U.S. Geological Survey Programs in Maryland and the District of Columbia

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 natural-science data for more than a century. In this capacity, the USGS in Maryland and the District of Columbia works in partnership with municipal public-works departments, public-health agencies, water and sanitation districts, other Federal agencies, and State and county agencies. This Fact Sheet describes some of the current USGS activities in Maryland and the District of Columbia.

Chesapeake Bay Resources and Restoration

Poor water quality has increased concern about the commercial, economic, and recreational values of Chesapeake Bay (fig. 1). Excess nutrients, sediment and toxic substances carried by streams flowing into the Bay from agricultural, urban,

and forested areas have adversely affected its water quality. The USGS has collected scientific data and provided technical support needed for managing and restoring the natural environment and resources of the Chesapeake Bay.

In 1987, the States in the Chesapeake Bay watershed established an agreement to restore the Bay. The USGS supports the Chesapeake Bay Program through technical projects that provide information needed for managing the Bay's resources. The USGS also participates in technical committees formed by the U.S. Environmental Protection Agency to guide restoration of the Bay. Through these activities, the USGS provides information about the quality of major tributaries that empty into the Bay and associated resources. One project measures the quantity of chemicals from fertilizers that enter the Bay in surface and ground waters. The information

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from the study is used by State and Federal water managers to assess the effectiveness of fertilizer-reduction measures and to develop methods for reducing nutrients in the Bay's tributaries.

The USGS multidivisional Chesapeake Bay Ecosystem Program was initiated in 1996 to collect and interpret data to help resource managers determine the effectiveness and response of the Bay ecosystem to nutrient additions and climatic variation during the last 15 to 400 years. This is being accomplished by determining the response of water quality and selected living resources of the Bay watershed and estuary as nutrient input is reduced; defining and evaluating the natural controls on the response in water quality and selected living resources to changes in nutrient loading; and providing data to resource managers to evaluate the effectiveness of components of the nutrient-reduction strategies.

National Water-Quality Assessment

The effect of human activity on water quality is a visible environmental issue in the Nation. The USGS is conducting the National Water-Quality Assessment (NAWQA) Program, a comprehensive assessment of water quality in 60 large

Figure 1. National Water-Quality Assessment Program study areas.

regions across the Nation. Major parts of two of these regions, the Potomac River Basin and the Delmarva Peninsula, are in Maryland (fig. 1). A small part of the Lower Susquehanna River Basin study unit, which drains into Chesapeake Bay, also lies within Maryland. The results from the NAWQA Program are producing useful water-quality information for 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 other agencies that regulate water quality and manage resources.

The Delmarva Peninsula (fig. 1) NAWQA study, which was one of 7 pilot studies, was active during the period 1986–1991 and it is scheduled to restart in 1997. The Delmarva study has given resource managers information about the extent of ground-water contamination caused by agricultural and residential land use. For example, the study has shown that high concentrations (greater than 10 milligrams per liter) of nitrate, which is a known hazard to human health, are commonly found in water samples from most parts of the surficial aquifer, including deep parts of the aquifer that are 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. Data collected during the Delmarva study also showed that ground water with high concentrations of nitrate will continue to discharge to tributaries of Chesapeake Bay for at least the next few decades. Knowledge of ground- and surface-water quality is useful when policymakers and resource managers consider land-use changes and practices that are designed to improve water quality in the Chesapeake Bay watershed.

To meet the goals of the NAWQA Program in the Maryland–District of Columbia area of the Potomac River Basin (fig. 1), a wide variety of sampling approaches is being used to evaluate water quality in streams and ground water. Streams are being evaluated through either repetitive or “snapshot” sampling or both of water quality; of biological communities of insects, fish, and algae; of streambed sediment; and of clam and fish tissue. Ground-water quality is being evaluated by large-scale snapshot sampling of private wells in agricultural, urban, and suburban areas and repetitive sampling of

monitoring wells at a small research site in the Potomac River Basin. The first phase of the water-quality assessment for the Potomac study unit focuses on nitrogen, phosphorus, and pesticides, which are 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 a major factor in the decline of water quality in Chesapeake Bay during the last several decades. One form of nitrogen, nitrate, is a known human-health hazard if it is in sufficiently high concentrations in drinking water. Pesticides, including herbicides and insecticides, 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.

Sampling and analysis of water in the Potomac River Basin for nitrogen, phosphorus, and pesticides have begun to show which streams and ground-water reservoirs contain concentrations of these chemicals at levels harmful to humans and aquatic life; how concentrations of these chemicals vary seasonally; and the likely sources of these chemicals in streams and ground water.

With this information, managers in Maryland and the District of Columbia and the general public will be able to make more informed decisions concerning water-supply protection and management and the restoration of Chesapeake Bay.

The Potomac and Delmarva NAWQA studies operate under the guidance of liaison committees with representatives from many Federal, regional, and State agencies and universities.

U.S. Department of Defense Installation Restoration

Ground water supplies drinking water for many citizens of Maryland. Understanding how ground water becomes contaminated and how it can be cleaned up can improve protection of the State’s drinking-water supplies. Contamination of these supplies from leaking hazardous-waste sites can seriously affect human health; also, contamination leakage from these sites into Chesapeake Bay contributes to the overall decline of water quality of the Bay.

Since 1984, the USGS has assisted environmental managers at the Aberdeen Proving Ground (APG), Maryland (fig. 1), to identify areas of contaminated ground water. The USGS works with managers at the APG to locate areas of contamination, to develop ground-water-flow models that can be used to simulate 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 the APG to develop effective and economical plans to reduce contamination and to address the concerns of local citizens.

Hydrologic Hazards

Changes in climatic conditions can produce large variations in surface-water discharge; this was the case with the 100-year flood of the upper Potomac River in September 1996 that followed the drier-than-normal year of 1995. Floods and droughts can adversely affect the agricultural sector of the State economy as well as public safety. The USGS actively works to improve estimates of the severity of floods and droughts. State, county, and local planning officials use these estimates to improve methods for water management and the design of infrastructure.

The Maryland State Highway Administration (MDSHA) provides cooperative funds for USGS studies of streambed scour at highway bridges and flood magnitude and frequency. The results of these studies are used by the MDSHA to reduce maintenance, repair, and replacement costs for highway bridges and to improve the safety of travelers during floods. The Maryland Geological Survey (MGS) and the Maryland Water Resources Administration (WRA), which cooperated with the USGS in a study of drought frequency, also use the results of USGS studies. The WRA uses the results of drought studies to improve analyses of water appropriation and use during drought, thereby allowing appropriate water-supply decisions to ensure that the water needs of Maryland’s citizens are met.

Acid Rain

Acid rain, which results from burning oil and coal, affects the quality of streams, lakes, and ground water because of the

inability of some areas of the Earth's surface to neutralize the acidity in rainfall. Ground and surface waters affected by acid rain become more acidic than normal. Water can become so acidic that aquatic life dies, thus affecting the viability of fisheries and recreation. The USGS monitored the severity of acid rain in Frederick County, Maryland (fig. 1), from 1982 to 1995, in cooperation with the Maryland Department of Natural Resources and the Maryland Department of the Environment.

Saltwater Intrusion

Aquifers along Maryland's coast can be contaminated by saltwater when too much water is pumped from them. The USGS, in cooperation with the MGS and other agencies, investigated the potential for saltwater intrusion in rapidly developing areas bordering the Atlantic Ocean and Chesapeake Bay, including Ocean City and Annapolis (fig. 1). The studies provide a scientific basis for ground-water development by mapping the present distribution of saltwater, developing predictive models to forecast future conditions, and establishing a monitoring well network to monitor water-level and water-quality trends.

Water-Data Network and Water Use

Most domestic and agricultural water 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 90 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 locations of continuous streamflow-gaging stations that have been operated since 1980 are shown in figure 2.

The responsibilities of the USGS include monitoring ground-water levels, streamflow, and changes in water quality; supporting efforts to reduce contamination; detecting contamination and predicting contaminant movement in water; and supplying the data needed to maintain freshwater fisheries. The USGS systematic data-collection program receives cooperative support from the MDSA, the MGS,

the Washington Suburban Sanitary Commission, the U.S. Army Corps of Engineers, and other organizations. Current and easily available data on ground-water levels, streamflow, and water quality, make the USGS systematic data-collection program an integral part of water-resources management.

Water-Monitoring Partnership

The USGS is a partner with the Maryland Department of Natural Resources, the Maryland Department of the Environment, local governments, other Federal agencies, volunteer groups, academia, consultants, and industry in the newly formed Maryland Water Monitoring Council (MWMC). The MWMC fosters communication, collaboration, and cooperation among groups involved in water monitoring. Its goals are to promote the development of collaborative watershed-based monitoring strategies, to document monitoring activities in Maryland, and to promote the use of quality-assured procedures for sample collection, analytical methods, assessment, and data management.

Biological Resources

The USGS, in cooperation with the Maryland Department of Natural Resources, is collecting information about the location and status of reptiles and amphibians. Study sites throughout Maryland are being used to test data-collection and monitoring methods for declining reptile and amphibian species.

The canvasback duck is an important part of the waterfowl hunting tradition of the Chesapeake Bay. The USGS is studying the causes for declining populations of wintering canvasbacks in the Bay during the past two decades.

The USGS participates as research and technical advisors in the Appalachian Clean Streams Initiative (ACSI), which is a comprehensive effort to implement

Figure 2. Locations of continuous streamflow-gaging stations in Maryland and the District of Columbia that were active since 1980

acidic mine drainage prevention and watershed restoration. Through the ACSI, Maryland has begun restoration work on the North Branch Potomac River so that this water can again support productive fisheries and recreational areas.

Assateague Island National Seashore (fig. 1) is a research site for National Park Service and the USGS for testing vegetation mapping methods, which were developed in cooperation with private industry. Vegetation maps of National Parks in Maryland can be used for management and planning.

Geologic Mapping

County and quadrangle geologic maps contain information that can be used for a wide range of public and private applications such as land-use planning; ground-water availability and quality studies; finding and making the best use of earth resources such as natural aggregate for construction; hazard assessment; and engineering and environmental studies for waste disposal sites and construction projects. Map information is used in hydrologic and geologic studies by the USGS, the MGS, and the U.S. Department of Agriculture's Natural Resources Conservation Service. Geologic maps, particularly those at 1:24,000 scale, are used by engineering companies for geotechnical studies for highways and other construction projects and by environmental firms for studies of pollution and remediation of individual sites throughout the State. Other companies use geologic maps and cross sections for siting industrial water wells.

The USGS, in cooperation with the MGS, produces technical papers and maps about the geology of Maryland as the data become available.

Since 1968, the USGS, in cooperation with MGS, has mapped bedrock and surficial geology throughout Maryland at scales of 1:62,500 and 1:24,000. This includes 1:24,000 scale mapping of the Maryland Piedmont region since 1991.

Currently, the USGS, in cooperation with MGS, is producing a geologic map of the Chesapeake and Ohio Canal National Historical Park for the National Park Service (C & O Canal, fig. 1). The Geology of the Mid-Atlantic Corridor Project, which is being conducted in cooperation with the MGS, maps geology in the urban, suburban, and outlying rural areas of the Baltimore, Maryland–Washington D.C. region. The results of the project will be in the form of 1:100,000 scale geologic maps in standard paper and digital formats to help meet information needs for environmental, resource, land-use, hazard, and engineering applications in the mid-Atlantic urban corridor.

Metallic Mineral Resource Assessment

Economic growth and development in Maryland depend in part on the availability of local mineral sources for use in industry, manufacturing, and the maintenance and upgrading of the region's infrastructure. The USGS, in cooperation with State Geological Surveys and resource agencies, including the MGS, is inventorying known mineral resources and assessing the potential for as-yet-undiscovered mineral resources, based on geological, geophysical, and geochemical studies. Information in digital and paper form will assist Federal and State land-management agencies, regional planners, industry, and local governments to ensure adequate supplies of minerals at the lowest possible cost and promoting sound management of the region's very substantial mineral resources.

Topographic Mapping

The demand for maps and digital cartographic data is widespread and it continues to grow. The USGS strives to

ensure availability of map data in graphic and digital form through timely data collection and revision procedures. The USGS fosters partnerships with State and Federal agencies to improve data-collection activities and to maximize resource sharing. The USGS, in cooperation with the Federal Geographic Data Committee's Wetlands Subcommittee, assisted the WRA and several Federal agencies to assess the causes of reporting discrepancies for wetlands in Wicomico County, Maryland by producing 1,200 digital plots that compared wetland interpretations from the Departments of the Interior, Agriculture, and Commerce, and from the Maryland WRA.

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. Maryland and the District of Columbia are covered by 264 maps at this scale.

Earth Science Information Center

The Earth Science Information Center (ESIC) in Baltimore, Maryland, was established under a cooperative agreement between the USGS and the Maryland Geological Survey. The ESIC provides information on topics such as cartography, geography, digital data, remote sensing, geology, geophysics, geochemistry, hydrology, geohydrology, aerial photography, and land use. It is supported by the USGS with reference materials, technical assistance, training, outreach activities, and access to USGS data bases.

Cooperative Programs

The USGS cooperates with about 30 local, State, and Federal agencies in Maryland and the District of Columbia. Cooperative activities include water-resources-data collection, studies of water availability and quality, mineral-resource assessments, and mapping. For information on geologic and topographic reports published by the State of Maryland (including maps, images and computerized data), contact the Maryland Geological Survey, 2300 St. Paul Street, Baltimore, Maryland 21218, (410) 554-5500.

For More Information

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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**

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
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