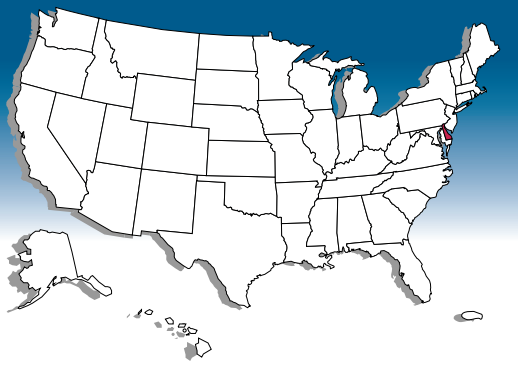
U.S. Geological Survey Programs in Delaware



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 Delaware works in partnership with municipal public-works departments, public-health agencies, water and sanitation districts, other Federal agencies, and State and county agencies. The USGS, as the Nation's principal agency for natural science, provides the national perspective to the many programs that are done in concert with these agencies.

Index of Subjects

National Water-Quality Assessment

The effect of human activity on water quality is an important and visible environmental issue in the Nation. In response to this concern, the USGS is conducting the National Water-Quality Assessment (NAWQA) Program, which is a comprehensive assessment of water quality in 60 large regions across the Nation. The purpose of this Program is to assess current water-quality conditions and to investigate the effects of natural and human factors on water quality. The Delmarva Peninsula is 1 of the 60 study areas included in the NAWQA Program (fig. 1). The study is federally funded; however, the USGS is working in partnership with Federal and State agencies that also conduct research and that regulate water quality and manage resources.

Maintenance or improvement of ground- and surface-water quality are important considerations in managing land-use practices on the peninsula. The Delmarva Peninsula study has provided resource managers with useful information on the relation of water-quality problems to agricultural and residential land use. The study has shown that although high concentrations of nitrate (greater than 10 milligrams per liter as nitrogen), a known human-health hazard, are present in approximately 15 percent of the water samples from wells in the surficial aquifer, the distribution of the nitrate concentrations differs regionally in relation to changes in geology, soils, land use, and hydrologic flow patterns. High nitrate concentrations in the surficial aquifer are more likely in upland areas (fig. 1), where soils typically are well-drained and sandy and the predominant land use is agriculture, than in other parts of the Peninsula. High nitrate concentrations also are found in deep parts of the surficial aquifer. Pesticides, which are widely present in water from shallow parts of the surficial aquifer at concentrations below the U.S. Environmental Protection Agency (USEPA) Health Advisory Limits, are not presently found in deep parts of the aquifer.

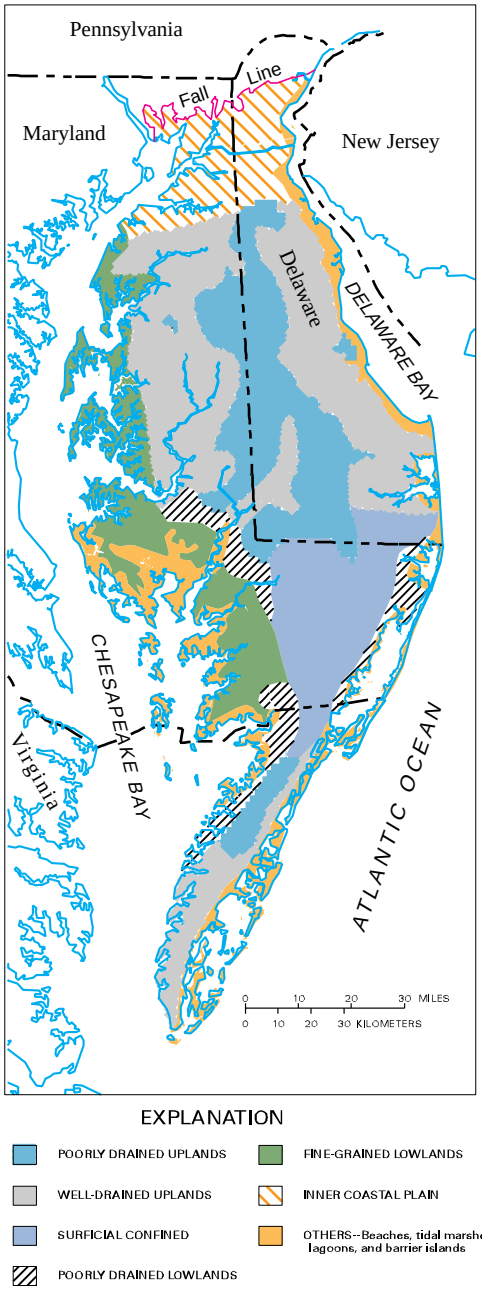


Figure 1. Hydrogeomorphic regions in the surficial aquifer in the Delmarva Peninsula.

The Delmarva Peninsula study also examined chemical patterns in ground and surface water in small watersheds representing different landscapes on the peninsula. Nitrate presently in the ground-water system will continue to discharge to streams for at least the next few decades. Landscape characteristics, such as the amount of forest cover and of poorly drained soil and channel slope in a small watershed, were statistically related to the major processes that affect water chemistry.

Ground-Water Flow and Water Quality at Dover Air Force Base

The USGS is providing multidisciplinary technical assistance on environmental issues at Dover Air Force Base. The USGS is assessing ground-water flow in the surficial aquifer and determining whether or not contaminants at several previous waste disposal sites are naturally attenuating at rates that are adequate to prevent risk of offsite contamination. This is being accomplished by drilling wells, sampling ground water, and sampling soils in selected areas of the base; determining the capacity of soils and aquifer materials to attenuate contaminants naturally; and developing computer models to estimate ground-water flow and pollutant transport in parts of the base.

On the east side of Dover Air Force Base, disposal of fuel hydrocarbons and degreasing solvents has resulted in contamination of the water-table aquifer. Both the analysis of the ability of the aquifer materials to attenuate the contaminants and the results of a geochemical model specific for the site indicate that intrinsic remediation is sufficient for decreasing contaminant concentrations to acceptable off-site levels.

Ground-Water Flow in the Delaware City Area

Understanding how ground water becomes contaminated can lead to informed decisions on ways to protect drinking-water supplies. The USGS provides technical assistance to the USEPA, Region III, Resource Conservation and Recovery Act Division, with computerized simulations of ground-water flow in the Delaware City area. To simulate ground-water flow in the area, the USGS collects data, develops models of ground-water flow by means of a geographic information system, and models possible ways to reduce ground-water contamination caused by leaks from hazardous-waste sites in the Delaware City area. These efforts will help the USEPA to develop effective and economical plans to reduce contamination in this area.

Hydrologic Hazards

Floods and droughts can adversely affect the agricultural sector of the State's economy as well as public safety. The USGS, in cooperation with the Delaware Geological Survey (DGS), is improving the accuracy of estimates of the severity of floods and droughts. State, county, and local planning officials use the estimates to develop improved strategies for water management and the design of infrastructure.

The Delaware Department of Transportation (DelDOT), which provides cooperative funds for studies of flood magnitude and frequency, and the Delaware Department of Natural Resources and Environmental Control, which cooperated with the USGS in a study of the frequency of low streamflows, are two of the agencies that rely on the results of USGS studies. Results of these studies are used by the DelDOT to reduce maintenance, repair, and replacement costs for highway bridges and to improve the safety of travelers during floods. State and local agencies use the results of the low-streamflow study to allocate surface water and evaluate droughts, thereby allowing appropriate water-supply decisions that 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 valuable to the citizens of Delaware.

Data Networks and Water Use

The amount and quality of ground and surface water are vital to the citizens of Delaware. The USGS operates a cooperative network of 14 streamflow-gaging stations, 6 tidal gages, and numerous water-level gaging stations at wells to collect the data necessary to evaluate hydrologic conditions. The locations of streamflow-gaging stations that were active after 1980 are shown in figure 2.

The detection of contamination and the prediction of contaminant movement in ground water are important in the part of Delaware south of the Chesapeake & Delaware Canal, where ground water supplies most freshwater needs. Similarly, maintaining adequate supplies of surface water for public consumption in northern Delaware and for fisheries and other industries, the support of wildlife, and recreation are also important issues. The USGS systematic data-collection program in Delaware received cooperative support from the Delaware Geological Survey, the Delaware Department of Natural Resources and Environment Control, the Delaware Department of Transportation, the U.S. Environmental Protection Agency, the U.S. Army Corps of Engineers, and other organizations. The USGS has an important role in collecting data to address these issues. The availability of up-to-date data on water levels and water quality and its use by water-resource managers to help maintain the quantity and quality of water needed for future use make the USGS systematic data-collection program an integral part of water-resources management in Delaware.

Since 1950, the USGS has published reports at 5-year intervals on the estimated use of water in the United States. Estimates of water use in Delaware are combined with estimates by other States and water-resources regions in accordance with methods and standards to meet regional and national needs.

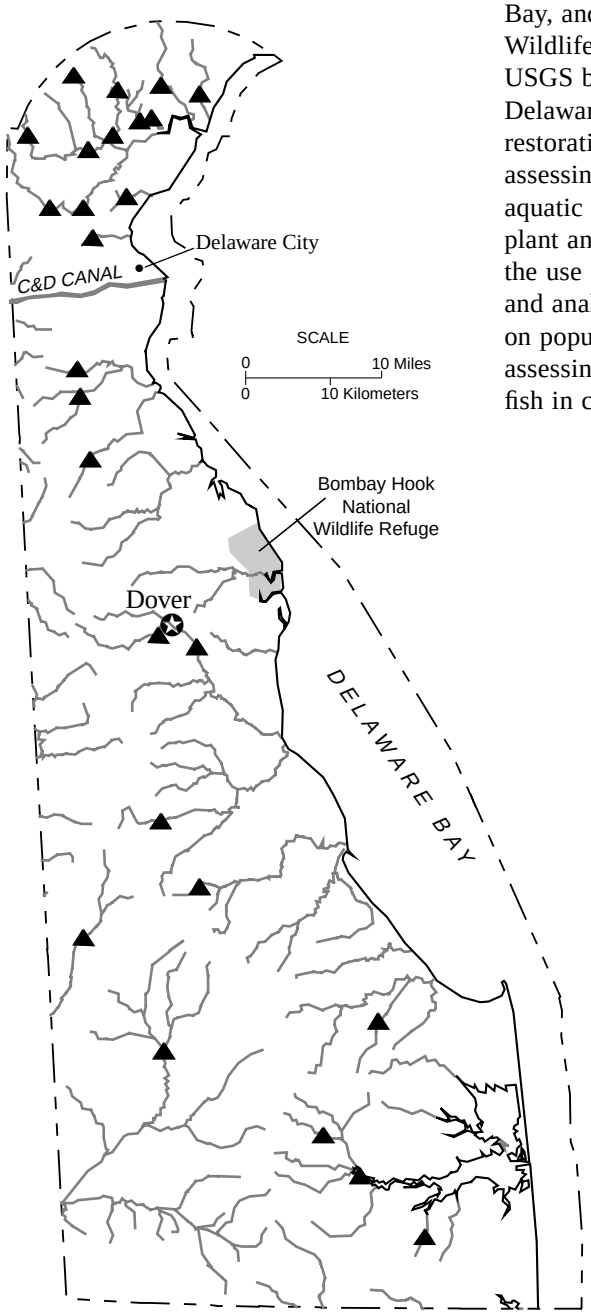


Figure 2. Locations of continuous streamflow-gaging stations (solid triangles) in Delaware that were active after 1980.

Biological Resources

The USGS Biological Resources Division (formerly the National Biological Service) cooperates with other Federal and State agencies to assess the type, quantity, health, and diversity of biological resources in Delaware. The Delaware River, Delaware Bay, Chesapeake Bay, and the Bombay Hook National Wildlife Refuge are current locations for USGS biological research and study in Delaware. Study topics include habitat restoration for fish and bird species; assessing the effects of pesticides on aquatic life; mapping the diversity of plant and animal communities through the use of satellite imagery; gathering and analyzing quantitative information on populations of breeding birds; and assessing the effects of urbanization on fish in certain river reaches.

Topographic Mapping

The use of maps and digital cartographic data is widespread and demand for this information continues to grow. The USGS strives to ensure the availability of map data in graphic and digital form to the public through timely and effective data-collection and revision procedures. The USGS also fosters partnerships with other Federal and State agencies to improve data collection and to maximize resource sharing. In 1995, under a cooperative agreement with the DelDOT, the USGS assisted DelDOT's efforts to prepare digital orthophotoquads (DOQ) that meet USGS technical standards for image quality, resolution, and format. A DOQ is derived from an aerial photograph that has been corrected for displacement caused by camera tilt and terrain relief. A DOQ combines the image characteristics of a photograph with the geometric qualities of a map. The DelDOT has provided the USGS with 1:12,000-scale color infrared DOQ's covering the entire State. The DOQ's are being archived by the USGS for distribution.

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. Delaware is covered by 57 maps at this scale. These maps have long been favorites with the general public for outdoor uses, as well as with scientists and engineers for technical applications. Digital cartographic data, including boundaries, transportation, and hydrography captured from the 1:24,000-scale map series are available statewide. The USGS, in cooperation with the DGS, funded a 6-year statewide revision of the 1:24,000-scale topographic maps covering Delaware.

For More Information

Earth Science Information Center

The Earth Science Information Centers (ESIC's) provide information to the public about USGS programs, products, and technological developments. The ESIC in Newark, Delaware, was established under a cooperative agreement between the USGS and DGS and it is operated by the DGS. The ESIC provides information on 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.

Metallic Mineral-Resource Assessment

Economic growth and development in Delaware depend in part on the availability of local sources of minerals for use in industry, manufacturing, and the maintenance and upgrading of the region's infrastructure. The USGS, in conjunction with the State Geological Surveys and resource agencies including the DGS, 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 in ensuring adequate supplies of minerals at the lowest possible cost and promoting sound management of the region's mineral resources.

Cooperative Programs

USGS activities in Delaware that are conducted in cooperation with other agencies include water-resources data collection and interpretive studies of water availability and quality. Projects have included assessment of ground-water flow and quantity using ground-water-flow models of surficial, confined, and fractured rock aquifer systems; assessments of water quality with respect to brackish-water intrusion; studies of the effects of different land uses on water quality in the surficial aquifer; studies of the relation of wetlands to surface- and ground-water quality; and documentation of floods.

The DGS is the official point of contact for cooperative programs between the USGS and the State of Delaware. The USGS cooperates through the DGS with many State and local agencies throughout Delaware. For information on geologic and hydrologic reports published by the State of Delaware and to obtain USGS topographic mapping products (including maps, images, and computerized data), contact the Delaware Geological Survey, DGS Building, University of Delaware, Newark, Delaware 19716, (302) 831-2833, or e-mail at dgs@mvx.udel.edu.

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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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