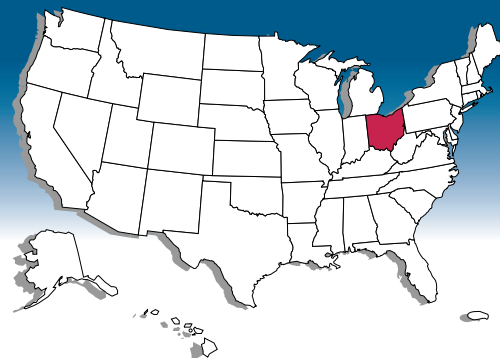




U.S. Geological Survey Programs in Ohio



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

For more than 100 years, the U.S. Geological Survey (USGS) has provided the information needed to manage the Nation's earth resources, to mitigate geologic hazards, and to understand the environment. In Ohio, the USGS works cooperatively with local, State, and other Federal agencies, as well as with universities, to study earth science.

Water Resources

Much of Ohio's social and economic development is determined by the availability of usable water. Surface water is abundant in Ohio's streams and lakes, which include parts of the Ohio River and Lake Erie. In addition, unconsolidated aquifers (sand and gravel deposits) and sedimentary bedrock aquifers (sandstone or dolomite deposits) throughout Ohio provide a source of ground water. However, water quality is a concern. Geologic processes, such as fracturing and mineral concentrations, and human activities, such as agriculture, mining, industry, and urbanization, affect water quality and the health and well-being of the people, the economy, and the environment of Ohio. Point-source contaminants of water can include organic substances from sewage and industrial waste discharges and minerals from mining activities, and nonpoint-source contaminants can include herbicides and fertilizers used in agriculture and lawn care.

Collection of Water-Quality Data

The USGS has collected and analyzed water-quality data in Ohio since 1946 to support national, State, and local water-resources managers in their efforts to conserve, protect, and provide safe and usable water for the public (fig. 1). Partners in this effort include the Ohio Department of Natural Resources (ODNR), and other Federal, State, and local agencies.

The USGS maintains and operates a monitoring network of ground- and surface-water stations throughout Ohio to collect short- and long-term water-quality data. The data from this monitoring network are made available through computer data bases and as published reports and maps. The USGS also provides "realtime" data as part of its monitoring network. Realtime data allow the USGS and

others to have immediate access to timely, up-to-date information on water-quality conditions throughout the State.

National Water-Quality Assessment Program

In 1991, the USGS began the National Water-Quality Assessment Program (NAWQA) to describe the status and trends of large, representative parts of the Nation's ground and surface waters and to identify and describe the natural and human factors that affect their quality. USGS scientists are studying the occurrence and distribution of pesticides, fertilizers, sediment, and trace organic and inorganic contaminants by using data from the USGS monitoring network and other agencies and academic institutions.

The Lake Erie-Lake St. Clair Basin study unit of NAWQA (fig. 2) drains an area of about 22,300 square miles that includes northern Ohio, southeastern Michigan, northeastern Indiana, the northern tip of Pennsylvania, and southwestern New York. Water resources in the study unit are central to the economy and culture of the region. In 1988, the value of Lake Erie and its tributaries with respect to sport fishing and related commerce was estimated to exceed \$850 million.

Index of Subjects

- Water Resources
- Collection of Water-Quality Data
- National Water-Quality Assessment Program
- Big Darby Project
- Metzger Marsh Restoration
- Energy-Resource Assessments
- Disposing of Byproducts of Coal Burning
- Geologic Mapping
- Topographic Mapping and Digital Line Graph Data Production
- Shoreline Erosion on Lake Erie
- Landslide Hazards and Mitigation
- Earth Science Information
- Educational Activities
- Cooperative Programs
- Biological Research

The study unit contains about 300 public recreational areas and about 90,000 acres of inland waters for public use. Lake Erie supports the largest freshwater fishery in the Great Lakes (an estimated 50 million–60 million pounds of fish are caught per year) and is widely considered to be the best walleye fishery in the world. Lakes Erie and St. Clair and the St. Clair, the Detroit, and the Niagara Rivers are vital shipping links that connect the upper Great Lakes to Lake Ontario and the St. Lawrence Seaway.



Figure 1. USGS staff collecting water-quality data in Ohio.

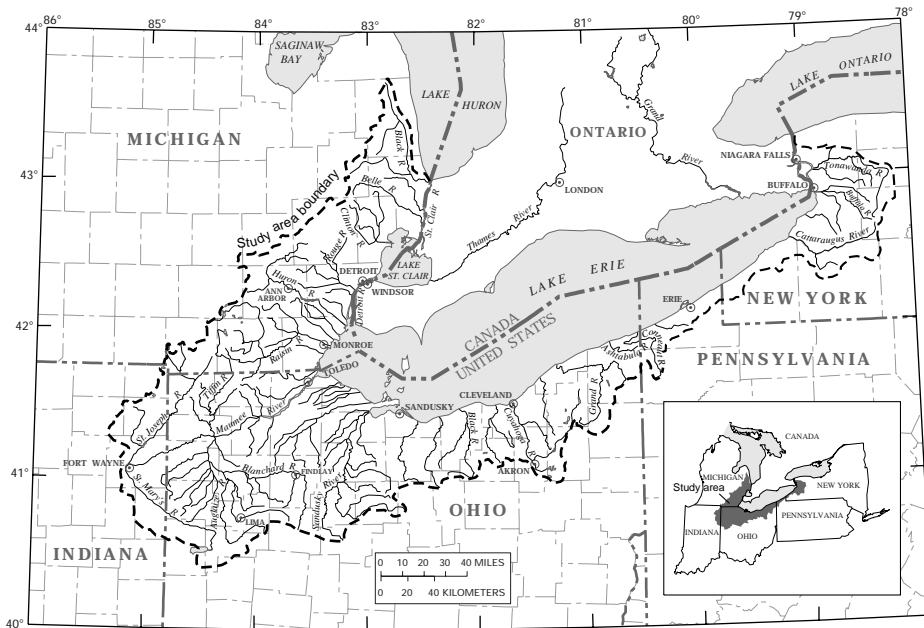


Figure 2. The Lake Erie—Lake St. Clair Basin study unit of the National Water-Quality Assessment Program.

Although much progress has been made in the Lake Erie Basin to control contamination and to improve water quality since the early 1970's, water-quality managers often must regulate certain contaminants on the basis of incomplete or conflicting information. More study is needed on the following major water-quality issues in the Lake Erie—Lake St. Clair Basin study unit:

- Reproductive impairment in fish and wildlife as a result of exposure to and bioaccumulation of contaminants, such as PCB's, pesticides, methyl-mercury, and other trace-element and trace-organic compounds.
- Elevated concentration of PCB's and other substances in fish tissue, which affect the suitability of fish for human consumption.
- Decrease in water quality owing to the discharge of nutrients, pesticides, trace elements, synthetic organic compounds, and pathogens to streams and lakes by storm runoff.
- Declines in biological diversity of aquatic communities, which result from habitat disturbance and alteration.
- Water-supply and ecosystem management problems caused by the proliferation of nonnative species, such as the zebra mussel.

Communication and coordination between the USGS and other scientific and water-management organizations are critical components of the NAWQA Program. Each

study-unit investigation has a local liaison committee that consists of representatives of Federal, State, and local agencies; universities; and the private sector. Each liaison committee exchanges information on water-quality issues of regional and local interest, identifies sources of data and information, assists in the design and scope of project elements, and reviews project-planning documents and reports.

Big Darby Project

Big Darby and Little Darby Creeks have recently been designated National Scenic Rivers because of their unusual diversity of fish (86 species) and freshwater mussels (40 species). This watershed (fig. 3) has received attention nationally as one of The Nature Conservancy's Last Great Places, one of the Natural Resources Conservation Service's Hydrologic Units, and one of the U.S. Environmental Protection Agency's Ecological Risk Assessment Case Studies. The USGS has been studying the washout and recolonization of algae and macroinvertebrates in the Big Darby Creek Watershed to clarify how its biological diversity is affected by the hydrology, water chemistry, and physical disturbance associated with runoff during storms. During the study, the USGS collected comprehensive data on sediments, nutrients, and pesticides carried by storm runoff. Data and interpretive reports from the study assist water-resources managers who oversee the watershed and benefit residents of the watershed by providing insight into the probable consequences of land-use practices in the Big Darby Creek Watershed.

Metzger Marsh Restoration

The lacustrine wetlands of Ohio, as well as other wetlands around the Nation, have been greatly reduced in extent and function. The USGS, in cooperation with the ODNR, and the U.S. Fish and Wildlife Service, is actively involved in a restoration program for Metzger Marsh within the Ottawa National Wildlife Refuge.

Wetlands act as a natural water filter and thus improve water quality, as well as provide habitat for waterfowl and large and small mammals and serve as nursery grounds for major lake fisheries. Increased development has virtually eliminated fully functioning wetlands along the Ohio shoreline of Lake Erie.

The Metzger Marsh restoration project represents a novel approach to wetlands restoration that seeks to provide the widest possible range of functionality. Follow-up monitoring will determine the success of this project, which has the potential to provide a model for wetland restoration projects throughout the Nation.

Energy-Resource Assessments

Coal is used to produce about 20 to 25 percent of the total energy and more than 50 percent of the electricity generated in the United States. Even with substantial increases in energy conservation and the use of other energy sources, coal will continue to be a major energy source into the next century. In the National Coal Assessment, the

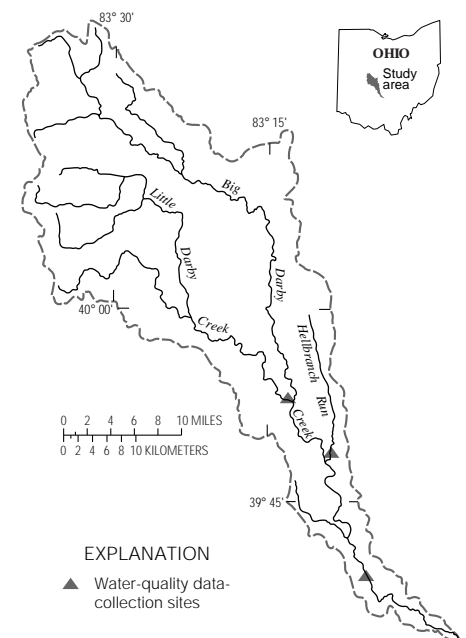


Figure 3. Location of the Big Darby Creek Watershed in Ohio.

USGS is working with the ODNR to identify the location of coal resources, which include coal potentially suitable for the export market, on public and private lands.

A key issue of interest to future coal users is the quality of coal that will be mined in the next 20 years, particularly in the Appalachian Basin, which includes southeastern Ohio. Investigators are compiling information on the quality of various major coal beds. This information allows planners and industry to identify areas that can sustain production of coal of specific quality for various uses, which include clean coal combustion and synfuel production.

Disposing of Byproducts of Coal Burning

The USGS, in cooperation with several Federal and State agencies, is evaluating a beneficial use for the byproducts of scrubbers on coal-burning powerplants that are designed to reduce sulfur emissions. Many tons of scrubber byproducts are produced daily, and disposal costs are high. Use of the byproducts in the reclamation of abandoned coal mines has been proposed as a cost-effective and beneficial means of disposal. At a test site in an abandoned mine in Tuscarawas County, the USGS is studying how the application of scrubber byproduct affects the quality of ground water beneath the site.

Geologic Mapping

Important geologic mapping in Ohio is funded by the National Cooperative Geologic Mapping Program. This statewide geologic mapping effort is necessary to improve the definition of important resources, such as coal, boiling gas, and ground water. The mapping also delineates areas that have a high potential for indoor radon and zones of landsliding.

Topographic Mapping and Digital Line Graph Data Production

The USGS strives to ensure that map and digital data are available to the general public through timely and effective data-collection and revision procedures. Among the most popular and versatile products of the USGS are its 1:24,000-scale topographic quadrangle maps (1 inch on the map represents 2,000 feet on the ground). These maps depict natural and cultural features of the landscape, such as lakes and streams, highways and railroads, boundaries, and geographic names. Ohio is covered by 788 quadrangle maps at this scale. These maps have long been favorites with the general

public for outdoor uses, as well as scientists and engineers for technical applications.

The USGS has a cooperative agreement for digital map production with the Ohio State University Center for Mapping (CFM). The USGS provides base materials and other assistance to the CFM to support preparation of digital line graph (DLG) data from 1:24,000-scale USGS topographic quadrangle maps. DLG data layers that are being collected include the Public Land Survey System, boundaries, hydrography, transportation routes, and contours. A consortium of State agencies, which also supports this project, uses the data for planning and resource-management applications and transportation and utilities studies. The CFM has developed an innovative DLG production scheme that uses "work-at-home" contractors to perform key production functions. The CFM performs quality control, then sends the completed DLG files to the USGS via the Internet for final review and public domain archiving. Through 1995, this collaboration has resulted in DLG coverage for more than 300 maps, or 40 percent of the State.

Shoreline Erosion on Lake Erie

The shoreline along Lake Erie is eroding rapidly, which is resulting in damage to public and private property. The USGS, working in cooperation with the ODNR, is in the final year of a 5-year study to document historic erosion of Ohio's shoreline bluffs (fig. 4) and

to determine what natural processes and human activities are contributing to the erosion of the shoreline. Because the Ohio shoreline is similar to other eroding areas throughout the Nation, the results of this study of erosion potential could have wide applications. Losses owing to coastal erosion in Ohio exceed \$40,000,000 per year. The research conducted under this cooperative program enables prediction and mitigation of this severe geologic hazard.

Landslide Hazards and Mitigation

The Cincinnati metropolitan area has one of the highest per capita costs of landslide damage of any metropolitan area in the Nation. Landslides in this area damage or destroy buildings, roads, and public utilities and cost millions of dollars annually in lost productivity and repairs. USGS scientists, in cooperation with the University of Cincinnati, have identified some of the main causes of landslides and have helped lay the technical groundwork for the landslide-mitigation efforts now underway.

Additionally, USGS scientists have developed a method to compare the benefits and costs of programs designed to mitigate landslide damage. Use of the method, which was developed in cooperation with the Federal Emergency Management Agency, Hamilton County, and the city of Cincinnati, identified a mitigation program that could produce annual benefits of \$3.1 million at a cost of \$1.4 million.



Figure 4. A section of Ohio's shoreline along Lake Erie has eroded several hundred meters since 1876. (Labeled time lines show position of shoreline for years given.)

Nationally, the USGS National Landslide Information Center in Golden, Colorado, is the focal point for collection and dissemination of information on significant landslide events, critical research results, and public policy issues that relate to landslides. The Center collects and distributes a vast amount of information related to landslides to users throughout the world.

Earth Science Information

The USGS Earth Science Information Centers (ESIC) provide information to the public about USGS programs, products, and technological developments. The ESIC in Columbus was established under a cooperative agreement between the USGS and the ODNR. As part of the national ESIC network, the ODNR office provides information on aerial photography and remote-sensing data. In addition, the USGS and the ODNR provide geological, geochemical, geohydrologic, geophysical, and hydrological information to the general public. The ODNR also serves as the contact point for USGS topographic quadrangle maps for the State.

Educational Activities

As part of its outreach effort, the USGS participates in numerous educational activities. For example, interested children from Millcreek Elementary School (Perry County) and adults living in the Monday Creek Watershed have been invited to help scientists write a new book for children and teachers called *"Hands-On Acidic Mine Drainage—Science Experiments for Kids Living Where Creeks Are Red and Yellow."* The Monday Creek Watershed is one of many Ohio waterways affected by acid drainage from mineral resources and abandoned mining operations. Creeks can be colored red, yellow, and orange from the combination of acids and iron precipitates. Children play in these creeks and are even known to use red crayons when asked to draw pictures of waterways. Scientists from the USGS, the U.S. Forest Service, the ODNR, and Ohio University have teamed up with Rural Action's Monday Creek Restoration Program for this activity.

The USGS also participates in the Partners In Education Program with the Grandview Heights School District (Franklin County). USGS personnel have demonstrated and explained methods of collecting water-quality data to students who represented the District's Middle School Science Olympiad team. During the Spring Olympics (1995) for Ohio schools, the team placed in the top five in the water-quality data-collection competition.

Cooperative Programs

USGS activities in Ohio are conducted in partnership with numerous Federal and State agencies, local governments and organizations, and colleges and universities. For example, water-resources studies in the State are funded through a combination of Federal, State, and local government monies. More than 50 percent of the 1995 water-resources studies were financed through matching-fund agreements with State and local governments. The remaining studies were funded through Federal sources, which include other Federal agencies.

Another example of cooperative studies is a geologic mapping program by the USGS and the ODNR to develop a new statewide bedrock map to replace the existing 75-year-old one. As of August 1995, all 1:24,000 bedrock-quadrangle maps west of 82° longitude were available as open-file editions at the ODNR. Full-color, 1:100,000-scale versions of three 30- x 60-minute quadrangles in western Ohio have been published. These new geologic mapping products are popular with those engaged in mineral, fossil-fuel, and ground-water exploration.

Biological Research

The USGS Biological Resources Division (formerly the National Biological Service) seeks to improve the understanding and management of exotic and invasive species, commercial and recreational fisheries, and contaminants in aquatic ecosystems in Ohio.

Studies are being conducted through the Great Lakes Science Center in collaboration with the ODNR and others that focus on population dynamics of walleye, yellow perch, lake trout, and other key predator, forage, commercial, and recreational species and gathering important fish stock data in the region. Biologists also are evaluating the effects of invasive zebra mussels, ruffe, and sea lampreys in the Great Lakes and are developing methods to stop the spread of these species. Other studies include monitoring contaminants in aquatic ecosystems, restoration of diked wetlands, and restoration of polluted watersheds affected by acidic mine drainage.

The Ohio Cooperative Fish and Wildlife Research Unit, which is located on the campus of The Ohio State University, is a cooperative effort supported by the USGS. Unit scientists conduct research throughout the State on fishery issues, habitat modification, bird community dynamics, and endangered species in conjunction with State and Federal agencies.

For More Information

USGS State representative
975 West Third Avenue
Columbus, OH 43212-3192
(614) 469-5553
Fax: (614) 469-5626
E-mail: dc_oh@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-035-96