EMEP NEWS

Spring 2004

Environmental Monitoring, Evaluation, and Protection Program

In this issue...

New York Energy $mart℠
Public Service Commission — NYSERDA
George E. Pataki, Governor

Nation's Toughest Acid Rain Controls Begin This Year in New York

Last spring the New York State Department of Environmental Conservation promulgated Governor Pataki's acid rain initiative, approving the nation's strictest regulations on emissions of the pollutants that cause acid rain. The regulations, intended to protect public health and critical natural resources in the State, target electricity generators' emissions of sulfur dioxide (SO_2) and nitrogen oxides (NO_x), pollutants that have been identified as primary contributors to the formation of acid rain and smog.

The regulations set year-round reductions in NO_x emissions beginning October 1, 2004. Starting January 1, 2005, and phased in over a three-year period, electricity generators in New York will be required to reduce SO_2 emissions an additional 50 percent below levels allowed under the Acid Rain Program requirements of the federal Clean Air Act. Overall, the regulations are projected to reduce New York sources' SO_2 emissions by approximately 130,000 tons and NO_x emissions by 20,000 tons annually.

Acid deposition (often called acid rain) forms when sulfur dioxide and nitrogen oxides react chemically with water, oxygen, and oxidants to form sulfuric and nitric acid. Acid deposition occurs when these compounds are transported from the atmosphere to earth as gases, particles, rain, snow, clouds, and fog.

Acidic deposition causes lower pH levels (acidification) in lakes, ponds, and streams and also affects air quality and soil. Highly acidified water bodies are often unable to sustain plant and aquatic life, and the damage can extend into the interdependent eco-system. Many water bodies in the Northeast are especially sensitive to the effects of acid rain because their surrounding soils do not have strong buffering capacity—that is, the ability to neutralize acid rain. In addition, acid rain damages soils and forests, particularly red spruce trees above 2,000 feet, and is a contributing factor in sugar maple declines and visibility degradation.

The New York Energy $mart℠ EMEP program is currently supporting 10 research projects exploring the effects of and potential solutions to acidic deposition in New York and the Northeast.

EMEP Website Gets Makeover

A user-friendly format and many new features will characterize the reconstructed website of the Environmental Monitoring, Evaluation, and Protection program (www.nyserda.org/environment/environmentalprograms.html). Users will be able to link to project sites and related educational resources, download project reports and fact sheets, and locate extensive information about EMEP study field sites, including the types of data being collected. Bard College of Environmental Policy, an EMEP outreach contractor, is currently putting the final touches on the site, which is expected to be up and running this summer.

A Message from Peter R. Smith, President, NYSERDA

While most people may associate the New York State Energy Research and Development Authority with energy-efficiency programs and Energy Star products, NYSERDA has a long-standing commitment to environmental research. With a small amount of funding NYSERDA supports energy-efficient waste management in the agriculture, industrial, and municipal sectors. In addition, the New York Energy $mart Environmental Monitoring, Evaluation, and Protection (EMEP) program provides scientifically credible and objective information on the environmental impacts of energy systems to assist the State in developing science-based and cost-effective policies to mitigate impacts.

To date, a total of 35 EMEP projects have been initiated and more than 100 peer-reviewed journal articles have been published, based on research supported by this program. EMEP funds have attracted more than $20 million in project cofunding and are helping to establish New York State universities and institutions as world-class leaders in the environmental field. In addition to building critical research capabilities, these EMEP projects are already beginning to affect environmental policy in many ways, including the following:

- Providing the long-term data, through the Adirondack Lakes Survey Corporation, to support Governor Pataki's Acid Rain Initiative.
- Providing critical scientific information to better understand and control ambient fine particles in the development of a PM-2.5 State Implementation Plan.
- Building partnerships between academic institutions and state and federal agencies, which helped shape recent EPA guidelines for procedures to demonstrate attainment and maintenance of the eight-hour ozone and fine particulate (PM-2.5) National Ambient Air Quality Standards.
- Developing state-of-the-art instruments to measure fine particles in real time.

In October 2003, 225 scientists and policy makers spent two days together at the third EMEP conference, "Environmental Monitoring, Evaluation, and Protection in New York: Linking Science and Policy." This conference provided a forum to learn about and discuss the latest research results on pollution issues in the State associated with energy. NYSERDA is playing a critical role in ensuring that energy-related environmental policy can be based on sound science, and that is good news for the health and well-being of New Yorkers and for our natural resources. It is a goal that we have supported for many years and will continue to support.

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EMEP OVERVIEW

The Environmental Monitoring, Evaluation, and Protection (EMEP) program supports research to increase the scientific understanding of the behavior, cycling, and interaction of primary and secondary pollutants related to electricity generation (e.g., sulfur oxides, nitrogen oxides, ozone, particulates, mercury) in the environment so that policy makers can identify effective strategies for mitigating the impacts of energy production and use. The program also supports research that will increase the understanding of the role of local versus regional sources of air pollution in New York State so that more equitable control strategies can be developed.

EMEP is guided by a Program Advisory Group and a Science Advisory Board. (See page 3 of this newsletter for the current members of both advisory groups.)

EMEP is part of the New York Energy $mart℠ Program, which is funded by a system benefits charge on the electricity transmitted and distributed by the State's investor-owned utilities. The New York State Energy Research and Development Authority (NYSERDA), a public benefit corporation created by law in 1975, administers the funds and programs under an agreement with the Public Service Commission. For more information on NYSERDA and EMEP, visit www.nyserda.org.

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www.nyserda.org/environment

EMEP-Supported Papers Address Practical and Theoretical Issues

NYSERDA disseminates the results of the EMEP research program in several ways—posting final reports on the Internet, distributing hard-copy reports, publishing special communications that summarize findings from multiple projects, holding frequent project briefings and workshops, and providing electronically accessible databases of site information. The research ultimately undergoes rigorous review for publication in refereed journals. In 2003 the results of research funded by EMEP have appeared in 17 peer-reviewed publications; one paper has been published thus far in 2004.

Air Quality and Health Effects

Application of receptor modeling to atmospheric constituents at Potsdam and Stockton, New York. W. Liu et al. *Atmospheric Environment* 37: 4997–5007. 2003.

Intercomparison and evaluation of four semi-continuous PM-2.5 sulfate instruments. F. Drewnick et al. *Atmospheric Environment* 37: 3335–50. 2003.

Measured summertime concentrations of particulate components, Hg0, and speciated polycyclic aromatic hydrocarbons at rural sites in New York State. P. Hopke et al. *Environmental Pollution* 123(3): 413–25. 2003.

Measurements of gaseous HONO, HNO_3, SO_2, HCl, NH_3, particulate sulfate and PM-2.5 in New York, New York. A. Bari et al. *Atmospheric Environment* 37: 2825–35. 2003.

Parameterization of albedo over heterogeneous surfaces in coupled land-atmosphere schemes for environmental modeling. Part I: Theoretical background. D.T. Mihailovic et al. *Environmental Fluid Mechanics* 4: 57–77. 2004.

Probabilistic assessment of regional scale ozone pollution in the eastern United States. E. Gego et al. In *NATO Science Series, IV: Earth and Environmental Sciences, Vol. 30, Air Pollution Processes in Regional Scale,* edited by D. Melas and D. Syrakov. Dordrecht: Kluwer Academic Publishers. 2003.

Regional sources of particulate sulfate, SO_2, PM-2.5, HCl, and HNO_3, in New York, New York. A. Bari et al. *Atmospheric Environment* 37: 2837–44. 2003.

Summertime characteristics of the atmospheric boundary layer and relationships to ozone levels over the eastern United States. S.T. Rao et al. *Pure and Applied Physics* 160: 21–55. 2003.

The airshed for ozone and fine particulate pollution in the eastern United States. K. Civerolo et al. *Pure and Applied Geophysics* 160: 81–105. 2003.

Ultrafine particle deposition in humans during rest and exercise. C.C. Daigle et al. *Inhalation Toxicology* 15(6): 539–52. 2003.

Ecosystem Response

Abundance of *Alnus incana* spp. *rugosa* in Adirondack Mountain shrub wetlands and its influence on inorganic nitrogen. B.D. Kiernan et al. *Environmental Pollution* 123(3): 347–54. 2003.

Chemical response of lakes in the Adirondack region to declines in acidic deposition. C.T. Driscoll et al. *Environmental Science and Technology* 37: 2036–42. 2003.

Discussion on "Spatial patterns of precipitation quantity and chemistry and air temperatures in the Adirondack region of New York": Authors' response. M. Ito et al. *Atmospheric Environment* 37(1): 135–38. 2003.

Effects of acidic deposition on forest and aquatic ecosystems in New York State. C.T. Driscoll et al. *Environmental Pollution* 123(3): 327–36. 2003.

Effects of beech bark disease on aboveground biomass and species composition in a mature hardwood forest, 1985 to 2000. J. Forrester et al. *Journal of the Torrey Botanical Society* 130: 70–78. 2003.

Interactive effects of changing climate and atmospheric deposition on N and S biogeochemistry in a forested watershed of the Adirondack Mountains, New York State. J. Park et al. *Environmental Pollution* 123: 355–64. 2003.

Nitrogen biogeochemistry in the Adirondack Mountains of New York: Hardwood ecosystems and associated surface waters. M.J. Mitchell et al. *Environmental Pollution* 123(3): 355–64. 2003.

Nitrogen pollution in the northeastern United States: Sources, effects and management options. C.T. Driscoll et al. *BioScience* 53(4): 357–74. 2003.

Field Notes

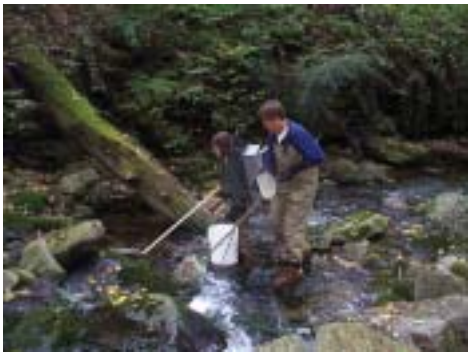
New EMEP Projects Assess Water Quality

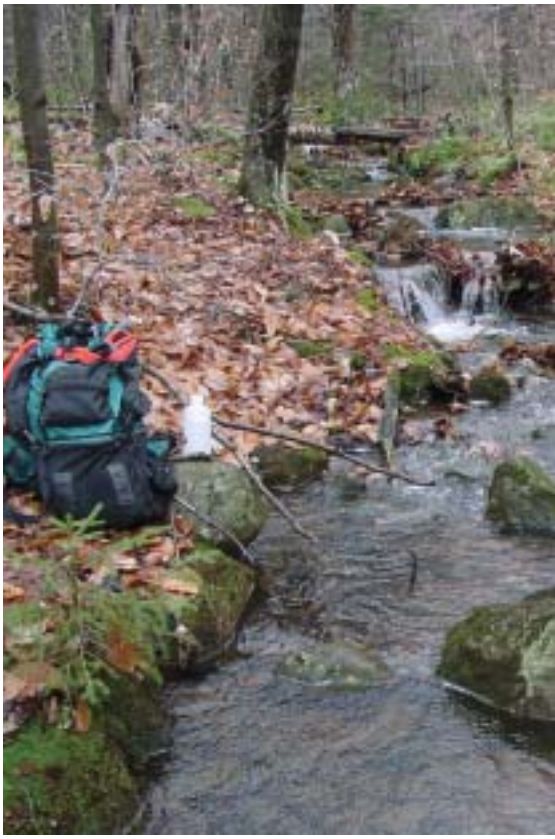
Potential recovery of water chemistry and stream biota from reduced levels of acidic deposition at a sensitive watershed in the Catskill Mountains. U.S. Geological Survey.

The objective of this study is to examine changes in water chemistry and stream biota in relation to decreased levels of acidic deposition in the Catskills during the past 16 years. In mid-September 2003, researchers sampled water chemistry at 16 sites along the Neversink River that were sampled in 1987. At each site, a stream reach of about 50 meters was defined, and species diversity, weight, and length of fish were determined. Additionally, macroinvertebrates were sampled for species determination, and a multihabitat sample of periphyton was collected for determination of diatom species. Sample and data analysis and synthesis are expected to be completed by the end of March; a report comparing these findings with the 1987 data will follow.

Assessment of chemistry and benthic communities in streams of the Oswegatchie-Black River basins of the Adirondack region. U.S. Geological Survey.

To address the need for better characterization of the status of Adirondack streams and soils, a stream survey is being conducted in the Black River and Oswegatchie River watersheds of the western Adirondacks—the region likely to be most heavily affected by acidic deposition within New York State and possibly in the nation. The project is assessing acidic deposition impacts in this region and is serving as a pilot project that can be evaluated as a possible research approach for other regions of the Adirondack Mountains as well as elsewhere in New York State. In 2003 the summer and fall rounds of sampling included 200 stream sites. Samples were also taken at sites for which 1980–82 data are available. Field sampling will run through summer 2005, and a final report is scheduled to be released in spring 2006.





Above: Doug Burns and Karen Murray of the U.S. Geological Survey are studying how fish species diversity is related to water chemistry in the west branch of the Neversink River. PHOTO: ROBERT BODE.

Right: A tributary of Cranberry Lake, St. Lawrence County, is one of 200 collection sites for water chemistry analysis. PHOTO: BARRY BALDIGO.

Bottom left and right: Loons drawn to researchers' boat by distress calls are disoriented by the light and captured for measurements, banding, and the collection of blood and feathers. PHOTOS: NINA SCHOCH.

Long-term monitoring and assessment of mercury based on integrated sampling efforts using the common loon, prey fish, water, and sediment. Wildlife Conservation Society and Adirondack Cooperative Loon Program.

The common loon *(Gavia immer),* a fish-eating diver, will be used as an indicator species to assess the mercury exposure and risk in aquatic ecosystems in the Adirondack Park of New York State. Mercury contamination is highest in acidic water bodies, where mercury from such sources as coal-burning power plants, waste incinerators, and forest fires is converted to a more toxic form, methyl mercury. High levels of mercury in loons can lower rates of survival and reproduction. The risks extend to humans, and the New York Department of Health has recommended that women and children restrict their intake of fish containing mercury. In this project, lakes are monitored to determine the return

rate and reproductive success of loons, and samples of loon blood and feathers, fish, zooplankton, crayfish, water, and sediments are being collected. The results will allow for more defined management of water bodies and populations of fish-eating animals. The project will end in winter 2004–05, and the final report will present the findings on mercury exposure in the lakes sampled during the study.

INTERVIEW

Stuart E.G. Findlay

Aquatic Ecologist and EMEP Science Adviser

Like the discipline of ecology that is the subject of his scientific inquiry, Stuart Findlay takes a broad view of the environmental challenges we face as a state and a nation. Findlay is a research scientist at the Institute of Ecosystem Studies, in Millbrook, New York, and an EMEP science adviser.

Initially from Charlottesville, Virginia, he did his undergraduate work at the University of Virginia, completed his master's at the University of South Carolina, and earned a Ph.D. at the University of Georgia. Since 1985 he has pursued his research interests—microbial ecology of stream sediments, assimilation of dissolved organic carbon, and assessing multiple functions in vegetated aquatic ecosystems—at the Institute of Ecosystem Studies.

What initially interested you in environmental issues?

A combination of simple curiosity—stimulated by observing and trying to understand what is happening around us—and a sense of ethics. If we don't take some personal responsibility for the resources, we have a hard case whining about what others are doing.

What will be the most critical environmental issues over the next 10 years?

Probably like everyone else I'd have to say managing the perhaps-inevitable spread of development. While much of the development in the less-developed world is driven by population increase, ours is largely driven by lifestyle choices and desires. Given that these attitudes are unlikely to change dramatically, how might they be channeled?

One of the national issues we'll be facing is improving our science education. The current approach, driven by specific narrow standards and goals, is not going to instill the critical thinking capacity we will need. The pendulum is now swinging away from this extreme, but I fear we've lost an opportunity with a significant proportion of the next generation.

Where will you be focusing your efforts over the next five years?

Much of what I do will be connected to understanding how various aquatic habitats are changing across the landscape and how those changes can be measured and the net effect on ecosystem function assessed. From a very practical point of view, we have a fairly limited opportunity to manage the landscape around us, and we need to be sure our efforts will bring maximum benefit for the effort expended.

The landscape of the area where I live—the Hudson River valley—has changed a great deal since I came here 18 years ago. Every chance I get, I encourage newcomers to appreciate the history of the region and understand how it has been altered by previous lumbering, industry, and the growth, decline, and revival of towns. A book I often recommend is *River of Mountains: A Canoe Journey Down the Hudson*, by Peter Lourie, about his 1990 solo canoe trip from the Hudson headwaters to the Atlantic; it puts the Hudson in both historical and geographical perspective.

Seeing the bigger picture is one of the reasons I value my opportunity to serve on the EMEP science board. As an adviser, I can look up from my own research focus and consider the broader energy-related environmental issues of New York and the Northeast.

Final Reports

Integrating Observations and Models; Real-Time PM Monitoring

Reports on three recent major studies supported by EMEP are now available. One addresses the problem of long-range transport of air pollution; the other two represent advances in ambient particulate matter measurement.

Analysis of ozone and fine particulate matter in the northeastern United States. State University of New York at Albany.

This study confirms the regional nature of air pollution in the northeastern United States and southern Canada. Along with "Assessing the effects of transboundary pollution on New York's air quality," released in 2003, the research underscores the challenge facing states in the Northeast: No single state can adequately address pollutant problems until region-wide control strategies for ozone (O_3) and fine particulates (PM-2.5) are implemented.

To assist policy makers and state regulatory agencies in designing optimum control measures to reduce ambient concentrations of O_3 and PM-2.5, the EMEP-sponsored research has proposed methods for integrating both observations and model predictions into an overall framework that draws on the strengths of both approaches, while also providing a measure of the uncertainty. The results have already helped shape recent U.S. Environmental Protection Agency guidelines for procedures to demonstrate attainment and maintenance of the eight-hour ozone and PM-2.5 National Ambient Air Quality Standards (NAAQS). The methods described will allow decision makers to assess the probability of attaining the NAAQS under simulated emissions control strategies. This tool is also valuable for comparing emissions control options and their associated costs.

Develop and field-test R&P Series-6400 controlled sampling continuous particulate monitor and *Innovative instrument for an ambient air particulate mass measurement standard.* Rupprecht & Patashnick Co., Inc.

These two reports and a summary communication describe refinements in sampling and major advances in real-time monitoring of fine particles, achieved with EMEP research support. First, the moisture content of the sampled ambient air is lowered so that the temperature of the device can be reduced from 50°C to 30°C (which is closer to the federal reference method used by the U.S. Environmental Protection Agency); and second, an innovative approach was developed and demonstrated to account for the loss of semivolatile materials on the filter surface. The new devices have the potential to provide highly time resolved and accurate fine particle mass data that can be used to improve health effects studies, verify the impact of state implementation for controlling PM-2.5, and reduce monitoring costs. The developer of the improved system to account for the loss of semivolatile materials, Rupprecht and Patashnick, recently received the 2004 Inventor of the Year Award from the Eastern New York Intellectual Property Law Association for this technology.

The new devices have the potential to provide highly time resolved and accurate fine particle mass data that can be used to improve health effects studies and reduce regulatory monitoring costs.

Upcoming Releases

Several draft reports are currently undergoing review:

- Atmospheric transport and fate of mercury in New York State. Research Foundation of SUNY.
- Effects of atmospheric deposition of sulfur, nitrogen, and mercury on Adirondack ecosystems. SUNY College of Environmental Science and Forestry.
- Evaluation of the recovery from acidification of surface waters in the Adirondacks. SUNY College of Environmental Science and Forestry.
- Monitoring particle size distribution in Rochester. Clarkson University.

All EMEP final reports can be downloaded from the NYSERDA website; go to

www.nyserda.org/environment/emepreports.html

Measuring Particulate Emissions at the Stack

More accurate measurement of fine particulate matter to determine the contribution of industrial and power generation facilities to atmospheric concentrations is the goal of a project underwritten by federal and state agencies and industry organizations. The expected improvements in sampling methods could have significant consequences for regulatory decision making.

In response to adverse health effects associated with particulate matter, in 1997 the U.S. Environmental Protection Agency promulgated new National Ambient Air Quality Standards (NAAQS) for particles with aerodynamic diameters smaller than 2.5 micrometers (PM-2.5). Fine particulates in the atmosphere also contribute to reduced atmospheric visibility, which is the subject of both new regional haze rules and existing rules for siting emissions sources near national parks and wilderness areas.

Information on chemical characterization and mass of fine aerosols (fine particles in a gaseous suspension) emitted during the combustion of oil, gas, coal, and other fuels from industrial and power generation facilities, however, is generally outdated and incomplete. Traditional sampling methods for stationary emissions sources tend to underestimate or overestimate the contribution of the source to ambient aerosols because they do not properly measure primary aerosols or account for secondary aerosol formation after gases leave the stack. Inadequacies in the existing PM emissions inventory and methods were acknowledged by the National Research Council, which in 1999 suggested that dilution sampling could improve source profiles.

The primary purpose of the project, which is jointly funded by the U.S. Department of Energy, California Energy Commission, Gas Research Institute, American Petroleum Institute, and NYSERDA, is to develop improved measurement methods and reliable source emissions data for use in assessing the contribution of industrial and power generation sources to ambient PM-2.5 concentrations. Data generated using the new methods will permit more accurate source apportionment and source receptor analysis for PM-2.5 NAAQS implementation and streamline the environmental assessment of industrial and power production facilities.

Field-test reports will provide total system emissions rates, speciation profiles, and particle size information and will also identify issues, procedures, methods, and results that may be useful for future studies. See http://www.nyserda.org/environment/emepreports.html for results from three of the seven field-test sites. The final report should be available at the end of 2004.

Mercury Monitoring Gets EMEP Funds

The EMEP program now provides funding for mercury monitoring stations located in the Adirondacks and Catskills. These sites are part of the National Acid Deposition Program/Mercury Deposition Network, which manages some 70 sites nationwide.

The objective of the network is to develop a national database of weekly concentrations and seasonal and annual fluxes of total mercury in precipitation. The data will be used to develop information on spatial and seasonal trends in mercury deposited to surface waters, forested watersheds, and other sensitive receptors.

These monitoring sites provide essential baseline deposition data and will help provide accountability for anticipated mercury regulations.

Michael McHale of the U.S. Geological Survey completes the installation of the mercury sampler in the Catskills. PHOTO: MARK WATSON.

They also provide valuable information that complements ongoing NYSERDA research projects focusing on mercury contamination in fish and common loons in New York State lakes, as well as projects exploring the movement and effects of mercury in Adirondack wetlands, lakes, and terrestrial systems.

The Catskill site, Biscuit Brook (NY 102 in the network), is operated by the U.S. Geological Survey and the Frost Valley YMCA; it is funded through October 2006. The Adirondack site at the Huntington Wildlife Forest (NY 20) is operated by Syracuse University and the SUNY College of Environmental Science and Forestry at Syracuse; it is funded through December 2006. The EMEP program is also providing funding for the interpretation of data and trends.

For more information on the mercury deposition network, see http://nadp.sws.uiuc.edu/mdn/.

2003 EMEP Conference Proceedings

Andrew Revkin, a science writer from the *New York Times*, spoke on the challenges that can hamper the use of science in policy making. He participated a plenary session panel discussion on communication at the 2003 EMEP conference. PHOTO: RAY HULL.

Proceedings from the October 7–8, 2003, EMEP conference are in preparation and will be sent to all conference attendees and posted on NYSERDA's website. Included will be summaries of the four major conference sessions, speaker abstracts and biographical information, and a CD of many of the presentations.

Some conference presentations are already available on the NYSERDA website; visit www.nyserda.org/environment/emep2003conference.html.

If you would like to be removed from the EMEP mailing list, please contact Liz Hamm, ehh@nyserda.org.

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