

United States Geological Survey

Programs in Connecticut



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.

National Water-Quality Assessment Study in the Connecticut, the Housatonic and the Thames River Basins

Protecting the quality of the Nation's streams, lakes, and ground water is a high priority for many government agencies and the public. To provide nationally consistent information on water quality, the U.S. Geological Survey (USGS) began the National Water-Quality Assessment (NAWQA) Program. The Program is implemented through a series of studies that encompass important river basins and population centers.

The goals of the NAWQA Program are to describe current water-quality conditions, define long-term trends in the quality of the Nation's surface- and ground-water resources, and provide an understanding of the natural and human factors that affect the quality of these resources. This information is intended to provide policymakers, water managers, and the public with an improved scientific basis to evaluate the effectiveness of water-quality-management programs.

In 1991, the USGS began an investigation of the Connecticut, the Housatonic, and the Thames River Basins, which is a 16,000-square-mile area in the Northeastern United States that includes most of Connecticut (fig. 1). Water resources in the study area are abundant; however, water quality has been adversely affected by human activities in urban, residential, industrial, commercial, agricultural, and recreational areas. Waste materials from population centers and industries have created serious water-quality problems on major rivers. Nonpoint pollution sources, such as residential septic systems, storm runoff, and agricultural areas, have affected small streams and principal aquifers. Water and sediments in parts of the study area have been contaminated by nutrients, pesti-



Figure 1. The Connecticut, Housatonic, and Thames River Basin National Water-Quality Assessment Study.

cides, trace metals, or synthetic organic chemicals. The presence of contaminants affects the suitability of water for drinking, industrial use, recreation, or aquatic life. In addition, the quality of freshwater in this study area also affects Long Island Sound, which receives water from all major streams in Connecticut. The movement of nutrients, especially nitrogen, into the Sound is a major regional concern. The USGS is currently compiling available information on water quality and is conducting an intensive sampling program to characterize water-quality conditions in the study area.

Surface- and Ground-Water Data-Collection Networks

Complete and accurate hydrologic data are needed for many water-related activities in Connecticut by water-resource managers, engineers and planners, public safety officials, consultants, and research-

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ers throughout the State. To meet this need, the USGS currently has a network of data-collection stations—about 75 for surface-water measurements and about 70 for ground-water measurements—and maintains historical data for additional locations.

Because one-third of Connecticut's population relies on ground water as its source of drinking water, an active program to protect ground-water supplies is underway under the jurisdiction of the Connecticut Department of Environmental Protection. Water companies in 88 towns in Connecticut are responsible for mapping Aquifer Protection Areas around selected well fields. Town officials, consulting firms, and State agencies routinely use information from the USGS surface- and ground-water data-collection networks to outline Aquifer Protection Areas. Long-term water-level monitoring also is used to evaluate climatic effects on ground-water systems, to measure the effects of ground-water withdrawals, and to assist in planning for development of future water supplies.

Surface-water records of the USGS are used for water-supply planning, stream-flow allocation, hydroelectric-power projects, flood control, hazard warning, bridge and culvert design, estuarine and wetland programs, wildlife management, pollution abatement, flood-plain manage-

ment, permits for water withdrawal and use, and Long Island Sound management plans. Surface- and ground-water data bases of the USGS, which have been compiled over many years, are key tools for planning, managing, and protecting water supplies in Connecticut.

Potential for Channel Scour at Bridges

Channel instability and scour near bridge piers is a widespread problem throughout the United States and causes more bridge failures than earthquakes, wind, or structural, corrosive, accidental, or construction-related causes. The Connecticut Department of Transportation has identified 1,763 bridges that span water in Connecticut. These bridges range in size from simple span structures to multilane highways carrying thousands of vehicles every day, such as the Interstate 91 bridge over the Connecticut River in Windsor Locks. Only about 100 bridges in the State have been assessed for channel stability and scour potential. In 1993, the USGS began a cooperative project with the Connecticut Department of Transportation to assess and evaluate 1,663 bridges in Connecticut. On the basis of this evaluation, bridges with observed scour or high scour potential will be targeted for more detailed study to provide data necessary to ensure public safety.

Water-Quality Network and Trend Study

The statewide USGS water-quality network in Connecticut (fig. 2), operated in cooperation with the Connecticut Department of Environmental Protection, provides data that is being used to determine the natural quality of streams and lakes and trends in water quality, to monitor compliance with water-quality standards established by State and Federal statutes, to demonstrate effects of management practices on water quality, and to highlight unforeseen changes in water quality. This information also can be used for other local, State, and national programs, such as the previously described National Water-Quality Assessment Program.

As the needs of State and Federal water-quality monitoring and protection programs have changed over the years, the number and distribution of water-quality samples, how often samples are

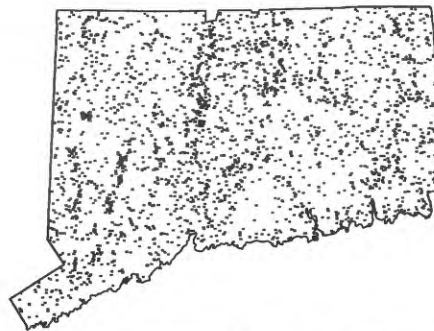


Figure 2. Water-quality data-collection sites in Connecticut.

collected, and the substances for which water samples are analyzed have changed, with advances in analytical technology and an improved understanding of how water quality affects freshwater systems. Monitoring activities expanded substantially after the passage of Connecticut's Clean Water Act in 1967 and the Federal Water Pollution Control Act Amendments of 1972. The station on the Connecticut River at Thompsonville (fig. 3) monitors the largest area (almost 10,000 square miles) and provides important data on the quality of the river as it enters the State. Stations on the Salmon and the Shepaug Rivers provide data on the less populated areas of the State, whereas stations on the Quinnipiac, the Naugatuck, and the Hockanum Rivers monitor the effects of urban conditions.

The water-quality network is vital to the State to meet monitoring requirements mandated by the U.S. Environmental Protection Agency. The network also provides a basis for establishing, reviewing, and updating the State's water-quality classification system. All water is classified by the State according to its suitability for drinking, recreation, and aquatic habitat. The USGS uses state-of-the-art sampling protocols, equipment, and laboratories to provide data users with the most accurate and complete information possible. USGS data on concentrations of trace metals are used by the Connecticut Water Management Bureau to evaluate toxicity levels.

Ground-Water Quality and Land-Use Study

As part of a National Toxic Waste-Ground-Water Contamination Program, the USGS monitored the effects of land use on ground-water quality in stratified-drift aquifers of the Pootatuck, the

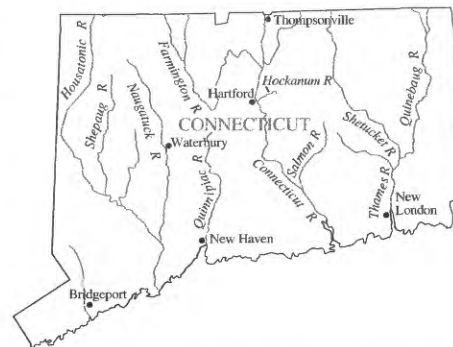


Figure 3. Major rivers and cities in Connecticut.

Pomperaug, the Farmington, and the Hockanum River valleys. Stratified-drift aquifers (layered glacial deposits of sand and gravel that could yield significant quantities of water) are among the most productive sources of public water supply in the Northeastern United States. The study showed that human activities, as defined by different land uses, can affect ground-water quality, as measured by statistical comparisons of water-quality constituents. The following land-use categories were evaluated: undeveloped, untilled agricultural, tilled agricultural, unsewered residential, sewerred residential, commercial, and industrial. Ground-water quality is most adversely affected beneath commercial and industrial areas (fig. 4).

A second study, authorized by the Connecticut General Assembly and conducted by the USGS, focused on ground-water contamination from pesticide use on

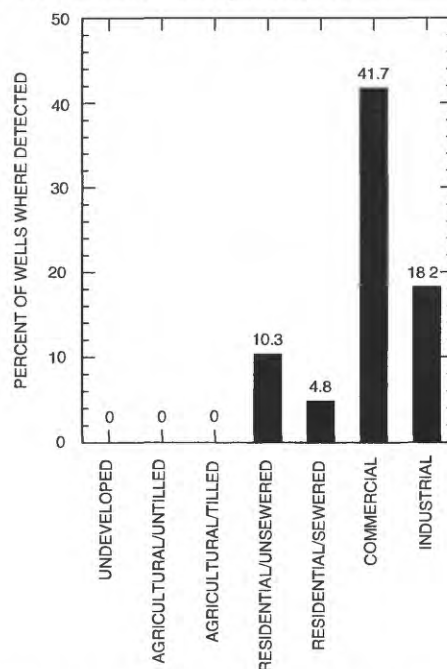


Figure 4. Histogram showing detections of trichloroethylene in wells.

agricultural and nonagricultural lands. This study was initiated after ethylene dibromide, which is a pesticide used on tobacco fields in north-central Connecticut, was discovered in water from domestic and public-supply wells in 10 towns. The USGS cooperated with the Connecticut Department of Environmental Protection, the Connecticut Agricultural Experiment Station, the Connecticut Department of Health Services, and several groups from the University of Connecticut for this study. At least one pesticide was detected in ground water at 66 percent of the sites, most of which were near agricultural fields and golf courses.

Studies at the U.S. Environmental Protection Agency Superfund Sites

Under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (amended by the Superfund Amendments and Reauthorization Act of 1986), a list has been compiled of sites throughout the United States that are contaminated with hazardous materials. These are known as Superfund sites. USGS hydrologists and geologists, in cooperation with the U.S. Environmental Protection Agency, are studying the regional and local geohydrology at selected Superfund sites.

In Connecticut, geohydrologic studies have been conducted at three Superfund sites. At Gallup's Quarry, which is an inactive sand and gravel pit near the village of Plainfield, chemical wastes were dumped, which contaminated local ground water. In Durham Center, which is a long-established residential, industrial, and commercial area in the town of Durham, widespread and persistent contamination of ground water has resulted from the use of organic halides by two manufacturing companies. At two industrial sites in Cheshire, ground water has been contaminated by volatile organic compounds and inorganic constituents. The geohydrologic and water-quality information collected by the USGS at these sites is an important step to guide future studies on clean-up procedures.

Studies of Till for Low-Level Radioactive-Waste Disposal

In 1991, consultants for the Connecticut Hazardous Waste Management Ser-

vice identified thick till deposits as a preferred setting for low-level radioactive-waste-disposal sites. Till is an unsorted glacial sediment containing a wide range of particle sizes. Ground water moves very slowly through some types of till. Most of the thick till in Connecticut is present in drumlins (oval hills shaped by glaciers) and related glacial landforms. The potential sites under investigation were areas known or inferred to be underlain by till deposits greater than 15 feet in thickness. Geologists and hydrologists of the USGS, in cooperation with the Connecticut Department of Environmental Protection, subsequently reviewed and summarized information on the hydrogeology of thick till areas in Connecticut, particularly information that relates to ground-water flow and contaminant transport. The study, which addressed physical and hydrologic characteristics of drumlins and hydrogeologic processes in thick till areas, indicated that water movement in some thick tills could be less than 100 feet in 100 years—a critical standard for hazardous-waste disposal sites. The USGS report identified areas of potential concern and provided a framework for the design of studies at specific sites.

Geologic Information Centers

The USGS conducts a wide range of geological and geophysical research and mapping investigations of the continental margins of the United States and around the world through its office in Woods Hole, Massachusetts. From this office, marine scientists carry out investigations primarily along the U.S. Atlantic Coast and in the Gulf of Mexico, the Caribbean Sea, the Great Lakes, and polar regions. These marine geologic studies identify environmental problems and geologic hazards in offshore areas, and assess critical nearshore processes that affect erosion, wetland loss, and polluted sediments. These studies also improve our understanding of the Nation's energy and mineral resources, and document the past record of climate change. The long-range goals of the research and mapping efforts are to provide a comprehensive body of knowledge of the geology, history, and processes of the continental margins, and to develop a predictive capability to guide and assess the consequences of the use of these margins.

Geologic Mapping Projects

Geologists and hydrologists of the USGS have worked cooperatively with geologists from the Connecticut Geological and Natural History Survey for many years to map Connecticut's geologic features and natural resources. A key result of this cooperation is a series of bedrock and surficial geology maps for the State. Bedrock geology maps give information about the character and distribution of the solid bedrock, or "ledge," that underlies all areas of the State. Surficial geology maps give information about the character, distribution, and thickness of the unconsolidated materials located between the soil layer and the bedrock surface. Maps are available on a statewide basis or, in most cases, by individual quadrangles. The surficial geology map (also called the materials map), which was published in 1992, is particularly useful because it is available in print and in digital computer format. The materials map has many uses, including water-resources evaluation and protection, engineering and construction projects, and slope-stability planning. The State of Connecticut also has used the map to locate and evaluate potential low-level radioactive-waste-disposal sites.

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. Connecticut is covered by 116 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.

Contamination of Sediments in Long Island Sound

Long Island Sound is a major urbanized estuary that lies near the most densely populated region of the United States. Sewage, wastes, and chemicals enter the Sound from direct waste discharges, river runoff,



Figure 5. Portion of a high-resolution sidescan sonar mosaic obtained off the Connecticut Coast in Long Island Sound. Dark tones on the image represent areas of weak acoustic backscatter produced by finer-grained sediments; light tones represent areas of strong acoustic backscatter produced by coarser-grained sediments. Selected features reflecting natural processes and human influences are labeled on the image. [200 meters equals about 655 feet]

and the atmosphere. This has caused widespread contamination of bottom sediments and loss of habitat for bottom-dwelling (benthic) organisms.

The USGS, working in cooperation with the Connecticut Geological and Natural History Survey and the Connecticut Department of Environmental Protection, has initiated a multidisciplinary, basin-wide program to document the sea-floor processes that control the distribution of benthic habitats and sediment-related contaminants (fig. 5). This program, which uses unique USGS capabilities in seafloor imaging, contaminant-transport modeling, and geochemical sampling, is basic to a wide range of environmental issues for Long Island Sound. These issues, in turn, affect millions of people who use the Sound each year for recreational and commercial activities.

Cooperation

The USGS cooperates with local, State, and Federal agencies in Connecticut on many activities, including water-resources-data collection, interpretive water-quality studies, and mapping. With local and State agencies, activities are typically funded on a cost-sharing basis. In addition to agencies already mentioned, the USGS cooperates with the town of Fairfield, the city of New Britain, the city of Torrington, the South Central Connecticut Regional Water Authority, and Northeast Utilities.

The USGS provides support to the Connecticut Institute of Water Resources at the University of Connecticut, which conducts a program of research, education, and information and technology transfer.

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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.

U.S. Department of the Interior
U.S. Geological Survey
Fact Sheet FS-007-95