Connecticut

Contaminants in River Basins in Connecticut

In 1995, as part of the National Water-Quality Assessment Program, the U.S. Geological Survey (USGS) completed an intensive study in the Connecticut, Housatonic, and Thames River Basins, a 16,000-square-mile area that includes most of Connecticut. Several classes of contaminants were detected, including volatile organic compounds (VOC's) and pesticides. Major findings from the study include:

- One or more of 25 different VOC's were detected in water samples from 46 percent of the sampled wells. VOC's are manmade chemicals found in fuels, solvents, paint thinners, and dry cleaning agents. The gasoline additive methyl-*tert*-butyl-ethylene, known as MTBE, was the most commonly detected VOC and it was found in water from 25 percent of the wells; chloroform, the next most commonly detected VOC, was detected in water from 23 percent of the wells. The numbers of times that VOC's were detected in ground water were directly related to population density. Concentrations of five VOC's exceeded the Maximum Contaminant Level or Lifetime Health Advisory established by the U.S. Environmental Protection Agency (EPA), but most VOC's (64 percent) were detected at low concentrations.

- Pesticides were detected in streams and ground water, but, with two exceptions, current drinking-water standards were not exceeded.

- Nutrient concentrations were highest in urban streams because of wastewater discharges, although use of chemical fertilizers and manure in some agricultural areas caused nitrogen concentrations of nitrate to exceed 10 milligrams per liter in samples from shallow ground water.

- Toxic contaminants have accumulated in some streambed sediments and fish. Fish consumption advisories have, therefore, been issued for some rivers and lakes.

Conservation of the Roseate Tern

A long-term study of the population dynamics of the roseate tern (fig. 1) in the northeastern United States is providing critical information for the restoration of this endangered species. The USGS is working in partnership with the U.S. Fish and Wildlife Service (FWS), Connecticut Department of Environmental Protection (DEP), Connecticut Audubon Society, Connecticut Chapter of the Nature Conservancy, and others to develop and evaluate recovery techniques by focusing on the Stewart B. McKinney National Wildlife Refuge in Connecticut and other island nest sites. Falkner Island, which became part of the McKinney National Wildlife Refuge in 1985, is the site of the largest roseate tern colony in Connecticut.

The northeast breeding population of roseate terns has declined since the 1950's, and the species was declared "endangered" by the FWS in 1987. Currently, about 7,500–8,000 roseate terns breed in an area from the south shore of Long Island to Nova Scotia. During the late 1980's and early 1990's, about 90 percent of the Northeast breeding population nested south and west of Cape Cod, including 280 to 360 adults nesting on Falkner Island. The causes for the long-term decline of roseate terns are the focus of several studies.

Figure 1. Roseate tern. (Photo courtesy of Pat Lynch.)

Computer Models Show Water Well Contributing Areas

About one-third of the population in Connecticut obtains drinking water from public-supply systems that rely on ground water. To protect drinking-water, the Connecticut Legislature enacted the Aquifer Protection Act in 1988 to delineate land-surface areas that contribute ground water to wells.

A computer model that simulates ground-water movement in the aquifer is used to define contributing areas. Traditionally, flow models are adjusted until a reasonable match is achieved between calculated water levels and streamflows and those measured in the field. The USGS has developed a more objective method that answers key questions about

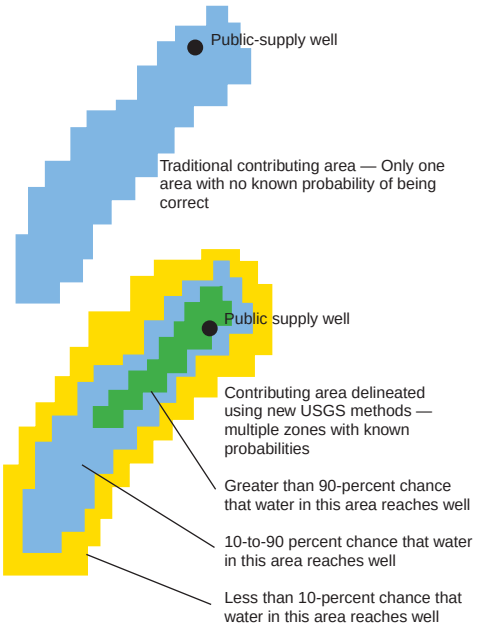


Figure 2. Diagram of hypothetical contributing areas.

ground-water flow and is applying this method, in cooperation with the Connecticut DEP and Department of Mental Retardation, to a site in Southbury, Conn.

A contributing area delineated by traditional methods allows only two choices for aquifer protection—a given parcel of land is either inside or outside the protected area. The more objective method assigns probabilities to different zones in the contributing area (fig. 2), so that different management decisions can be made, including the decision that additional information may be needed in critical areas.

Hydrogeology and Water Quality at a Superfund Site

Many areas throughout the United States have been contaminated by hazardous materials and are designated Superfund sites by the EPA. USGS scientists study Superfund sites to provide hydrogeologic and water-quality information for guiding clean-up efforts. The USGS hopes to provide critical information for specific sites and also to increase information about hydrogeology and ground-water flow in fractured bedrock and surficial aquifers. New techniques being developed will have broad applications at other Superfund sites.

An area around Nutmeg Valley Road in Wolcott, Conn., was designated a Superfund site after ground-water contamination by VOC's was found in water from 21 of 90 domestic wells sampled by State and local agencies. The USGS, in cooperation with the Town of Wolcott and the EPA, summarized the site history, reviewed existing water-quality data, analyzed the geohydrologic framework, and constructed water-table maps and a conceptual model of ground-water flow.

Figure 3. Video image of part of a borehole showing different rock types and fractures.

The USGS used new techniques to assess water quality, characterize the geometry and hydraulic properties of the surficial and bedrock aquifers, and develop a more detailed conceptual model of ground-water flow. Passive-vapor sampling was used to determine where VOC's were entering streams. In addition, recent technology was used in test wells (boreholes) at the Wolcott site. A "borehole image processing system" captured three-dimensional video images (fig. 3) of the borehole wall. These images, along with images from an acoustic televiewer, were used to measure the orientation of fractures in the boreholes.

Sedimentary Environments in Long Island Sound

The sea floor in Long Island Sound (LIS) comprises benthic habitats that support a large commercial and recreational fishery. As a consequence of the dense population in its watershed, the Sound is heavily used and receives wastes and contaminants from wastewater-treatment plants, urban runoff, rivers, and the atmosphere.

The USGS, in cooperation with Connecticut DEP, is studying the sea-floor processes that control the distribution of benthic habitats and sediment-associated contaminants in the LIS estuarine system. The interpretation of sea-floor sedimentary environments has used unique USGS capabilities in sea-floor mapping, hydrodynamic modeling, video imaging, and sediment sampling. Bottom sedimentary environments provide information about sea-floor processes and also reveal changes in geologic and oceanographic conditions across the estuary. This provides a framework for understanding the present sea floor and predicting the effects of future human activities.

Enhancements in Hydrologic Data

The USGS has focused recently on adapting new communications and sampling methods to develop more efficient methods for collecting and distributing data. Many streamgaging stations are equipped with satellite transmitters or telephone modems that transmit river levels to USGS computers. Real-time streamflow and river-level data, as well as historical streamflow data, are available on the World Wide Web at http://ct.water.usgs.gov. On-line availability of streamflow data enables users to monitor river stages and respond immediately during floods.

Connecticut needs an extensive water-quality monitoring network to quantify the diverse conditions of the landscape, with respect to its natural features and human use of land and water resources. To supplement the current surface-water-quality network of 34 stations, the USGS has begun using automated water-quality data collectors that measure selected characteristics at 15-minute intervals 24 hours per day. Monitors have exceptional resolution and accuracy and are being used to collect continuous water temperature, dissolved oxygen, pH, specific conductance, and turbidity data for 7- to 10-day periods. Analysis of the data clearly shows how these characteristics are affected by photosynthesis in algal populations and by specific events, such as storm runoff.

Network	Type of site	Number of sites	Frequency of measurement
Surface water	Continuous-record gaging site	46 (31 real time)	Every 15 minutes
	Tidal site	4	Ranges from every 5 to 15 minutes
	Miscellaneous measurement site	25	Ranges from once per year to 6 times per year
Water quality	Network monitoring site	34	Ranges from 4 times per year to 11 times per year
	Continuous monitoring site	15	Every 15 minutes for selected intervals
Ground water	Observation well	70	Once per month

Table 1. Connecticut's 1998 water-data collection network

Map and Information Sources

The USGS, in cooperation with State agencies and universities, coordinates a network of Earth Science Information Centers (ESIC's) that provide information about natural science products and services. Two State ESIC's in Connecticut offer unique services to the public:

- Map and Geographic Information Center (MAGIC), University of Connecticut Map Library. MAGIC is a publicly accessible, on-line library of geospatial information and a map-library reference site, linking customers to an extensive network of map and geographic information system resources. MAGIC collects, processes, and serves data from sources that include the Connecticut DEP, Connecticut Department of Transportation, USGS, U.S. Bureau of the Census, and other Federal agencies. Current data include roads, hydrography, wetlands, land use and land cover, soils, scanned USGS topographic quadrangle maps, and scanned, rectified aerial photographs. MAGIC also has a library collection of more than 150,000 maps, 20,000 aerial photographs, microforms, atlases, and reference books. Telephone: (860) 486-4589. World Wide Web: http://magic.lib.uconn.edu/.

- Connecticut DEP Maps and Publications Store. The DEP Store is the point of distribution for the Connecticut Geological and Natural History Survey and the information outlet of the DEP Natural Resources Center. The store offers a wide variety of published geologic, natural history, and environmental information to the public, including USGS topographic maps. The Store's seasonal catalog contains more than 1,300 items, including natural resource, natural history, and map information popular with the public. Walk-in hours: M–Th 9:00 a.m.–3:30 p.m. Telephone orders and information request hours: M–F 8:00 a.m. to 4:00 p.m. Telephone: (860) 424-3555. World Wide Web: http://dep.state.ct.us/

Atlantic Salmon Restoration

Genetics is providing tools that address several critical research needs for restoring Atlantic salmon in the Connecticut River—development of a fry or hatchling mark, genetically-based broodstock management, and assessment of the genetic variability of the Connecticut River salmon population. By using the inherent genetic variability within the Connecticut River population, the USGS has developed ways to identify the family membership of fish produced

in a hatchery. Fish from different families will be stocked into selected tributaries. By determining the family membership of young fish swimming to the sea for the first time and returning adult fish, USGS scientists will be able to determine the tributary of stocking. This fry mark is being used in a pilot study in the Farmington River, into which almost 500,000 fry from 160 known families were stocked in the spring of 1998. Genetic information on individual Connecticut River broodstock also is being used to limit matings of closely related fish. This approach maximizes genetic variability and virtually eliminates inbreeding in a small population. Using this approach, the relatedness among the sea-run progeny decreased by about 20 percent in 1997, as compared to previous random mating protocols.

New Glacial History Map

A new map that shows the glacial history and postglacial deposits of Connecticut and Long Island Sound is the latest product in the long-standing, cooperative geologic mapping program between the USGS and the Connecticut Geological and Natural History Survey. The map shows deposits from two glacial periods. Thick, older glacial till deposits are preserved in more than 1,400 glacially smoothed oval hills found in all parts of the State. More recent glacial materials are sediments deposited by glacial ice, and meltwater sediments, which were deposited in glacial lakes and streams that formed in front of the retreating ice sheet 18,000 to 14,000 years ago (fig. 4). Numerous glacial lakes, including glacial Lake Connecticut in Long Island Sound and glacial Lake Hitchcock in the Connecticut River valley are shown. Offshore, a large buried sand deposit in Long Island Sound represents material eroded from the bottom of drained Lake Hithcock by the ancestral Connecticut River.

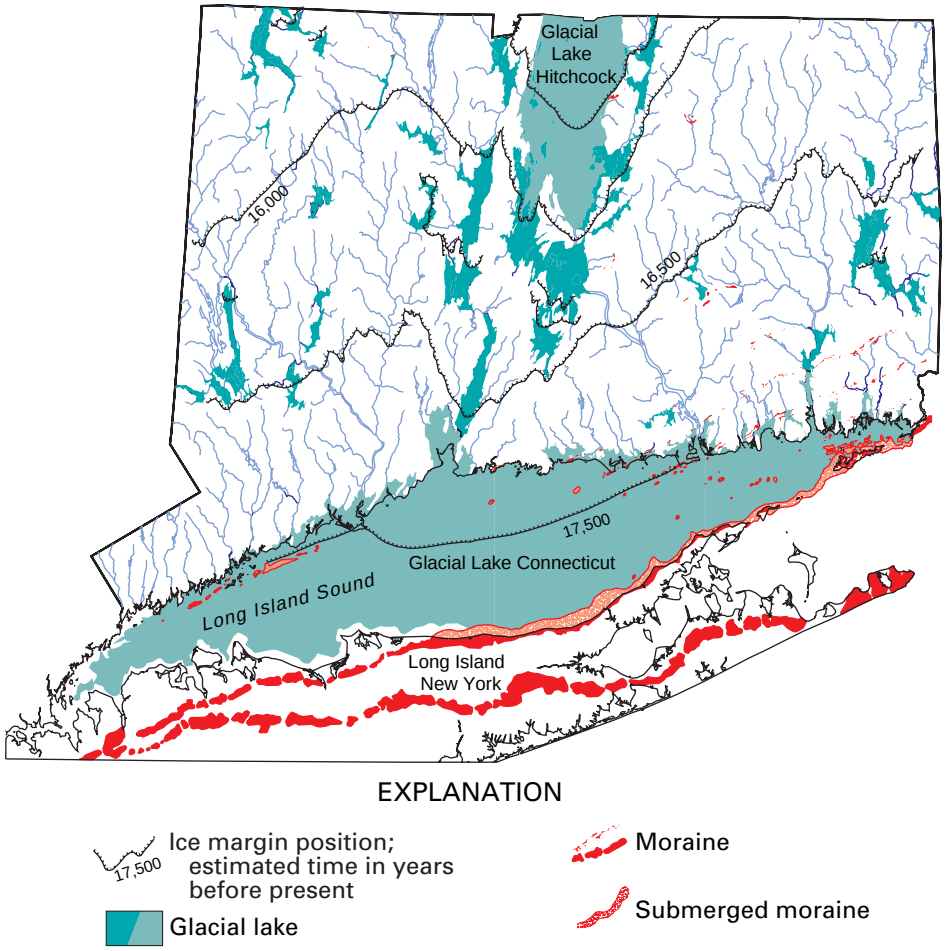
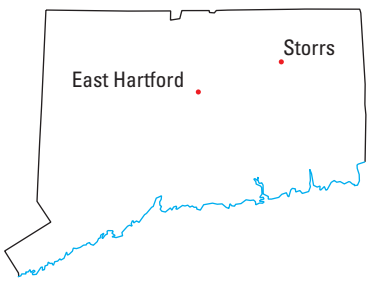


Figure 4. Glacial lakes and retreating margins of the ice sheet, Connecticut and Long Island Sound.

This map, along with the companion surficial materials map, detailed geologic maps, and cross sections of glacial and postglacial deposits, can be used to assess ground water in glacial aquifers and the susceptibility of aquifers to contamination. The maps also can be used to determine the locations of sand and gravel for construction aggregate, the potential for coastal erosion, and as basic information for environmental and ecosystem studies.

USGS office locations

The USGS has 36 employees in Connecticut



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