

New York Water Science Center, Strategic Science Plan, 2005-2010: **ENVIRONMENTAL QUALITY AND HUMAN HEALTH**

Background and Relevance

Water issues related to environmental quality and human health are closely intertwined and, for purposes of this science plan, are treated collectively and include things such as: 1) surface- and ground-water contamination associated with agriculture, urban development, wastewater disposal and other sources; 2) atmospheric deposition, including mercury contamination; 3) contaminated sediments; and 4) aquatic habitat degradation.

Atmospheric deposition, or acid rain, has been a major water-quality issue in New York State for many years. In the late 1970s and the 1980s, the emphasis was on lake acidification and associated mortality of fish and other aquatic organisms. The issue faded from widespread public attention in the late 1980s. But recently, atmospheric deposition has received renewed attention, and concerns have broadened to include atmospheric mercury deposition. Acid rain itself also has received renewed interest to include stream acidification, the effects on soil-calcium depletion, reduced forest growth and health, nitrate saturation of watersheds, and the slower-than-anticipated recovery of streams and lakes due to reduced rates of nitrate deposition.

The New York City watersheds, in general, produce high quality water. Consequently, in 1997 the EPA issued a filtration avoidance determination (FAD) for New York City's watersheds west of the Hudson River, and in 2002 the FAD was renewed for five years. Agriculture, waste disposal, suburban development,

timber harvesting, stream-bank erosion, and atmospheric deposition all can cause deterioration of water quality to a point where filtration is necessary. A filtration system for such a large water system would be a huge undertaking. Thus, managing the City's watersheds to maintain the high quality of the supply is of utmost importance, and the City, State, and EPA direct considerable resources towards the issue.



Figure 1. – Stream restoration project, near completion in New York City water-supply watershed, showing restoration of stream meanders.

Sediment reduction, stream-bank restoration and stabilization, and stream habitat improvement recently have gained attention as important environmental quality issues. There is increasing interest

in using vegetative and geomorphic approaches to stream channel restoration and stabilization, and to move away from engineered approaches to stream stabilization (fig. 1). Until recently, however, geomorphic efforts to stabilize stream channels in New York State have been limited by an absence of reference information on stable stream channel and flow characteristics.

Contaminated sediment is an important issue in the Hudson River basin for several reasons. PCB-contaminated sediment in the upper basin has been brought to the forefront again as plans to dredge the contaminated sediment are being developed. (PCBs bioaccumulate in fish, and consequently, fish consumption advisories have been issued to prevent human exposure to PCBs.) Also, contaminated sediment, which is deposited in the New York/New Jersey harbor by the Hudson River and other sources, must be regularly dredged to maintain shipping channels and docking facilities, and disposing of contaminated sediment creates considerable problems and expense.

Ground-water contamination is an ongoing concern because of the time and money required to remediate ground-water problems. In 2003, the New York State passed legislation establishing a Brownfields Cleanup program in the NYSDEC to provide for more effective remediation of brownfields and to better protect ground-water resources.

A broad list of compounds commonly referred to as “emerging contaminants” is receiving growing attention from scientists, water and environmental managers, and the general public. These contaminants are typically present in the environment at very low concentrations,

and their effect on human health is not well understood. There is evidence to suggest, however, that some emerging contaminants, by virtue of their ability to interact with the endocrine system, are causing a variety of adverse health effects in humans and wildlife. These contaminants are expected to receive increased attention over the next several years.



Figure 2. – USGS employee collecting a depth-integrated water-quality sample.

A large part of the USGS program in New York focuses on environmental quality and human health issues. The projects range from routine water-quality assessments to advanced research and are too numerous to describe here. A brief description of all projects currently being conducted by the New York Water Science Center (WSC or Center) can be found on the web at <http://ny.usgs.gov>

Program Plans, Goals, and Actions

In early 2005 the WSC conducted a planning exercise to gather information and ideas from within and outside the USGS to help formulate a strategic science plan for the next five years. The following paragraphs incorporate key ideas from that exercise.

- The USGS plans to continue a large multi-discipline investigation of the effects of forest harvesting on nutrient retention, soil nutrient status, and surface-water chemistry in New York City watersheds. It plans to continue the “upper node-lower node” water-quality monitoring program in New York City watersheds and will pursue new studies to evaluate the effects of various land uses on water quality.
- The WSC will continue to play a principal role in studying the effects of atmospheric deposition. It will investigate stream acidification in the western Adirondack Mountains and relations between soil chemistry and stream acidification. It will pursue new opportunities to develop integrated monitoring and assessment programs, such as a program to conduct long-term monitoring of acid deposition and forest health.
- The USGS will continue to measure suspended sediment loads in the Hudson River at Poughkeepsie, important to the management of New York harbor, and will pursue a project to quantify the suspended sediment loads of the largest tributaries to the lower Hudson River above Poughkeepsie. The WSC also will seek project opportunities expected to develop as EPA formulates plans to dredge PCB-contaminated sediments from the Hudson River. There also is growing interest in the links between sediment generation and suburbanization

and other types of development, and the WSC will stay abreast of project opportunities in these areas.

- The WSC will remain actively involved in the National Water Quality Assessment (NAWQA) program. It will take the lead in the second high intensity cycle of the Hudson NAWQA and will play a major role in the second high intensity cycle of the Long Island/New Jersey NAWQA. The WSC also will participate in the Delaware NAWQA during the low intensity cycle, and will continue to play an active role in national synthesis studies. In 2006 a mercury topical study will begin in New York as part of the NAWQA program and the Center will explore opportunities for cooperative projects that build on this mercury study;
- The WSC will remain actively involved



Figure 3. – Sampling tidal marsh on Long Island for pesticides used in the control of mosquitoes carrying West-Nile Virus.

in ground-water-quality assessments. A ground-water sampling program to support the State’s 305B program will continue Upstate; plans call for sampling two or three major drainage basins each year. Downstate, a comprehensive ground-water quality monitoring in the New York City boroughs will continue, and an opportunities will be pursued to expand similar monitoring to Nassau and Suffolk Counties .

- The WSC will continue a surface-water-quality monitoring program in the New York City watersheds, which focuses on pesticides and organic wastewater, or “emerging” contaminants, and plans to participate in multidiscipline projects investigating the effects, if any, of these contaminants on aquatic biota, particularly effects on the endocrine system. It also will continue to sample ground water in New York City and on Long Island for emerging contaminants. The Center will continue environmental monitoring of pesticides applied to control mosquitoes carrying the West Nile virus in the New York City and Long Island areas.
- The WSC will continue involvement in federal long-term environmental monitoring programs such as the Hydrologic Benchmark Network, National Trends Network, and EPA’s Regional Long-Term Monitoring program. It will investigate opportunities to build on current programs and to expand into new areas of surface-water-quality monitoring by building on the Center’s extensive stream gaging program and other programs. Also, the Center will explore opportunities to monitor microbial contaminants, particularly in the Hudson River.
- The USGS has been extensively involved in surface- and ground-water investigations in the Onondaga Lake watershed for many years, and the WSC plans to continue a lead role in providing data, hydrologic models, and other information critical to the cleanup of Onondaga Lake.
- In recent years the New York WSC has provided borehole logging and other geotechnical support for the EPA and other federal agencies. The WSC will

make other federal agencies aware of the full range of its capabilities, including such things as solute transport modeling, and will pursue opportunities to expand its role in assisting for other federal agencies.

- The WSC will continue geomorphology projects to define regional relations



Figure 4. – USGS crew doing borehole geophysical logging of a ground-water well in New York City.

between stable stream channels, bank-full discharge, drainage area, and other basin characteristics. Understanding these relations is essential to successful stream restoration. Also, the WSC will continue projects to evaluate the effects of stream channel restoration on stream habitat and fish communities.

The above summarizes some of the principal plans and goals of the New York WSC in the programs areas of environmental quality and human health. If you would like to discuss any of the above plans or make additional suggestions, please contact:

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