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Water Resources Update

New Hampshire-Vermont District Newsletter

U.S. Department of the Interior
U.S. Geological Survey
Web sites: http://nh.water.usgs.gov *OR* vt.water.usgs.gov June 2001

Inside This Issue

Message from the District Chief

About those streamgaging costs……

In fiscal year 2001, the cost of operation of a streamgage in our District increased by 9 percent; a source of consternation both internally and among our cooperators. Over the previous 7 years, costs had risen only at the rate of inflation. The unusual 2001 increase resulted from a restructuring of the U.S. Geological Survey (USGS) budget that reduced the net funds available for District operations.

Over the past several decades, a number of changes have affected streamgaging costs. Advances in sensor technology, particularly pressure transducers, have eliminated the need for stilling wells and manometers, thus greatly reducing gage-construction costs. Electronic data storage, satellite telemetry and automated data processing have greatly accelerated the processing of records and dissemination of data. Yet, one of the most expensive parts of the operation, stream-discharge measurement, has remained largely unchanged. This operation is manpower intensive, and associated costs have increased greatly for a number of reasons.

Safety requirements for streamgaging operations have increased significantly. Today, every gaging site requires a site-specific Job Hazard Analysis that identifies a multitude of potential hazards and prescribes safety measures to address them. Cableway systems for measurements at high flows are now subject to much stricter design and testing standards, requiring that many systems be rebuilt over the past decade. For sites without cableways, where high-water measurements must be made from bridges, traffic-control plans must be developed and implemented. Discharge measurements from watercraft and on ice-covered streams have likewise become more demanding. Stilling wells in older gaging stations, that require periodic flushing and maintenance of intakes, are now classified as confined space, with associated Occupational Safety & Health Administration (OSHA) requirements. Many streamgaging operations now require a two-person team where a single individual was involved in the past. At the same time, the knowledge and skills required of hydrologic technicians has greatly increased and include proficiency in electronics and computer technology. In FY-2000, the long-overdue increase in the full-performance grade level of USGS Hydrologic Technicians was finally approved. The need for these skills must be reflected in gaging costs.

On the benefits side, our cooperators and the public are getting much more for their

Photograph shows a hydrologist checking the equipment in a new stream-gaging station in New Hampshire.

The USGS provides the Nation with reliable, impartial information about the Earth to minimize the loss of lives and property from natural disasters, to manage biological, water, mineral, and energy resources, to enhance and protect the quality of life, and to contribute to wise economic and physical development.

gaging dollar today than ever before. In particular, the timeliness and availability of stream-flow data has increased tremendously, whereas the amount of lost record has declined sharply. Over the past 6 years, the District has made a concerted effort to convert the network to near-real-time reporting. In 1995, about 40 percent of the network had real-time reporting to a very limited number of users. By the end of 2001, essentially 100 percent of the network (more than 90 stations) will have real-time reporting on the World-wide Web. In addition, an increasing number of stations are being equipped to transmit rainfall and water-quality parameters.

The USGS has just released NWISweb (National Water Information System on the World-Wide Web). This system, illustrated on page 9, will significantly enhance the capability of all users to view and download USGS water data, including ground-water and water-quality information. NWISweb will allow users to access both real-time and historical data and to develop customized graphical and tabular outputs. Users will be able to obtain real-time data for the past 31 days, and obtain provisional mean-daily flow values back to the beginning of the water year (no more gaps in data availability between real-time and historical records!). Peak-flow data, discharge-measurement data, and detailed site information will also be available on-line.

In conclusion, there is reason to believe that emerging technology will eventually reduce the costs of streamflow measurement. Last year, the District purchased its first Acoustic Doppler Current Profiler (ADCP) which employs sophisticated sensor and digital technology to accurately measure discharge on larger streams in a matter of minutes, compared with current-meter measurements that would have taken hours. New prototypes are being developed and tested that will permit this technology to be employed with hand-held instruments on smaller, shallower streams. USGS' ultimate goal is to 'get the streamgager out of the stream' entirely. An internal program called 'HYDR0 21' has been established to assess and incorporate new technologies within the hydrologic-data network. In addition to improved transducer and acoustic instrumentation, HYDRO 21 is investigating a variety of non-contact instruments, such as radar, to measure velocities, stages, and river cross-section geometry. The future may not be far off where streamflow measurements will be made entirely by remote sensing devices.

--Brian R. Mrazik

Outreach

New Hampshire Consortium on Arsenic

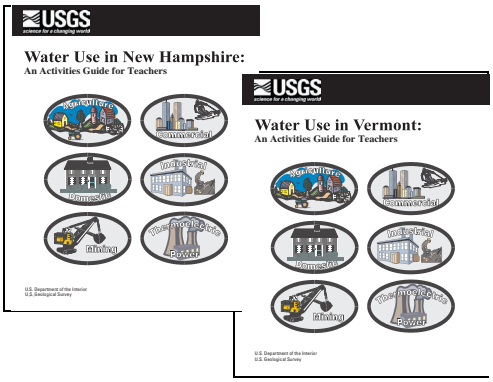
The USGS, U.S. Environmental Protection Agency (USEPA), Dartmouth College, and New Hampshire Departments of Environmental Services (NHDES), and Health and Human Services have formed a new collaboration to provide the latest information on arsenic occurrence in New Hampshire and its environmental and human health effects.

Soil and water in parts of New Hampshire are found to contain levels of arsenic that are higher than those found in many other regions of the country. Because of the potential health concerns from arsenic exposure, scientists from USGS, Dartmouth College, and officials from the USEPA and State agencies are working together through joint meetings to share study results, public outreach, and a planned regional conference on arsenic in 2002.--*Debra Foster (603) 226-7837 or dhfoster@usgs.gov*❑

Teacher's Activities Guide and Watershed Map

Water-use data are collected and compiled every 5 years by the USGS, in cooperation with the NHDES and the Vermont Agency of Natural Resources. Activity guides with an accompanying watershed map were created for teachers of 4-8th grade students throughout the two States. The activities in these guide books can be used to teach students about watersheds and water use in New Hampshire and Vermont.

The guidebooks encourage the development of skills that are recommended by the New Hampshire and Vermont Departments of Education curriculum standards. The guide books and watershed maps are available by contacting the *Outreach Coordinator at (603) 226-7837 or dhfoster@usgs.gov*❑



The activity guides (without the maps) also are available online at **http://nh.water.usgs.gov/Publications/online_publications.htm**

Online Publications

Several recently published USGS reports for New Hampshire and Vermont are now available online. Check out:

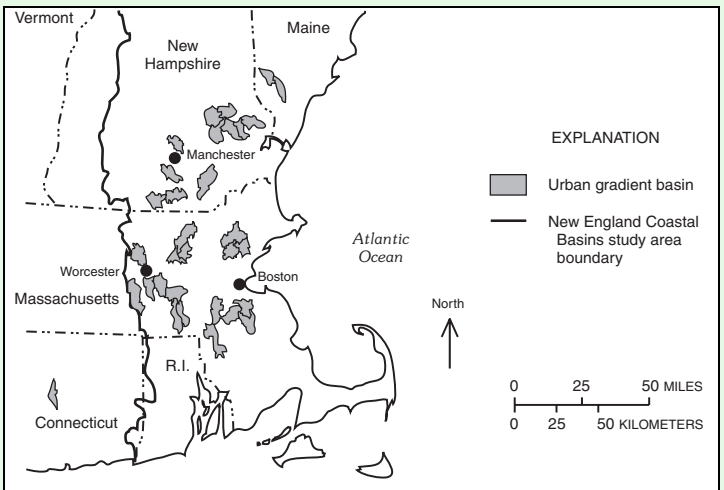
http://nh.water.usgs.gov/Publications

New England Coastal Basins National Water-Quality Assessment Program

Since 1998, the New England Coastal Basins (NECB) National Water-Quality Assessment (NAWQA) Program has been monitoring surface and ground waters in Maine, New Hampshire, Massachusetts, and Rhode Island. Focus issues for the study include determining how new and increasing urbanization influences water quality and stream health, the range and distribution of mercury in streams, how water quality varies from small streams to large rivers, variations in the water quality of important ground-water aquifers, and the variability of arsenic in different ground-water systems. Some details of these monitoring activities are described in the following sections. The information collected as part of the NECB NAWQA study will not only be used to characterize waters of eastern New England, but also will help in preparing assessments of the Nation's water resources.--*Keith Robinson*
(603) 226-7809 or kwrobins@usgs.gov❑

Effects of Urbanization on Surface Water

The NECB urban-gradient study is designed to examine how increasing urbanization influences water quality and stream health. The study is investigating how biological, chemical, and physical characteristics of streams change as urban land-use increases. Thirty-one sites in southern Maine, southern New Hampshire, and eastern Massachusetts are included in the study. One additional site is located in central Connecticut that links to Project NEMO (Non-point Education for Municipal Officials) work in that state. These 32 watersheds represent a complete range of urbanization.



Map shows urban gradient basins to be studied in the New England Coastal Basins study area.

Physical, chemical, and biological characteristics of all 32 rivers were monitored in 2000. Data were collected on continuous streamflow discharge or stage, water temperature, concentrations of nutrients and pesticides in stream water, and macro invertebrate, algal, and fish community structure. Report preparation is planned for 2001.--*Keith Robinson*
(603) 226-7809 or kwrobins@usgs.gov❑

Mercury Distribution in New England Streams

Conditions that can cause increasing mercury methylation are of particular concern because methylmercury (MeHg) is the most toxic mercury species, and it is most rapidly bio-accumulated. The NECB NAWQA study has evaluated relations between concentrations of total mercury (HgT) and MeHg in stream water and streambed sediment over a range of urban land use. Fifty-five stream sites from Rhode Island to Maine were sampled during 1998-2000. Sediment and water samples were collected during summer low-flow conditions to show patterns of HgT and MeHg accumulation at various sites in watersheds. Results of the study suggest that urban areas have higher HgT but lower methylation rates than rural areas. Methylation efficiency was high at sampling sites with low urbanization and high wetland density. Concentrations of MeHg in water and sediment were correlated with concentrations of organic carbon. These results indicate that MeHg decreases in ecosystems that are urbanized. The findings from this study were presented at a U.S. Environmental Protection Agency sponsored workshop on "Fate, transport, and transportation of mercury in aquatic and terrestrial environments" in May 2001.
--Ann Chalmers, (802) 828 4511 or chalmers@usgs.gov❑

Shallow Ground-Water Quality in the Boston Metropolitan Area

The effect of urbanization on water quality is an important issue to many water-resource managers and is a major focus of the NECB study. The USGS installed and sampled 29 monitoring wells in unconsolidated surficial aquifers in suburban parts of the Boston, Mass. metropolitan area, including southeastern New Hampshire.

Cont. on page 4

New England Coastal Basins
National Water-Quality Assessment Program

USGS installing a shallow monitoring well in a suburban area of Nashua, N.H.

Cont. from page 3

Analyses of water samples collected from the monitoring wells indicate that shallow ground water in recently urbanized settings often contains trace amounts of nutrients, fuel, and industrial-based organic compounds. Most of the samples that contained detectable amounts of organic compounds also had elevated levels of iron and total dissolved solids. Nitrate was detected in 83 percent of the samples, but the USEPA drinking-water standard of 10 milligrams per liter was exceeded in just one sample. Low levels of volatile organic compounds (VOCs) were detected in 76 percent of the samples, with as many as 13 different VOCs detected in a single sample. The concentration of methyl-*tert*-butyl ether (MTBE) in one sample was 267 micrograms per liter, which exceeds the Massachusetts Department of Environmental Protection drinking-water guideline (70 micrograms per liter). Chloroform and MTBE were the two most frequently detected VOCs. MTBE was detected at the same frequency in ground water in the Boston metropolitan area as in other urban areas of New England. Chloroform was detected at higher frequency in old, densely populated areas in New England than in more recently developed, less densely populated areas. Pesticide detections were few, only at trace concentrations, and none of the concentrations exceeded any drinking-water standard.

--Sarah Flanagan (603) 226-7811 or sflanga@usgs.gov❑

Arsenic, Radon, and Radium in Ground Water

The NECB NAWQA study evaluated arsenic, iron, and manganese concentrations in selected bedrock public water-supply wells throughout the study area (Ayotte and others, 1999). Variability in concentrations, associated with bedrock lithochemical groups and land use were explored. Concentrations of arsenic at or above 0.005 mg/L (milligrams per liter) were detected in more samples of water from wells completed in bedrock than in water from wells completed in stratified drift. Arsenic concentrations are higher in water from wells in metamorphosed variably calcareous marine sediments than in water from wells in igneous and other metamorphic rocks. Iron and manganese were detected at approximately the same frequency in water from wells in both types of aquifers.

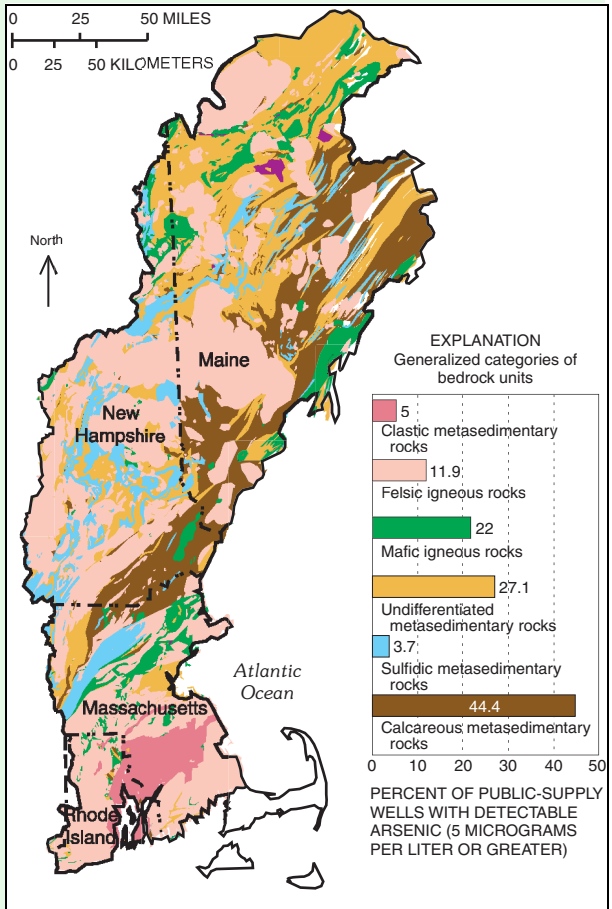
Private domestic bedrock wells also were sampled for arsenic and selected radionuclides (radon and radium). Analyses of water samples from 58 wells show that concentrations of arsenic are highest in waters with high pH and low dissolved oxygen. These results indicate that solubility and mobility in ground water are affected by factors other than just the presence of arsenic concentrations in rock.

Radon, a colorless and odorless gas, that decays to other elements and releases radiation in the process, was detected in water from bedrock wells in New England at concentrations greater than 2,000 picocuries per liter (pCi/L) in most samples, but exceeded 100,000 pCi/L in some samples. The USGS analyzed samples from bedrock wells around eastern New England and found that the median radon level for wells in metamorphosed marine calcareous sediments is about 2,185 pCi/L, whereas the median for wells in other metamorphosed marine sediments is about 3,750 pCi/L.

Radium isotopes were also detected in water samples but generally at low concentrations (less than 1 pCi/L). At least one radium isotope, however, was detected in concentrations greater than 1 pCi/L in 33 percent of the bedrock wells.*--Joseph Ayotte (603) 226-7810 or jayotte@usgs.gov*❑

For more information on arsenic, radon, and radium, visit the web site at URL

http://co.water.usgs.gov/trace/



Type of rock where arsenic concentrations exceed a detection limit of 5 micrograms per liter in the New England Coastal Basins study area.

Water Quality

Effectiveness of Best Management Practices in the Lake Champlain Basin

Increased flood flows, decreased dry weather flows, erosion, and elevated concentrations of bacteria, nutrients, sediment, and other pollutants are water-related problems characteristic of urbanized areas. Urban Best Management Practices (BMPs) are actions or procedures that are designed to minimize these problems and may include stormwater retrofits and stream channel rehabilitation, street sweeping and litter clean-up days, anti-littering laws, enforcement of existing laws, and education. In 1999, the USGS, in cooperation with the State of Vermont and the City of Burlington, with additional support from the Lake Champlain Basin Program, initiated a study of the effectiveness of urban BMPs in the Englesby Brook watershed. Substances carried by Englesby Brook are flushed into Lake Champlain, an important resource shared by Vermont, New York, and Quebec.

To determine baseline water quality before BMPs are put in place, continuous streamflow and water-quality data are being collected on Englesby Brook at a stream-gaging station about 1,200 feet upstream from the mouth. Water samples are automatically collected when streamflow increases during storms or snowmelt and are subsequently analyzed for nutrients such as nitrogen and phosphorus. *E. coli* bacteria are analyzed at the Burlington Main Wastewater Treatment Facility about 1 mile from the USGS collection site. Provisional data results are posted on the Englesby Brook web page at: **http://vt.water.usgs.gov/Current-Projects/Englesby/Englesby.htm**
--Laura Medalie (802) 828-4512 or lmedalie@usgs.gov❑

Blanchard Beach at the mouth of Englesby Brook has been closed to swimming since 1991 because of high counts of bacteria.

Bacteria Study in Hampton Harbor

Hampton Harbor is a tidally dominated, shallow estuary at the extreme southeastern corner of New Hampshire. Hampton Harbor, and its nearby tributaries, are one of the most productive shellfish habitats in the State. Concentrations of fecal coliform in the harbor generally increase following rainfall events, presumably as a result of contaminated storm-water runoff, which results in the closure of shellfish harvesting beds. Better predictions of fecal coliform concentrations in the harbor are sought so that the shellfish beds can be closed only when necessary.

A fecal coliform monitoring program was implemented by the USGS, in cooperation with the New Hampshire Department of Environmental Services (NHDES), to supplement the ongoing ambient State monitoring program of shellfish waters. The USGS monitoring program involves collecting water-quality data for the Harbor during and after storms. Also, the major tributaries draining into the Harbor are being sampled in order to gather information on fecal coliform levels entering the Harbor during storms. This study will provide data to better understand how fecal coliform levels change in the Harbor during normal, wet, and dry weather conditions. This information will be used by the NHDES to improve bacterial-level forecasting and to establish criteria for safe shellfish harvesting.--*Jeff Deacon*
(603) 226-7812 or jrdeacon@usgs.gov❑

Water Quality Trends in the Lake Champlain Basin

Reducing phosphorus inputs to Lake Champlain is one of the top three priorities established by the Lake Champlain Basin Program. Analyzing water-quality data periodically for changes over time is one way to determine if reduction goals are being met. In 1999, the USGS began a study to identify any changes in water-quality data from the Lake Champlain Basin during the 1990s. Seasonal trends in phosphorous and other constituents such as nitrogen, chloride, and total suspended solids are being analyzed. Changes in basin characteristics will be related to trends in order to identify potential causes.--*Laura Medalie*
(802) 828-4512 or lmedalie@usgs.gov❑

Lake Champlain Mercury Transport Study

The USGS is initiating a 5-year study, in cooperation with the Lake Champlain Basin Program, to determine the role of land use and stream hydrology on the mobility of mercury and methyl-mercury in the Lake Champlain Basin. Research will focus on developing a mercury mass balance for the Lake Champlain Basin, determining mercury methylation potential as a function of upstream land use, understanding mercury dynamics during high-flow events, and other controls on mercury transfers from the basin to the Lake.

Any linkages between mercury mobility and land-use practices will be used to identify potential approaches to the management of mercury contamination. The investigation will include synoptic sampling of tributary stream sediments, synoptic snowmelt surveys of stream waters, fixed-site stream monitoring, and intensive watershed investigations for targeted land uses.--*Jamie Shanley*
(802) 828-4466 or jshanley@usgs.gov❑

Water Quality

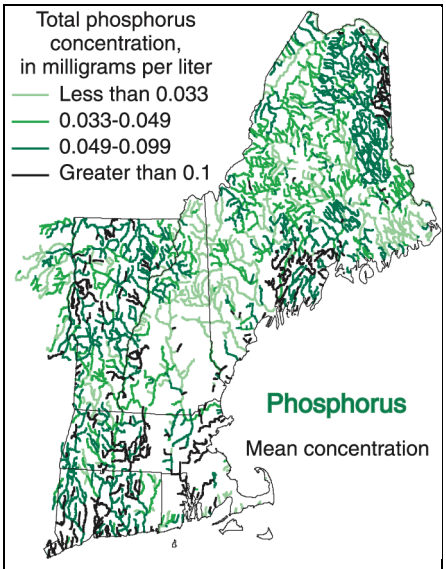
Development of a New England Nutrient Water-Quality Model

The USGS, in cooperation with the USEPA, is developing a water-quality model, called SPARROW (Spatially Referenced Regressions on Watershed Attributes), to assist in the development of regional nutrient water-quality criteria and total maximum daily loads (TMDL) for streams in New England. SPARROW is a spatially detailed, statistical model that relates concentrations of phosphorus and nitrogen (nutrients) in streams to pollution sources and watershed characteristics. The SPARROW model for New England will refine a national model developed by the USGS in the early 1990s. The model provides estimates of nutrient concentrations, yields, and transport in watersheds.

The New England SPARROW model will provide estimates of the amount of in-stream nutrients based on data pertaining to point and non-point contaminant sources and watershed characteristics such as slope, streamflow, stream density, percent wetlands, and land use. Information about point sources will be derived from databases such as the USEPA's Permit Compliance System; information about nonpoint sources will be derived from data such as fertilizer use, livestock wastes, and atmospheric deposition.

The New England SPARROW model will provide estimates of phosphorus and nitrogen concentrations and yields, sources, and downstream movement of nutrients by watershed. This information will be used to

- understand ranges in nutrient levels in surface waters
- identify the environmental factors that affect nutrient levels in streams
- define the variation of nutrient level by ecoregion, watershed, and other environmental settings, and
- evaluate management options for reducing nutrient loads to achieve water-quality goals.



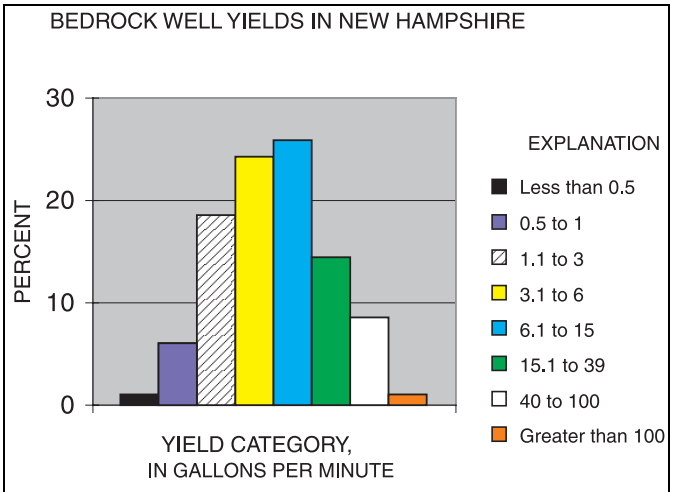
Map is showing areas of estimated concentration of phosphorus as produced by the national SPARROW model.

--Richard Moore (603) 226-7825 or rmoore@usgs.gov❑

Ground Water

Assessing High-Yielding Bedrock Aquifers in New Hampshire

The USGS, in cooperation with the NHDES, recently completed a study to assess the potential of the State's bedrock aquifers to provide ground-water supplies. Statewide and regional assessments were conducted to quantify relations between well yields and bedrock data, physiographic setting, fracture measurements, and well characteristics. A statewide model providing predictive well-yield probabilities was developed. The results of this study are planned for release in 2001 and will provide information and predictive tools that can be used by water-resource professionals, and community, regional and state planners, in locating, and understanding, bedrock water resources.



Bedrock well yields for New Hampshire statewide.

The assessments identified the following factors related to bedrock well yields: (1) steep slopes tend to have decreased yields; (2) regionally, hilltops are associated with decreased yields and valleys are associated with increased yields; (3) wells farther away from waterbodies are associated with decreased yields; (4) large drainage areas to the wells are associated with increased yields; (5) sites within 100 feet (ft) of specific types of lineaments are associated with increased well yields; and (6) various geologic map units were found to be significantly related to well yields.*--Richard Moore (603) 226-7825 or rmoore@usgs.gov*❑

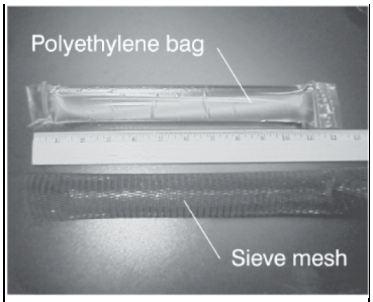
Hazards

New Contaminant Sampling Method Tested at Superfund Site in Milford, NH

The USGS, in cooperation with the NHDES and USEPA, has established a contaminant monitoring system for the Savage Well Superfund Site in Milford, N.H. The area is underlain by a large 0.5 mi^2 plume of volatile organic compounds (VOCs). The monitoring system is designed to document the rate of clean-up of the VOC plume after installation and operation of a remediation system.

A sampling program began in 1997, using low-flow sampling procedures before the installation of the remediation system. Low-flow sampling involves purging a low volume of water from a well until water-quality parameters stabilize enough to collect a sample. Low-flow sampling can take up to several hours per well to purge and collect a sample. To increase the amount of sampling and reduce sampling costs, passive diffusion sampling was introduced in 1998 to coincide with the start of remedial operations.

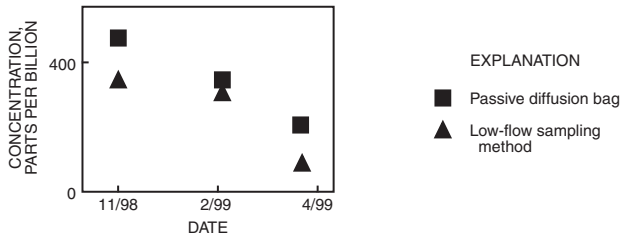
A passive diffusion sampler consists of a polyethylene bag containing deionized, contaminant-free water (see photograph) suspended in well water inside a mesh sleeve. Contaminants in the well water diffuse through the polyethylene bag until the concentration inside the bag matches the concentration in well water.



Example of a passive diffusion sampler and a sieve mesh that surrounds it inside a well.

Passive diffusion sampling proved to be an easy and inexpensive approach to collecting water-quality samples and was completed in one-fifth the time of the traditional low-flow sampling. At the site, concentrations of VOCs were similar in diffusion samples and in low-flow samples. By reducing the cost of sampling, the frequency of sample collection can be increased, which leads to an better understanding of how contaminants are transported through the site.

--Philip Harte (603) 226-7813 or ptharte@usgs.gov❑



Graph shows similar results between passive diffusion sampler and low-flow sampling methods for VOCs.

USGS Updating Flood Hazard Maps

The USGS is currently updating flood-zone mapping for three sites in New Hampshire, in cooperation with the Federal Emergency Management Agency (FEMA). Flood maps for Canaan Street Lake and Mirror Lake in the town of Canaan and for Squam Lake in Holderness will be revised. The updated maps will show the 100-year flood zone along the perimeter of the lakes. The flood insurance rate maps for these lakes will be updated from computer modeling and surveying results and printed by FEMA for the public.

--Thor Smith (603) 226-7814 or tesmith@usgs.gov❑


A USGS hydrologist is surveying land elevations at Mirror Lake in Canaan, N.H., for use in the flood insurance map update.

Spicket River Flood Information System Pays Off

In October 2000, the USGS installed two new streamgaging stations on the Spicket River in Salem, N.H., to assist communities in flood forecasting and warning, and emergency response activities. The 76 square-mile Spicket River drainage extends from Big Island Pond in Derry, N.H., through the urban centers of Salem, N.H., and Methuen and Lawrence, Mass., to the Merrimack River. The Spicket has a history of flooding that has been exacerbated by urbanization of the watershed and floodplain development. Major flooding in October 1996 led to a Presidential disaster declaration for communities along the Spicket River.

Following the flood events of the late 1990s, USGS teamed with the New Hampshire Office of Emergency Management and the NHDES to develop a Hazard Mitigation Grant Program proposal to FEMA for new streamgages and upgrades of existing gages to real-time reporting. This grant was approved and some of the funding was used to install two new streamflow and precipitation gages on the Spicket River; one in North Salem above Arlington Mill Reservoir, and another on the New Hampshire/Massachusetts State line. Funding for continued operation of these stations is being provided by the Town of Salem and the USGS.

Spicket River cont. on page 10

Surface Water

Real-time Precipitation Gages Installed

In 2000, real-time precipitation gages were installed in Vermont by the USGS, in cooperation with the Two Rivers-Ottauquechee Regional Commission. These gages were funded through FEMA's Project Impact Program and will transmit real-time data through satellites. The data will be used by the National Weather Service (NWS) and State and local agencies to issue flood warnings. The precipitation gages are co-located with USGS stream-gaging stations and data from them can be used to develop models for flood forecasting.

Real-time rain gages are now installed on 14 stream-gaging stations in New Hampshire and Vermont, with plans to install an additional 12 rain gages in New Hampshire in the summer of 2001. Precipitation levels at real-time stations with rain gages can be viewed online at

http://nh.water.usgs.gov/WaterData/index.htm

--Ken Toppin (603) 226-7808 or ktoppin@usgs.gov❑

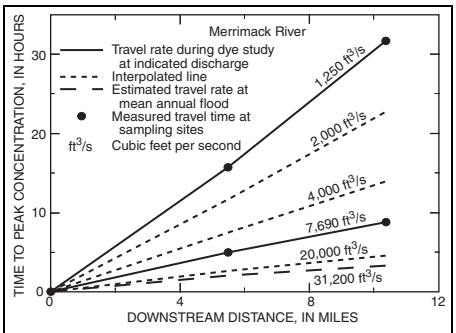
Time-of-Travel Studies on New Hampshire Rivers

Between April and December 2000, the USGS injected and monitored a safe, fluorescent red dye in 13 New Hampshire rivers to measure the travel rate of a potential contaminant spill into the rivers. These studies were done, in cooperation with the NHDES, as part of the Drinking Water Source Assessment Program. The results of these studies will be used by local agencies to plan emergency responses to chemical spills into the rivers, including guiding decisions regarding closing and reopening of intakes to drinking-water systems.

Dye was injected, at low flow and mean flow, into the Ammonoosuc, Androscoggin, Connecticut, Contoocook, East Branch Pemigewasset, Exeter, Lamprey, Mascoma, Merrimack, Oyster, Piscassic, Salmon Falls, and Sugar Rivers. Rivers were then sampled to measure dye concentrations and the arrival times of the dye cloud. Relations were developed from this information that will allow emergency responders to estimate travel times and concentrations of contaminants at different flow rates and locations on these rivers.

In general, river velocities were slowest in the New Hampshire seacoast region, where topography is low and river slopes are mild such as on the Oyster River. Velocities were highest in steeper-sloped rivers, such as the Mascoma River, draining upland and mountainous areas.

--Thor Smith (603) 226-7814 or tesmith@usgs.gov❑



Graph shows the travel time for specified distances downstream for a dye-cloud peak as it flows in the Merrimack River. The travel time is dependent on the amount of water being discharged in the river.

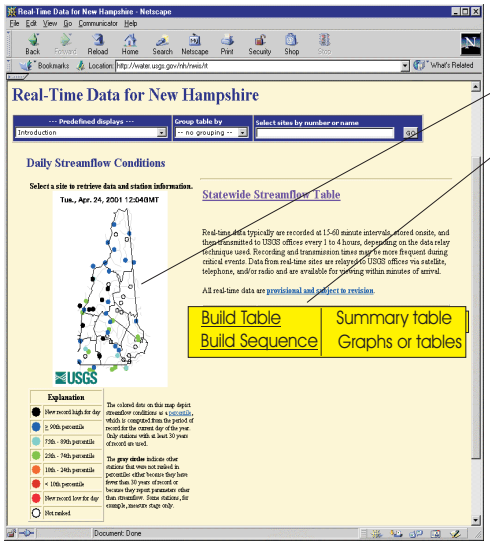
Snapshot of Average Runoff in Selected Rivers in New Hampshire and Vermont in Water Year 2000 (October 1, 1999 to September 30, 2000)

Station name	Record length of station (years)	Mean runoff in 2000 water year		
		Mean (cubic feet per second)	Percent of median	Range
Androscoggin River near Gorham, N.H.	87	3,177	131	Above-normal
Saco River near North Conway, N.H.	97	1,022	110	Normal
Lamprey River near Newmarket, N.H.	67	291	104	Normal
Pemigewasset River at Plymouth, N.H.	97	1,493	112	Normal
Smith River near Bristol, N.H.	83	149	106	Normal
Merrimack River near Goffs Falls, below Manchester, N.H.	64	5,933	120	Normal
Connecticut River at Wells River, Vt.	51	6,086	125	Above-normal
Sugar River at West Claremont, N.H.	73	472	117	Normal
Connecticut River at North Walpole, N.H.	59	11,250	120	Above-normal
Ashuelot river at Hinsdale, N.H.	92	799	111	Normal
Waloomsac River near North Bennington, Vt.	70	276	126	Above-normal
Otter Creek at Middlebury, Vt.	98	1,281	124	Above-normal
Dog River at Northfield Falls, Vt.	66	154	128	Above-normal
Lamoille River at East Georgia, Vt.	72	1,576	130	Above-normal
Missisquoi River near East Berkshire, Vt.	81	1,250	137	Above-normal
Black River at Coventry, Vt.	49	251	130	Above-normal

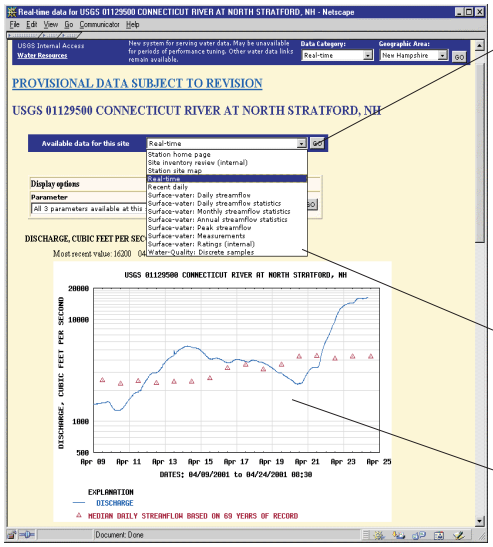
New Water Resources Data Web Pages

These new web pages will serve USGS Water Resources data for New Hampshire and Vermont or any state in the Nation. The new sites can be visited at http://water.usgs.gov/vt/nwis ***or*** *http://water.usgs.gov/nh/nwis.*

Web pages include real-time, surface water, ground-water, water-quality, and site information for all data-collection sites. Examples of two of the web pages are given in this section.



- Current daily streamflow conditions map
- Ability to build a customized table or sequence of tables or graphs for any combination of stations
- Output data in the form of graphs for selected number of days or as tables in html, fixed-width, or tab-separated columns
- Pull down menus to select
  - real-time (15-minute) data for the previous 31 days
  - recent daily values for the past 18 months
  - historical daily values for the period of record
- Ability to group table of gages by major river basin, County, or hydrologic unit
- Site information for all sites:



- Station home page
- Station site map
- **Real-time**
- Recent daily
- Surface water: Daily streamflow
- Surface water: Annual streamflow statistics
- Surface water: Daily streamflow statistics
- Surface water: Monthly streamflow statistics
- Surface water: Peak streamflow
- Surface water: Measurements
- Water quality: Discrete samples

- Ability to select other parameters such as stream stage, precipitation, and water temperature for each site
- Ability to obtain a discharge hydrograph for any length of time that includes the median daily streamflows

Surface Water

Point and Click Tools for Obtaining Streamflow Characteristics

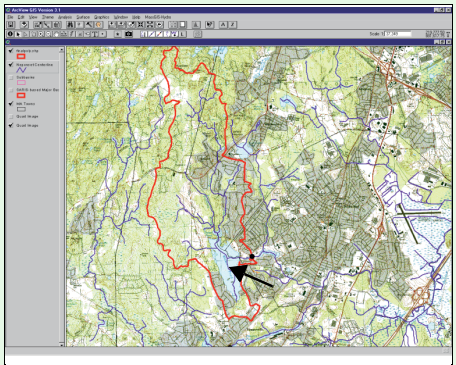
New Hampshire

The USGS, in cooperation with NHDES, is using Geographic Information Systems (GIS) to produce a point-and-click tool for estimating low-flow characteristics of any unregulated stream at any locale in New Hampshire. Low-flow characteristics to be estimated include flow durations (the percentage of time that various flows are equalled or exceeded) and low-flow frequencies (such as the 7-day low flow discharge that occurs once on the average every 10 years or the 7Q10).

This study will also develop similar tools for estimating ground-water recharge in the various aquifers of the State. These tools will be used by the NHDES to administer such programs as the Large Groundwater Withdrawal Program and the Rivers Management and Protection Program.--*Robert Flynn (603) 226-7824 or rflynn@usgs.gov*❑

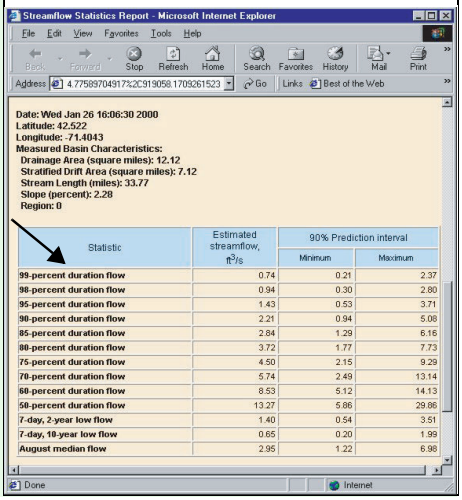
Vermont

Currently, the USGS monitors streamflow at 72 gaging stations in Vermont. Monitoring all points in all rivers and streams is not practical and estimating floods in ungaged rivers is a challenge for engineers, hydrologists, planners, and various local agencies. The USGS, in cooperation with the Vermont Agency of Transportation, is developing equations for estimating the magnitude and frequency of floodflows using basin characteristics such as slope, elevation, drainage basin size, and climate for Vermont. This information will then be coupled with GIS map coverages to develop a "point and click" package that allows the user to estimate floodflow characteristics for any stream in the State. This software is planned for distribution in Fiscal Year 2002.--*Scott Olson (603) 226-7815 or solson@usgs.gov*❑



An example of a watershed delineated (in red) by clicking on a stream point to bring up data on peak flows and frequencies of occurrence.

An example of a table showing floodflow statistics that will appear after a stream (in blue) in the window shown to the left is selected with a computer mouse.



Hazards

Spicket River cont. from page 7

Heavy rainfall, on the unusually heavy snowpack this spring, again caused the Spicket River to flood, cresting at near the 25-year flood level on March 24, 2001. However, the Towns were prepared. Evacuations were effected, inventory was relocated, traffic was rerouted, and reservoirs were operated to minimize damages from the flood event. Emergency managers and reservoir operators were kept well informed by following real-time river conditions on the USGS Web site. The gage at the State line will become an official forecasting site by the NWS, Northeast River Forecast Center later this year. Flood forecasting by the NWS will further improve the emergency preparedness and response of the communities along the Spicket River in the future.
--*Ken Toppin (603) 226-7808 or ktoppin@usgs.gov*❑

Recent Publications of the New Hampshire/Vermont District

October 1, 1998-March 30, 2000

Contact the Outreach Coordinator, Debra Foster at dhfoster@usgs.gov for the availability of these reports. Reports in blue are available online at http://nh.water.usgs.gov/Publications/online_publications.htm

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For additional information on District Programs contact:

Brian R. Mrazik, District Chief
(603) 226-7807 or bmrazik@usgs.gov

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Debra H. Foster

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U.S. Department of Interior
U.S. Geological Survey
New Hampshire/Vermont District
361 Commerce Way
Pembroke, NH 03275