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THE HUDSON RIVER ENVIRONMENTAL SOCIETY

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YEAR-END ROUNDUP

In This Issue:

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Channel Morphology in the Hudson River Estuary: Past Changes and Opportunities for Restoration

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The Hudson River has a long history of anthropogenic impacts. Until now, these impacts have favored human use over ecosystem function. Current efforts to restore the Hudson must answer the intriguing question: What conditions are we trying to recreate? To answer that question requires understanding the nature of change on the Hudson River over the last few centuries and balancing competing needs and uses of the river today. Unfortunately, as with many disturbed systems, a detailed account of historic conditions is lacking. Several charts of the Hudson River estuary exist dating to the early 1800's (pre navigation channel dredging), which identify shoreline, depths and vegetated areas. These resources combined with analysis of current conditions are being used to identify potential physical loss of important habitat types and are suggesting opportunities for restoring lost ecosystem function in the Hudson River estuary.

History

Large-scale modification of Hudson River channel morphology began in the early to mid 1800's and continues today. With the completion of the Erie Canal in 1825, the city of Albany became a transportation center for the northeast and mid western United States for goods arriving by ocean-going ship via the Hudson River (Stanne 1996). For much of the southern portion of the estuary, the river is naturally deep enough to accommodate deep draft vessels. However, near Catskill (river mile 115), the river morphology changes to shallow sandy substrate which required major modifications to allow oceangoing vessels to pass. Early attempts to create and maintain a navigation channel included construction of dikes designed to focus river flow through a self-maintaining channel. The method worked but maintained a limited channel depth. In 1925, to accommodate deeper draft vessels capable of transporting more materials, the United States Congress authorized deepening the original 12-foot channel to 27 feet. In 1932, the federal navigation channel was again deepened to 32 feet below mean low water where it is maintained to this day (ACOE 1995).

The tidal Hudson River can be separated into 3 zones based on depth:

1) **Deepwater**- areas greater than 6 feet deep at low tide. Historically, this depth was the limit of light penetration. Aquatic vegetation is not found in this zone (Reschke 1990).
2) **Shallows**- areas of the river less than six feet deep at low tide to the low tide line. This zone typically supports all the submerged aquatic vegetation in the river and is considered one of the most productive habitats in the estuary and of great ecological importance (Reschke

1990).

3) **Intertidal**- areas of the river that are exposed at low tide and submerged at high tide. This zone consists of mud flats, sand, broadleaf marsh and emergent intertidal vegetation (Reschke 1990).

Dredging for the federal navigation channel had impacts on the shallows and intertidal zones in the upper Hudson River estuary (river mile 110 to 150) in two ways. Shallows and intertidal zones were converted to deepwater habitat (navigation channel) through dredging. Then, dredge spoil was placed and retained on adjacent shallows and intertidal zones (converting them to uplands). The resulting dredge spoil islands were then colonized by upland vegetation and, through the process of succession, have developed into mature forest, often unrecognizable as dredge spoil by the unsuspecting eye. The result of these actions was a dramatic shift in the relative amounts of habitat types and their functions in a large portion of the estuary

Recent efforts to assess the need and feasibility of restoration of the upper Hudson River estuary have focused attention on identifying the way the historic tidal Hudson River functioned and quantifying the loss of function based on the loss of habitat as a result of navigation channel dredging and spoil deposition. Unfortunately, there is little record or knowledge of historic habitat functions and distributions that pre-date significant modification of the river. An attempt to identify historic river function is a five-step process:

Identifying historic river function

1) Identify current distribution of existing habitat types
2) Identify historic distribution of similar habitat types based on available information
3) Identify functions of similar habitat types.
4) Project current habitat functions to historic distributions in an attempt to quantify historic habitat function.
5) Estimate loss of habitat function as a result of loss of habitat type

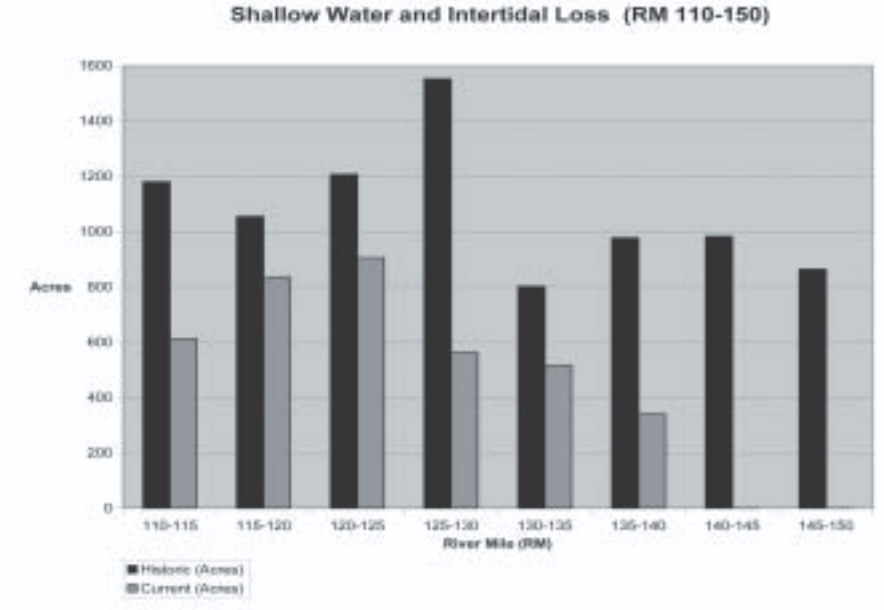
The process of identifying historic habitat functions on the Hudson River involves study of historic distributions of habitat types (defined by depth) combined with current understanding of functions of similar habitats today. By comparing historic distribution of habitat types to current distributions of similar habitats, physical loss can be quantified. This loss can then be used to approximate loss of function (assuming similar habitats functioned in a similar manner through time).

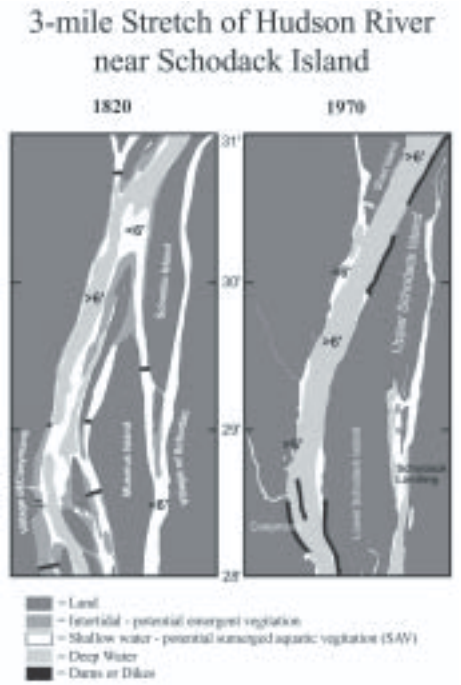
Shallows and intertidal habitats have vital ecological roles in the Hudson River estuary. Many animals depend on the aquatic plants, plankton, nekton and benthic invertebrates that create a complex food web which occurs in shallow water and intertidal habitats (NYS DOS 1990). Submerged (SAV) and emergent aquatic vegetation occurs only in the shallow water and intertidal zones of the estuary. SAV beds function as juvenile fish nurseries, act as nutrient and contamination sinks and provide oxygen production for the entire estuary (NYS DOS 1990). They are among the most important habitats in the estuary for production of fish and forage species. Additionally, their importance may be growing as a location for primary production because the traditional source, phytoplankton, has been drastically reduced by the invasion of zebra mussels (*Dreissena polymorpha*) (Strayer et al., 1999).

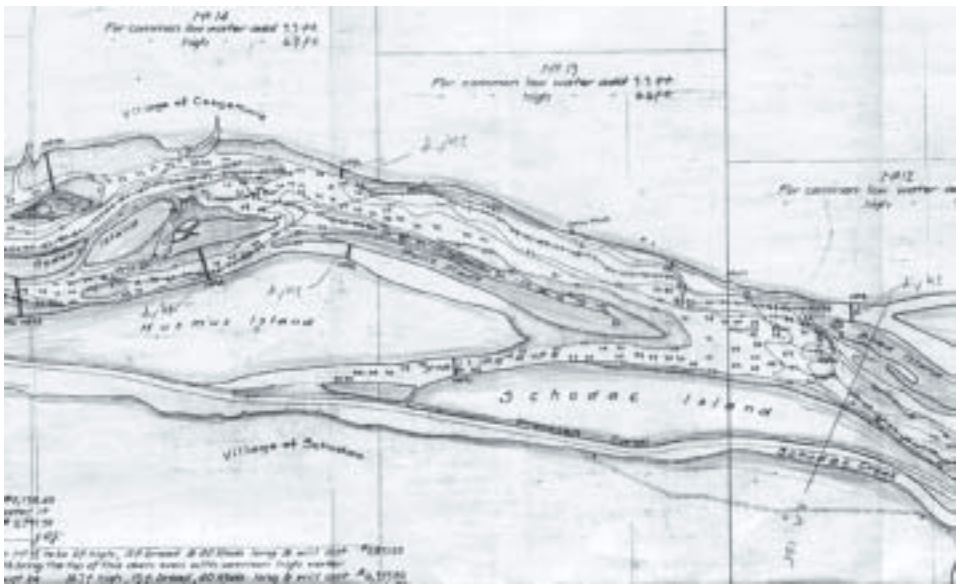
Once habitat function is determined, it is assumed that similar habitats functioned in the same way historically although, their relative role may have been different given their different relative abundance. After the functional role of the habitats is determined the loss of function can be inferred by the relative loss of each type of habitat.

Identifying historic habitat distributions and loss

In 1995, staff of the Hudson River National Estuarine Research Reserve (HRNERR) conducted a preliminary analysis to quantify change in Hudson River channel morphology as a result of navigation channel dredging. The results which appear in the Hudson River Habitat Restoration, Hudson River Basin, New York, Reconnaissance Report (ACOE 1995). Several sets of historic charts of the Hudson River that pre-date navigation dredging were combined to develop maps of deepwater, shallows, and intertidal zones. The maps used in this analysis indicated water depths in shallow areas. Intertidal areas were inferred from map symbology. In most cases the historical maps did not show the extent of tributaries to the Hudson including the Mohawk River, so our estimates of historical area should be taken as a minimum. Shoreline







A piece of the 1820 chart of the Hudson Estuary from Troy to the City of Hudson generated by John Randel, Junior, for the State of New York (scale 1:15,000).

length and numbers of islands were also noted. This information was then compared to information gathered from modern NYS Department of Transportation quad maps using similar methods. The comparison identified substantially altered river morphology with potentially massive ecological effects.

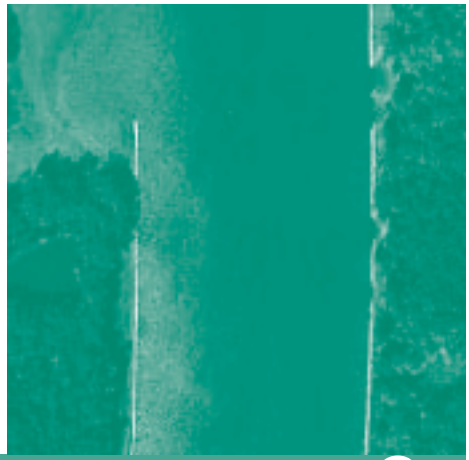
Some of the charts indicate the presence of vegetation, although they cannot be considered a quantified assessment. To identify historic areas that *could have* potentially supported submerged and emergent vegetation, historic channel morphology data is combined with present day understanding of factors limiting the extent of vegetation communities on the Hudson. Most importantly, it is commonly accepted that vegetation communities in the Hudson are limited by how deep light penetrates the water's surface. Historically, light penetration limited vegetation communities to shallow water and intertidal zones (Reschke 1990). With this understanding, it is assumed that historic shallow water and intertidal zones were potentially vegetated habitat. The difference between the area of calculated historic and present deep, shallow and intertidal zones was calculated in five mile sections of the river to show the areas of habitat potentially gained or lost for river miles 110 to 150.

Findings

The figure above showing a 3-mile stretch of the Hudson near Schodack Island demonstrates the physical alteration of the Hudson River channel morphology as a result of channel dredging and spoil disposal. It shows a system formerly dominated by water depths that potentially supported aquatic vegetation now dominated by deepwater and upland habitat. Data from the historic and current river channel morphology analysis indicate that approximately 57% (4,300 acres) of the historic shallow water and intertidal zone, from river mile 115 to 151 was obliterated by dredging and filling. In terms of total surface area, 30% (3,300 acres) of the river surface was filled due to navigation channel dredging activities.

Opportunities for restoration

In addition to identifying lost historic ecosystem function, mapping efforts aid in accurately identifying areas of former wetland that were filled and converted to upland habitat. Filled areas can then be evaluated as potential restoration sites. However, simply identifying areas as dredge spoil is not the only factor in determining restoration feasibility. Additional factors include property



These photos illustrate the longitudinal dikes that were constructed in the late 19th and early 20th centuries along the banks of the main channel of the estuary north of the City of Hudson. In many areas such as along the west shore of Schodack Island (above and below right) the trees are growing on dredge spoil deposited in the shallows behind the dikes.

ownership, habitat trading issues and restoration dredge spoil disposal.

Because navigation channel dredging occurred nearly a century ago, many of the dredge spoil islands have established functioning upland habitat that host a variety of species including some that are considered rare and endangered. Proposals to eliminate the created upland habitat in favor of restoring shallow water habitat may make sense in a historic context, but current issues of relative values of habitats being traded have to be addressed by a variety of agencies, all with unique priorities.

Many wetland restoration projects, while scientifically complex often result in a simple solution. In most cases, a physical insult has occurred that has destroyed habitat, or drastically altered hydrology. The solution is often to "undo" the physical insult that has caused the need for restoration. Theoretically, restoring the physical environment would create conditions conducive to reestablishing historic plant and animal communities (NRC 1992). Taking this approach, restoration of the Hudson River estuary would require restoring shallow water and intertidal zones and habitats by removing dredge spoil and placing it back into the dredged channel. This option, however, is precluded by the continued need to maintain a navigation channel. Therefore, the challenge for restoring Hudson River shallow water habitats is finding an appropriate dredged spoil reuse or disposal method. During this process one needs to recognize that destroying habitat while disposing material minimizes the benefit of the restoration project. Given the massive amount of material that would be generated by significant shallow water and intertidal habitat restoration on the Hudson River, where and how to dispose of dredge material becomes one of the most significant issues for determining feasibility of such an effort.

Conclusions

Preliminary analysis of historic Hudson River estuary channel morphology has identifiedmassive alteration to the river and loss of critical shallow water and intertidal zones. This loss combined with the important functional role of habitat that occurs in these zones suggests a dramatic loss of ecosystem function and demonstrates the need to fully explore the feasibility of restoring these critical habitats.

Restoration of Hudson River estuary shallow water and intertidal habitats faces many challenges. As described above, identifying the need and goals of restoration efforts is dependant on understanding the historic function of the river prior to environmental insult. However, while restoring to pre-disturbance function may be ideal, this is often not a viable option (Brookes, 1995). Ecosystems are dynamic systems that continually respond to internal and external pressures. The balances that ecosystems achieve often change along a trajectory over time and are irreversible. Additionally continued presence of human kind as an inseparable component of the ecosystem often precludes restoration of ecosystems to pre-disturbance form.

Next Steps

The intial analysis of historic river channel morphology by HRNERR staff was preliminary. Since this work, mapping technologies including remote sensing and GIS utilities have created the opportunity for more accurate use of these historical maps. New York State has conducted high resolution mapping of modern Hudson River morphology, habitat and vegetation communities. There are several current initiatives to more accurately identify historic river channel morphology including an analysis of historic wetland distribution and change for the entire estuary being conducted by the New York State Department of Environmental Conservation. These efforts will allow a more accurate depiction of channel morphology change over the past two centuries. This information combined with continued assessment of habitat distribution and function will allow quantitative assessment of lost environmental function as a result of a variety of human activities including construction of the federal navigation channel.

Discussion

Identifying historic conditions is an imperative to preserve a reference point for understanding human impacts on our environment. With every passing generation, the prehistorical, undisturbed, fully functional ecosystem becomes more difficult to envision. Modification of river channel morphology in the Hudson River estuary began in the mid 19th century and was conducted on a large scale in the early 20th century. Because this environmental insult occurred so long ago and without documentation of pre-disturbance ecological conditions, the way the Hudson River appeared, and functioned is a rapidly fading memory. Maintaining an understanding of historic river function is critical to understanding the magnitude of environmental degradation due to human actions and is essential to justifying the time and resources needed for restoration.

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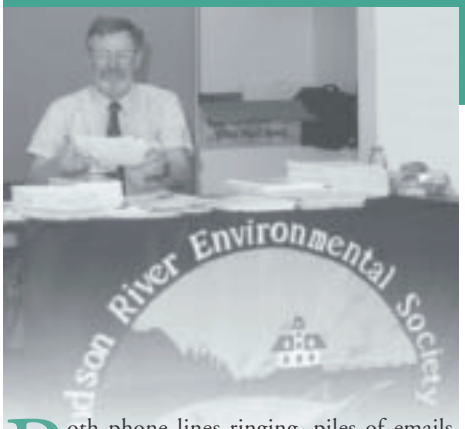
Currents

Volume XXXII, Issue 3

From the Executive Director



Both phone lines ringing, piles of emails, keeping our web site up-to-date, publishing *Currents*, pricing our next conference, persuading members to renew, encouraging past members to rejoin the Society… these and a myriad of details keep me and able Admin. Assistant, Aaron Wunderlich, hopping.

Our mission has changed little in the past 35 years: to organize and produce meaningful programs on significant environmental issues in the Hudson River, ensure access to the results of research efforts in the Valley, and serve our 200 individual paid-up members and ten corporate/ institutional members.

Over these years, we have found that a longer gestation period results in a much better conference, and certainly facilitates the processes we employ to produce it. Therefore, we want to identify viable topics significantly in advance. On page six of this issue, you will find a **survey**, which is designed to help you tell us about potential new program themes. Further, we hope that you will participate in our process of selecting topics from these for future conferences, symposia, or workshops.

Our **Committee** structure is vital, not only in producing programs, but in our selection of awardees, finding new Board members, determining what, how and when we will publish important findings in Hudson River research. Our By-Laws specify that there should be non-Board members on our Committees, and we encourage you to attend our Board meetings, and better, to participate activley in one of the HRES committees. (A full listing can be found on page 7 of *Currents*, or on our website at www.hres.org)

Our next Board of Directors' meeting will commence at 10:00 AM on Wednesday, the 10th of March in Hudson. Subsequent meetings are scheduled for Tuesday, the 11th of May and prior to our Annual Members' Meeting on Tuesday, the 8th of June. If the locations and directions are not posted on our web site, you may call me (518/ 861-8020). We are always searching for interesting new sites in the Valley, at which we can hold our one-day Board meetings.

After the *Birds of the Hudson Estuary* Conference at the American Museum on the 29th of April, we are planning to address *Contaminants in the Harbor Estuary* at Stevens Institute of Technology next fall. Additional topics being considered for the future: *Man/Environment in the HRV*, with the Hudson River Valley Institute at Marist College; *Anticipating Impacts of "Tech Valley;"* and *Habitat Restoration*. What other themes should we be addressing?

Through the generous support of the New York Power Authority, we have been able to waive registration costs for students at our last two conferences. We are seeking support to continue free admission for **students** who are in college and university environmental, natural, biological or physical science programs.

It is with great sorrow that I had to report the death of William Pressman. We are all saddened by the loss of an HRES founding member in early January. Bill has contributed stability and hope in great measure to the Society over the past thirty-plus years, and his presence in the society will be greatly missed.

Finally, there have been some changes in the makeup of our Board of Directors for the coming year. Five of our board members have resigned in the past several months:

G. S. Peter Bergen, an environmental attorney, and a former Treasurer, had served as an Assistant Commissioner in DEC. Peter is known for his work on the proposed Storm King Mountain pumped hydro power plant case;

Betsy Blair, Director of the Hudson River National Estuarine Research Reserve, headquartered at Annandale-on-Hudson;

John Holsapple, Director of the Energy Alliance of New York State, formerly Director of Environmental Affairs for the New York Power Pool / ESEERCO;

Leonard Houston, Director of Environmental Research for New York District of the US Army Corps of Engineers, a long-time Board member best known for producing our *Who's Doing What in Hudson River Research* Programs;

and;

Doug Reed, Director of the Hudson Basin River Watch, a tremendously successful high school program of water sampling and analyses in the Hudson and its many tributaries.

HRES wants to thank all for their many contributions over the past years and wish them the best in their future endeavors.

HRES
Spring Conference

HRES Announces

In Conjunction with
the American Museum of
Natural History
and
Audubon New York

Birds of the Hudson River Estuary

Thursday, 29 April, 2004

The American Museum
of Natural History,
New York, NY

Exploring which species use these habitates, how each population has changed over time, the threats to their continued existence, and ongoing protection efforts.

Look for more information in the mail or online at www.hres.org

FUTURE POTENTIAL HRES PROGRAMS SURVEY

Over many years HRES has striven to put on conferences on Hudson River Valley environmental issues which are timely and important to you, our members. We would like to have your ideas for potential program topics, or even possible themes, as we plan our future programs. Not only do we need to draw on the depth of your knowledge about these issues, but also we invite you to assist our Program Committee in determining the topics' viability as potential future Society programs.

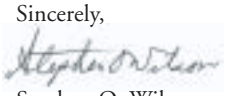
During the past five years, we have concentrated on improving the processes we employ for producing our conferences. Utilization of long lead times for developing themes (7-12 months) has allowed us to prepare more thoroughly, and to reach out to more diverse groups who share our interests. Involvement of individual members in event planning has enriched the conference content and has suggested that we might address topics in a variety of ways; e.g., as symposia, workshops, focus groups, field investigations, or video conferences.

While many environmental issues in the Hudson River Valley appear to warrant our continued attention, we are not prepared to invest our time, nor your money, in producing a program on them until we can determine how we may improve a general understanding of those ideas. On the survey below, we have identified examples of issues that have been "on the Society's plate" for some time. While we feel some of these should continue to be followed through informal discussions as they unfold, we really need to learn about new or different issues that are of interest to you.

What additional topics would you like to have us evaluate? In what ways would you like to contribute your ideas, to help us learn what you know about the issue(s)? What do you think about them? How might they best be presented as potential HRES programs? These are just some of the questions to which we need answers.

Please mark up this survey, add your comments and send it to us. We appreciate your continued interest and participation in HRES.

Sincerely,



Stephen O. Wilson
Executive Director

HRES Members Survey

Tell HRES what you think!

HRES wants to know what you think about the direction your organization should take for the future.

1 – Program – Check if you would like to see this as a future HRES sponsored Program, Conference or Symposium.

2 – Know – If you have knowledge of this topic that would be relevant to a future Program, Conference or Symposium on this topic

3 – Volunteer – If you would be willing to assist in the development of future Programs, Conferences or Symposium on this topic.

1	2	3	
Ä	Ä	Ä	PCB's and Fish Contamination
Ä	Ä	Ä	Power Plants / Utilities Deregulation
Ä	Ä	Ä	Shore Lands Development and Valley Reindustrialization
Ä	Ä	Ä	Watersheds – Planning and Restoration
Ä	Ä	Ä	River Biota
Ä	Ä	Ä	Dredged Materials Management/Disposition
Ä	Ä	Ä	Aquatic Invasion/Invasive Species – Plants/Animals
Ä	Ä	Ä	Status and Future of HR Agriculture
Ä	Ä	Ä	Parks and Preserves Management/Expansions

Ä YES! Please Contact Me About Being An Active Participant in Future HRES Activity Planning

NAME _____

ADDRESS _____

_____

CITY, STATE _____

ZIP (+4) _____

PHONE _____

EMAIL _____

Please Complete this survey, clip, and mail to:

Hudson River Environmental Society
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Altamont, NY 12009-4523
Attn: Survey

REMEMBERING BILL PRESSMAN 1920 - 2004

In January, HRES lost one of its founders and long-time members William Pressman after a long battle with prostate cancer. He was 83 years old.

Mr. Pressman received his B.S. in Chemical Engineering from the University of Pennsylvania in 1942. He did graduate work in environmental engineering and briefly in social work. He retired from the position of Chief of Research and Development for the New York City Department of Environmental Protection where he worked for 26 years. Among the many achievements of which he was proud was being instrumental in allowing NYC residents to install garbage disposals in their homes, which had not been previously permitted within the city. He spent his final years working as a consultant for Konheim and Ketcham. Bill was also an avid musician, studying the guitar, banjo and mandolin. His son Jack, a promising historian, passed away in 1997.

He is survived by his wife Marjorie, his daughter Nancy Morganstern and four grandchildren.

Bill Pressman was one of the founders of the Hudson River Environmental Society. He was among attendees at a symposium on the Hudson River, hosted by the New York University Medical Center in 1971, who championed the formation of a society that would continue and enhance the communication of research findings on the Hudson River. Bill helped to define the role, write the charter and bylaws, and to establish the name of the then fledgling Hudson River Environmental Society.

Over the course of the past 30-plus years, Bill continued to provide staunch belief in, and support to the continued existence and activities of the Society. During his long service on the Board of Directors, he consistently defended the participatory rights of the membership. His persistent support, quiet amicable manner and ever-present bashful smile will be greatly missed by the HRES membership.

Gerry Lauer & Warren McKeon

HRES Award Nominations

Every year the Board of Directors of HRES recognizes people who make outstanding contributions to the environmental well being of the Hudson River Valley. We do this in the formof awards to outstanding scientists and engineers, educators who teach at all levels, administrators, politicians and decision makers, and writers and journalists. Our highest honor, the Distinguished Career Award, goes to persons for career-long excellence in any of the above categories. These awards are presented during the annual meeting of members held each June.

So that the Board of Directors can have the broadest array of candidates, we invite you to nominate anyone whom you know to have made outstanding contributions which benefit the environment of the Hudson River Valley. Please send nominations to Dr. Robert Henshaw, Awards Committee, at the Society address shown elsewhere in this newsletter. Please include a short statement about each person and their contributions. The Awards Committee will assemble nominations from all sources and recommend a slate of awardees for 2004 to the Board of Directors. The awardees for 2004 will be announced in Currents before the June Annual Meeting.

Robert Henshaw,
Awards Committee Chair

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

Currents
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Please consider becoming a member of HRES or renewing your existing membership. Your membership is tax deductible. **Look at the date next to your name on the address label of this newsletter (or other HRES mailing) for your renewal date.** New members should fill out this form.

YES!

Please Enroll Me (or my organization)
As A Member of
The Hudson River Environmental Society
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Ä	$10	Student
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Ä	$100	Sustaining
Ä	$300	Nonprofit or educational institution
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WELCOME!