

# United States Geological Survey

## Programs in Maryland and the District of Columbia



*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.*

### Contributions to the Chesapeake Bay Program

Water contamination has increased concern about the commercial, economic, and recreational values of Chesapeake Bay (fig. 1). Sediment and toxic substances carried by streams flowing into the Bay from agricultural, urban, and forested areas have adversely affected its water quality. As one of the Nation's lead agencies for assessing water resources, the U.S. Geological Survey (USGS) has actively collected scientific data and provided technical support needed to manage and restore Chesapeake Bay.

The USGS supports the Chesapeake Bay Program through technical projects that provide relevant information needed to manage the Bay's resources. The USGS also participates in technical committees that were formed by the U.S. Environmental Protection Agency to help guide restoration of the Bay. Through these projects and participation on the committees, the USGS provides information on how the quality of the major rivers that empty into the Bay affects its quality and the quality of associated resources. One of the most important projects measures the quantity of chemicals from fertilizer

that enter the Bay in surface and ground water. The information generated by the study is used by State and Federal water managers to assess the effectiveness of fertilizer-reduction measures and to develop methods of reducing nutrients in the Bay's tributaries. Funding for this work comes through the Federal-State Cooperative Program, in which the USGS conducts and funds up to half the cost of such studies in cooperation with non-Federal government agencies.

### National Water-Quality Assessment Program

The effect of human activity on water quality is a very important and visible environmental issue in the Nation. In response to this concern, the USGS is conducting comprehensive assessments of water quality in 60 large regions across the Nation. The National Water-Quality Assessment (NAWQA) Program is designed to describe the status and trends in the quality of a large representative part of the Nation's surface and ground water and to provide a sound, scientific understanding of the most important natural and human factors that affect water quality. The results from the NAWQA Program are beginning to produce a wealth of useful water-quality information for policymakers and managers at the national, State, and local levels. The Program is federally funded, but the USGS is working in partnership with a large group of State and Federal agencies that regulate water quality and resource management.

#### Delmarva National Water-Quality Assessment Study Unit

The Delmarva Peninsula (fig. 1) is 1 of the 60 study areas in this Program and was 1 of 7 areas chosen for pilot studies. The Delmarva study has given policymakers and resource managers important

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information on the extent of ground-water contamination caused by agricultural and residential land use. For example, the study has shown that high concentrations of nitrate (greater than 10 milligrams per liter), a known hazard to human health, are found in most water samples from the surficial aquifer, including deep parts of the aquifer used for water supply. Pesticides generally are not found in deep parts of the surficial aquifer, but they could migrate to these zones during the next few decades. The Delmarva study also showed that ground water with high concentrations of nitrate will continue to discharge to streams draining into Chesapeake Bay for at least the next few decades. Accordingly, ground-water quality, as well as surface-water quality, has to be factored into land-use practices designed to improve water quality in the Chesapeake Bay watershed. The issue is of vital importance to local resource managers and concerned citizens because the States in the Chesapeake Bay watershed have made a commitment to reduce contamination of the Bay significantly by 2000.

#### Potomac National Water-Quality Assessment Study Unit

To meet the NAWQA Program's goals in the Maryland-District of Columbia area of the Potomac River Basin (fig. 1), a



**Figure 1.** National Water-Quality Assessment (NAWQA) Program study areas.

wide variety of sampling approaches are being used to evaluate water quality in streams and ground water. Streams are being evaluated through repetitive water sampling of selected streams; "snapshot" sampling of many streams at once; repetitive and snapshot sampling of biological stream communities, such as aquatic insects, fish, and algae; and snapshot sampling of streambed sediment and tissues from clams and fish. Ground water is being evaluated by large-scale snapshot samplings of private wells in agricultural, urban, and suburban areas and repetitive sampling of monitor wells at a small-scale research site representative of an important setting in the Potomac River Basin. The first phase of the water-quality assessment for the Potomac study unit focuses on nitrogen, phosphorus, and pesticides—three of the most common contaminants in water. Excessive amounts of these chemicals in streams and ground water in the Maryland–District of Columbia part of the Potomac River Basin have been identified as one of the major factors in the decline in the quality of Chesapeake Bay during the last several decades. One form of nitrogen, nitrate, is a known hazard to human health if it is in sufficiently high concentrations in drinking water. Pesticides, including herbicides and insecticides, also have been linked to aquatic-health problems in Chesapeake Bay, and many pesticides are known or suspected to be toxic when they enter the food chain.

The sampling of water in the Potomac River Basin for nitrogen, phosphorus, and pesticides has begun to provide the answer to the following questions:

- Which of these chemicals are found in streams and ground water?
- Which streams and ground-water reservoirs contain concentrations of these chemicals at a level high enough to harm humans and aquatic life?
- How do concentrations of these chemicals vary seasonally?
- What are the likely sources of these chemicals in streams and ground water?

With the answers to these questions in hand, managers and policymakers in Maryland and the District of Columbia, as well as the general public, will be able to make more informed and more cost-effective decisions concerning water-supply protection and management and the restoration of Chesapeake Bay.

The Potomac study unit operates under the guidance of a liaison committee comprising representatives from 25 other Federal, regional, and State agencies and universities, who also assist in many of its sampling activities.

### **Contributions to the U.S. Department of Defense Installation Restoration Program**

Ground water supplies most of the drinking water for the citizens of Maryland. Understanding how ground water becomes contaminated is basic to making informed decisions for protecting the State's drinking-water supplies. Contamination of these supplies from leaking hazardous-waste sites can seriously affect human health. Also, the leakage of contamination from these sites into Chesapeake Bay contributes to the overall decline of its water quality.

Since 1984, the USGS has assisted environmental managers at Aberdeen Proving Ground (APG), Maryland (fig. 1), to identify areas of contaminated ground water. The USGS works with managers at APG to locate areas of contamination, to develop ground-water-flow models that predict the effects of various methods to reduce contamination at hazardous-waste sites, and to develop ways to mitigate contamination of wetland environments. These efforts have added to the ability of the environmental managers at APG to develop effective and economical plans to reduce contamination and to address the concerns of local citizens.

### **Hydrologic Hazards In Maryland**

Changes in climatic conditions in Maryland can produce large variations in surface-water supplies. Severe variations (floods and droughts) can adversely affect the agricultural sector of the State

economy, as well as public safety. The USGS actively works to improve the accuracy of predictions of floods and droughts. State, county, and local planning officials use these predictions to develop improved methods for water management and the design of infrastructure.

The Maryland State Highway Administration (SHA), which provides cooperative funds for studies of streambed scour at highway bridges and flood magnitude and frequency; the Maryland Geological Survey; and the Maryland Water Resources Administration (WRA), which cooperated with the USGS in a study of drought frequency, are some of the agencies that use results of USGS studies. The results of these studies are used by the SHA to reduce maintenance, repair, and replacement costs for highway bridges and to improve the safety of travelers during floods. The WRA uses the results of the drought study to improve analyses of water appropriation and use during drought, thereby allowing it to make appropriate water-supply decisions to ensure that the water needs of the greatest number of people are met to the greatest possible extent. Such contributions to public safety and well-being make USGS reports invaluable to the citizens of Maryland.

### **Acid Rain in Maryland**

Acid rain is a widespread environmental problem in developed parts of the world because most of the acid-producing gases are caused by the burning of oil and coal to support transportation, industry, and generation of electricity. Acid rain affects the water quality of streams, lakes, and ground water because some areas of the Earth's surface are not capable of neutralizing the acidity in rainfall. Ground and surface water affected by acid rain becomes more acidic than normal; in some cases, the water is so acidic that aquatic life dies, thus affecting the viability of industries, such as fisheries, and recreation. Water quality needs to be monitored on a long-term basis to determine whether changes in water quality result from changes in climate or in levels of acid-producing gases in the atmosphere.

Maryland receives some of the most acidic rain in the Nation because it is



located downwind of major emitters of acid-producing gases. The USGS has monitored the severity of the acid-rain problem in Frederick County, Maryland (fig. 1), since 1982. The Maryland Department of Natural Resources funds some of the USGS research on the effects of acid rain on Maryland's environment. The Maryland Department of the Environment also cooperates with the USGS on research study and long-term monitoring of the quality of rain and surface water.

## Data Network and Water Use

The amount and quality of surface and ground water are vitally important to the citizens of Maryland and the District of Columbia. Most domestic and agricultural water use is supplied by wells, whereas most public-water supplies come from streams and rivers; all water supplied to the District of Columbia comes from the Potomac River. The USGS operates a network of 87 streamflow-gaging stations and 330 water-level-gaging stations at wells to collect the data necessary to evaluate the amount and quality of the water resources in Maryland and the District of Columbia. The location of water-resource data-collection sites are shown in figure 2.

Some of the responsibilities of the USGS include the monitoring of ground-water levels, streamflow, and changes in water quality; the support of efforts to reduce contamination; the detection of contamination and prediction of contaminant movement in water; the supplying of data needed to maintain freshwater fisheries; and public education. The USGS systematic data-collection program receives cooperative support from the Maryland State Highway Administration, the Maryland Geological Survey, the Washington Suburban Sanitary Commission, the U.S. Army Corps of Engineers, and other organizations. Up-to-date data on ground-water levels, streamflow, and water quality, as well as its availability and use by decisionmakers to maintain the quantity and quality of water to meet future needs, make the USGS systematic data-collection program an integral part of water-resources management for the citizens of Maryland and the District of Columbia.

## Maryland Geologic Mapping

Since 1991, the USGS, in cooperation with the Maryland Geological Survey (MGS), has mapped bedrock and surface geology at a scale of 1:24,000 as part of the Maryland Piedmont Project. The geologic data are necessary to the work of the U.S. Department of Agriculture's Soil Conservation Service and the MGS. The USGS, in cooperation with the U.S. Department of the Army, began a study of the Aberdeen Proving Ground as part of a new multiagency initiative on the ecology of the Chesapeake Bay region. In cooperation with the MGS, the USGS produces technical papers and maps on the geology of Maryland so the data become available.

## Mineral Resources of Maryland

Like many Eastern States, Maryland depends on diminishing supplies of local minerals that are required to maintain and construct buildings and other structures. In addition, recent geologic data indicates the presence of mineral deposits with commercial applications that were not discovered until recently. The USGS is inventoring known mineral resources in Maryland and is assessing the potential for minerals in areas that have not yet been explored. This work involves the compilation and analysis of geological, geophysical, geochemical, and mineral-deposit data. The USGS publishes traditional maps, as well as digital data sets available on CD-ROM, that have widespread application for industry, Federal and State land-management agencies,

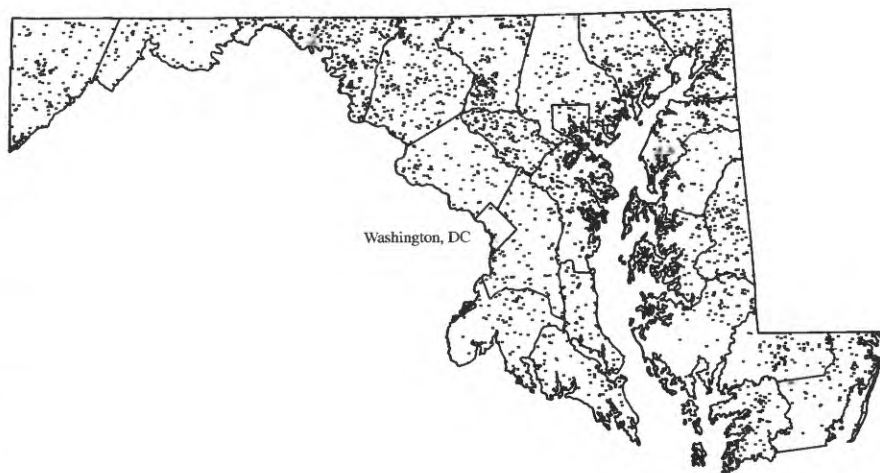
regional planners, and local governments. Ongoing work by the USGS in this area provides geologic information needed to support the economy, evaluate mineral resources, and predict the effect of future development on the State's water resources.

## 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. Topographic contour lines are used to depict the elevation and shape of the terrain. Maryland and the District of Columbia is covered by 264 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.

## 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 about 40 years. Satellite images dating from 1972 can be



**Figure 2.** Data-collection sites in Maryland and the District of Columbia.

used to study changes in regional landscapes.

## Cooperative Programs

The USGS cooperates with more than 30 local, State, and Federal agencies in Maryland and the District of Columbia. Cooperators include county and municipal public works departments, public-health agencies, water and sanitation districts, and Federal agencies. Cooperative activities

include water-resources-data collection, interpretive studies of water availability and water quality, mineral-resource assessments, and mapping. When local and State agencies are involved, activities typically are funded on a matching-funds basis. In addition to agencies already mentioned, the USGS cooperates with the following: the District of Columbia Department of Public Works, the Metropolitan Washington Council of Governments, the Department of Consumer and Regulatory Affairs,

the University of the District of Columbia, the cities of Baltimore and Salisbury, the Interstate Commission on the Potomac River Basin, the town of Indian Head, the Maryland Bureau of Mines, the Prince Georges County, the Calvert County Soil Conservation District, the Delaware River Basin Commission, the U.S. Department of the Army, the U.S. Navy, the National Oceanic and Atmospheric Administration, the National Transportation Safety Board

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### For more information contact any of the following:

For water information  
District Chief  
8600 LaSalle Road  
208 Carroll Building  
Towson, Maryland 21286  
(410) 512-4800

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

For geologic information  
Assistant Chief Geologist  
953 National Center  
Reston, Virginia 22092  
(703) 648-6660  
National Earthquake Information Center  
Denver Federal Center, Mail Stop 967  
Denver, Colorado 80225  
(303) 273-8500

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.