

United States Geological Survey

Programs in Wisconsin



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

Wisconsin is a water-rich State that borders Lake Michigan, Lake Superior, and the Mississippi River. In addition to these surface-water supplies, the State has an abundant ground-water supply equivalent to about one-third of the water in Lake Superior.

Although water supplies are abundant, numerous water issues need to be fully understood and resolved to make the most efficient use of the resource. Most of the issues are related to water quality, but ground-water availability is a concern in some of the high-population areas.

The U.S. Geological Survey (USGS) collected stream-flow data at 96 continuous-record sites and numerous lake-stage sites (fig. 1); recorded ground-water levels continuously in more than 200 wells (fig. 2), and measured water quality statewide at numerous points (fig.3) in 1994.



EXPLANATION

- Continuous-record streamflow gaging station
- ◻ Continuous-record lake-stage gaging station

Figure 1. Streamflow and lake-stage gaging stations in Wisconsin.

Non-Point Source Contamination by Agricultural and Urban Runoff

Contamination of surface water and ground water by agricultural and urban runoff is common. The most frequently identified contaminants in ground water are nitrate, and the pesticides Atrazine, and Alachlor; and in surface water are phosphorus, suspended sediment, and Atrazine. The Wisconsin Department of Natural Resources (DNR) has implemented a Wisconsin Non-Point Source Pollution Abatement Program which provides funding to land owners for installation of best-management practices.

The USGS and the DNR are studying 10 sites (fig. 4) to determine the trends in water quality before and after implementation of best-management practices in 7 selected priority basins. Another study will determine the effects of storm-water discharge on the levels of contaminants in urban streams.

Contamination of the Great Lakes by Toxic Substances

Contamination by toxic substances, including polychlorinated biphenyls (PCBs), other synthetic organic compounds, trace elements in bottom sediments of rivers and harbors (Menominee River at Marinette, lower Fox River, Sheboygan Harbor, and Milwaukee Harbor), and suspended sediment inflow to the Great Lakes are specific water-quality problems.

The USGS and the DNR are cooperating on projects in the lower Fox River to estimate the total mass of PCBs present in the bottom sediments and to compute the total PCB load carried by the river. The project also will simulate future PCB transport in the river. This study will com-

plement the Environmental Protection Agency's (EPA) study of PCBs in Green Bay.

The USGS and the DNR also are cooperating on an EPA study of PCBs in Lake Michigan. The USGS is responsible for monitoring the input of backups, and several contaminants, from 11 of the major tributaries to the Lake.

Another study with the DNR will develop ultra-clean sampling methods of ground water and examine the temporal variability of trace-metal concentrations in stream/ground-water ecosystems.

The EPA has sought the assistance of the USGS in developing methods to estimate the contribution of sediment loads of several large rivers to the Great Lakes in the areas of Minnesota, Wisconsin, Illinois, Indiana, and Michigan. Models then will be developed to estimate the sediment loads of smaller streams that yield sediment to the Great Lakes.

Inland Lake Contamination

Many State lakes are being contaminated by nonpoint sources of chemicals,



Figure 2. Ground-water level recording sites.

nutrients, and drainage from rural and urban areas. During the past year, the USGS studied 20 lakes at the request of various lake-management districts, townships, sanitary districts, cities, villages, and conservation districts. These projects continuously monitor lakes and streams to detect chemical and biological changes caused by nonpoint contamination. The data from the Delavan Lake study have been used to direct a 7.5 million dollar remediation effort.



Figure 3. Water-quality data-collection sites in Wisconsin.



Figure 4. Water-quality trend sites.

Ground-Water Contamination

Nitrates, volatile organic chemicals, and pesticides have been detected in ground water from wells across the State. Areas of concern generally are related to the locations of the sources of contamination. The southern two-thirds of the State is agricultural; the other source areas are population/industrial centers.

The USGS also is assisting the EPA with numerous Superfund projects and assisting the Department of Defense at several sites of contaminant spills.

Ground-Water Availability

Large municipalities in the lower Fox River Valley; Milwaukee, LaCrosse, and Madison areas, realize the need to understand ground-water systems and the need to formulate a regional approach to ground-water management. Ground-water quantity issues facing these municipalities include excessive drawdown of aquifer water levels and depletion of surface water (streams, lakes, and wetlands) by pumping wells, and by capturing ground water that (under nonpumping conditions) would discharge to surface water.

Current comprehensive studies of the Dane County area and the lower Fox River Valley area in cooperation with State and regional governments will provide government and regional planning agencies with tools to aid their management of the county's water resources. The LaCrosse and Milwaukee areas are intended for further studies to help plan development and use of their ground-water resources.

Mercury Contamination of Recreational Lakes

Evaluation of data from the waters and biota of many Wisconsin lakes indicates that there is a statewide problem with mercury contamination in natural water systems. Numerous advisories have warned against consuming fish from about one-third of Wisconsin's 15,000 lakes. The causes of mercury contamination and processes affecting mercury cycling within the lakes are not well understood.

The USGS and the DNR are coopera-

tively studying the processes responsible for the aquatic transport and transformation of mercury. The project will determine the accumulation rates of mercury in sediments, qualify fluxes of mercury from sediments, and determine variations in mercury accumulation in bottom sediments.

National Mapping Program

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 the ground). These maps depict basic natural and cultural features of the landscape, such as lakes and streams, highways and railroads, boundaries, and geographic names. Contour lines are used to depict the elevation and shape of terrain. The entire State 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 have long been favorites with the general public for outdoor uses, including hiking, camping, exploring, and back-country fishing expeditions.

Topographic Map Updating

Wisconsin and the USGS have a strong history of cooperative efforts in mapping. The Wisconsin State Cartographer's Office provides a broad variety of mapping information to Wisconsin citizens and serves as the state's affiliate for cartographic information in the USGS Earth Science Information Center network. The USGS coordinates its mapping projects with the Wisconsin Land Information Board. The Wisconsin Geological and Natural History Survey has maintained a series of joint funding agreements with the USGS to revise and update topographic maps in the State. Maps covering parts of southeastern Wisconsin currently are being revised due to population increases that have resulted in numerous changes.

Digital Aerial Photographs

The USGS also has several cost-sharing projects involving a mixture of Federal, State and county agencies to produce computerized (digital) files of aerial photographs that cover the same areas as spe-

cific topographic maps (fig. 5). These digital images provide "snap shots" of the Earth's surface that may be displayed on a geographic information system computer to extract various information and update other existing cartographic data, such as county soil maps in computer format. The USGS is also producing digital aerial photos in cooperation with the National Park Service for the St. Croix National Scenic Riverway in western Wisconsin.

Internet Access to Geospatial Data

The Wisconsin Land Information Board was recently awarded a grant by the Federal Geographic Data Committee to establish a node on the Internet for accessing a variety of Wisconsin digital geospatial data. Collaborating organizations include the Wisconsin State Cartographer's Office, Wisconsin Geological and Natural History Survey, Wisconsin Department of Natural Resources, Wisconsin Department of Transportation and several county agencies.

Coastal Wetlands

Coastal wetlands of Lake Superior protect Wisconsin's drinking water and Wisconsin's shoreline communities. Many processes have interacted to cause the deterioration of Great Lakes wetlands. Cores are collected and analyzed to correlate the similarities and differences in the wetlands of the all States that border the Great Lakes. The analysis delineates high stands of the lakes, timing of onset of peat deposition, changing climatic regimes, history of wetland deterioration and regrowth, and history of early human effects on the wetlands. A geographic information systems map is in preparation for all the Great Lakes. Monitoring the change in the wetlands using these maps will provide a predictive tool to land use planners, political entities who must blend conflicting best-management practices, and scientists trying to understand geological limits on biodiversity. The ability to predict the response of Wisconsin's coastal wetlands to natural processes and human activities has required close cooperation with University of Wisconsin, Northland College, Bad River Band of the Chippewa, U.S. Department of Agriculture, Fish and Wildlife Service

(including National Wetlands Inventory), and National Park Service.

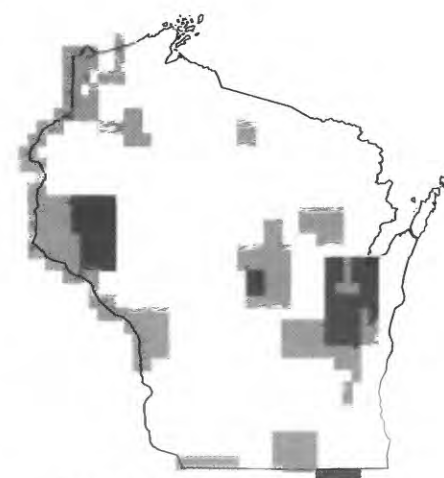
Rapid Submergence of Lake Superior Shorelines

The Lake Superior basin is being progressively tilted from the northeast to the southwest as a result of residual uplift following glacial retreat 9,800 years ago. Lake level is controlled by the spillway to the St. Marys River at Sault Ste. Marie, but the outlet is rising more rapidly than most other points along the U.S. shore of the lake. As the outlet rises, the accompanying lake level submerges the shore at an increasing rate westward from Sault Ste. Marie to Duluth (fig. 6). USGS scientists, in cooperation with the National Park Service and the Michigan and Wisconsin Sea Grant Programs, have documented approximately 15 feet of submergence over the past 2000 years at the Apostle Islands National Lakeshore near Bayfield, Wisconsin. Submerged wetlands and forests are in evidence below the present lake level. Farther west at Duluth, Minnesota, as much as 18 ft. of submergence has taken place. The rates of lake level rise at these areas are on the order of one inch per decade. Rising lake level attributable to uplift at the outlet will continue to inundate low-lying areas and river mouths, expand wetlands, and contribute to erosion of exposed and erodible shores.

Geologic Mapping

At a broad, regional scale, glacial and shallow bedrock deposits have been mapped across the State. A regional map

of the texture and thickness of glacial deposits has been produced, and converted to digital form for analysis and for eventual publication on a CD-ROM, and for production of derivative maps. For example, a derivative map has been produced that estimates the relative likelihood that ground water in aquifers might become contaminated due to field application of agricultural chemicals. Such estimates have, traditionally, been highly uncertain. Nevertheless, those estimates are important information for municipalities, which must plan for the potential degradation or loss of a water supply and



EXPLANATION

- In work
- Available in National Digital Cartographic Data Base (NDCDB)

Figure 5. Digital orthophoto quadrangle (DOQ) coverage at the 1:12,000 scale for the State of Wisconsin.

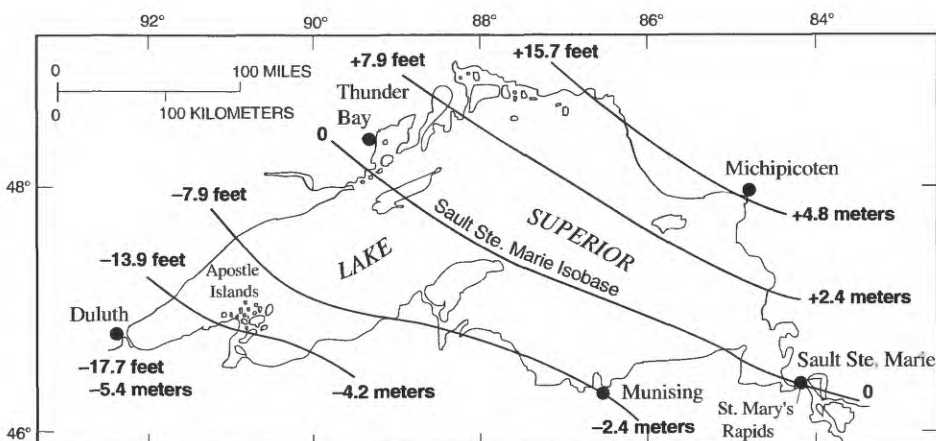


Figure 6. Submergence and emergence of Lake Superior shorelines since 2100 yrs B.P.

the economic uncertainties that can result. This map and more detailed contamination-potential maps in the State are under study, to find more accurate, quantitative ways of forecasting the likelihood of ground-water contamination.

Assessment of Mineral Resource Potential in Wisconsin

Economic growth and development in the upper Midwest depends in part on the availability of local sources of minerals for use in industry, manufacturing, and the maintenance and upgrading the region's infrastructure. The region also contains identified resources of iron, copper, nickel, and zinc of national and global importance whose extraction and processing can form the basis for an enhanced regional economy. The USGS is preparing an inventory of known mineral resources and an assessment of the potential for as-yet undiscovered mineral resources, based on geological, geophysical, and geochemical studies. Maps and reports in digital and paper form will assist Federal and State land management agencies, regional planners, industry, and local governments in ensuring adequate supplies of minerals at the lowest possible cost and promoting sound management of the region's very substantial mineral resources.

Oil and Gas Resources

In an effort to assess the future energy resource potential of the Nation, the USGS is conducting a National Petroleum Assessment of undiscovered conventional and unconventional natural gas and oil resources. The USGS has the personnel, expertise, physical resources, and experience in producing unbiased estimates of our national endowment. With these estimates, federal energy planners can chart a course for the future. Wisconsin may have some potential to produce resources that can be added to our Nation's reserves. The USGS is working cooperatively with the Wisconsin Geological Survey in analyzing samples from wells drilled in the State that have penetrated this formation.

Earth Observation Data

Through its Earth Resources Observation Systems Data Center near Sioux Falls, South Dakota, the USGS distributes a variety of aerial photographs and satellite image data products that cover the entire State. Mapping photographs of some sites go back at least 40 years. Satellite images can be used to study changes in regional landscapes dating from 1972.

Geologic Information Centers

The Center for Environmental Geochemistry and Geophysics (CEGG)

focuses on environmental geoscience research and information exchange. CEGG coordinates and supports basic and applied research on the natural and human-induced environmental effects associated with geologic sources—especially those related to mineral and energy resources and their development. Some examples of currently supported investigations include: environmental geochemistry of historic mining and smelting activities, behavior and transport of toxic elements in natural systems and use of naturally occurring minerals as scavengers for toxic metals.

Cooperative Programs

The USGS work is pursued in partnership with numerous State and local agencies. In addition to those mentioned above, cooperation is carried on with the Wisconsin Department of Transportation, the Dane County Regional Planning Commission, the Brown County Planning Commission, the City of Madison, the Menominee Indian Tribe of Wisconsin, and others.

The USGS provides support to the Wisconsin Water Resources Center, which conducts a program of research, education, and information and technology transfer.

For more information contact any of the following:

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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.