

United States Geological Survey

Programs in Maine



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.

The U.S. Geological Survey (USGS) collects, compiles, and disseminates data on water, energy, and mineral resources in the State of Maine. The USGS is known for its impartial data collection and research mission to gather, interpret, and present data that enable resource planners and others to make informed decisions on the basis of objective information. As the Nation's leading earth science agency, the USGS works cooperatively with local, State, and Federal agencies to address issues related to earth resources. Today's earth science issues are more pressing than ever, which emphasizes the continuing need for informed resource development, describing and predicting the fate of toxic contaminants, and understanding the effects of human activities on natural resources.

Identification of Potential Deposits of Metals

The USGS has evaluated large areas in northern New England for deposits of copper, molybdenum, tin, tungsten, uranium, rare-earth elements, and gold. Identifying local sources of minerals containing these metals will assist in the economic development of the region. Recent geochemical investigations identified belts of rocks that are favorable for deposits of copper and molybdenum in northern Maine and deposits of tin, tungsten, and uranium in southern Maine and Vermont. As a means of addressing environmental concerns about element mobility, USGS scientists are establishing geochemical data bases documenting baseline element abundances for rock types containing copper and molybdenum deposits, as well as measurements of the types of fluids involved during element migration.

Aquifer Studies Program

Sand and gravel aquifers are the primary sources of water capable of meeting the water-supply requirements of municipalities and industries in Maine. They also are the source of water for many

domestic wells. Information from detailed aquifer mapping, seismic work, resistivity work, and test drilling is required to evaluate, manage, and protect these ground-water resources effectively.

In 1981, the USGS, in cooperation with the Maine Department of Conservation, Maine Geological Survey, and the Maine Department of Environmental Protection, began a long-term program to evaluate and map Maine's sand and gravel aquifers. Objectives of the program include identifying the principal aquifers and accurately mapping their boundaries; determining aquifer yield, stratigraphy, depth to water table and to bedrock; and characterizing regional ground-water chemistry. Reports are compiled and released after each summer field season.

National Water-Quality Assessment Program

In 1991, the USGS began a full-scale National Water-Quality Assessment (NAWQA) Program. The objectives of this Program are to describe the quality of large representative parts of the surface- and ground-water resources of the United States and to identify the primary natural and manmade factors that affect the quality of these resources. Products of the NAWQA Program include information that is useful to water-resource policy-makers and managers at national, State, and local levels. Data for evaluation of surface- and ground-water quality, river-bed sediments, and aquatic organisms are being collected.

The Northern New England Basins NAWQA study unit contains an 18,600-square-mile drainage area that encompasses western and central Maine, central and eastern New Hampshire, and north-eastern Massachusetts. In Maine, this area includes the drainage basins of the Kennebec, the Androscoggin, the Presumpscot, and the Saco Rivers (fig. 1), as well as the small coastal drainage basins south of the Kennebec.

Index of Subjects

Potential Deposits of Metals
 Aquifer Studies Program
 National Water-Quality Assessment Program
 Hydrologic Data Collection
 National Mapping Program
 Nonpoint-Source Contamination From Rural Highways
 Studies at Superfund Sites
 Contaminated Sediments
 "Red Tide" Investigations
 Geologic Mapping
 National Earthquake Information Center
 Water-Use Information
 Earth Observation Data
 Cooperative Programs

This study plans to provide information related to the following issues:

- The presence and distribution of toxic substances in surface and ground water
- Effects of the operation of reservoirs and industries on water quality
- The effects of land use and releases of treated wastewater on surface-water quality
- The contribution of upland sources to downstream contaminants in coastal waters
- The presence of high concentrations of naturally occurring trace elements and radon gas in some aquifers
- The occurrence of synthetic, organic-chemical contaminants in surface and ground water
- The relation of fish and aquatic insect communities to upstream land-use practices

A local committee of representatives from Federal, State, and local agencies; universities; and the private sector works closely with the USGS during each NAWQA Program study to exchange information on regional and local water-quality issues and to assist in designing and planning project products to meet the needs of the States and towns in the study units.

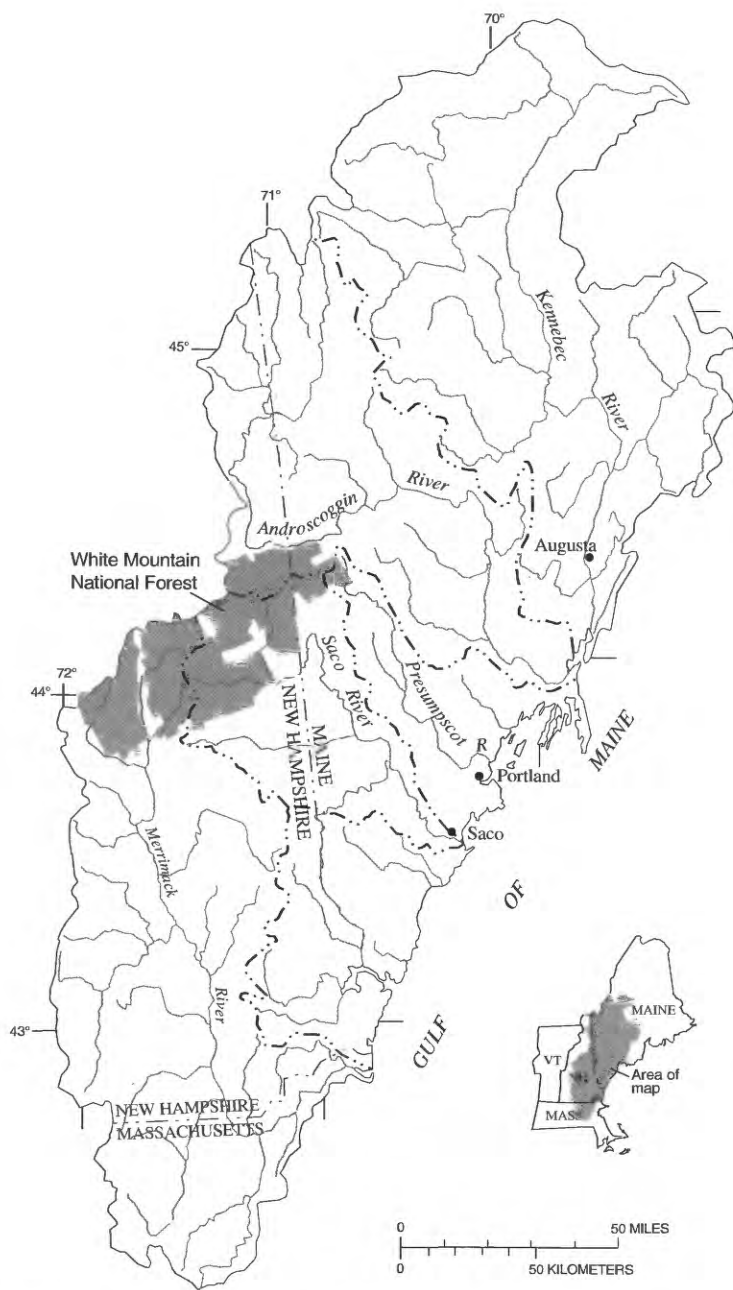


Figure 1. National Water-Quality Assessment Program study area in Maine.

Hydrologic Data Collection

The USGS statewide program of water-data collection in Maine monitors the amount and quality of water in the State's rivers, streams, lakes, reservoirs, and aquifers (fig. 2). These data are used for forecasting; water-resources planning; design and operation of projects for water supply, hydroelectric power, flood control, pollution control, and other purposes; designing bridges and culverts; flood warning; flood-plain management; and hydrologic research. Long-term records are needed to evaluate the responses of hydrologic systems to natural climatic variations and human-induced stresses so that potential problems can be

defined early and appropriate planning and management actions can be taken by local and State officials.

Since 1901, the USGS has maintained the only network of streamflow gaging stations in Maine, which provides streamflow information statewide. In addition, most of these streamflow gaging stations have satellite data-relay capability, which can provide streamflow data to users on a near-realtime schedule. The USGS also provides detailed statistical analyses of streamflow information for all locations where sufficient flow-data have been collected. These data are available for use by individuals or organizations concerned with water-resources issues or problems



Figure 2. Historic hydrologic data-collection sites in Maine.

in Maine. Currently (1995), 43 streamflow stations are in the network, and data and information are available for an additional 63 stations in the historical data base.

For more than 50 years, the USGS has maintained the only statewide network of observation wells to provide ground-water data for Maine. Currently (1995), 31 observation wells are in the network, and data and information are available for an additional 36 wells in the historical data base.

Since 1952, the USGS has developed the only continuously operating statewide network of water-quality data-collection sites for Maine. The network includes sites where dissolved oxygen, specific conductance, pH, and water temperature are measured hourly and the data are available in realtime; sites where water samples are periodically collected and analyzed for chemical and physical properties; and one site located near the White Mountain National Forest, where a Hydrologic Benchmark Station has been in operation since 1964 to monitor long-term trends in ambient water-quality conditions in a pristine watershed. Currently (1995), 16 water-quality stations are in the network, and data and information are available for an additional 64 sites in the historical data base.

The hydrologic information collected for these three networks is published annually in the report *Water Resources Data—Maine*. Statewide streamflow and

ground-water conditions are reported monthly in *Current Water Resources Conditions in Maine*.

National Mapping Program

Among the most popular and versatile products of the USGS are its topographic maps at the scale of 1:24,000 (one 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. Maine is covered by 710 maps at this scale, which are 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.

Nonpoint-Source Contamination From Rural Highways

In Maine, rural highways are a potential nonpoint source of phosphorus and trace metals to surface water. Previous studies have not examined water-quality characteristics of runoff from rural highway systems in the Northeastern United States. Determining highway runoff values for phosphorus, sediment, and selected trace metals can define the magnitude of the problem and provide information to develop mitigation measures.

In 1992, the USGS, in cooperation with the Maine Departments of Transportation and Environmental Protection, began a study of three rural highways in central Maine. The objectives of the study include determining concentrations of total phosphorus, dissolved phosphorus, and suspended solids in runoff from the three study sites, as well as concentrations of dissolved and total copper, chromium, lead, nickel, and zinc.

Studies at 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. Environmen-

tal Protection Agency (EPA), are studying the regional and local geohydrology at selected Superfund sites.

In Maine, technical assistance to the EPA is currently (1995) being provided by the USGS at the Saco Municipal Landfill and the Saco Tannery Superfund sites. Assistance also has been provided at the U.S. Air Force-Loring Airbase to assess water-quality conditions on and around the base during its deactivation. The USGS assistance at these sites includes assessments of problems related to ground-water hydraulics, surface-water runoff, water-quality conditions, and analyses of geohydrologic systems.

Contaminated Sediments in the Gulf of Maine

Many types of contaminants are ultimately deposited in sediments in the Gulf of Maine, where they can adversely affect the commercial and recreational uses of marine resources. The USGS is assembling existing data on contaminants in sediments as part of a study to assess contaminant levels and transport pathways in the Gulf. The data base is used to create maps of contaminant distribution; to provide information to local, State and Federal regulatory agencies; and to address specific questions about the transport and long-term fate of contaminants in the waters of Maine, New Hampshire, and Massachusetts. The study is developing a method for establishing and using a national contaminated-sediments data base. Preliminary maps indicate that "halos" of elevated contaminant concentrations commonly exist in marine-surface sediments for tens of kilometers offshore from urban or industrial centers. The study is conducted cooperatively with investigators from regional academic institutions and is partially supported by the National Oceanic and Atmospheric Administration's Regional Marine Research Program.

"Red Tide" Investigations in the Western Gulf of Maine

Blooms of a toxic red microorganism (*Alexandrium tamarense*) have become a serious economic and public health problem affecting nearshore and offshore shellfish resources, fish, and marine mammal populations in the Gulf of Maine. This so-called red tide phenomenon, which has expanded in recent years to include more areas and more fisheries resources, can be managed most effectively if the hydrodynamic, nutritional,

and biological mechanisms underlying the population development of the microorganism are understood. USGS scientists are using a combination of numerical modeling, hydrographic and biological measurements, moored and drifting current measurements, and satellite imagery to quantify the structure, variability, and mechanics of the coastal current in the western Gulf of Maine. The study area extends from Penobscot Bay in the north to Massachusetts Bay in the south. USGS scientists are testing the hypothesis that a source population of algae in southern Maine is carried southwestward along the coast in a buoyant coastal plume. The distribution of the plume is determined by wind stress, runoff, and general water circulation in the Gulf of Maine. Some of these blooms enter Massachusetts Bay, and others continue along the coast across Stellwagen Bank and onto Georges Bank. This study provides a quantitative understanding of the physics, biology, and chemistry of the regional red tide phenomenon. From this research, a numerical model is under development that can be used by managers concerned not only with toxic algae, but also with long-distance transport of dissolved and particulate contaminants. This work is conducted cooperatively with the Woods Hole Oceanographic Institution, Oregon State University, and the University of New Hampshire and is partially supported by the Gulf of Maine Regional Marine Research Program.

Geologic Mapping

Surficial geologic mapping of the distribution of sand, gravel, silt, clay, and till is conducted by the Maine Department of Conservation, Maine Geological Survey (MGS), in cooperation with the State Map Program and the USGS. Geologic mapping is conducted mainly in the southwest where most of the population growth has occurred and where the need for geologic information regarding water supplies, waste disposal, and construction requirements is greatest. In addition, bedrock geologic mapping has been conducted in the southern part of the State by the MGS in cooperation with the State Map Program and the USGS. Bedrock geologic mapping has been used for land-use planning, particularly near the coast. Geologic maps also are used by earth science teachers in the State and by National and State Park naturalists to increase public appreciation of unique geologic features in the parks. Geophysical data sets, especially a new gravity map of the State, are impor-

tant resources to geotechnical and mineral industries.

National Earthquake Information Center

The National Earthquake Information Center (NEIC) in Golden, Colorado, collects, processes, and distributes information from more than 20,000 seismic events each year. This information is distributed in the form of alerts, bulletins, and routine catalogs to emergency management officials at the Federal and State level, operators of critical facilities, news media, the general public, and the earthquake research community. These catalogs of recent and historical earthquake information are used in earthquake hazards assessments. To fulfill its mission better, the NEIC has developed and is deploying the U.S. National Seismograph Network (USNSN), which, when completed, will consist of approximately 60 seismograph stations nationwide. The USNSN monitors nationwide seismicity, provides early notification of seismic events to national level emergency-services personnel, maintains an archive of high-quality digital data on national seismicity, and provides public information on earthquakes.

In Maine, the seismic network is coordinated by the Maine Department of Conservation, Maine Geological Survey. The MGS is a member of the Northeastern U.S. Seismic Network, which is a consortium of universities, State and Federal agencies, and private companies monitoring and recording seismic activity in the Northeast. Seismic data in Maine is recorded on instruments run by the Massachusetts Institute of Technology and

Boston College. These data are then fed to NEIC, where the MGS obtains daily seismic reports automatically over the internet to respond to inquiries regarding seismic activity in Maine.

Water-Use Information

In southwestern and coastal Maine, water resources are increasingly stressed by new demands. Competition for water in the future will require that information on water availability and water use be accurately known to plan and manage the State's water rights and water allocation programs. The Maine Department of Conservation, Maine Geological Survey, and the Maine Department of Human Services cooperate with the USGS in collecting, archiving, analyzing, and reporting on water-use trends in Maine. The data are entered into the New England Water-Use Data System, which is accessible to the State and other users by computer; reports are published at set intervals.

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 of Maine. Mapping photographs of some sites go back about 40 years. Satellite images dating from 1972 can be used to study changes in regional landscapes.

Cooperative Programs

The USGS cooperates with more than 15 local, State, and other Federal agencies

in Maine. Cooperators include regional and municipal agencies, natural-resource agencies, public utilities, water districts, and other Federal agencies. In addition to agencies previously mentioned, the USGS also cooperates with the U.S. Army Corps of Engineers, the University of Maine, the Greater Portland Council of Governments, the Kennebec Valley Council of Governments, the Aroostook County Soil and Water Conservation District, the town of Jay, the Federal Emergency Management Agency, the Veteran's Administration, the Federal Energy Regulatory Commission, and the U.S. Department of State-International Joint Commission. Cooperative activities include water-resources-data collection, interpretive hydrologic studies of water-availability and water-quality, mapping, hazards analyses, and natural-resource assessments. Federal-State cooperative activities are funded on a matching-funds basis. Jointly funded programs are considered when the study is mutually advantageous to Federal and State or local agency interests in appraising water resources and seeking solutions to water-related problems. These cooperative, jointly funded programs are reviewed and renegotiated annually to ensure that they are responsive to the needs of the State and localities and to national interests.

The USGS also provides support to the Maine Water Resources Program at the University of Maine, 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.