CIUS
CUNY INSTITUTE FOR URBAN SYSTEMS

13th Edition Winter 2005

Focus on Water Infrastructure

Does an Old Friend Need a Makeover? A Watershed Approach to the NYC Harbor Estuary

By Al Appleton, CIUS Senior Fellow

By any standard of public policy, the Clean Water Act — passed in 1972 by a Congress spurred by images of the burning Cuyahoga River and rising concern over the deterioration of American waters — has been one of the great successes of American governmental policy. Over the last thirty years, the state of America's waters has been transformed. The New York harbor estuary is a perfect example: its water quality is the highest it has been since the mid-19th century. The harbor estuary has become an attractive outdoor asset that is much healthier and more fishable. This restoration has spurred the post-industrial redevelopment of waterfronts throughout the region.

Are the priorities that the Clean Water Act sets still the right ones?

Yet the Clean Water Act has failed to address two significant remaining threats to the New York Harbor Estuary. One is what water quality experts call non-point source pollution, the stormwater runoff and pollution it collects as it flows across the landscape. The second is the ongoing destruction of estuary habitats: shallow water areas, wetlands, and the meadows, forests and uplands adjacent to wetlands and intrinsic to their ecological functioning. Without the policy-focusing mandates of the Clean Water Act, the region has been slow to develop strategies to address these problems.

The Clean Water Act set a primary goal of restoring all significant American waters to fishable, swimmable quality through a technology-based treatment approach to reducing discharges into waters. A major method for this reduction was a program of Federal Clean Water grants for the construction of sewage treatment plants. It is now apparent that the limiting and treating of pollution discharges is ill-suited to deal with either of these problems. The result has been a tendency of environmental regulators to set stricter discharge standards under the Clean Water Act to make up for the limited success of environmental controls in other areas. From a viewpoint of environmental sustainability, this is now leading to some patterns of environmental investment that are increasingly difficult to defend. For example, at the end of the nineties, EPA and New York State forced New York City to upgrade the Newtown Creek sewage treatment plant at a cost of $2.5 billion, even though the improvement in water quality from that investment will be marginal at best, and may not even be noticeable in the overall harbor environment.

The question is whether spending that $2.5 billion in a different way would produce a better estuary environment. Which leads to an even more compelling question: what should be the future priorities for environmental investment in the harbor estuary and are the priorities that the Clean Water Act sets still the right ones?

CIUS, in collaboration with the New York City Department of Environmental Protection and other estuary stakeholders, has begun to explore that question from a water-

Continued on page 4

Featured CUNY Research

Megan Wiley, Ph.D.

This month CIUS continues its series on innovative CUNY research with a focus on the work of Megan Wiley, Ph.D., Assistant Professor of Civil Engineering and a faculty member of the NOAA-Cooperative Remote Sensing Science & Technology Center (NOAA-CREST) at City College.

By Chris Andrichak

With a wealth of technology able to sense basic data about the environment, such as the temperature of the air and water, humans often only make casual use of their built-in senses. Animals do not have this luxury, and rely on their senses of feeling and smell among others to alert them to opportunities for food and the dangers of prey in their environments. Dr. Megan Wiley, Assistant Professor of Civil Engineering at City College, is currently conducting research with Dr. Frank Grasso, Associate Professor of Psychology at Brooklyn College, on how catfish use their senses of touch and smell to track prey in their environments by following the wake that a fish swimming underwater creates. While the project's immediate objective is to contribute to the understanding of catfish tracking behavior, Dr. Wiley sees important technological benefits as well.

Megan Wiley (lower left) and students at the Hudson River National Estuarine Research Reserve

The events of September 11 sparked an interest in security research in many areas of science and engineering. One area of interest is how to secure and monitor our nation's water supply from possible terrorist attacks. One of the difficult problems in this area is predicting how contaminants (possibly chemicals or other biological agents) would disperse through a system, and also locating the source of the contamination. Working with the National Oceanic and Atmospheric Administration (NOAA), Dr. Wiley and some undergraduate and graduate students are doing further research on how catfish and mantis shrimp utilize odors - chemical signals - in the water to find food, mates and suitable habitat. Studying the methods used by the catfish and the shrimp, Dr. Wiley and her students hope to develop strategies for locating pollutants in water sources and determining how they might spread.

Modeling Long Island Sound

A further area of research for Dr. Wiley is in building a coupled hydrodynamic and biological model of Long Island Sound to predict the occurrence of Harmful Algal Blooms (HABs). HABs are algal masses that produce potent neurotoxins, which can cause illness or death to marine life and humans. Working with a graduate student, she hopes to combine their modeling work of the Sound with that of other local institutions and then utilize satellite data to detect HABs. One of the challenges they face is the suitability of the satellite data, which must be compared to *in situ* data on HABs to show that it can identify the correct organisms in the water. Dr. Wiley and her student, Bernard Mhando, are working on this research through the NOAA-CREST Center, a multi-institutional center led by CUNY.

The causes of HABs are not well understood, but there are connections to pollution from sewage treatment, runoff from agriculture and other land uses, and the dredging of marine channels. Being able to predict and model the occurrences of HABs along with data on their possible triggers could lead to a better understanding of what role land-based infrastructure plays in causing them.

Advancing Engineering Education

In addition to research, Dr. Wiley has a strong interest in undergraduate education. She strives in all the classes that she teaches to get her students involved in real-world problems and examples so that they can feel as though they are learning something applicable to their professional life beyond the University. A class that she taught last year on Water Resources on the Hudson, with the help of CIUS fellow Al Appleton, asked students to look at the problems of PCB contamination in River sediment and nitrogen levels in runoff. The students used real data on soils and groundwater levels from local organizations along with field experiments to aid in their reports. Professor Wiley is also heavily involved with the Environmental Entrepreneurship Program (EEP), a collaboration between the engineering and economics departments. The aim of this program is to support the development of environmentally-conscious engineers and entrepreneurs of the future. The main focus of the program is on the environmental health of marine systems, especially the NY/NJ Harbor Estuary which surrounds New York City.

Professor Wiley comes to City College from Stanford University in California, where she got her Ph.D. in 2003 and her MS in 1997, both in civil engineering.

Highlands 2 Ocean: The State of Our Natural Region

By Christopher Meier and Tony Hiss

H2O: Highlands to Ocean, our new book recently published by the Geraldine R. Dodge Foundation, gives a name to, and analyzes, the New York/New Jersey metropolitan region as a vast and still vibrant, if often invisible, natural area. The book examines 14 indicators of the health of the H2O Region, a name capturing both the region's boundaries (south of the Highlands – our own stretch of the Appalachian Mountains – and north of the Atlantic Ocean) and its geologic reality as a post-glacial, water-based, and water-sculpted landscape.

"*H2O*" turns out to be a good news book – perhaps surprisingly, many of the indicators, which range from Striped Bass to Peregrine Falcons to asthma to sprawl to climate change show positive changes, as a result of a generation of efforts by government agencies and regional activists. The process of focusing on the region as a natural area began eight years ago, in 1997, when a couple dozen residents of the then still unnamed region gathered at the Pocantico Conference Center to discuss the future of the region's extraordinary natural endowment.

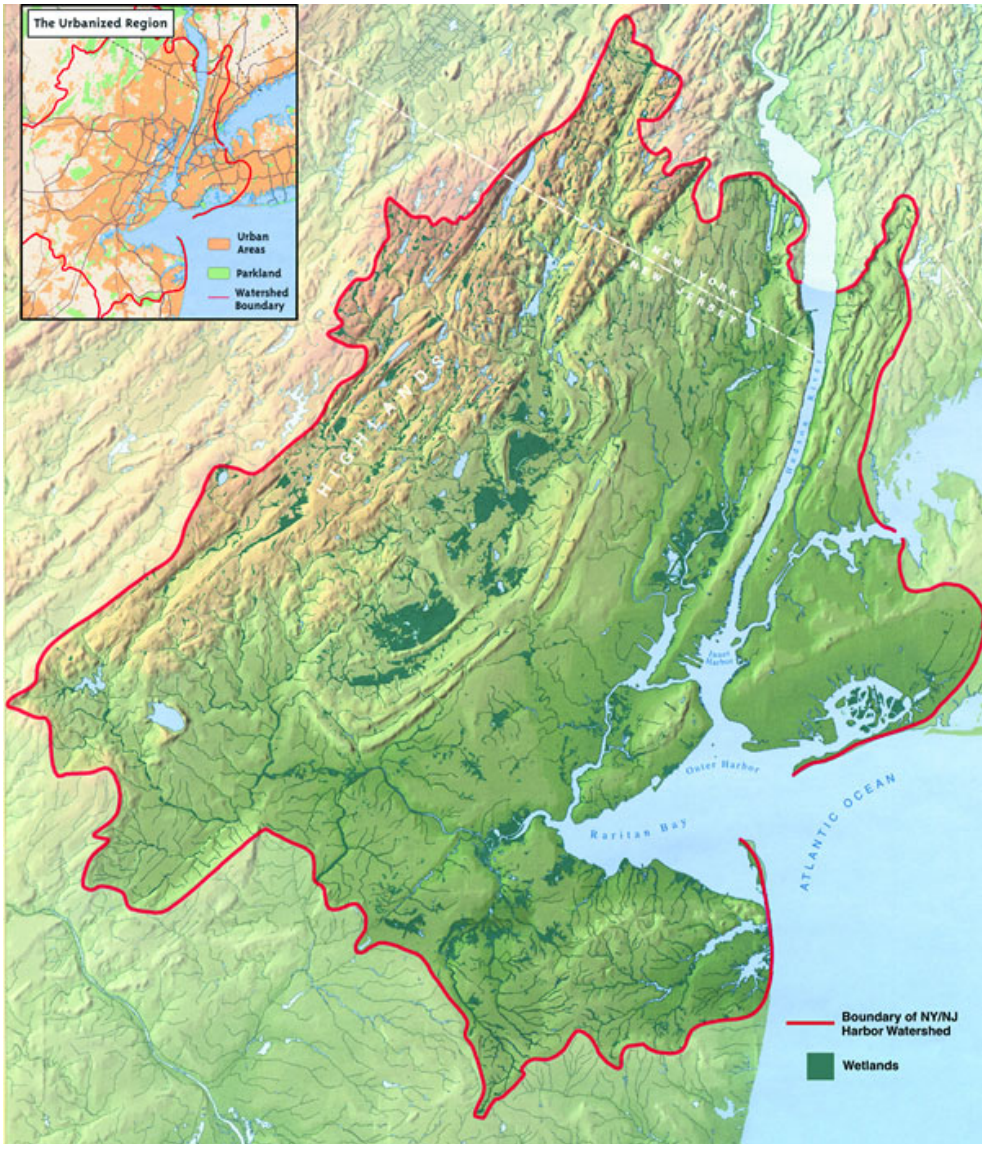
The region is based on water-flow patterns and resembles a diamond shape beginning at the crest of the highlands of northern New Jersey and southern New York, then sloping down to New York/New Jersey harbor and the Atlantic Ocean. Overall, the region includes 12 New Jersey and 9 New York counties. A main aim in describing the workings of the H2O Region is to renew a sense of wonder in the innate resiliency and many beauties of a natural environment that both surrounds and flows through hundreds of urban and suburban neighborhoods. The human-made landmarks of the region often evoke wonder in the eyes of beholders: so many people, so much concrete and steel. The natural features – when brought to people's attention – are equally dazzling.

We specifically ask our readers to get used to the idea that they have "two addresses:" a street address where each of us resides, and the less-well-known "natural neighborhood," the hidden dimension of the region, that lies just beyond.

As a taste of the offerings in *H2O: Highlands to Ocean*, let us take a brief look at one of the region's major water resources: wetlands. Many of them (for instance, the Hacksensack Meadowlands or the Great Swamp next to the Passaic River) are former lake bottoms formed by the retreat of the last glacier, called "the Wisconsin", somewhere between 12,000 and 15,000 years ago.

The Meadowlands – an important wetland only a few

Continued on page 5



NYC Harbor Estuary (continued from p. 1)

shed perspective. This approach examines the overall environmental needs of a watershed area, compares the current program of environmental investment to them, and then asks whether there are more productive ways of investing the environmental dollar.

In the early 1990s, New York City pioneered a new era of watershed planning with its nationally famed program for protecting the Catskill Mountains watersheds. This program used a mix of pollution prevention innovations, starting with its groundbreaking urban-rural pollution prevention partnership with Catskill farmers, to maintain the pristine quality of the City's drinking water without resorting to constructing extremely expensive filtration facilities. This program was also notable for the many social and economic benefits it produced for Catskill residents, and was a predecessor of today's sustainable development strategies.

What drives thinking about exploring a watershed strategy is a simple tradeoff. Everywhere on the perimeter of the NYC Harbor estuary, the wetlands and adjacent areas that are the key to harbor productivity are under assault and shrinking from the relentless pressures of a land hungry regional economy. In addition to protecting these vital resources, which are central to the ecological functioning of the estuary, dozens of opportunities for desperately needed wetland and environmental restoration have been identified. During the period when the City was being forced to spend $2.5 billion at Newtown Creek for the most marginal of water quality improvements, a program that could meet all of the wetland and restoration needs and more would have cost $500 million. Actual expenditures for habitat protection and restoration during this period may have totaled at most $50 million.

In the years ahead, New York City expenditures on Clean Water mandates will total many more billions of dollars, with other bordering jurisdictions making similar large expenditures for the same purpose. Has the Clean Water Act reached a point of diminishing returns? What are the alternatives for environmental investment and how can funds be channeled in those new directions? How can what the Clean Water Act has accomplished be preserved without committing the region to increasingly sub-optimal expenditures, such as those at Newtown Creek? And how can the bureaucracies and stakeholders that have thought for thirty years in Clean Water terms, one problem at a time, with discharge standards and treatment plant construction the preferred solution, learn to think in an integrated and holistic fashion about the environmental needs of the harbor estuary?

These are challenging issues without easy or obvious answers. In the months ahead, CIUS will be working to constructively address them and, in the months ahead, offer important insights into how environmental investment in the estuary can be organized to meet new environmental priorities.

Construction on a $2.5 billion upgrade of the Newtown Creek Wastewater Treatment Plant began in August 2003.

Highlands 2 Ocean *(continued from page 3)*

miles west of Manhattan – shows why the region offers reasons for hope. Although reduced from its original size (20,000 acres), it is still enormous (7,700 acres). Over a 200-year span from the late 1700s to the late 1900s, New York and New Jersey lost 60% and 39% or their wetlands, respectively – mostly to development.

The passage of the 1972 Clean Water Act, once hailed by former Secretary of the Interior Bruce Babbitt as the only urban renewal program that actually worked, had a cleansing effect throughout the region. In the Meadowlands, it both restored the health of the Hackensack River and brought into being a new generation of citizen activists who have now become the marshland's fierce protectors. Two hundred and sixty species of birds have recently been counted in the Meadowlands, and the area's champions are beginning to present it as the 21st Century "Central Park" of the entire H2O Region (even today, the Meadowlands are almost ten times the size of Manhattan's Central Park).

> "This first State of the H2O Region Report hopes to awaken the interest and enlarge the horizons of the residents of this magnificent area—and to startle and even amaze its readers. The economy, the cultural accomplishments, and the urbanity of the New York/New Jersey metropolitan area are celebrated around the world. In the background and almost unrecognized is the region's extraordinary natural endowment—except for fleeting moments, as when a falcon is seen soaring through a sunrise; or the day a drought emergency is proclaimed. This richness supports and envelops each new generation of humanity that calls this densely settled region home."
>
> -- from *H2O: Highlands to Ocean*

Those of us lucky enough to live in the H2O Region have 5,350 square miles of land and water as our common inheritance. It is worthy of repeated exploration. We hope our book provides insight and inspiration, and encourages all residents to play their own part in the conservation and restoration of our astonishing natural treasures, which are as much a core strength of the region as its economic triumphs and cultural richness. We owe those gathered in 1997 our gratitude for more than just naming our region: they have opened our eyes to the great wonder we always had but too often didn't even know existed. For further information, or to add your voice to the conversation, please visit our new website: www.regionbuilder.org. (Thanks to the generosity of the Dodge Foundation, any organization or government agency in the region can order free copies of "H2O: Highlands to Ocean" for their own use and for redistribution throughout the region. There's an order form on the Web site.)

CCNY Chemist's Research Featured in *New York Times*

The *New York Times* featured the work of Dr. Teresa J. Bandosz, Professor of Chemistry at City College (Anthony DePalma, "City College Scientist Finds Filter Potential in Waste Itself, February 21, 2005, p. B1). The article described her experimental work on turning sludge pellets into odor absorbers for the stench created by sludge at waste processing facilities. The *Times* dubbed her "New York's unofficial odor warden" for her research in trying to find a more effective odor absorber than the activated carbon made from coconut shells that is currently considered as the best virgin carbon for this purpose. The processed sludge pellets have the ability to remove twice as much hydrogen sulfide, a major air pollutant from the sludge, and convert it almost entirely to elemental sulfur. This results in cleaner air output and less harmful process byproducts.

Dr. Bandosz's research is focused on the application of adsorption to environmental problems. With two visiting researchers and several graduate and undergraduate students based in her lab at City College, Dr. Bandosz and her colleagues work on the development of new materials which would more effectively remove pollutants from gases or liquids. Another recent area of research is in the desulfurization of diesel fuel via reactive adsorption on activated carbons containing highly dispersed metals within a unique arrangement of pores. The benefit of removing sulfur from diesel fuel is that it allows diesel engines to produce less harmful exhaust. Reducing diesel engine pollution has become a greater concern with the large and growing amounts of truck traffic in this country and Europe. Construction vehicles have also recently been targeted as localized sources of diesel exhaust pollution, with the use of low-sulfur fuel being mandated at the World Trade Center Reconstruction site for this reason.

CIUS
CUNY INSTITUTE FOR URBAN SYSTEMS

CIUS
Marshak, J-910
City College of New York
New York, NY 10031
212-650-8072
www.ccny.cuny.edu/cius

To Subscribe:
Write to cius@ccny.cuny.edu

Director:
Robert E. Paaswell, Ph.D., P.E.

Newsletter Editor:
Chris Andrichak

CIUS Briefs

Daniel Libeskind Presentation

The Jewish Faculty & Staff Association (JFSA) at New York City College of Technology, in collaboration with CIUS and several community- and College-based co-sponsors, will host a JFSA Distinguished Speakers Series presentation, "The Architecture of Memory," by internationally acclaimed architect and World Trade Center site master planner Daniel Libeskind on Thursday, April 7, 2005, from 1 to 2:30 p.m., with reception to follow, in the College's Klitgord Center Auditorium, 286 Jay Street (at Tillary), Downtown Brooklyn.

Joseph Berger, senior reporter on cultural and diversity affairs for *The New York Times*, will introduce Libeskind, an international figure in architecture and urban design. He first achieved international renown with the design of the Jewish Museum Berlin, which opened in September 2001 on the eve of the terrorist attacks on America. He is well known for his introduction of a new critical and multidisciplinary discourse into the field, and in 2003 won the design competition and commission for redevelopment of the World Trade Center site.

High Performance Building Academy

As part of the CUNY Sustainable Construction Initiative, The Graduate Center will offer its first High Performance Building (HPB) Academy. HPB is rapidly changing the face of urban development, as smarter buildings—made more efficient, healthier, more secure and more resilient through new technologies and approaches in the areas of energy, water, security, lighting, air handling, and materials—are becoming an integral part of cities' competition for global leadership positions in the 21st century.

The Academy classes are organized along five learning tracks. For owners, developers, labor leaders, and end-use clients, and others, there is a track that provides an overview of what HPB is and why it will be an increasingly key driver of the local and global real estate marketplace. There are three tracks specifically for architects, engineers, landscape architects, and building systems consultants and contractors. There is also a track for building managers and operators. The Academy curricula are practical and case-based, taught by leaders in the field and designed to enable people to go out and do "high performance" work. In that regard, one highlight of the Academy is an innovative Mock Review of a High Performance RFP that will walk participants through the decision-making process regarding whether, and how, to respond to an RFP including high performance criteria. Class sessions will be held Monday to Thursday, April 4–7, and a tour of high performance buildings and facilities in NYC will be available on Friday, April 8.

CUNY The City University of New York
SUSTAINABLE CONSTRUCTION INITIATIVE

For more information see the Graduate Center web site at: http://web.gc.cuny.edu/cepp/courses/building_academy.html

CIUS seeks to advance the state of the practice in public infrastructure investment through research, education, policy advisement, and professional development. Its work focuses on three main challenges: how *technology* is reshaping the nature of infrastructure systems; how *institutions* can adapt to manage the next generation of infrastructure effectively; and how the methods and strategies of *public finance* are changing to meet evolving needs and constraints. CIUS seeks to help the region identifying innovative solutions to its changing infrastructure needs, by actively working to bridge the professional and academic realms.