THE NEWSLETTER OF
THE HUDSON RIVER ENVIRONMENTAL SOCIETY

Currents

Volume 33, No. 2 **Fall 2003**

In This Issue:

Hudson River Tributaries, The State of our Knowledge

A conference in June 2003 sponsored by HRES and co-sponsored by New York Sea Grant Program, NY Power Authority, Mid-Hudson Trout Unlimited, New York City Dept of Environmental Protection.

by Stuart Findlay

The drainage basin of the Hudson River covers approximately 14,000 sq miles with a network of tributaries extending across 1/3rd of NY State and parts of two other states. These tributaries are ultimately responsible for delivering water and its load of dissolved and suspended materials to the mainstem Hudson River. Also, these tributaries are habitat and tranportation corridors for a wide variety of vertebrates and invertebrates that spend all or part of their life cycles in the Hudson. Human activities ranging from agriculture to development have affected many miles of tributaries and considerable effort has gone into trying to rectify some of the past damage. Watershed stewardship groups spread across the basin have taken an increasing interest in protecting and studying individual streams or areas of the basin. Research projects sponsored and carried out by academic, state and federal organizations have provided a large data base of information but with a fairly disjunct distribution in space and time. Given the importance of tributaries, the potential for changes in their characteristics in recent times and a commitment to understanding and protecting them, this conference was organized to bring together speakers covering topics ranging from physical structure to fishes. Speakers were asked to address their individual subject broadly; summarizing what was known across as large an area and over as long a time span as possible.

The schedule was organized loosely by subject area, beginning with chemical and physical characteristics of streams, progressing through various aspects of the biology and ending with some of the current management issues and questions of future change.

Evidence For Both Improvement and Deterioration

Some of the strongest data sets available deal with water quality in Hudson River tributaries and this information has been collected to address issues of point sources such as waste water treatment plants as well as more diffuse effects of changes in land use and atmospheric deposition. Based on reasonably long-term records (>10 years) from 5 streams there was evidence for both improvement and deterioration in water quality. As true

for many other records from the North East U.S., sulfate concentrations have declined in HR tributaries almost certainly as response to decreased emissions mandated by the Clean Air Act. In contrast, chloride concentrations are increasing across the region (Fig. 1) with >2-fold higher concentrations in some of the more urbanized tributares. While road salt may be the ultimate source of the chloride it is noteworthy that the highest concentrations occur during summer low flow suggesting winter salt applications may have the greatest effect some months later when the biota are most active. Nutrient concentrations in the mid-Hudson are high relative to forested sites of the Catskills and Adirondacks but there is only weak evidence that concentrations are still increasing.

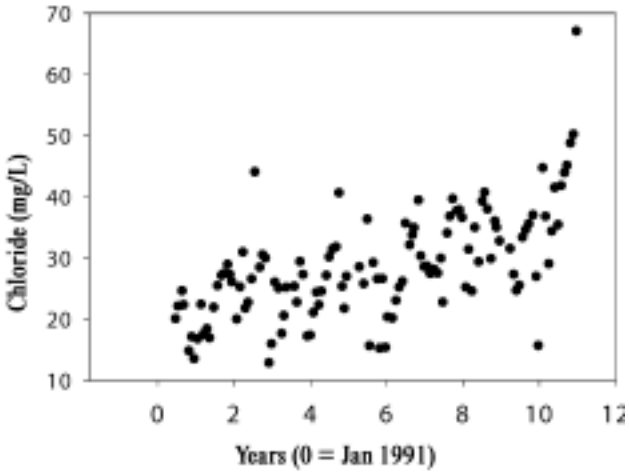


Figure 1: Chloride concentrations in the Sawkill are representative of Hudson River tributaries in general. Chuck Nieder prepared this figure showing increasing chloride concentrations with time from ongoing tributary monitoring.

Benthic Macroinvertebrates Indicate Water Quality

Benthic macroinvertebrates are considered to be good indicators of water quality in a stream because they will integrate events over their life spans. Work by DEC and the USGS shows that more than half the tributaries in the Hudson drainage are not impaired while ~ 10% have been moderately to severly impaired. Comparing the past several decades, there appeared to be a period of stability or improvement from the1960's to 1980's perhaps representing the positive effects of the CWA (Fig. 2). Since the 1990's however there is evidence that as many as $^{1}/_{5}^{th}$ of the sites monitored have undergone some deterioration. Based on the composition of the invertebrate community, non-point source inputs of nutrients and pesticides are likely culprits and some of the negative changes are associated with higher chloride concentrations indicative of human development near the local site (Fig. 3). In specific comparisons of more- vs. less-developed watersheds (Wappingers Creek vs. more developed Fishkill watershed) there are suggestions of poor water quality or unsuitable habitat in the presence of greater human development (Fig. 4). Land-cover trends in the Hudson Valley are clearly towards forest cover at the expense of agriculture but increasing residential and light commercial development may be acting to offset the beneficial effects of greater forest cover in sub-watersheds of the Hudson. Despite efforts at improved management and infrastructure there are still problems with "legacy" pollutants and novel contaminants. Pesticides and herbicides are readily detectable in almost all surface waters and many of the organisms in the Hudson drainage. Some of these are residual contaminants such as DDT, no longer in active use, or sediment contaminants from previous industrial activity. There are also new classes of chemicals (hormone mimics, anti-microbial compounds) appearing in streams probably as a result of human use in the watershed. The environmental persistence of many of these compounds is unknown and the effects of long-term exposure, even to low doses is, unclear and largely unregulated. An increase in the human population in the Hudson watershed will almost certainly lead to higher inputs of these compounds with uncertain consequences.

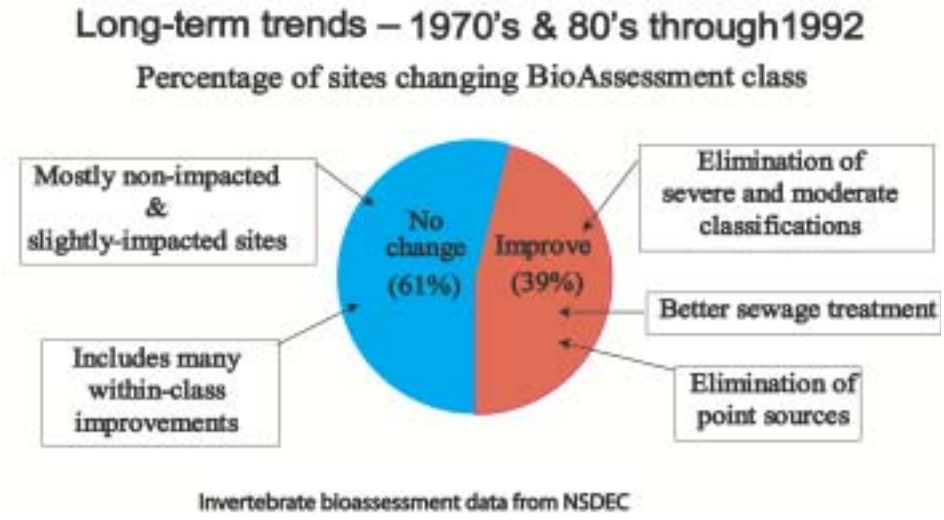
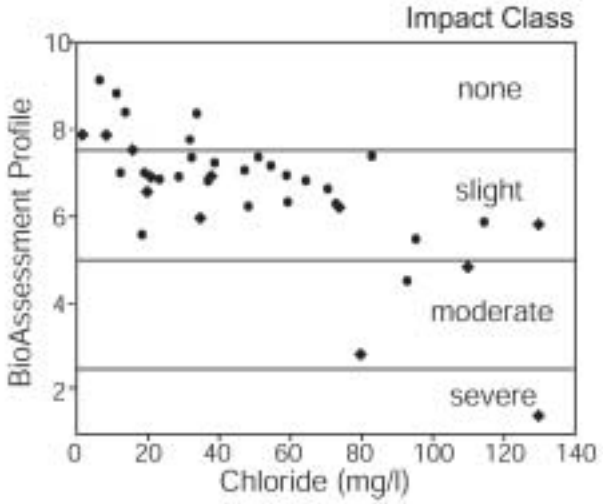


Figure 2. Invertebrate bioassessments indicate improvements in water quality in many tributaries since enactment of the Clean Water Act. Karen Riva-Murray prepared this figure.

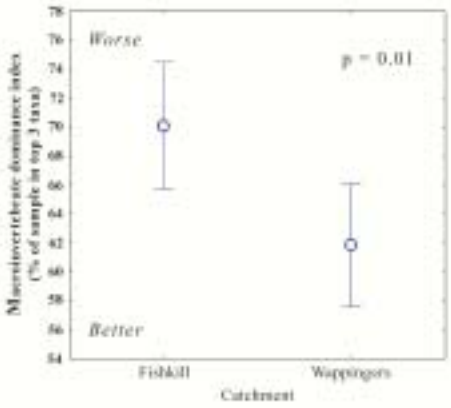
Fish Community Changes

Fish communities of Hudson River tributaries have been assessed extensively as far back as the State surveys in the mid-1930's. The fish communities in the streams (as is true for the mainstem and many other waters of NY) have a large proportion, as high as 40%, of exotic species largely derived from the mid-west, probably as a result of the opening of major routes of water transportation. There has been loss

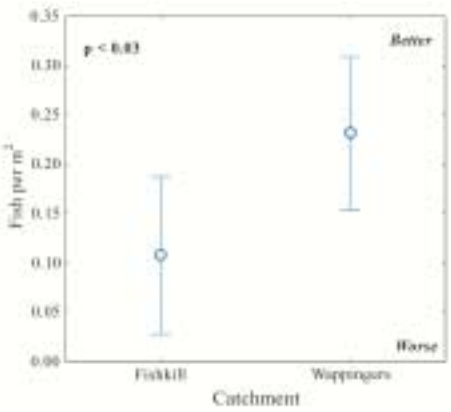


Invertebrate bioassessment in relation to chloride concentration for selected streams in the Hudson River Basin. Invertebrate data are compiled from NYSDEC (dots) and USGS (diamonds); chloride data courtesy of Sophia Passy (University of Texas at Arlington).

Figure 3: Karen Riva-Murray shows that the quality of invertebrate habitat tends to decline with increasing chloride content.



Figures 4 A & B: Karin Limburg's data shows that diversity in the macroinvertebrate community and fish populations are greater in watersheds that experience less human development.



of several species from the region. Species composition in the tributaries used to be more homogeneous across the lower and mid-Hudson than now with the loss of several species. It is possible that the tributaries are behaving more as isolated habitats due to human modification of the tributary mouths. Fishes may not have the same opportunity to move among tributaries as occurred in the past.

Potential for Stewardship and Restoration

In light of the degradation of some streams by several direct and indirect human activities, there is a great deal of impetus to effect some positive change through both stewardship and restoration. There seems to be considerable potential for dam removal to improve access to spawning habitats. A few of the many dams are at least viable candidates for removal. Physical rehabilitation of stream channels following flood damage or to protect infrastructure (bridges, culverts) is moving away from the sort of hard-engineering solutions (rip-rap, concrete) towards efforts to design channels in keeping with natural principles of stream hydraulics. When done properly, these channels should be more stable or at least have more predictable movements and flooding regimes than artificially straightened or leveed systems. Along with these efforts at physical design are new efforts to assess habitat requirements for important fishes and design stream modifications to accommodate or encourage natural communities. These approaches have matured to the point of allowing prediction of fish abundance under noval scenarios including differing flow conditions (Fig. 5) or dam removal. To obviate the requirement for rectifying problems, stewardship efforts involving the communities in the watershed along with scientists and natural resource managers are taking a more balanced view of occasionally conflicting goals. Broadly-based and proactive management plans attempt to clarify what different users consider important about watersheds and resolve potential conflicts early in the process.

Envisioning the Future

In trying to envision the future of the Hudson and its tributaries it is very important to recognize that the Hudson is one of the better-studied rivers in the US with relatively long and extensive data bases including a large number of important

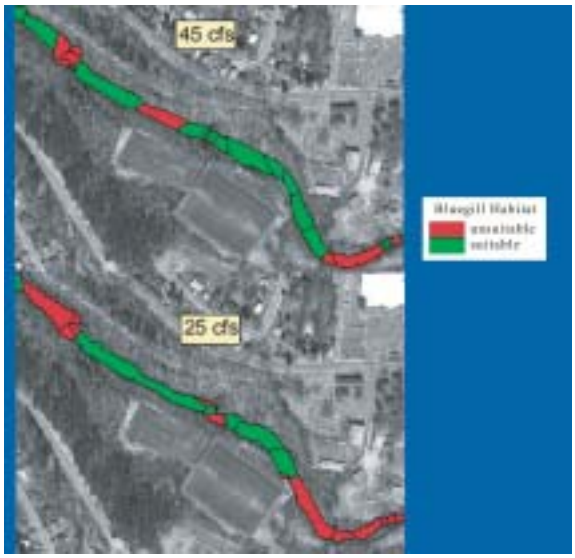


Figure 5: Piotr Parasiewicz shows that fish habitat varies with flow in Hudson River tributaries.

variables. Collaboration among state, federal and private institutions has provided a reasonably well-founded understanding of how the ecosystem functions and why it might change in the future. Establishing a stewardship ethic by involving school groups and volunteers in monitoring the Hudson and its tributaries is an excellent investment in protecting the resource in addition to providing valid and valuable information about particular streams. Predictive models of hydrology and regional climate change provide important tools in describing various scenarios. The ability to model groundwater movement and surface flows under conditions of differing water demands and climatic conditions may catalyze action on the level of local land management, planning development and perhaps altering human attitudes and behavior in a way to protect and enhance the resources of the basin. Differences in precipitation amount and frequency of wet/dry conditions will have large effects on streams that may exacerbate some of the negative trends. For instance, a greater frequency of high flows will exacerbate scouring problems and prolonged low flows will fail to dilute pollutants. Projections of climate at the regional scale and potential changes in inundation are tenuous but we need to take seriously the root causes of global climate change.

Emerging Themes

Several speakers touched on similar themes and findings often derived from different data sets in different parts of the drainage. Firstly, stream condition has not continued to improve at the rapid pace observed following correction of many of the point source problems. Residual contamination and non-point inputs from humans is rising through the ranks of causative factors. Humans have altered material loadings, channel morphology, hydrology and species pools in sometimes subtle yet significant ways. Stream chemistry and biotic communities are showing changes consistent with a direct human effect on streams despite the general increase in forest cover throughout the valley.

Attempts to solve problems and manage streams are moving away from the "one problem - one solution" mode to trying to deal with multiple issues at once and even (sometimes) in a proactive rather than reactive fashion.

While there are informational, geographic and temporal gaps in the various data sets we actually have a reasonably firm handle on what is happening. Future efforts should 1) do a more quantitative synthesis (i.e. RIBS, NAWQA coordination) 2) highlight particularly weak areas (suburbanizing streams, de-industrializing streams…)

CONFERENCE SPEAKERS

Gary Wall (US Geological Survey), *Suspended sediment transport through the tidal Hudson River.*

Chuck Nieder (Hudson River National Estuarine Research Reserve), Stuart Findlay, Vicky Kelly and Dave Burns. *Review of the surface water quality for several Hudson River Estuary tributaries.*

HRES Welcomes its New Members

Jacqueline Anderson
Joseph M. Aronow
Elizabeth A. Blair
Michael Calaban
Dave Cerino
Damon Chakry
Christopher F. D'Elia
John Duschang
Geof Eckerlin
Stuart Findlay
Michael J. Flaherty
Robert J. Foley
Mary Ford
Peter Henderson
Roy A. Jacobson
Shawn Kiernan
Fred W. Koontz
John J. Kreyling
Paul Mankiewicz
Richard A. Manley
Kim McKown
John G. Mickelson
L. Grady Moore
Wesley Natzle
Sandra Nierzwicki-Bauer
Dorothy Peteet
Ronald L. Pinzon
Michael Riner
Lisa Rosman
Andrew M. Ryder
Jennifer C. Samson
Arthur Sanderson
William Sarbello
Pasquale Strocchia
Betty Jo Tabor
Tim Tear
David B. Tompkins
Lawson R. Upchurch
Lisa Vasilakos
Tim Welling
Shayla D. Williams
Louise Wold

HRES REACHES OUT TO STUDENTS

William H. Shaw

HRES has initiated a student scholarship program, which hosted 10 students and interns for the March 6-7 Fisheries Conference at Marist College and 16 students and interns at the June 13 Hudson River Tributaries Conference at The Institute of Ecosystem Studies in Millbrook. HRES has, however, a long history of hosting students unofficially on a small scale. As a professor at Sullivan County Community College, I brought students to conferences through the 1980's and 1990's. Karin Limberg, of the faculty at the College of Environmental Science and Forestry and a former HRES Board member, first attended an HRES conference gratis as a graduate student and has since brought students to conferences. Karin's experience was similar to mine. Warren

Piotr Parasiewicz (Cornell University). *Stream restoration planning supported by habitat simulation model.*

Karin Limburg (SUNY College of Environmental Science and Forestry), Bob Schmidt, Karen Stainbrook, and Dennis Swaney. *Land use effects on Hudson River tributaries: history, legacies, and prospects for the future.*

Karen Riva-Murray (US Geological Survey) and Robert W. Bode (NYS DEC). *Benthic macroinvertebrates in Hudson River tributaries: status, trends, and stressors.*

Robert A. Daniels (NYS Museum) and Robert E. Schmidt (Simon's Rock College). *Changes in fish assemblages in Hudson River tributaries.*

John Waldman (Hudson River Foundation). *Fish Passage Possibilities and Issues on Hudson River Tributaries.*

Pat Phillips (US Geological Survey). *Emerging contaminants in Hudson Tributaries*

Michael Sorensen (Water Resources Institute). *Steps toward What-If Hydrology modeling for the lower Hudson Basin*

Beth Reichheld (NYC Dept of Environmental Protection). *Stream Management in the NYC Watershed: Planning for long term stream stewardship.*

Rene VanSchaack (Green County Soil and Water Conservation District).*Natural Channel Design for Stream Restoration*

Martha Cheo (Hudson Basin River Watch). *Student and Citizen Water Quality Monitoring of Hudson Tributaries.*

Cynthia Rosenzweig and William D. Solecki, (Goddard Institute of SpaceStudies and Hunter College). *A Future Look: The Hudson River and Global Climate Change.*

The Biological Status of Hudson River Park Sanctuary Waters, Post 9/11.

By Geofrey E Eckerlin

In New York Harbor, the Hudson River Park (HRP) Sanctuary, encompasses waters to the end of the piers from Battery Park to 59th Street. HRP Sanctuary interpier areas support a unique and diverse marine community. In an emergency action following September 11, 2001, portions of the Hudson River Park Sanctuary were dredged to facilitate debris removal by barges from Ground Zero. Dr. Mark Bain, Geofrey Eckerlin, Anne Gallagher and Marci Meixler, Cornell University, seek to assess any impact from these events by investigating the current biological status of the Hudson River Park Sanctuary waters.Assessing any estuarine community impact and the status of the Hudson River Park Sanctuary waters will provide information necessary to adhere to the Federal Emergency Management Agency (FEMA) philosophy of "smart recovery," (FEMA 2002) adopted to integrate the environment into disaster planning. We intend to compare post-September 11th status of HRP Sanctuary waters, with similar past studies in New York Harbor and the Hudson River. In doing so, we will identify ways to mitigate dredging impacts within Hudson River Park Sanctuary waters.

We are sampling two main components of the interpier biota of the Hudson River Park Sanctuary waters. Benthic macroinvertebrates (larger than microscopic, soft or shelled organisms) live in or on river sediments removed by dredging. These organisms are relatively sedentary and therefore often provide an effective indicator of local conditions. An impacted community will display some form of unsettledness, usually the dominance in numbers by one or a few hardy and adaptable taxa. The second major environmental component we are sampling, the fish community associated with HRP waters, provide indication of fine variation in available habitat by their selection of occupation locations.

We have selected 8 sites within HRP Sanctuary waters, one impacted by post 9/11 dredging and the others apparently unaffected by similar perturbation. Our impact site is Pier 25, where emergency dredging allowed the removal of over one million tons of WTC debris. Pier 25 and our seven other sites span the length of the HRP Sanctuary waters as evenly as possible, given high traffic and urbanized conditions of the area. Sampling began June 2002 and is currently slated to continue through August 2004.

Benthic macroinvertebrates are sampled using a small benthic dredge (9"x9" Ponar). Four replicate samples are taken at each site each month. Extensive laboratory processing is necessary before relative condition indices can

McKeon, who led HRES in those days would assign a nominal fee for students, or if the conference was well attended, would wink and wave us on our way. This is the first time that HRES has reached out to encourage student participation and it appears to be well received. Vivian Tetik (Dutchess County Community College) wrote "I found it to be a highly valuable learning experience and an introduction to the inside view of the scientific community". Corey Lowe and fellow interns for River Keeper added, "Understanding how human activities can affect the waterways from a scientific perspective is very helpful to our understanding of the legal and policy issues affecting the Hudson River Watershed." The scholarship program was made possible through support arranged by Dennis Dunning at New York Power Authority. HRES plans to continue encouraging support for students at future conferences with the hope of promoting future participation in the management and conservation of the Hudson River Watershed. **The Society appreciates this significant support from the New York Power Authority**

be applied to samples collected among our impact and reference sites. While processing benthic dredge samples, we are developing a pictorial guide to the benthic invertebrates of the Hudson River Park, available and continually updated on our project website, http://www.environment.cornell.edu/hudson/HRPTWeb.htm.

The Hudson River Park fish community is sampled using an otter-trawl. Trawls are a drag-fishing gear and are essentially large cone-shaped nets pulled, in our case, along the bottom to sample bottom and mid-water oriented fishes. Each of our 8 sample sites is fished 4 times each month, usually after invertebrate samples are taken so as to avoid interference. Between June 2002 and September, our crew has recorded 27,000 individual fish and 41 fish species among our Hudson River Park Sanctuary sites. Dominant species so far include bay anchovy *Anchoa mitchilli*, Atlantic herring *Clupea harengus*, alewife *Alosa pseudoharengus*, striped bass *Morone saxatilis*, weakfish *Cynoscion regalis*, menhaden *Brevoortia tyrannus* and bluefish *Pomatomus saltatrix*.

Each monthly deployment seems to reveal new species as well as a new assemblage of fish among Hudson River Park Sanctuary waters. Until we have sampled for at least one annual cycle, a complete picture of the HRP Sanctuary fish community will likely evade us. So too do we need time to process benthic invertebrate samples in the laboratory before any comparisons or conclusions can be drawn. Updates, news and findings are updated to our project website:http://esox.dnr.cornell.edu/Research/HRP/HRPTWeb.htm

Photo courtesy Geoffrey Eckerlin

Photo courtesy Geoffrey Eckerlin

Cornell University invertebrate specialist, Anne Gallagher cleaning a freshly retrieved benthic dredge from Hudson River Park Sanctuary waters.

The author, Geofrey Eckerlin, graduated Cornell University with a B.S. in Natural Resources spring 2001. Previous Hudson River work includes: project manager for 2000-2002 functional assessment of the fish support function of submerged aquatic vegetation in the Hudson River (Cornell IRIS and HRNERR), data coordinator for Hudson River based GIS project (HRF) and student intern for Hudson River wetlands fish support function study (Cornell University).

For More Information

Able, K. W., J. P. Manderson and A. L. Studholme. 1998 "The distribution of shallow water juvenile fishes in an urban estuary: The effects of manmade structures in the lower Hudson River Estuaries" 21:731-744.

Able, K. W., J. P. Manderson and A. L. Studholme. 1999. "Habitat quality for shallow water fishes in an urban estuary: The effects of manmade structures on growth." Marine Ecology Progress Series 187:731-744.

Adams, D. A., J. S. O'Connor and S. B. Weisburg. 1998. "Sediment quality of the NY/NJ Harbor system: an investigation under the regional environmental assessment program (R-EMAP)." Final Report, U.S. Environmental Protection Agency, EPA/902-R-98-001.

United States. FEMA (U.S. Federal Emergency Management Agency). 2002. FEMA: What Are Our Environmental Responsibilities? Federal Emergency Management Agency, <http://www.fema.gov/mit/ep/overview.htm>

FISHERIES CONFERENCE STUDENT ATTENDEES

Jacqueline Anderson	Dutchess Community College
Ian Blackburn	New York State DEC
Katherine Finch	Orange County Community College
Kristine Garbarino	Orange County Community College
Adam Keller	Orange County Community College
Laurie Rubin	Columbia Greene community College
Claudio Sorrentino	New York University Medical Center
Karen Stainbrook	College of Environmental Science and Forestry
Vivian Tetik	Orange County Community College
Helena Vanderveer	Orange County Community College

Hudson River Park. 2003. Hudson River Park Welcome Page, Hudson River Park Trust, <http://www.hudsonriverpark.com/welcome.html>

Lawler, Matusky and Skelly Engineers. 1992. "1990 Year class report for the Hudson River Estuary monitoring program." Annual Report to ConsolidatedEdison Co. of New York, Inc., New York, NY.

Stoecker, R. R., J. Collura and P. J. Fallon, Jr. 1992 "Aquatic Studies at the Hudson River Center Site." Estuarine Research in the 1980's. C. L. Smith (editor) State University of New York, Albany, NY. Pages 407 to 427

U.S. Environmental Protection Agency. 2002. "Sediment quality of the NY/NJ Harbor system: an investigation under R-EMAP." Final Report of the US Environmental Protection Agency, Regional Environmental Monitoring and Assessment Program (REMAP), <http://www.epa.gov/emap/html/pubs/docs/otherdocs/remap/nynjharbor.html>

Woodhead, P.M., T. Rotunno and S. Zappala. 1999. New York Harbor habitat assessment project. "Biological assessment of fish habitat associated with shipping piers in New York Harbor." Report by the Marine Sciences Research Center, SUNY at stony Brook, NY.

Woodhead, P.M., T. Rotunno and S. Zappala. 2000. New York Harbor habitat assessment project. "Ecological surveys at the project test-site in New York Harbor." Report by the Marine Sciences Research Center, SUNY at stony Brook, NY.

Photo courtesy Geoffrey Eckerlin

Banner marking impact site for Cornell University study at Hudson River Park Sanctuary.

Currents

the Newsletter of the

Hudson River Evironmental Society

Publications Committee & Editors:

John Ladd

Roland Vosburgh

Publications Manager

Stephen O. Wilson

Associate Editor/Layout

Aaron R. Wunderlich

HRES was formed in 1970 to help science enlighten decision-making by bringing toghether scienctists, educators and decision makers.

HUDSON RIVER ENVIRONMENTAL SOCIETY
6626 Stitt Road
Altimont, New York 12009
518-861-8020
hres@nycap.rr.com

TRIBUTARIES CONFERENCE STUDENT ATTENDEES

Aaron Bennett	Hudson Basin River Watch	Caitlin Robinson	Student Conservation Association
Amielle Dewan	Cornell University	Karen Stainbrook	College of Environmental Science and Forestry
Kevin Downey	Student Conservation Association		
Chip Haldeman	Rudgers University	Ellen Tarquinno	Student Conservation Association
Laura Heady	Hudsonia, LTD	Krystyn Tendy	Riverkeeper
Nancy Heinzen	SUNY Albany	Mandy Tran	Riverkeeper
Megan Kelly	Student Conservation Association	Lisa Vicens	Riverkeeper
Corey Lowe	Riverkeeper	Chester Zarnoch	Brooklyn College
Leonard Machut	College of Environmental Science and Forestry		

Hudson River Environmental Society
6626 Stitt Road
Altamont, New York 12009

www.hres.org

YES!

Please Enroll Me (or my organization)
As A Member of
The Hudson River Environmental Society
(Please Print or Type)

NAME

AFFILIATION

ADDRESS

CITY

STATE ZIP(+4)

PHONE

FAX

EMAIL

HRES ANNUAL DUES

☐	$10	Student
☐	$25	Regular
☐	$50	Professional
☐	$75	Contributing
☐	$100	Sustaining
☐	$300	Nonprofit or educational institution
☐	$400	Life Membership
☐	$500	Corporate

Please indicate the appropriate box and mail your payment to:

Hudson River Environmental Society
6626 Stitt Rd.
Altamont, NY 12009-5423
Attn: Membership

Checks should be made payable to HRES and *are* tax deductable. HRES is a non-profit IRS 501(c)(3) corporation. Federal ID #23-7078474

WELCOME!