

# United States Geological Survey Programs in Ohio



*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.*

Much of Ohio's social and economic development has been and continues to be determined by its geologic and water resources. The effects of geologic processes and human activities—floods and droughts, soil erosion and landslides, industry, agriculture, and urbanization—on Ohio's natural resources are important to understand because these processes and activities, to a large degree, affect the health, safety, and well-being of the people; the economy; and the environment of the State.

For more than 100 years, the U.S. Geological Survey (USGS) has been and continues to be involved in studies that concern the geology, water resources, and physical features of Ohio. This long-term effort of data collection, data

interpretation, and mapping provides natural-resources managers and policymakers with essential earth science information needed to make decisions about Ohio's resources.

### Flood and Drought Studies

Millions of dollars of flood damage has been recorded throughout Ohio's history. Droughts, which occur on the average once every 10 years in the State, can lead to costly losses of crops. To improve the understanding of the patterns of floods and droughts, USGS scientists analyze data from its monitoring network as part of flood and drought studies. In addition, USGS scientists occasionally collect data after floods to determine their magnitudes. Published reports by the USGS on these

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studies, along with the monitoring-network data and maps, provide water-resources managers and policymakers with information to help them determine how floods and droughts could affect communities in Ohio. For example, the USGS, in cooperation with the Federal Emergency Management Agency, has and continues to conduct studies that are used to help establish flood-plain management programs to mitigate flood losses. These studies are also used to develop flood-risk zones within flood-prone areas.

The National Weather Service, which issues flood warnings and determines drought conditions, uses real-time data from the USGS monitoring network in Ohio to assist in rapidly determining the flow conditions of the State's streams.

### Shoreline Erosion on Lake Erie

The shoreline along Lake Erie is eroding rapidly, resulting in damage to public and private property. The USGS, working in cooperation with the Ohio Department of Natural Resources (ODNR), Division of Geological Survey, is in the midst of a 5-year study to document historic erosion of Ohio's shoreline bluffs (fig. 1) and to determine what natural processes and human



**Figure 1.** 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.)

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.

## Bridge-Scour Studies

Bridge scour, the erosion of the streambed surrounding the foundations of bridge piers, has been identified as the leading cause of failures of our Nation's bridges. Laboratory-derived mathematical equations have been developed to predict the erosion of a streambed during floods. Concerns about the high cost of over-designing a bridge or repairing a failed bridge, combined with concerns about public safety, have created a need for field data to verify the laboratory-derived equations.

The USGS, in cooperation with the Ohio Department of Transportation, is collecting bridge-scour data at 22 bridges throughout the State. The data collected during these studies, as well as data from the USGS monitoring network, are being analyzed and interpreted by USGS scientists. The bridge-scour data from these studies will be placed in a national computer data base that has been established by the USGS, in cooperation with the Federal Highway Administration. The results of the studies will provide bridge designers and public officials with information needed to assess the effects of bridge scour on bridge safety and bridge design.

## 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 landslide-mitigation efforts now underway.

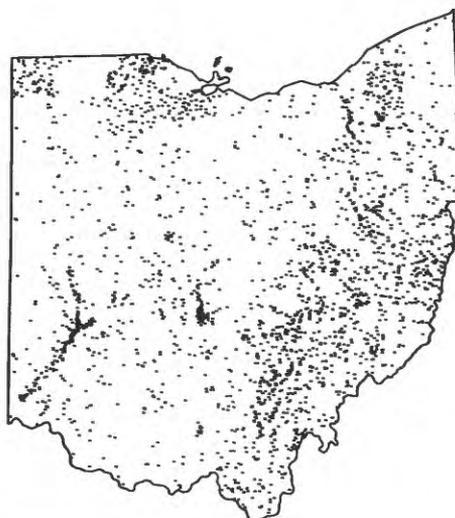
Additionally, USGS scientists have developed a method to compare the

benefits and costs of programs designed to mitigate landslide damage. Use of the method—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.

Nationally, the 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 relating to landslides. The Center collects and distributes a vast amount of information related to landslides to users throughout the world.

## Water-Quality Investigations

USGS scientists have conducted numerous studies within Ohio to assess natural processes, such as ground-water flow and surface-water flow, and human activities, such as waste disposal, manufacturing, and farming, that affect water quality (fig. 2). In southwestern Ohio, the USGS, working with agencies that include the U.S. Air Force and the U.S. Environmental Protection Agency, is studying areas in and around several Superfund sites in order to describe and simulate regional ground-water flow and quality (fig. 3). The USGS, in cooperation



**Figure 2.** Water-quality data-collection sites in Ohio.

with the Ohio Department of Transportation, is studying several counties throughout the State to determine the effects of highway-deicing chemicals (road salt) on the ground-water quality. Additionally, the USGS, with cooperators that include Summit County and the Northeast Ohio Regional Sewer District, is studying the Cuyahoga River, a source of drinking water and a recreational resource for the heavily populated northeastern part of the State.

## Coal Studies

Coal is used to produce one-third of the total energy and more than one-half of the electricity generated in the United States. Even with substantial increases in energy conservation and in 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 USGS is working with ODNR, Division of Geological Survey, to identify the location of coal resources on public and private lands, including coal potentially suitable for the export market.

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 will be compiling information on the quality of various major coal beds. This information will allow planners and industry to identify areas that can sustain production of coal of specific quality for various uses, including clean coal combustion and synfuel production.

In another coal-related study, the USGS is working in cooperation with several Federal and State agencies to evaluate 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 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.

## 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 ODNR, the National Biological Survey, and the U.S. Fish and Wildlife Service, is actively involved in a restoration program for Metzger Marsh within the Ottawa National Wildlife Refuge.

Natural wetlands serve a variety of functions, providing habitat for waterfowl and large and small mammals, affecting water quality, and serving as nursery grounds for major lake fisheries. Increased development has virtually eliminated fully functioning wetlands along the Ohio shoreline.

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

## 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 all of Ohio. Mapping photos of some sites go back at least 40 years. Satellite images can be used to study changes in regional landscapes dating from 1972.

## 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. Ohio is covered by 788 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

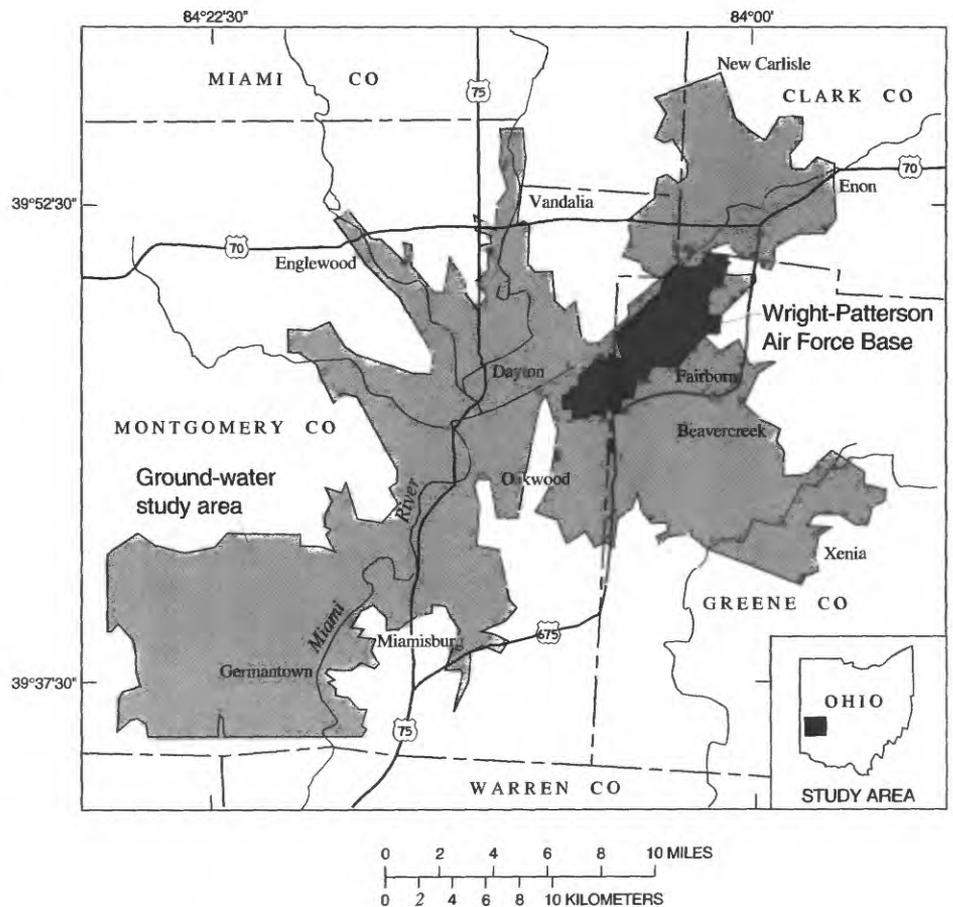


Figure 3. Ground-water study area in southwestern Ohio.

general public for outdoor uses, including hiking, camping, exploring, and back-country fishing expeditions.

Currently (1995), the USGS and The Ohio State University, Center for Mapping, are producing a computerized map data base derived from information on printed maps, including the Public Land Survey System, political boundaries, transportation routes, and land-surface contours. The USGS is encoding and entering these data files into the National Digital Cartographic Data Base for use by the public. Additionally, the USGS and the Ohio Department of Transportation are revising topographic maps of southeastern Ohio.

## National Water-Quality Assessment Program

In 1991, the USGS began the National Water-Quality Assessment Program to describe the status and trends of a large, representative part of the Nation's ground water and surface water and to identify and describe the natural and human

factors that affect their quality. One study unit in the program, the Lake Erie-Lake St. Clair Basin, covers approximately 20,850 square miles and represents all the drainage to Lake Erie and Lake St. Clair from Ohio, Michigan, Indiana, Pennsylvania, and New York. USGS scientists are studying the occurrence and distribution of pesticides, fertilizers, sediment, and trace organic and inorganic contaminants, using data from the USGS monitoring network and from other agencies and academic institutions. The USGS works in cooperation with a liaison committee that includes 10 Federal agencies, 14 State agencies, 28 local and area-wide agencies, 12 academic institutions, and 5 private, regional and international organizations. The goal of the National Water-Quality Assessment Program is to provide scientific information to support the needs of water-resources managers and policymakers at the national, State, and local levels in their efforts to conserve, protect, and provide usable water for the public.

## Collection of Hydrologic Data

Since the turn of the century, the USGS has maintained and operated a monitoring network of ground-water observation wells and surface-water gaging stations throughout Ohio to collect short- and long-term data (fig. 4). Data from the statewide monitoring network provide the USGS and its cooperators with information on ground-water levels, surface-water flows, quantity of available water, and water-quality characteristics. The data from this monitoring network are made available through computer data bases and as published reports and maps. Cooperators in the operation of the statewide monitoring network include the U.S. Army Corps of Engineers; the ODNR, Division of Water; the Ohio Department of Transportation; the Ohio Environmental Protection Agency; the cities of Columbus and Akron; the University of Cincinnati; and Heidelberg College.



**Figure 4.** Historic and current ground- and surface-water monitoring sites in Ohio.

reports, current and historical water-resources data, information on map products, answers to earth science questions, and referrals to other Federal, State, and local agencies.

USGS educational activities in Ohio include providing lectures and demonstrations for college and university classes and elementary and secondary schools, judges for Science Fairs, and exhibits for job fairs and career days. The USGS, in cooperation with Ohio State University Extension and other Federal, State, and local organizations, also has assisted with the design, development, and implementation of an educational workshop titled "Water Systems for Small

Communities." The workshop is offered periodically by the Extension at locations throughout the State to educate community leaders about Ohio's water resources and their role in meeting the demand for usable water by the citizens of the State.

## Cooperative Programs

USGS activities in Ohio are pursued 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 one-half of current (1995) water-resources studies are financed through matching-fund agreements with State and local governments. The remaining studies are funded through Federal sources, including other Federal agencies. A few cooperators not previously mentioned are the U.S. Department of Agriculture, Geauga and Ross Counties, the cities of Canton and Toledo, the Cuyahoga River Community Planning Organization, and the Miami Conservancy District. Additionally, the USGS provides support to The Ohio State University, Water Resources Center, which conducts a program of research, education, and information and technology transfer.

## Outreach Activities

Each year, the USGS office in Columbus, Ohio, receives and responds to hundreds of requests for earth science information from the general public, Federal and State agencies, local governments, private organizations, elementary and secondary school students and teachers, and colleges and universities. The information provided by the USGS staff includes published

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For more information contact any of the following:

For water information  
District Chief  
975 W. Third Ave.  
Columbus, Ohio 43212  
(614) 469-5553

For geologic information  
Assistant Chief Geologist  
953 National Center  
Reston, Virginia 22092  
(703) 648-6660

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

For map information  
Chief, Mapping Applications Center  
567 National Center  
Reston, Virginia 22092  
(703) 648-6002

National Landslide Information Center  
Denver Federal Center, Mail Stop 966  
Denver, Colorado 80225  
1-800-654-4966

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