

## **NERRS Science Collaborative Progress Report for the Period 3/1/12 through 8/31/12**

**Project Title:** Sustainable Shorelines along the Hudson River Estuary

**Principal Investigator(s):** Betsy Blair, Hudson River NERR, NYS DEC

**Project start date:** 9/15/10

**Report compiled by:** Betsy Blair

### **Contributing team members and their role in the project:**

- Emilie Hauser, NYS DEC Hudson River NERR -- outreach coordination and project coordinating committee
- Ona Ferguson, Consensus Building Institute (CBI) – project integration lead and project coordinating committee
- Stuart Findlay, Cary Institute of Ecosystem Studies -- ecological studies and project coordinating committee
- Nickitas Georgas, Stevens Institute of Technology -- physical forces assessment and project coordinating committee
- Kristin Marcell, NYS DEC Hudson River Estuary Program and Cornell University -- project coordinating committee and climate change program liaison
- Dan Miller, NYS DEC Hudson River Estuary Program -- demonstration project development, ecological studies, and project coordinating committee
- Jon Miller, Stevens Institute of Technology -- physical forces assessment, demonstration project, and project coordinating committee
- Dave Strayer, Cary Institute of Ecosystem Studies -- ecological studies and project coordinating committee
- Kathie Weathers, Cary Institute of Ecosystem Studies – project integration and project coordinating committee

### **A. Progress Overview:**

The purpose of the Hudson River Sustainable Shorelines Project is to provide science-based information about the best shoreline management options for preserving important natural functions of the Hudson River Estuary's shore zone, especially as sea level rise accelerates and storms increase in intensity. With the ongoing input of decision-makers and intended users of project results, the project team is generating new information about engineering performance, ecological tradeoffs, economic costs, projected river conditions, legal and regulatory opportunities, and the needs and priorities of key audiences. With NERRS Science Collaborative funding, the shorelines project team is 1) conducting studies to test how shoreline structure affects ecological services, 2) expanding knowledge of physical forces impinging on shorelines, 3) constructing a demonstration site, and 4) and developing one or more decision support tools. The project involves and fosters collaboration with shorelines decision-makers, with the ultimate goal of providing useful products, informing decisions, and influencing outcomes.

During this reporting period, we developed a demonstration site, conducted field research on shoreline ecology and wave behavior, advanced the physical modeling work, sent two updates to our advisory team, and disseminated results in a variety of settings.

### **B. Working with Intended Users:**

#### *Progress:*

We combined the Project Team and the Advisory Committee into one group, henceforth known as the Advisory Committee. These two groups were initially convened to serve slightly different functions (one more technical, one more diverse in terms of stakeholders). As the project has

evolved, the discussions at the two different meetings have overlapped more and more, and we felt that combining them would streamline our efforts while ensuring plenty of time for robust discussion and exchange. Although we did not meet with the Advisory Committee during this reporting period, we sent two email updates. We held several Coordinating Team calls, and had regular project management calls among Betsy Blair, Emilie Hauser, and Ona Ferguson to keep project activities on track. We also held one meeting of the informal shoreline and habitat adaptation dialogue group (August 28, 2012). Consensus Building Institute staff continued to provide expert facilitation and project management services to advance the project. Several members of the project group also interacted with and provided information to decision-makers and resource managers in other coastal areas, including DEC staff working on the Great Lakes, a municipal official for a community on Lake Ontario, and state resource agency staff in Connecticut.

We developed a new look to our website: <http://www.hrnerr.org/udson-river-sustainable-shorelines>, and added content in order to have one location where our intended users can find report findings and products. The website has a page with citations and links to available articles and reports, including a document that provides standard definitions of terms used. It is: <http://www.hrnerr.org/udson-river-sustainable-shorelines/publications-resources/>

We presented information about sustainable shorelines considerations and initial best management practices at a Revitalizing Riverfronts community forum for Columbia and Greene counties, held in Hudson NY attended by over 100 people. The forum is the third in a series being organized by Scenic Hudson, the Hudson River Estuary Program, and the Research Reserve to promote community dialog on climate adaptation. A fourth forum is scheduled for November 15, 2012 in Peekskill, NY.

*In the next 6 months we plan to:*

- Hold a day-long Advisory Committee meeting October 3, 2012.
- Convene an all-day, in-person coordinating team meeting in October-November to plan next steps, including outreach for this project and identification of additional research and funding needs.
- Hold peer review focus groups to assess and refine various aspects of the modeling/physical forces work.
- Continue to explore opportunities to contribute recommendations to state or other programs and policies that affect shorelines.
- Present information about shorelines project findings during the fourth Revitalizing Riverfronts community forum in November.
- Incorporate information about shoreline management options into the work of task forces being created in two flood-prone waterfront communities.
- Deliver a special 1.5-hour session on the Sustainable Shorelines Project at the Northeast Chapter of International Erosion Control Conference, which is being held November 7-9 in Fishkill, NY.

*Lessons Learned:*

- A project web site that contains reports, findings, and outreach tools is an essential part of disseminating information about a large and complex project.
- It is helpful to develop a uniform look and publication guidelines well in advance of finished documents.
- It is important to clarify and define terminology when working across disciplines.

C. Progress on project objectives for this reporting period:

1) ***Shoreline structure effects on ecological services***

Stuart Findlay and Dave Strayer (Cary Institute) and Dan Miller (DEC Hudson River Estuary Program) collected data at 20 study sites on the physical structure of the sites, fish communities, and plant communities. This field sampling is being done on a range of built shorelines to explore how their physical structure affects ecological function. Stuart and Dave developed Rapid Assessment Protocol that is designed to enable people without ecological expertise to evaluate the ecological components of a shoreline in an hour or two. The protocol has been tested with high school and college students. The Reserve printed additional copies of the brochure *Managing Shore Zones for Ecological Benefits*.

In the next 6 months, the group will complete data collection at the 20 sites, and work on data analysis.

2) ***Physical forces on shorelines***

The overall goal of the engineering and modeling analysis is to characterize the physical forces acting on the shorelines of the Hudson River Estuary (HRE) using a combination of modeling and observational approaches. Jon Miller and Nickitas Georgas (Stevens Institute) are making progress on multiple fronts in the engineering realm.

a. *Refinement of NYHOPS model*

Nickitas Georgas has refined the New York Harbor Observing and Prediction System model to generate much more accurate information than currently exists about currents and waves in the Hudson Estuary to the Troy Dam. He completed an ultra high resolution grid with both bathymetry and potential future inundation zones, and interpolated meteorological, hydrological, and astronomical forcing functions on the grid.

b. *Analysis of ice historical record and production and distribution of ice GIS map layers*

All ice records since 2005 were analyzed and incorporated into a new Hudson River ice climatology dataset. Daily records included ice thickness, ice area, and ice type throughout the past winter seasons, compiled by Hudson River region. Probabilities for ice occurrence, ice thickness, and prevalent ice types were computed by region, summarized, geo-referenced, and included in a new interactive GIS layer, complete with pictures of the seasonal Hudson River ice cover, probability statistics, data cards, and extensive metadata information that includes uncertainty estimates for ice thickness. The project continued to exchange information with Hudson River pilots to aid their navigation and ability to accurately estimate and manage cargo volume and transit times.

c. *Creation and analysis of NYHOPS data and assessment of NYHOPS predictions*

The majority of the effort during this reporting period focused on completing the ultra resolution grid, refining the model's forcing, and attempting to run the sECOM model for a year to produce hydrodynamic predictions for currents and waves along the Hudson's coastlines. The model refinement work included generating and mapping wind and other meteorological variables on the grid's surface, hydrological inputs from the distributed network of Hudson tributaries, streams, and wastewater treatment plant outfalls on the grid's sides, and tidal and other ocean-

generated forces on the grid's open boundary at the Battery. Nickitas spent considerable time running and trouble-shooting the sECOM hydrodynamic model to generate current and wave data along the Hudson River's coastline; he ultimately determined that for the moment model runs must focus on areas that are currently inundated by tides, and exclude areas of projected future inundation. The new model's predictions are being assessed while the model is running. The model is presently at its 3<sup>rd</sup> month of operation towards completing a year-long simulation.

During the next 6 months, the new model runs should become available, and the model results will be statistically analyzed and geo-referenced.

#### *d. Collection and analysis of field and analytical data on wake energy*

Over the summer, Jon Miller and his students took measurements of waves generated by boats and at about 30 sites along the Hudson using techniques developed, adapted and tested by students. To supplement the observed data, an analytical approach was adopted to predict the maximum expected wake in the channel based on vessel dimensions. This approach will be used to augment the observations made during the summer of 2012. An externally funded undergraduate research student is working on refining the approach for calculating theoretical wakes. As a part of the analysis he is working on breaking the estuary into zones based on geometry and/or ship traffic for the analysis. Analysis of the 2012 field wake data began in late summer.

During the next 6 months 2012 field data will be analyzed and compared with the analytical model.

#### *3) Demonstration site*

The Coxsackie boat launch shoreline demonstration site was constructed in February and planted in May, in partnership with NYS Office of Parks Recreation and Historic Preservation. The plants are now well-established and the site is being monitored. You can see photos at: <http://www.hrnerr.org/hudson-river-sustainable-shorelines/demonstration-site-network/> Dan Miller continued to work with partners to identify other sites for installation of demonstration sites, and met with Dutchess County staff and their consultants in summer, 2012 to advance sustainable shoreline-related adjustments for the Quiet Cove shoreline project in Poughkeepsie, NY. The Hudson River Estuary Program made approximately \$200,000 available for design of additional shoreline demonstration projects, to be spent over the next two years. Dan Miller, Emilie Hauser, and Brian Cooke (SCA intern) continued to advance the demonstration site network (see below).

In the next six months we will continue to monitor the Coxsackie boat launch demonstration site, pursue involvement in the Quiet Cove shoreline renovation project as a demonstration site and pursue additional opportunities to develop demonstration sites in other regions of the estuary

#### *4) Decision support tool*

We continue to explore the needs and preferences for decision support tools with our intended users. During the last six months, progress was made in the developing a demonstration site network that will show engineers and other experts how to design a shoreline treatment and to show regulatory agencies and municipalities how ecologically enhanced shorelines look and perform. Brian Cooke, an SCA intern, worked with a Demonstration Site Network subgroup to develop a simple assessment form and rating system which is being used to identify shoreline

protection projects that represent the best management practices of the project. Case studies will give shoreline engineers, property owners and other decision-makers information on the successes and shortcomings of these innovative or non-traditional restoration and engineering techniques. The case study of the Coxsackie boat launch site is finished and case studies are being developed for other sites. Updates may be found at: <http://www.hrnerr.org/udson-river-sustainable-shorelines/demonstration-site-network/>

D. Benefit to NERRS and NOAA:

Two members of the team are working with Dolores Leonard to prepare and present a webinar for NERRS staff to provide an overview of the project on October 23, 2012. If there is sufficient interest, we'll follow this up with more detailed webinars on project elements by other team members.

E. Describe any activities, products, accomplishments, or obstacles not addressed in other sections of this report that you feel are important for the Science Collaborative to know

We are interested to see the work diffusing through a variety of means to other coastal areas, where decision-makers, local officials, and consultants are hungry for information about what innovative treatments exist and can work in their settings.

One person who reviewed *Terminology for the Hudson River Sustainable Shorelines Project* sent it to his staff at his consulting firm to be used as a reference.

We continue to work with state permit staff to ensure that ecological enhanced shorelines are "permissible."