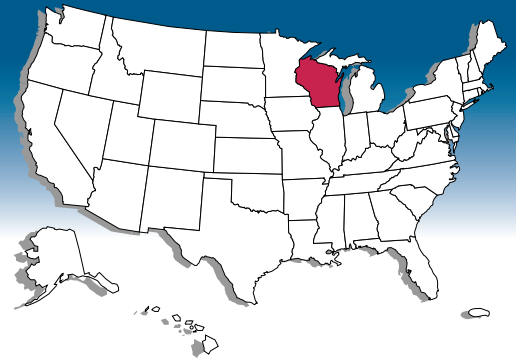




# U.S. Geological Survey Programs in Wisconsin

U.S. Department of the Interior ■ U.S. Geological Survey



The U.S. Geological Survey (USGS) has served as the Nation's principal collector, repository, and interpreter of earth science data for more than a century. In this capacity, the USGS in Wisconsin works in partnership with State, county, municipal public works departments, public health agencies, water and sanitation districts, Indian agencies, and other Federal agencies. This Fact Sheet describes some of the current USGS activities in Wisconsin.

## Mercury Studies

Evaluation of data from the waters and biota of many Wisconsin lakes indicates a statewide problem of mercury contamination in the natural water system. Numerous advisories have warned against consumption of fish from about one-third of Wisconsin's 15,000 lakes. Mercury is known to be toxic to both animals and plants.

The USGS and the Wisconsin Department of Natural Resources (DNR) are cooperating in a study of the processes responsible for the aquatic transport and transformation of mercury. The project will determine the accumulation rates of mercury in sediments, quantify fluxes of mercury from sediments, and determine variations in mercury accumulations in bottom sediments.

The USGS Mercury Laboratory, which is located in Madison, is involved with mercury-contamination issues across the Nation.

## National Water-Quality Assessment Program

The Western Lake Michigan Drainages study unit (fig. 1), begun in 1991, is one of 60 study units planned to be examined as a part of the National Water-Quality Assessment Program. The goals of the Program are to: provide a nationally consistent description of water-quality conditions for a large part of the Nation's water resources; define long-term trends in water quality; and describe, as possible, the major factors that affect water quality. Part of the surface-water component of the study includes sampling for nutrients, major ions, and suspended sediment at 8 gaging stations. These sites, identified in figure 1, were

chosen to represent the diversity in land use, surficial deposits, and bedrock in the study unit.

A survey was designed to determine how well the fixed-site network represents the water quality of the study unit. The study examined nutrient and suspended sediment concentration and transport at 95 sites during base flow in the summer of 1995. The study indicated that the fixed sites represent sites with similar environmental characteristics and represent the range in concentrations found in the study unit. The basins of each of the sites are color coded based on the measured total phosphorus concentration (fig. 1).

## Submergence of the Lake Superior Shoreline

The most recent period of glaciation loaded and depressed the land surface in the Great Lakes area until about 9,000 years ago. With melting of the glaciers, the Western Lake Superior Basin is slowly tilting from the northeast to the southwest because of elastic land-surface rebound following glacier melting and unloading of the land surface.

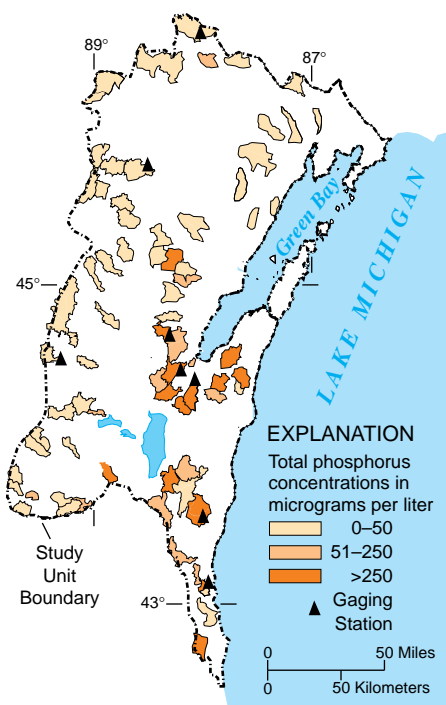


Figure 1. Phosphorus concentrations throughout Western Lake Michigan Drainages.

## Index of Subjects

- Mercury Studies
- National Water-Quality Assessment Program
- Submergence of the Lake Superior Shoreline
- Streamflow Trends
- Geologic Studies
- Geologic Mapping
- Topographic Mapping
- Earth Science Information Centers
- Mapping Partnerships
- Sharing Spatial Data
- Water-Resources Data
- Polychlorinated Biphenyls
- Biological Resources Division
- Nonpoint-Source Pollutant Monitoring

The spillway area into the St. Marys River at Sault Ste. Marie is rising more rapidly than most other points along the U.S. shore of Lake Superior. As the outlet rises, the accompanying lake surface rises and covers the shore at an increasing amount westward from Sault Ste. Marie to Duluth, Minnesota. Scientists of the USGS, in cooperation with the National Park Service and the Michigan and the Wisconsin Sea Grant Programs, have documented about 15 feet of submergence during the past 2,000 years at the Apostle National Lakeshore near Bayfield. Submerged wetlands and forests are evident below the present lake level. Farther west at Duluth, there is as much as 18 feet of submergence. The rates of lake-level rise at these areas are on the order of 1 inch per decade. The rising lake level, which is attributable to uplift at the outlet, will continue to inundate low-lying areas and river mouths, to expand wetlands, and to contribute to erosion of exposed shores.

## Streamflow Trends

Long-term trends of streamflow are being evaluated as a part of the basic-records program. It has long been suspected that streamflow characteristics were changing in response to a number of changes in agricultural practices and land use.

To check this possibility, the USGS used nine unregulated streamflow-gaging stations in southern Wisconsin where the predominant land use is agricultural. Three unregulated stations, used for control, were in forested areas, in the central and northern part of the State.

A comparison of the two types of stations is shown for the period between 1914 and 1991 in figure 2. The Sugar River near Brodhead had a significant decrease in annual peak flows and a significant increase in 7-day low flows. This trend was observed at the other eight gaging stations in the agricultural areas. During this period, the agricultural areas had substantial increase in contour strip cropping, crop rotation, contour plowing, gully filling, and conversion of hillside pasture to wood lots.

The Wolf River, which is in the central part of the State, remained predominantly forested. Neither annual peak flows nor 7-day low flows showed any change. This lack of trend also was observed at the other two gaging stations in forested areas.

Long-term rainfall records at Green Bay and La Crosse had no apparent trends during this period. Rainfall trends at Milwaukee, Wisconsin, and Dubuque, Iowa had slight upward trends. These upward trends might explain some of the upward trending low flows, but not the downward trending peak flows in the Sugar River. The trends imply the following:

- Use of long-term records as a guide to estimate of future flow characteristics is invalid because the data population might be changing.

- Decreased flood peaks have resulted in improved drainageways and stream channels;
- Combined increased baseflow and decreased flood peaks has had a positive effect on fish populations;
- The trend validates the effectiveness of the U.S. Department of Agriculture (USDA) National Resources and Conservation Service's best-management practices.

## Geologic Studies

The USGS has completed a prototype quantitative national assessment of mineral resources for five commonly used metals—gold, silver, copper, lead, and zinc. The assessment was based on geological, geophysical, and geochemical studies. Some regions of Wisconsin contain identified resources of these metals, whose extraction and processing form the basis for an enhanced regional economy.

The assessment identifies the significant known deposits and the areas with mineral potential and estimates the quantity of each mineral likely to be present. Major beneficiaries of the assessment are other Federal agencies, the State of Wisconsin, industry, and the general public. This information is available

in USGS Open-File Report 96-96 and on CD-ROM.

The USGS continues to study the bedrock geology and geologic resources of the State. Geologic maps at 1:100,000 scale are being prepared for several 30 X 60-minute quadrangles in the northern part of the State.

In related studies, airborne geophysical studies are being conducted in parts of northwestern Wisconsin. The surveys determine local variations in the Earth's magnetic and electric fields. These data are useful in inferring the type of bedrock and structures, such as faults and fractures, in the subsurface and in areas where bedrock is concealed by younger deposits of clay, sand, and gravel.

The USGS also is producing a desktop geographic information system that contains information on the State's bedrock geology and the location and character of mines and mineral deposits. The system allows users to search data bases on geology and mineral resources and to construct custom-made maps, graphs, and tables of mineral resource-related information.

## Geologic Mapping

The STATEMAP component of the National Cooperative Geologic Mapping Program is a funding tool whereby the USGS coordinates a 50:50 Federal:State dollar match that supports mapping projects by State geological surveys. By means of a competitive process, the State geological surveys generate funding for geologic mapping to resolve issues of groundwater protection, waste-disposal siting, mineral-resource identification, and land-use planning. Current STATEMAP projects in Wisconsin involve mapping of Quaternary materials in Walworth and Manitowoc Counties.

## Topographic Mapping

Among the most popular and versatile products of the USGS are its 1:24,000-scale topographic maps (1 inch on the map represents 2,000 feet on land surface). These maps show basic natural and cultural features of the landscape, such as lakes, streams, highways, railroads, boundaries, and geographic names. Contour lines show the elevation and shape of the terrain. Wisconsin is covered by 1,169 maps at this scale, which is useful for civil engineering, land-use planning, natural-resource monitoring, and other technical applications. These maps are favorites of the general public for outdoor uses, including hiking, camping, exploring, and back-country hunting and fishing.

The USGS coordinates mapping activities in the State with the Wisconsin Land Information Board (WLIB), which comprises

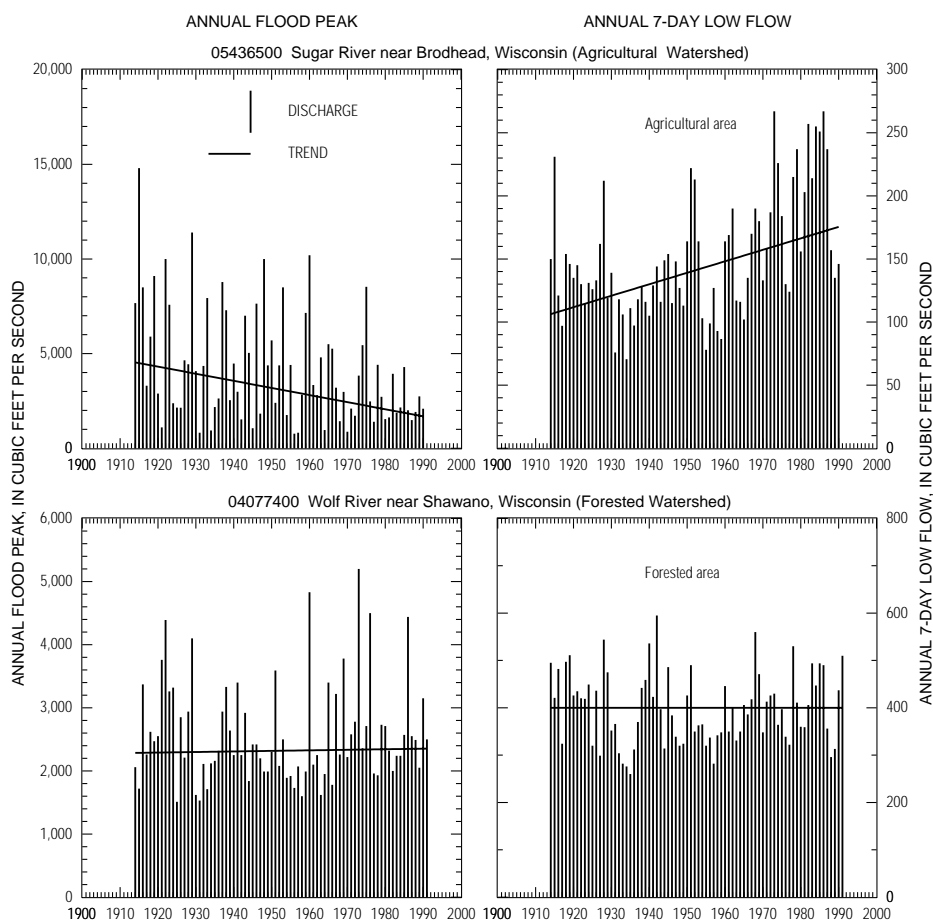


Figure 2. Relation of annual flood peaks and annual 7-day low flow with time for a gaging station in an agricultural area and a gaging station in a forested area.

representatives from local, county, and State agencies; public utilities; and the private sector. The WLIB is chartered by the State to provide leadership in developing and implementing integrated geographic and land-information systems throughout the State in a decentralized fashion starting at the local governmental level. The Wisconsin State Cartographer's Office provides a broad variety of mapping information to State citizens through publications such as the "Wisconsin Mapping Bulletin," public meetings, and educational forums, and serves as the State's affiliate for cartographic information in the Earth Science Information Center (ESIC) network.

## Earth Science Information Centers

The USGS's ESIC's provide information about USGS programs, products, and technological developments to the public. The ESIC in Madison was established under a cooperative agreement between the USGS and the Wisconsin State Cartographer's Office. The American Geographical Society Collection at the University of Wisconsin-Milwaukee Library also is a State ESIC affiliate. As part of the national ESIC network, these offices provide information on such earth science topics as cartography, geography, digital data, remote sensing, geology, geophysics, geochemistry, hydrology, geohydrology, aerial photography, and land use. Each ESIC is supported by the USGS with reference materials, technical assistance, training and outreach activities, and access to USGS data bases.

## Mapping Partnerships

Wisconsin and the USGS have a long history of cooperative efforts in topographic mapping. The Wisconsin Geological and Natural History Survey has maintained joint funding agreements with the USGS to revise and update topographic maps in the State. Maps that cover parts of eastern Wisconsin are being revised to reflect the rural development that has resulted in numerous changes to roads, buildings, and drainage features. These cooperative efforts were traditionally designed to revise printed map features. Efforts are underway to revise the map information digitally to provide a computerized map base. Revised digital map data enable State and local cooperators to display and manipulate cartographic data by using geographic information system technology to support numerous applications.

The USGS has several cost-sharing projects with Federal, State, and county agencies to produce digital orthophoto quads (DOQ's), computerized aerial photographs that cover the same areas as specific topographic maps. These digital images provide

"snapshots" of the Earth's surface that may be displayed on a computer to extract various types of information and to update existing cartographic data layers. The USGS is producing DOQ's in cooperative projects with the USDA, Natural Resources and Conservation Service for numerous counties in Wisconsin and in cooperation with the National Park Service for the St. Croix National Scenic Riverway in western Wisconsin.

The USGS recently developed a new product called a digital raster graphic (DRG), which is a scanned image of a USGS topographic map. The DRG is an inexpensive digital product that can be combined with other digital products to provide additional visual reference for the extraction and revision of base cartographic data. The USGS has entered into cooperative agreements with both State and Federal agencies to initiate statewide DRG production for Wisconsin.

## Sharing Spatial Data

The Competitive Cooperative Agreements Program (CCAP) was established by the Federal Geographic Data Committee (FGDC) through the USGS to help form partnerships with the non-Federal sector that will assist in the evolution of the National Spatial Data Infrastructure (NSDI). This Program provides funding to State and local government agencies, academia, and the private sector to encourage resource sharing through the use of technology, networking, and interagency coordination. The WLIB was awarded a CCAP grant to establish an NSDI clearinghouse node for posting and accessing a variety of Wisconsin digital geospatial data that are cataloged in accordance with FGDC data content standards. As the data become available, they are entered into the Internet to all participating agencies as a new component of the established services in Wisconsin. Organizations collaborating with the WLIB include the Wisconsin State Cartographer's Office, the Wisconsin Geological and Natural History Survey; the Wisconsin Department of Natural Resources; the Wisconsin Department of Transportation; the Dodge County Survey and Description Department; the Marathon County Planning Department; and the USDA, Natural Resources Conservation Service.

## Water-Resources Data

The USGS collected streamflow data at 96 continuous-record sites and numerous lake-stage sites, recorded ground-water levels continuously in about 170 wells, and measured water quality statewide at numerous points in 1996.

Realtime streamflow data for the past 7 days are available from the Wisconsin Home

Page on the Internet. The Home Page can be accessed at the following address:

<http://www.dwimdn.er.usgs.gov/>

After reaching the Home Page, any of more than 100 stations (with hydrographs) can be accessed by following two steps:

- Select "current streamflow" under the "Water Data" heading.
- Select "Station Number" (with reference to "Station Name").

The USGS, in cooperation with the Wisconsin Geological and Natural History Survey, has maintained an observation-well network since 1946. The purpose of this program is to determine trends in ground-water levels and to relate these trends to changes of ground-water storage.

In 1996, about 170 observation wells were measured periodically, and the measurements entered into a computer data base. These data are available on request. Selected water-level measurements representative of the water table are available on the Internet at:

<http://www.dwimdn.er.usgs.gov/gw/>

## Polychlorinated Biphenyls

Along the lower reach of the Fox River, 16 pulp and paper mills have historically discharged into the river PCB (polychlorinated biphenyl) wastes, which are associated with pulping and de-inking operations. Four other tributaries also contribute PCB's to Green Bay. The toxicity of PCB's is unusually high in some organisms.

The USGS collected water samples from all five major tributaries to Green Bay to determine the load of total PCB's entering the Bay. Samples were collected from the mouths of the Escanaba, the Menominee, the Peshtigo, the Oconto, and the Fox Rivers where the rivers enter Green Bay. Six additional sampling sites were located upstream on the Fox River; the most downstream of the sites is situated just upstream from the De Pere Dam, which is almost 7 miles upstream from the mouth.

Numerous water-column samples of from 80 to 100 liters were collected from April 1989 through April 1990 and analyzed for dissolved and particulate PCB's. According to these data, the total PCB load that enters the Bay for that period from the five tributaries was 169 kilograms. As the major source of PCB's, the Fox River contributed 93 percent of this total PCB load. Additional samples from the lower part of the River identified that the concentration of PCB's increased greatly from Lake Winnebago downstream to the De Pere Dam. The PCB load at the De Pere Dam was equal to 68 percent of the 157-kilogram load at the mouth of the Fox River. This lower part of the River extends for more than 39 miles from Lake Winnebago to Green Bay.

## Biological Resources

The USGS Biological Resources Division (formerly the National Biological Service) has major research facilities, several field offices, and cooperative research units in Wisconsin.

The National Wildlife Health Center in Madison provides information on national and international wildlife health issues and provides training and on-site information when there are wildlife disease outbreaks. Current studies include investigation of avian cholera in waterfowl that are nesting in Russia and Canada, lead poisoning in birds, and development of strategies to control avian botulism. Others focus on the effects of contaminants in the gender alteration observed in cormorants. For additional information about the Center, visit the Home Page at:

<http://www.emtc.nbs.gov/nwhhome.html>

The Environmental Management Technical Center in Onalaska, in cooperation with the U.S. Army Corps of Engineers, Illinois, Iowa, Minnesota, Missouri, and Wisconsin, administers the Upper Mississippi River System Long Term Resource Monitoring Program (LTRMP). State-operated LTRMP field stations collect data on vegetation, water quality, fishes, and invertebrates. The USGS coordinates a regional effort to map current vegetation and terrestrial vertebrate distribution to identify significant ecological areas and gaps in biodiversity conservation in support of the Upper Midwest Gap Analysis Program

The Upper Mississippi Science Center (UMSC) in La Crosse provides information on topics associated with large-floodplain rivers. Current research includes studies of native mussel species; bird habitats; exotic species, such as zebra mussels and sea lampreys; fisheries; wildlife; plants; water quality for sport fishes; and environmental pollution. In addition, the UMSC coordinates the national program to gain the approval or registration of chemicals and medicinal drugs to control sea lamprey populations and develop alternative treatment models to reduce the amount of lampicide currently being used.

Other research includes studies on lake-trout restoration, prey fishes, and nonindigenous species to document progress of restoration in the lake by the Lake Superior Biological Station of the Great Lakes Science Center and on the effects of the introduced zebra mussel on food web interactions and the biology of Great Lakes wetlands by the Northern Prairie Science Center.

Wisconsin has two cooperative research units. The Fisheries Unit, which is located at the University of Wisconsin-Stevens Point specializes in fish-management-related research, especially trophic relations and community dynamics among fish species. The Wildlife Unit, which is located at the

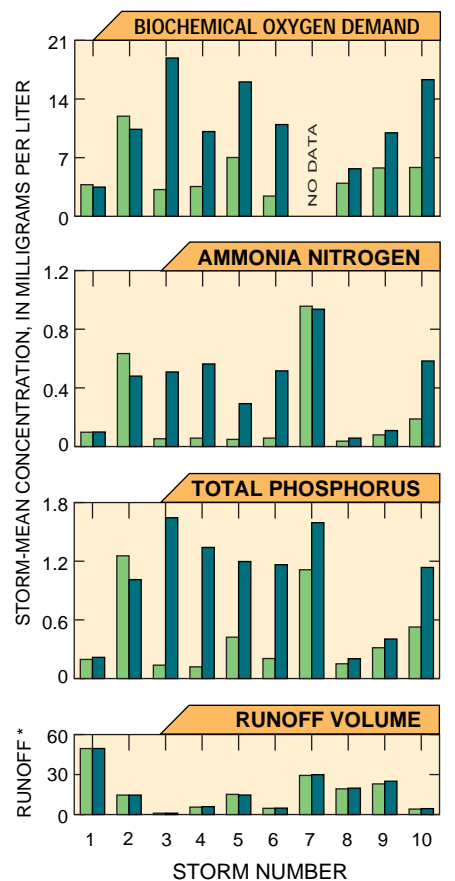
University of Wisconsin-Madison, studies migratory birds and avian ecology.

## Nonpoint-Source Pollutant Monitoring

In 1978, the Wisconsin Legislature created the Nonpoint Source Water Pollution Abatement Program. The goal of this Program is to improve and protect water quality within selected priority basins by controlling non-point sources of pollution.

The USGS, in cooperation with the DNR, is monitoring water-quality changes that result from implementation of the DNR's best management practices (BMP's). The data collected are then compared with the basin plans by the DNR to assess progress and determine if goals have been reached.

Data were collected on a storm basis before and after implementation of BMP's. These data indicate that (at each site), average downstream concentrations of total phosphorus, ammonia nitrogen, and biochemical oxygen demand were significantly greater than average upstream concentrations (fig. 3), before implementation of BMP's.



EXPLANATION  
\* Cubic foot per second-day, which is equivalent to 86,400 cubic feet  
UPSTREAM STATION  
DOWNSTREAM STATION

Figure 3. Concentrations and runoff volume for selected storms, Otter Creek, before implementation of best-management practices.

## For More Information

USGS State representative  
6417 Normandy Lane  
Madison, WI 53719  
608-274-3535  
Fax: 608-276-3817  
Email: [dc\\_wi@usgs.gov](mailto:dc_wi@usgs.gov)

Additional earth science information can be found by accessing the USGS Home Page on the World Wide Web at <http://www.usgs.gov/>

For more information on all USGS reports and products (including maps, images, and computerized data), call 1-800-USA-MAPS

The USGS provides maps, reports, and information to help others meet their needs to manage, develop, and protect America's water, energy, mineral, biological, and land resources. We help find the natural resources needed to build tomorrow, and supply the scientific understanding needed to help minimize or mitigate the effects of natural hazards and environmental damage caused by natural and human activities. The results of our efforts touch the daily life of almost every American.

U.S. Geological Survey  
Fact Sheet FS-048-96