancy identified the following critical ecological resources in the watershed:
 - Big Sable Point and Hamlin Lake include Great Lakes Dune Pine Forest, Great Lakes Beachgrass Dune, and Interdunal Wetland
 - The Pentwater Marsh includes Great Lakes Shoreline Cattail - Bulrush Marsh
 - The Pere Marquette watershed includes Central Cordgrass Wet Prairie and Central Cordgrass Wet Sand Prairie
 - Flower Creek and Dunes include Great Lakes Shoreline Cattail - Bulrush Marsh
 - Newaygo Prairies include Inland Coastal Plain Marsh, Midwest Dry Sand Prairie, and White Pine - White Oak Forest
 - Hoffmaster-Kitchel Dunes contains Great Lakes Beachgrass Dune
 - Stony Creek-Camp Miniwanca contains Great Lakes Shoreline Cattail - Bulrush Marsh
 - Pere Marquette River Watershed contains drowned river mouth lakes
 - Big Sable Point-Hamlin Lake is home to Pitcher's thistle
 - Pere Marquette River Watershed is home to Karner blue butterfly, and Hill's thistle
 - Flower Creek and Dunes is home to Pitcher's thistle
 - Newaygo Prairies is home to Hill-prairie spittlebug, Karner blue butterfly, and Hill's thistle
 - Hoffmaster-Kitchel Dunes is home to pitcher's thistle

Impaired (303d) Waters

Waterbody	Impairment
Big Blue Lake	Mercury (Fish Tissue)
Black Creek	PCBS Fish Consumption Advisory
Hamlin Lake	Mercury (Fish Tissue)
Lake Michigan—South of Franfort	Chlordane Fish Consumption Advisory DDT Fish Consumption Advisory Dioxin Fish Consumption Advisory PCBS Fish Consumption Advisory Mercury (Fish Tissue)
Mona Lake	PCBS Fish Consumption Advisory
Pere Marquette River	Mercury PCBS Fish Consumption Advisory PCBS
White Lake	Chlordane Fish Consumption Advisory PCBS Fish Consumption Advisory

Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

White Lake Area of Concern Activities

Location

- Includes White Lake and a one-quarter mile wide zone around the lake.

AOC Primary Contaminants

- Heavy metals
- Stormwater nonpoint pollution
- Arsenic
- Chromium

AOC Stressors

- Sediments
- Industrial contamination
- Groundwater contamination

AOC Relevant Programs

- Superfund
- RCRA

AOC Clean-up Actions

- Dredging in ATannery Bay@ (2002) – 73,000 cubic yards of waste (hides, chromium, arsenic)
- Cleanup of Occidental Chemical site in 2002
- Potential sources of groundwater contamination to White Lake and its tributaries have been identified and remediation efforts are underway
- Some eutrophication has been alleviated by improvements to the sewage collection and treatment systems
- Contaminated groundwater venting to the lake is being intercepted by purge wells and treated prior to discharge

AOC Key Activities Needed

- Assessment and further study of contaminated sites
- Stream buffers
- Coordination with RAP program for AOC delisting purposes

AOC Challenges

- Funding to pinpoint locations having greatest impact to eutrophication

AOC Next Steps

- Further study of the extent of contamination from the Whitehall Leather Company is needed, in addition to possible remediation funds.
- Assessment is needed of sediments at discharge points for other contaminated sites

Peshtigo River Watershed

Hydrologic Unit Code: 04030105

For more information, see the USEPA "Surf Your Watershed" website at:

http://cfpub.epa.gov/surf/huc.cfm?huc_code=04030105

The Peshtigo River Watershed is part of the WDNR Upper Green Bay Management Area. For more information, see the Wisconsin Department of Natural Resources' "Wisconsin's Basins" website at

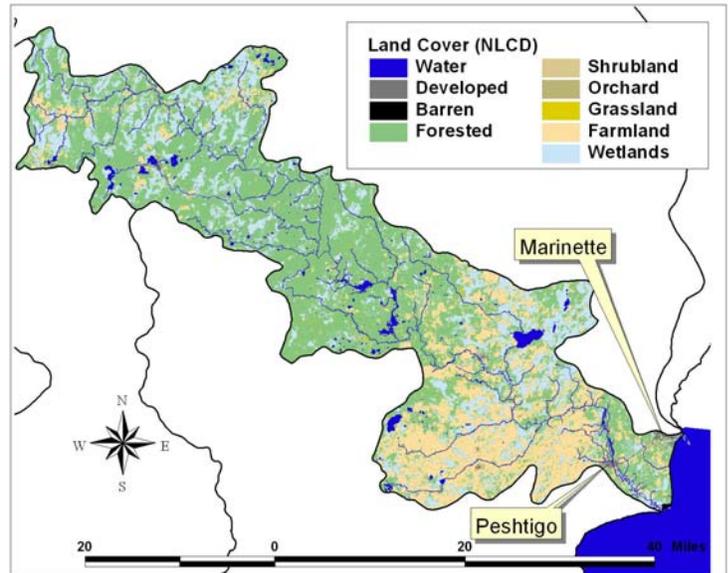
<http://dnr.wi.gov/org/gmu/gmu.html>

Watershed Groups

- Marinette County Land & Water Conservation — www.marinettecounty.com/lw_home.htm

Watershed Overview

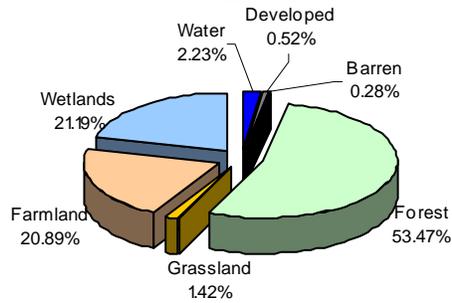
- The watershed flows into Green Bay in Wisconsin.
- The major waterways in the watershed include the Lower Peshtigo River, the Little Peshtigo River, The Middle Peshtigo and Thunder River, and the Upper Peshtigo River.
- The watershed has three listed impaired waters
- Marinette is the only urbanized area in the watershed.
- Wildlife include black bear, white-tailed deer, turkey, ring-necked pheasant, ruffed grouse, waterfowl, geese, beaver, mink, otter, timber wolves, elk, trumpeter swans, eagle, osprey, northern goshawk, shorebirds.
- Maple-basswood is the most common forest type and the tree species with the greatest volume in the basin is hard maple followed by aspen, white and red pine, soft maple and balsam fir.
- The Nature Conservancy identified the following critical habitats and ecosystems in the Peshtigo River: Great Lakes Shoreline Cattail - Bulrush Marsh; Silver Maple - Elm - (Cottonwood) Forest; White Pine - Red Oak Forest; Central Wet-Mesic Tallgrass Prairie; lake plain wetland lakes; large rivers on till plain and lake plain; cool/cold headwaters; large, cool/coldwater rivers in outwash, end moraine, and ice contact; large, headwater lakes in ground moraine, outwash, and ice contact; low gradient tributary streams on west Green Bay till plain; riverine coastal marsh; and spring-fed headwater lakes.
- The Nature Conservancy has identified the following critical species in the Peshtigo River watershed: Wood Duck; Le Conte's Sparrow; Ruffed Grouse; American Bittern; Whip-poor-will; Veery; Black Tern; Northern Harrier; Marsh Wren; Sedge Wren; Black-billed Cuckoo; Northern Bobwhite; Eastern Wood-Pewee; Yellow Rail; Cerulean Warbler; Blackburnian Warbler; hestnut-sided Warbler; Black-throated Green Warbler; Least Flycatcher; Willow Flycatcher; Bald Eagle; Wood Thrush; Baltimore Oriole; Hooded Merganser; Wild Turkey; Black-and-white Warbler; Mourning Warbler; Rose-breasted Grosbeak; American Woodcock; Clay-colored Sparrow; Field Sparrow; Forster's Tern; Golden-winged Warbler; Blue-winged Warbler; Nashville Warbler; Warbling Vireo; and Canada Warbler.



Watershed Activities / Concerns / Priorities

- The following are objectives for the Upper Green Bay management Basin, which includes the Peshtigo River watershed:
- Target the West Shore of Green Bay as a high priority for habitat protection
- Protect shoreland habitat and water quality through water regulation & zoning
- Work with local communities in developing "smart growth" plans & promoting wise land use and zoning
- Complete a comprehensive fisheries plan for the basin, focusing on the Oconto, Menominee, and Peshtigo Rivers and Lake Michigan, including addressing invasive exotic species
- Encourage sound forestry practices on public and private land and identify and manage terrestrial invasive exotic species
- Enhance educational activities for forestry, water quality, wildlife management, healthy ecosystem

Land Cover: Peshtigo River Watershed



Total Acreage = 1165 sq. miles

Between 1996 and 2001, there has been a slight increase in developed land, farmland, and forest and a slight decrease in grassland and wetlands.

Impaired (303d) Waters

Waterbody Name	Impairment
Bass Lake	Organic Enrichment/Low Dissolved Oxygen Winter Kills Nutrients
Gilas Lake	Mercury Fish Consumption Advisory
Noquebay Lake	Mercury Fish Consumption Advisory
Peshtigo River at Caldron Falls Flowage	Mercury Fish Consumption Advisory
Peshtigo River at High Falls Flowage	Mercury Fish Consumption Advisory
Peshtigo River at Peshtigo Flowage	Mercury Fish Consumption Advisory
Green Bay—South of Marinette and its tribs	Mercury Fish Consumption Advisory

Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

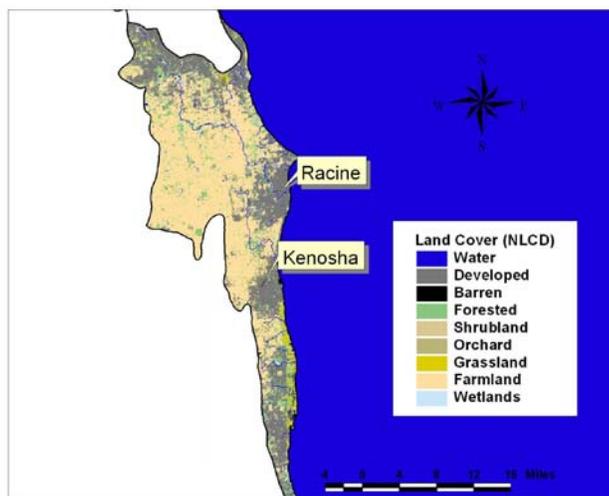
Pike-Root (Waukegan) Watershed

Hydrologic Unit Code: 04040002

For more information, see the Wisconsin Department of Natural Resources' "Wisconsin's Basins" website at <http://dnr.wi.gov/org/gmu/gmu.html> and the USEPA "Surf Your Watershed" website at http://cfpub.epa.gov/surf/huc.cfm?huc_code=04040002

Watershed Groups

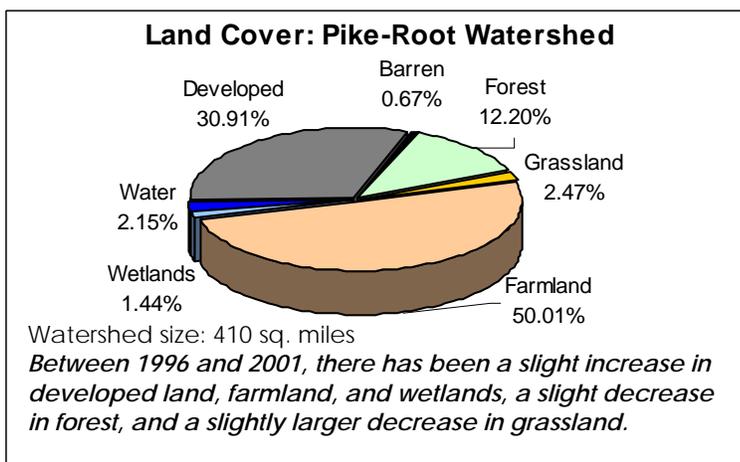
- Root-Pike Watershed Initiative Network — www.rootpikewin.org
- 1000 Friends of Wisconsin — www.1kfriends.org
- Midwest Center for Environmental Science and Public Policy — www.mcespp.org
- Sustainable Racine — www.sustainable-racine.com
- The Waukegan Harbor Citizens Advisory Group — wkkhome.northstarnet.org/iepa/page2.html
- Mike Luba, Root-Pike River Basin Water Leader — Michael.Luba@dnr.state.wi.us



Watershed Overview / Ecology / Biodiversity

- The Pike-Root watershed covers over 410 square miles and includes major subwatersheds as the Pike River, the Root River, Oak Creek, Racine Harbor, the Waukegan River, and Waxdale Creek. The watershed has over 113 miles of shoreline on the west side of Lake Michigan.
- The watershed stretches from south of Milwaukee to north of Chicago. It includes the cities of Racine and Kenosha, Wisconsin, and Waukegan, Illinois.
- The Waukegan Harbor is an Area of Concern. Waukegan Harbor consists of approximately 1.2 km² of industrial, commercial, municipal and open/vacant lands. The watershed of the expanded study area contains the Waukegan River drainage basin, the North Ditch drainage basin and other nearshore areas which drain to Lake Michigan.
- While over 50 percent of the watershed is used for agricultural purposes, 30 percent is urbanized.
- Groundwater below the surface basin has seen significant overpumping. There are several cones of depression.
- The Waukegan River, which is part of the basin, is the only river in Illinois that flows into Lake Michigan.
- The National Heritage Inventory has documented 16 endangered, 20 threatened, and 52 special concern plant and animal species and 17 rare aquatic and terrestrial species in the watershed.
- The combined effects of the draining of the majority of wetlands and stream modifications like channel manipulation have led to degraded water and habitat quality throughout the Pike- Root Basin.
- The Nature Conservancy identified critical Lakeplain Wet-Mesic Prairie, Mesic Sand Tallgrass Prairie, Interdunal Wetland, Black Oak / Lupine Barrens and Midwest Dry-Mesic Sand Prairie at the Chiwaukee Prairie-Illinois Beach.
- Chiwaukee Prairie-Illinois Beach is an important landbird stopover site and a raptor stopover site.
- Critical species identified by the nature Conservancy at the Chiwaukee Prairie-Illinois Beach include the pale false foxglove and the prairie white-fringed orchid.

Other important species identified by the Nature Conservancy include Central Cordgrass Wet Prairie, Central Cordgrass Wet Sand Prairie, Central Mesic Tallgrass Prairie, Central Water Lily Aquatic Wetland, Cinquefoil - Sedge Prairie Fen, Great Lakes Beach, Great Lakes Beachgrass Dune, Lakeplain Wet Prairie, Midwest Dry Sand Prairie, Midwest Mixed Emergent Deep Marsh, Skunk Cabbage Seepage Meadow, Tussock Sedge Wet Meadow, Blazing star stem borer moth, Forked aster, Henslow's Sparrow, Henslow's sparrow, Karner blue butterfly, Kirtland's Snake, Kirtland's snake, Pale false foxglove, Prairie white-fringed orchid, and Silphium borer moth.



Watershed Activities / Concerns / Priorities

- Recommendations for improving the Pike and Root River watersheds are:
 - Implement of urban nonpoint source best management practices.
 - Implement of agricultural nonpoint source best management practices, including buffer strip development.
 - Conduct baseline surveys on streams within the watershed.
 - Assess sediment delivery, sediment transport, and streambank erosion.
 - Conduct aquatic habitat and sediment assessments above and below dams on the Pike and Root Rivers.
 - Implement aquatic habitat restoration and water quality improvement practices.
 - Implement wetland restoration projects where practicable.
 - Evaluate dams for removal
- The Root-Pike Watershed Initiative Network awarded \$21,886 to seven area watershed projects to improve rivers and lakefronts within the Root River and Pike River watersheds in the Racine area.
- About 1 million pounds of PCBs have been dredged from Waukegan River.
- Friends of Fort Sheridan received 2005 Great Lakes Basin Program Project funding to restore the Scott Loop ravine which has eroded to build out. Restoration plans include repairing and stabilizing the down-cut ravine channel and stabilizing the ravine slopes.
- Great Lakes Basin Program Project funds were awarded to Northeastern Illinois University in 2005 to study and quantify methods of ravine restoration. Previously-installed BMPs in Illinois ravines flowing into Lake Michigan will be compared with an unimproved site to study their effectiveness.
- 2005 Great Lakes Basin Program funds support the Waukegan River Ravine Erosion Control project to implement measures to stop channel down-cutting, widening and bank erosion along the Waukegan River's North Fork .
- Using funds from the 2004 Great Lakes Basin Program, the Waukegan Harbor Citizens' Advisory Group and the Waukegan Park District sponsored five workshops to inform Waukegan River property owners about erosion control, including a demonstration of erosion control techniques. They will also create a digitally formatted laminated photographic aerial display, and design and produce four posters, two demonstrating simple erosion control methods and two more illustrating before-and-after conditions.

Impaired (303d) Waters

Waterbody Name	Impairment
Lake Michigan, WI	Mercury and PCB Fish Consumption Advisories
N. Branch Pike R., WI	Aquatic Toxicity, Fish Kills
Oak Creek, WI	Aquatic Toxicity
Racine Harbor, WI	Aquatic Toxicity, Metals
Root River, WI	Phosphorus, Organic Enrichment/Low Dissolved Oxygen, Sediment
Root River Canal, WI	Phosphorus, Organic Enrichment/Low Dissolved Oxygen, Sediment
Root River Canal W. Branch, WI	Phosphorus, Organic Enrichment/Low Dissolved Oxygen, Sediment
Root R. From Its Mouth Upstream To The Horlick Dam In Racine, WI	PCB Fish Consumption Advisory
Waxdale Creek, WI	Fish Kills, Aquatic Toxicity
Lincoln Pk North Pnd, IL	Nutrients, Phosphorus, Suspended Solids, Algal Growth, Noxious Aquatic Plants, Siltation
Pettibone Creek, IL	Priority Organics, PCBs, Metals, Arsenic, Copper Lead, Mercury, Zinc, Habitat Alterations
Pettibone Creek (S. Br.), IL	Priority Organics PCBS
Washington Park Lagoon, IL	Metals, Nutrients, Organic Enrichment/Low Dissolved Oxygen, Suspended Solids, Aquatic Weeds, Siltation
Waukegan River (Two Locations), IL	Priority Organics, PCBs, Salinity/TDS/Chlorides, Habitat Alterations
Waukegan River (South Branch), IL	Priority Organics, Nutrients, Salinity/TDS/Chlorides, Total Ammonia

St. Joseph River Watershed

Hydrologic Unit Code: 04050001

For more information, see the USEPA "Surf Your Watershed" website at http://cfpub.epa.gov/surf/huc.cfm?huc_code=04050001 or contact the Michigan Department of Environmental Quality at 517-335-6969 to request a copy of report number MI/DEQ/SQW-02/080, "A Biological Survey of the Lower St. Joseph River Watershed, Berrien and Cass Counties, 2001".

Watershed Management Plans

- Dowagiac River — Cass Conservation District — casscd.org
- Nottawa Creek — Calhoun Conservation District — www.calhouncd.org

Watershed Groups

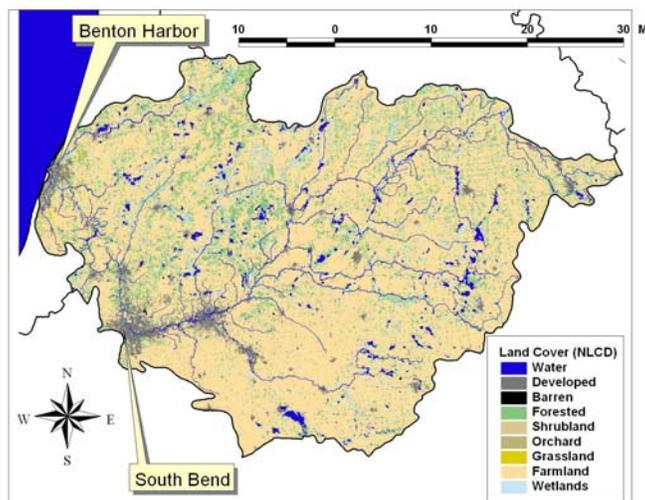
- Friends of the St. Joseph River — www.fotsjr.org
- St. Joseph River Basin Commission — www.sjrbc.com
- St. Joseph River Watershed Management Planning Project — www.stjoeriver.net
- Baugo Creek Watershed Management Plan — www.macog.com/PDFs/SJRBC/d10plnfnl.pdf
- MEANDRS — www.meandrs.org
- Pokagon Band of Potawatomi tribe—Dowagiac River watershed.

Watershed Overview / Ecology / Biodiversity

- The St. Joseph River Watershed is located in the southwest portion of the Lower Peninsula of Michigan and northwestern portion of Indiana. It spans the Michigan-Indiana border and empties into Lake Michigan at St. Joseph, Michigan.
- The watershed drains 4,685 square miles from 15 counties (Berrien, Branch, Calhoun, Cass, Hillsdale, Kalamazoo, St. Joseph and Van Buren in Michigan and De Kalb, Elkhart, Kosciusko, Lagrange, Noble, St. Joseph and Steuben in Indiana).
- The watershed includes 3,742 river miles and flows through and near the Kalamazoo-Portage, the Elkhart-Goshen, the South Bend and the St. Joseph/Benton Harbor metropolitan areas.

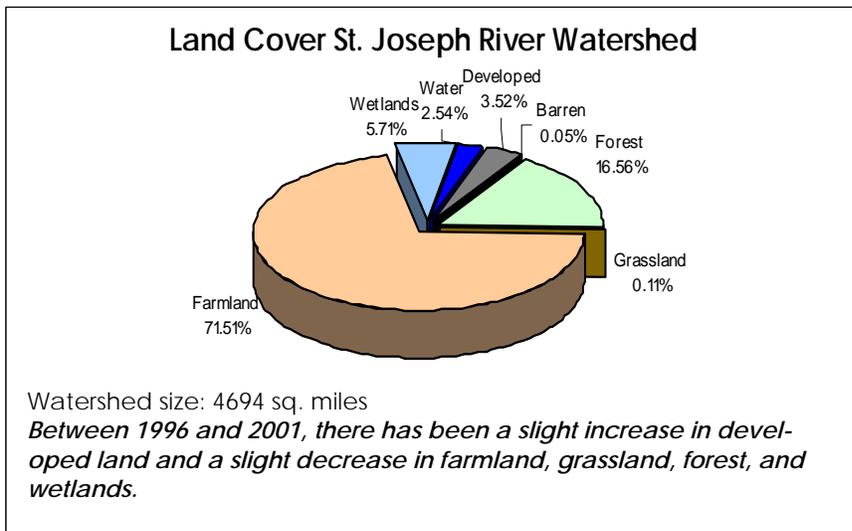
Watershed Activities / Concerns / Priorities

- The Friends of the St. Joe River was awarded a \$230,000 grant with a \$71,000 match in 2002 to develop a Watershed Management Plan for the entire St. Joseph River Watershed. This plan unites stakeholders in both Michigan and Indiana in a concerted effort to address water quality issues and natural resource protection across jurisdictional boundaries. All data compiled and reports generated as part of the planning project are available on the project website, www.stjoeriver.net. Products included: an informational brochure of the planning project; a Project WET workshop for 4-9 grade teachers in Paw Paw River Watershed; a rain garden workshop in partnership with Elkhart Environmental Center; a road/stream crossing workshop that helped stakeholders quantify sediment loads; volunteer stream monitoring training session for high school teachers and students; non point source modeling report; SWAT & urban storm water BMP effectiveness reports; and a report analyzing the mitigation needs and preservation potential of subwatersheds. A supplemental grant allowed the Friends of the St. Joe River to ensure that the watershed plan meets the nine minimum elements of watershed plans as required by USEPA.
- The St. Joseph watershed project has generated maps of subwatersheds, cities, USGS water resources stations, digital elevations, wetlands, river valley segments, land use, average annual precipitation, 1950-1999, designated trout streams, geological features, and soils.
- Under the Dowagiac River watershed management plan, nine municipalities in the Dowagiac River watershed have or will receive technical and/or financial assistance to work on master plans and zoning ordinances to protect farmland,



open space, rural character, wetlands, floodplains and water quality.

- Using Indiana's 2001 Incremental Funds from the federal 319 grant program, the Five Lakes Conservation Association, Inc. is developing a comprehensive management plan for the Little Elkhart Creek-Messick-Oliver Lake, Little Elkhart Creek-Dallas Lake, and Little Elkhart Creek-Tamarack-Cree Lakes watersheds that make up the headwaters of the Elkhart River. The Association plans to support a Watershed Planning Team, made up of experts and representatives from each watershed; conduct community outreach activities; hold at least eight public meetings; and conduct water quality and macroinvertebrate monitoring.
- Using Indiana's 2003 Incremental Funds from the federal 319 grant program, the Steuben County Commissioners is developing a watershed management plan for the Pigeon Creek watershed within Steuben County. The Commissioners plan to create a Planning Committee consisting of local officials, landowners, interested parties, experts, and representatives from cities and towns; develop a series of GIS maps and GPS information; develop a watershed map; hold at least three additional public meetings; and disseminate at least eight news releases to educate the public and encourage participation in the process.
- Using Indiana's 2001 Base Funds from the federal 319 program, Elkhart County Commissioners will be conducting water quality monitoring and engineering and geospatial analyses on 14-digit hydrologic unit code (HUC) watersheds in Elkhart County to prioritize watersheds according to levels of E. coli contamination. The Commissioners will educate the public on water quality issues in the three highest priority watersheds. They will also develop a watershed management plan (using stakeholder input and support) for the watershed most affected by E. coli contamination.
- Using 319 grant funds, the St. Joseph River Watershed Initiative will determine source of fecal contamination in the St. Joseph-Lake Erie watershed and northeastern Indiana; continue a trend water quality monitoring program; and develop a watershed management plan for the Cedar Creek subwatershed. The Initiative will also hold stakeholder meetings and conduct public outreach and education programs.
- The St. Joseph River Watershed Initiative is working to implement the St. Joseph River Watershed Management Plan by providing cost-share assistance to farmers for modification of their planting, tillage, and/or harvesting equipment to allow them to effectively implement conservation tillage and/or nutrient and pest management. Farmers will maintain accurate records where the conservation tillage equipment was used in comparison to a conventional tillage system. This information, when compiled, will provide an opportunity to evaluate the agronomic and economic performance of the conservation tillage system.
- Using Indiana's 2001 Incremental Funds, the Crooked Lake Association plans to reduce sediment and nutrient inputs into Crooked Lake by constructing approximately five sediment and nutrient retention basins/wetlands in the Crooked Lake watershed. The Association will conduct water quality monitoring before and after the construction of the retention basins/wetlands to determine their effectiveness. They will also conduct visual monitoring of sediment plumes following rain events and provide photographic documentation of the monitoring effort.
- The Crooked Lake Association will undertake a project to install 10 water bars and 750 lineal feet of drainage swale across and adjacent to existing gravel roads within the Steuben County 4-H Park, a known source of excessive sedimentation, loss of plant beds, and a decline in water clarity in the Crooked Lake. Rain gardens will also be installed to store and retain stormwater within the park. An education outreach program will be developed. This project is funded through the 2005 Great Lakes Basin Program.
- The most significant water quality problem in Lake George is excess sediment, much of it from severely eroding shorelines. The Lake George Sediment Control project, organized by the City of Hobart, will: 1) stabilize the eroding banks of Lake George with bioengineering methodology; 2) increase the habitat value of the riparian zone by establishing vegetation; 3) decrease the loss of shoreline oak trees; and 4) increase public awareness of erosion issues and environmentally friendly erosion control techniques. It is funded under the 2005 Great Lakes Basin Program.
- The St. Joseph River Erosion Reduction Project, using funds from the 2004 Great Lakes Basin Program, will work with partner conservation districts for farmer-to-farmer outreach efforts in six counties to sell conservation programs, thereby increasing buffers/filter strips in the watershed. It will also create digitized records, including an electronic database and GIS mapping, of conservation practices on the land within the watershed, in order to more



accurately and efficiently pinpoint critical areas in need of conservation and target efforts for reducing erosion and pollution.

- The High Drive Park/Christiana Creek Bank Restoration will stabilize Christiana Creek by installing biologs along with native plant material. The proposed plant material has the ability to filter out contaminants at a much higher rate than non-native plant material, thus improving the water quality and increasing its value to the overall health of the environment.
- The City of Watervliet, with support from the 2004 Great Lakes Basin Program, will incorporate porous pavement, rain gardens, and interpretive signs to increase awareness of "green" development techniques within the city. The project will incorporate one of the community's greatest natural resources, the Paw Paw River, to attract users to the site.

Basin Prioritization of Concerns

- The Watershed Concerns have been prioritized by the Steering Committee, according to the importance of each concern and the ease of implementing BMP's to correct those concerns, in the following manner:
 1. Sediments (tie)
 1. Nutrients (tie)
 3. Habitat Loss
 4. Wetlands (tie)
 4. Animal Waste (tie)
 6. Pesticides (tie)
 6. Urbanization & Land Use (tie)
 8. Biota
 9. CSO's
 10. Pathogens (tie)
 10. Hydrologic Modification (tie)
 10. Litter (tie)

Surface Water Designated Use Targets

- Warm and cold water fisheries
- Other indigenous aquatic life/wildlife
- Partial body contact, recreation
- Full body contact, recreation (May - October)
- Navigation
- Public Water Supply: Surface Intake Point
- Industrial Water Supply
- Agriculture
- Certain water bodies are also protected as a coldwater fishery

Additional Basin Designated Use Targets

- Groundwater
- Habitat preservation
- Increased public access (to the river/streams)
- Archeological preservation
- Preserve agricultural uses and access
- Preserve open space
- Greenways
- Public water trails
- Watershed linkages
- Manage invasive species

Impaired (303d) Waters

Waterbody Name	Impairment
Austin Lake, MI	Mercury (Fish Tissue)
Barton Lake, MI	Mercury (Fish Tissue) PCBs Fish Consumption Advisory
Coldwater Lake, MI	Mercury (Fish Tissue)
Dowagiac River, MI	PCBs Fish Consumption Advisory
Crawford Ditch, IN	Copper, Oil And Grease
Elkhart, River, IN	E. Coli, Mercury Fish Consumption Advisory, PCBs Fish Consumption
Eau Claire Extension Drain, MI	Macroinvertebrate Community Rated Poor
Farmers Creek, MI	Pathogens, Nuisance Plant Growth, Untreated Sewage Discharges, Pathogens
Fawn River, MI	PCBs Fish Consumption Advisory
Lake Chapin (St. Joseph River), MI	PCBs Fish Consumption Advisory
Mckinzie Creek, MI	Fish Community Rated Poor
Ox Creek, MI	Macroinvertebrate Community Rated Poor, Fish Consumption Advisories (PCBs)
Palmer Lake, MI	Mercury (Fish Tissue)
Randall Lake (North Lake and Cemetery Lake Chain), MI	PCBs Fish Consumption Advisory Mercury (Fish Tissue)
St. Joseph River, MI	PCBs Fish Consumption Advisory PCBS
St. Joseph River, MI	Mercury
Union Lake, MI	PCBs Fish Consumption Advisory

Waterbody Name	Impairment
Jimmerson Lake, IN	Mercury Fish Consumption Advisory
Juday Creek, IN	PCBs Fish Consumption Advisory
Lake James, IN	Mercury Fish Consumption Advisory
Lake Shipshewana, IN	PCBs Fish Consumption Advisory
Lake Wabee, IN	Mercury Fish Consumption Advisory
Lake Wawasee, IN	Mercury Fish Consumption Advisory PCBs Fish Consumption Advisory
Long Lake, IN	Mercury Fish Consumption Advisory
Marsh Lake, IN	Mercury Fish Consumption Advisory
Mather's Ditch, IN	Dissolved Oxygen, Endrin
Mud Creek, IN	Ammonia Dissolved Oxygen
Olin Lake, IN	Mercury Fish Consumption Advisory
Oliver Lake, IN	Mercury Fish Consumption Advisory
Orland Tributary, IN	Dissolved Oxygen
Pigeon Creek, IN	Mercury Fish Consumption Advisory PCBs Fish Consumption Advisory
Snow Lake, IN	Mercury Fish Consumption Advisory PCBs Fish Consumption Advisory
St. Joseph River, IN	E. Coli , Mercury Fish Consumption Advisory, PCBs Fish Consumption Advisory
Tippecanoe Lake, IN	Mercury Fish Consumption Advisory

Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

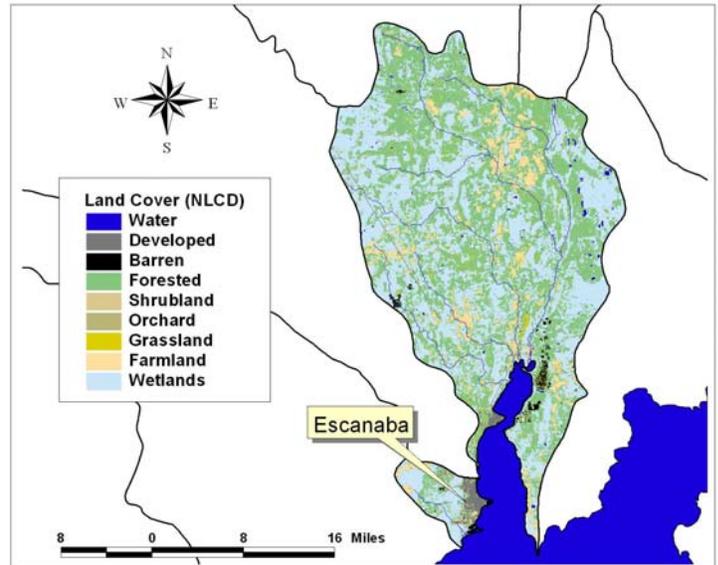
Tacoosh-Whitefish Watershed

Hydrologic Unit Code: 04030111

For more information, see the USEPA "Surf Your Watershed" website at:
http://cfpub.epa.gov/surf/huc.cfm?huc_code=04030111

Watershed Overview / Ecology / Biodiversity

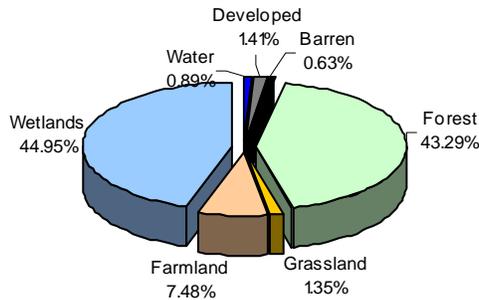
- The Tacoosh-Whitefish watershed is located in the upper peninsula of Michigan and covers approximately 633 square miles.
- The watershed has almost 53 miles of Lake Michigan shoreline.
- Escanaba, Michigan is the lone large urbanized area in the watershed.
- The watershed is mostly forest and wetland.
- The watershed includes parts of the Hiawatha National Forest.
- The watershed supports a world-class Walleye fishery and is an important spawning stream.



Impaired (303d) Waters

Waterbody Name	Impairment
Little Bay De Noc (Lake Michigan)	PCBS Fish Consumption Advisory Mercury (Fish Tissue)

Land Cover: Tacoosh-Whitefish Watershed



Watershed Size: 633 sq. miles

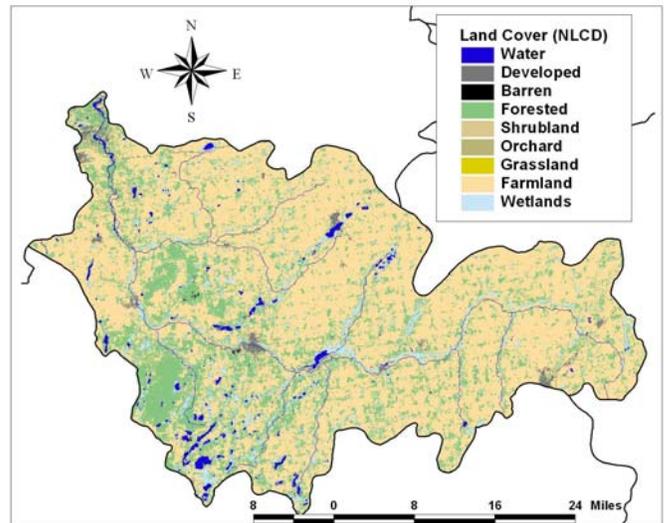
Between 1996 and 2001, there has been a slight increase in grassland, developed land, and farmland and a slight decrease in forest and wetlands.

Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

Thornapple River Watershed

Hydrologic Unit Code: 04050007

For more information, see the USEPA website at: http://cfpub.epa.gov/surf/huc.cfm?huc_code=04050007 or contact the Michigan Department of Environmental Quality at 517-335-6969 to request a copy of report number MI/DEQ/SWQ-02/001, "A Biological Survey of the Thornapple River and Selected Tributaries, 1998".



Watershed Management Plans

- Coldwater River — Coldwater River Watershed Council

Watershed Organizations

- Coldwater River Watershed Council — www.coldwateriver.org
- Thornapple River Watershed Council — www.thornappleriver.org
- Thornapple River Environmental Issues — www.thornappleriver.com
- Western Michigan Environmental Action Committee — www.wmeac.org
- Coldwater River Watershed Project — www.gvsu.edu/wri/isc/



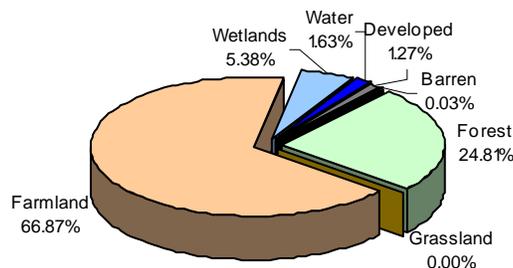
Watershed Overview / Ecology / Biodiversity

- The Thornapple River watershed flows into the Lower Grand River watershed.
- The watershed covers over 855 square miles.
- Over 83 percent of the watershed is in agricultural use.
- 324 miles of the watershed's streams and rivers flow year-round.

Impaired (303d) Waters

Waterbody Name	Impairment
Bear Creek (Tyler Creek)	Pathogens
Coldwater River	Pathogens
Jordan Lake	Mercury (Fish Tissue)

Land Cover Thornapple River Watershed



Watershed size: 857 sq. miles

Between 1996 and 2001, there has been a slight increase in developed land, farmland, forest, and wetland and a slight decrease in grassland.

Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

Lake Winnebago Watershed

Hydrologic Unit Code: 04030203

For more information, see the USEPA "Surf Your Watershed" website at

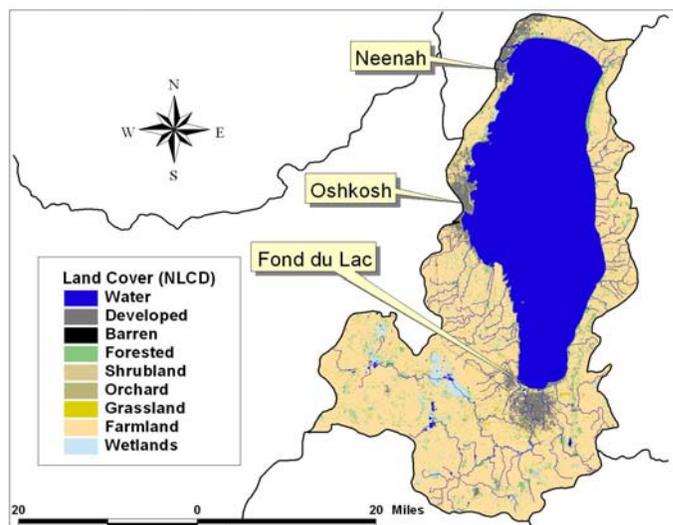
http://cfpub.epa.gov/surf/huc.cfm?huc_code=04030203

The Wisconsin DNR manages the Lake Winnebago watershed as part of the Upper Fox River basin management area. For more information, see the Wisconsin Department of Natural Resources' "Wisconsin's Basins" website at

<http://dnr.wi.gov/org/gmu/gmu.html>

Watershed Contacts

- The University of Wisconsin-Extension — basineducation.uwex.edu/foxwolf
- Fox Wolf Watershed Alliance — www.fwwa.org
- Lake Michigan Forum — www.lkmichiganforum.org
- Fond du Lac County Land & Water Conservation Department — www.co.fond-du-lac.wi.us/dept/landcon/landcon.html
- Fond du Lac River Priority Watershed Project — www.wclwcd.org/fdl.htm
- Winnebago County Land & Water Conservation Department — www.wclwcd.org
- Rob McLennan, the Upper Fox River Water Basin Team Leader — Robin.McLennan@dnr.state.wi.us



Watershed Overview / Ecology / Biodiversity

- The Lake Winnebago watershed covers over 581 square miles.
- Over 200 square miles of the watershed are lakes, the largest being Lake Winnebago.
- The watershed is located between the Upper and Lower Fox Rivers in Wisconsin.
- The watershed is primarily glacial plain.
- The watershed is above a sandstone aquifer.
- The Niagra Escarpment, a bedrock ridge, forms the eastern boundary of the Lake Winnebago watershed.
- Menasha, Oshkosh, and Fond du Lac, Wisconsin are the primary urbanized areas located in the watershed.
- High Cliff State Park is a 1,145 acre state park located in Calumet County.
- A Glacial Habitat Restoration Area (GHRA) is located in the watershed in Winnebago and Fond du Lac counties. The GHRA is an area where the state is restoring a patchwork of grasslands and wetlands over a large rural landscape so that wildlife can thrive side-by-side with agriculture.
- The basin hosts resident and migratory neo-tropical songbirds in its open grassland/ agricultural habitat.

Watershed Activities / Concerns / Priorities

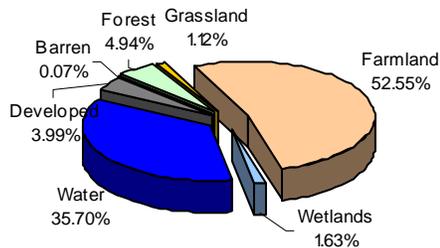
- Numerous urban stormwater outfalls discharge to Lake Winnebago from portions of the Cities of Oshkosh, Neenah, and Menasha. Storm event runoff from commercial, industrial, and residential construction sites and from plat developments in rapidly developing sections of Oshkosh, Neenah, and Menasha are also nonpoint source pollution problems.
- Water quality modeling done by Northeast Wisconsin Waters of Tomorrow (NEWWT) have indicated this watershed to be a major contributor of phosphorus and suspended solids to Lake Winnebago.
- Critical animal waste and soil erosion problems are intensified by the steep slopes along the Niagara escarpment.
- Average soil loss in all of Calumet County is estimated to be 2.7 tons per acre. These factors accelerate nutrient and sediment delivery to Lake Winnebago. Both the Winnebago Comprehensive Management Plan and the Lower Green Bay Remedial Action Plan identified this watershed as a high priority for the control of nonpoint sources of pollution.
- The eastern portion of the watershed was selected as a nonpoint source priority watershed project in 1989. The primary goals of this watershed project are to reduce Phosphorus and sediment loading to Lake Winnebago and decrease the loading of heavy metals from urban nonpoint sources.

- The Winnebago County Land & Water Conservation Department in Wisconsin, through the 2004 Great Lakes Basin Program, will sponsor a pair of one-day workshops aimed at examining compliance with existing Erosion Control & Storm Water Management Ordinance in Winnebago County and other storm water management issues targeted to elected officials, designers and developers. The LWCD will also prepare a full-color, four-fold informational brochure covering erosion control practices, installation, operation and maintenance.

- Lake Winnebago specific fisheries priorities include:

- Continue the Lake Winnebago Fisheries Community Assessment through trawling, seining, shocking, and netting to characterize the Lake Winnebago fish community and assess year-class strength.
- Continue lake sturgeon management in the Winnebago-Fox-Wolf System. Conduct population and harvest assessments; continue public involvement and education; work closely with the Winnebago Citizens Sturgeon Advisory Committee; pursue Upper Fox River long term sturgeon spawning stock rehabilitation, spawning, and nursery habitat protection and enhancement; cooperate with other regional, statewide, national, and international sturgeon management and research programs; and prepare the annual Winnebago System Sturgeon Management report, direct sturgeon registration, and annual sturgeon determine harvest cap for the spearing season.

Land Cover: Lake Winnebago Watershed



Watershed size: 581 sq. miles

Between 1996 and 2001, there has been a slight increase in developed land, grassland, and wetlands and a slight decrease in farmland and forest.

Impaired 303(d) Waters

Waterbody Name	Impairment
Deneveu Creek	Degraded Habitat Sediment
Fond Du Lac River	Metals Fish Consumption Advisories (Mercury) Fish Consumption Advisories (PCBs) TOC
Lake Winnebago	Nutrients Phosphorus Dissolved Oxygen Eutrophication Fish Consumption Advisories (Mercury) Fish Consumption Advisories (PCBs) Sediment
Fox River, Oshkosh	Aquatic Toxicity
Fox River, Lower Seg 1 (1)	Phosphorus Dissolved Oxygen Fish Consumption Advisories (PCBs)
Mosher Creek	Degraded Habitat Sediment
Parsons Creek	Degraded Habitat Sediment

Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)

Wolf River Watershed

Hydrologic Unit Code: 04030202

For more information, see the USEPA "Surf Your Watershed" website at

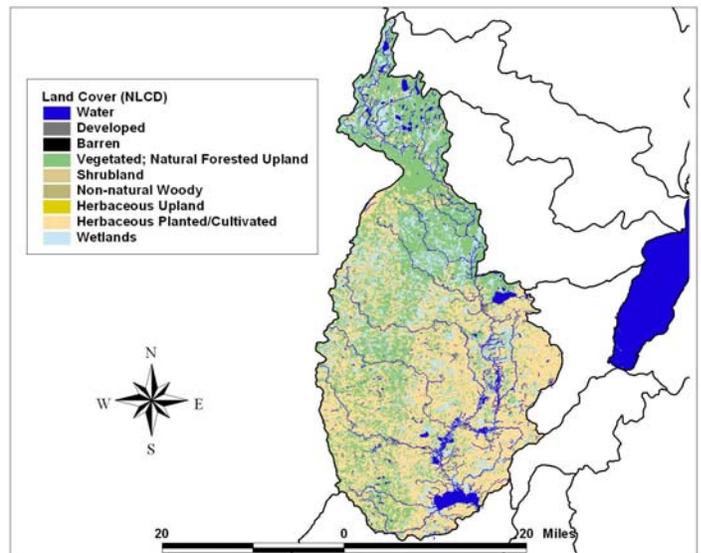
http://cfpub.epa.gov/surf/huc.cfm?huc_code=04030202

For more information, see the Wisconsin Department of Natural Resources' "Wisconsin's Basins" website at

<http://dnr.wi.gov/org/gmu/gmu.html>.

Watershed Groups

- The University of Wisconsin-Extension – basineducation.uwex.edu/foxwolf
- Fox Wolf Watershed Alliance — www.fwwa.org
- Lake Michigan Forum — www.lkmichiganforum.org
- Wolf River Basin — www.dnr.wi.gov/org/gmu/wolf
- Dan Helf, Wolf River Basin Water Team Leader — Daniel.Helf@dnr.state.wi.us



Watershed Overview / Ecology / Biodiversity

- The Wolf Basin's general topography can be characterized by rolling hills, plain meadows, lush and forested wetlands, numerous lakes and small tributaries. Vegetation consists primarily of hardwood forests mixed with large amounts of hemlock, northern white-cedar swamp, and hardwood-conifer swamp.
- The Wolf River originates with a discharge from Pine Lake located in Forest County. The river flows south for about 203 miles until it reaches Lake Poygan. At that point it becomes part of the Winnebago Lake system. Waters from the Winnebago system then flow into the Lower Fox River where they eventually reach the Bay of Green Bay.
- Development within the basin is predominately along the Wolf River or its major tributaries. Communities like Shawano, Clintonville, New London, Waupaca, Weyauwega and more were developed primarily because of being located on waterways that were used by the logging industry
- The Basin includes the Northern Hills and Northeast Plains Ecological Landscapes with small portions in the Central Sand Hills, Southeast Glacial Plains and North Central Forest.
- Surface waters are a mix of cold and warm water streams with smallmouth bass, walleye, northern pike, panfish, trout and salmon. Groundwater is generally abundant, clean and used for drinking water in many of the basin's communities.
- Over 143 rare animal species live in the Wolf River Basin, including northern goshawk, red-headed woodpecker, great gray owl, barn owl, red-shouldered hawk, bald eagle, osprey and various butterflies, beetles, dragonflies, fish, grasshoppers, mayflies, mussels, mammals, snails, snakes and turtles.
- The basin supports 57 rare plant (known accounts), including 8 state endangered, 11 state threatened, 38 special concern and two federally listed plants species. The majority of these plants are associated with wetlands.
- Menominee, Stockbridge-Munsee Band of Mohicans, Forest County Potawatomi Community, Sokaogon Chippewa, and Mole Lake-- participate in the Wisconsin NRCS Tribal Conservation Advisory Council
- The Nature Conservancy identified the Wolf Lake Chain, the Lower Wolf River, oxbow lakes, and rapids reach of the mainstem Wolf River as critical ecological systems.
- Important plant communities in the Wolf River watershed include Midwest Mixed Emergent Deep Marsh, Silver Maple - Elm - (Cottonwood) Forest, and Tussock Sedge Wet Meadow.
- The Nature Conservancy identified the Wolf River as a critical migratory waterfowl stopover site.
- The Nature Conservancy identified the following critical species in the Wolf River watershed: Lake sturgeon; American Bittern; Black Tern; Sedge Wren; Cerulean Warbler; Snuffbox; Wood Thrush; Red-headed Woodpecker; Black-and-white Warbler; Round pigtoe; Prothonotary Warbler; Golden-winged Warbler; and Blue-winged Warbler.
- The Lower Embarrass River's large tributaries to the lower Wolf River and cool headwaters are critical ecological systems identified by the Nature Conservancy.
- Critical species in the Lower Embarrass River include the Lake Sturgeon, Snuffbox, Round Pigtoe, Pygmy snaketail, Salamander mussel, and Western sand darter.

Watershed Activities / Concerns / Priorities

Environmental Concerns

- Loss of aquatic habitat and open land to development; pollution threats to surface and groundwater. Simplification of diverse habitat and loss of special places that support rare species.
- Water quality problems from in- place pollutants, dams, urban and agricultural runoff.
- Preserve of biodiversity and protect endangered and threatened species.
- Protection of large contiguous blocks of forests, grassland and wetland that serve as habitat for mammals, birds, and amphibians and provide a large self-sustaining ecosystem for all to enjoy.
- Invasive exotic nuisance species: purple loosestrife, gypsy moths, zebra mussels, Eurasian water milfoil, garlic mustard (uplands), and others.
- Monitoring wildlife populations, water quality, and ecosystem function is needed to the status and trends of resources in the basin.

Basin Priorities

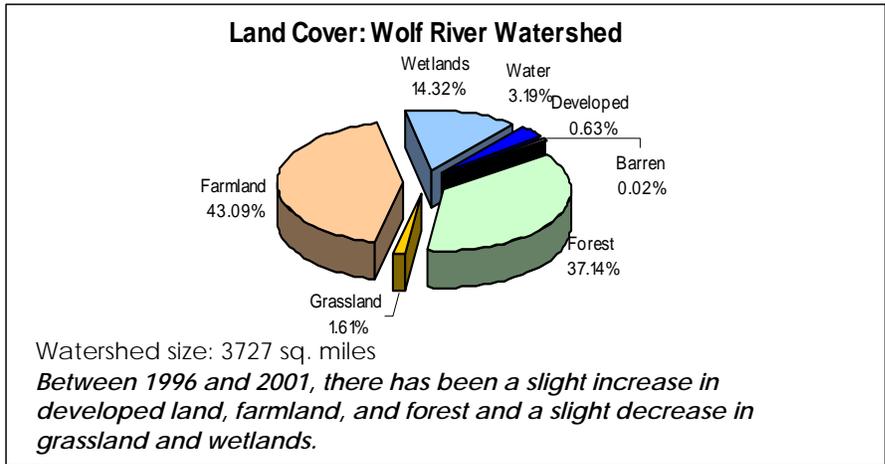
Wolf Basin Partners identified the following areas as highest basin priorities:

- Water Pollution
- Loss of Shoreline Habitat
- Hunting/ Fishing/ Trapping and Recreational Uses
- Inventory of Resources

Wisconsin DNR's Wolf Team has also identified priorities to guide work:

- Preservation and protection of wetlands
- The presence and spread of exotic species
- Pressures on Natural Resources from development
- Promoting sound land use and "smart growth" or comprehensive planning

Data Sources. Land cover map and percentages: National Land Cover database, 1992 (<http://edc.usgs.gov/products/landcover/nlcd.html>); Land use change: NOAA Coastal Change Analysis Program, 1996 and 2001 (<http://www.csc.noaa.gov/crs/lca/ccap.html>); Total Maximum Daily Load (TMDL) Impaired Waters: Surf Your Watershed (www.epa.gov/surf)



Impaired (303d) Waters

Waterbody Name	Impairment
Arbutus Lake	Mercury Fish Consumption Advisory
Bear Creek	Degraded Habitat Sediment
Big Hills Lake	Mercury Fish Consumption Advisory
Carpenter Creek	Degraded Habitat Sediment
Cloverleaf Chain of Lakes	Mercury Fish Consumption Advisory
Collins Lake	Mercury Fish Consumption Advisory
Columbia Lake	Mercury Fish Consumption Advisory
Deep Hole Lake	Mercury Fish Consumption Advisory
Kusel Lake	Mercury Fish Consumption Advisory
Little Sand Lake	Mercury Fish Consumption Advisory
Mayflower Lake	Mercury Fish Consumption Advisory
Poygen Lake	Mercury Fish Consumption Advisory PCBs Fish Consumption Advisory Organic Enrichment/Low Dissolved Oxygen Sediment
Rat River *	Organic Enrichment/Low Dissolved Oxygen Phosphorus
Rat River *	Organic Enrichment/Low Dissolved Oxygen Phosphorus
Roberts Lake	Mercury Fish Consumption Advisory
Shawano Lake	Mercury Fish Consumption Advisory
Winneconne Lake	Phosphorus Mercury Fish Consumption Advisory PCBs Fish Consumption Advisory Organic Enrichment/Low Dissolved Oxygen Eutrophication Sediment
Wolf River Below Shawano Dam Down To State Hwy 156	Mercury Fish Consumption Advisory PCBs Fish Consumption Advisory
Wolf River from Shawano Dam to Lake Poygan	PCBs Fish Consumption Advisory