CoastWatch...

Hudson River at Cornwall Bay, as it enters the Hudson Highlands between Storm King on the right (west) and Breakneck Ridge on the left (east). In summer and fall, the Hudson's salt front (or salt wedge) is often in Cornwall Bay.

That Settles It: Sediment transport in the Hudson River

The historic Hudson River—beautiful in any season—begins at the pristine Lake Tear-of-the-Clouds in the Adirondack Mountains and flows south to its mouth in New York Harbor. Along the way, the river's current transports sediment which may settle at predictable locations based on the size and concentration of particles and the speed and turbulence of the current. Because the Hudson is a tidal estuary, salt water from the ocean mixes with fresh water coming downriver making for a dynamic system of sediment transport.

Some of the sediment in the Hudson contains contaminants that entered the upper river decades ago mainly from the General Electric (GE) manufacturing plant at Fort Edward. These compounds, polychlorinated biphenyls or PCBs, were released before their risks to environmental and public health were known, and still persist in the river sediments. Now many years after the environmental risks were identified, GE has completed the first phase of dredging PCBs from the upper Hudson River in order to decrease the total amount in the sediment. But what is the fate and transport of sediment which contains PCBs? Do particles settle back down into the sediment after being stirred up by currents or dredging? By looking at the behavior of particulates in a tidal estuary, science can give us a better picture of sediment transport.

With NY Sea Grant funding, researchers from Stony Brook University's School of Marine and Atmospheric Sciences (SoMAS) conducted the first-ever modeling of size-resolving sediment tracking in the Hudson River. As published in *Continental Shelf Research*, **Dr. Fanghua Xu** (former Sea Grant Scholar now at Princeton), **Dr. Nicole Riemer** (now at the University of Illinois) and **Drs. Dong-Ping Wang** and **Roger Flood** have come up with a workable model that predicts where along the river contaminated sediments are most likely to have settled. They have also mapped out specific areas of the upper river indicating where the processes of dredging and monitoring for PCBs would yield the most optimal results. In other words, their model could be used to identify those areas of river bottom which would be most likely to have been impacted by releases of contaminated sediments from remedial dredging operations.

Wang summarizes the relationship between particle size and settling this way, "The smaller the particle, the longer it stays suspended in the water column. The bigger the particle, the faster it sinks. Generally, the more concentrated the particles, the more they will collide, form larger particles, then sink to the bottom." Scientists call this aggregation of particles **flocculation**. Adds Xu, "The larger particles tend to capture the smaller ones as they fall through the water column." This settling usually happens during slack tide. The water slows down, large particles are no longer buoyed by the swirling water and the particles settle to the bottom—sometimes in very predictable locations.

Explains Riemer, "Turbulence in the river has several, sometimes opposing effects: it helps mixing the particles in the water column, but as particles grow larger they can also be pulled apart by turbulence." A very strong current may actually lift particles from the river bottom altogether and put them back into suspension. Particle size varies widely, but most are in the range of the width of a human red blood cell to that of a human hair (or about 10 to 100 micrometers).

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...CoastWatch

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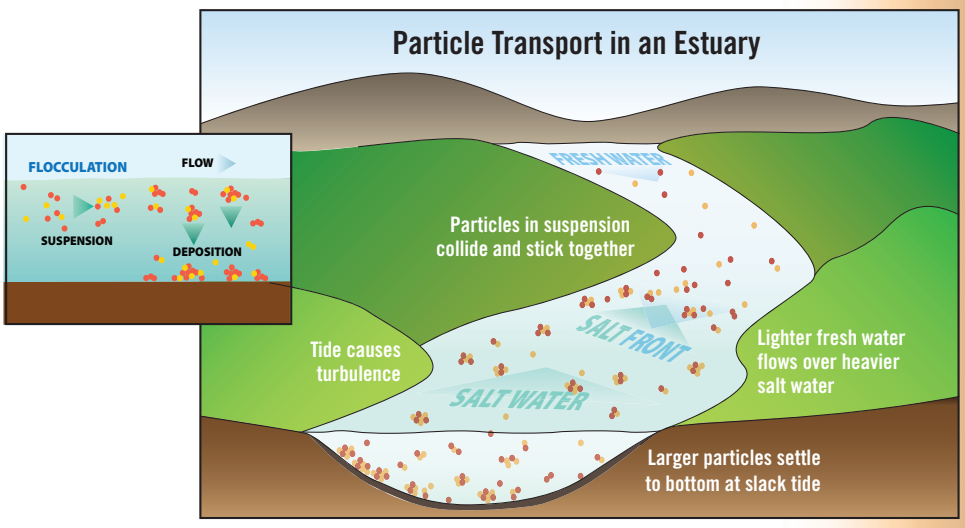


Above the Troy Dam in the upper Hudson, the site of greatest PCB input, the particle size is initially quite small and particles are suspended in the water column. The contaminants adhere to the surface of the particles, thus the greater the number of small particles, the more surface area there is for contaminants. At a part of the river where there is a bend or irregularity in the bottom, there may be a decrease in the turbulence and so many particles collide, coalesce into fewer larger ones, and settle to the bottom.

Below the Troy Dam, the Hudson becomes tidal; at around Poughkeepsie it becomes brackish—a mix of salt and fresh water. Explains Wang, "The area where salt water coming up from the mouth of the river meets fresh water coming down from the mountains is known as the salt front or wedge which moves with the seasons." The spring melt brings more fresh water and pushes the salt front downriver. The heavier salt water pushes upriver with the tidal current and usually flows under the lighter fresh water. Because there is a change in turbulence in the area of the salt front, the model predicts there will be an accumulation of sediment. Adds Riemer, "Only in this model in which flocculation is included, does the predicted accumulation of sediment look like what one is likely to observe."

If the sediment is contaminated, invertebrates, such as copepods and burrowing worms, may feed on contaminated detritus. Then vertebrates like fish and birds may feed on the invertebrates, biomagnifying the PCBs up the food chain. By taking into account model results, managers may be better able to identify representative biological monitoring locations by understanding where there are areas with a greater likelihood of sedimentation impacted by the PCB release in the upper Hudson.

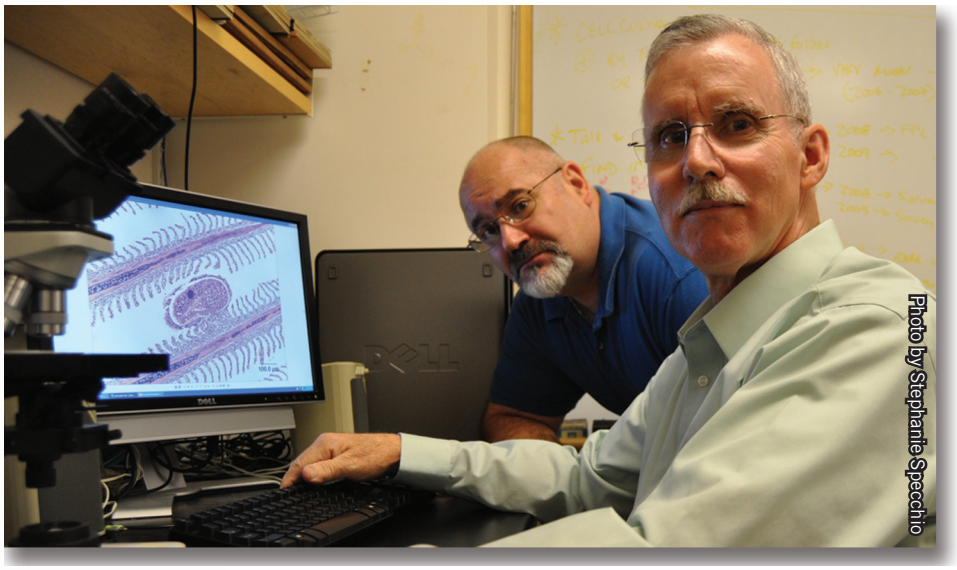
For years, many species of birds and fish along the Hudson have survived despite the persistence of PCBs in the sediment. In a separate project funded by NYSG, a Cornell research team, **Drs. Timothy J. DeVoogd**, **André A. Dhondt**, and graduate student, **Sara DeLeon**, is looking at the *sublethal* effects of PCB contamination on chickadees and other common regional songbirds. The team suggests that the contaminants are not enough to kill the birds, but may affect parts of their brains that control song. Measuring changes in the birds' characteristic song according to their location may indicate areas of higher contamination.

Whether existing on the surface of a microscopic particle carried by the tide, within a stable layer in the sediment, or as part of the dynamic food chain of the estuary, PCBs and the impacts of their dredging and containment are far from "settled." It is hoped that this dynamic model can be used to better focus any sediment sampling efforts by scientists charged with evaluating how the release of contaminants from river dredging impacts fish and other wildlife.

—Barbara A. Branca

NEW YORK Coastlines Sea Grant New York

Currents



Cornell University's Dr. Paul Bowser (at computer) and NYSG's Fisheries Specialist Dave MacNeill were recently recognized for translating Great Lakes fish disease science for the general public.

Cornell Researcher and NYSG Specialist Receive First-Ever Award

This past October at a Sea Grant meeting in New Orleans, LA, Cornell University researcher **Dr. Paul Bowser** and New York Sea Grant (NYSG) Fisheries Specialist **Dave MacNeill** were named the recipients of the Sea Grant Association's first-ever "Research to Application Award." This honor recognizes one researcher or research team for the successful and continued real-world application of a Sea Grant-funded research project conducted during the past 20 years.

Bowser and MacNeill were recognized for demonstrating how their work on the Viral Hemorrhagic Septicemia Virus (VHSV) is being applied and utilized in a non-academic setting. This viral disease has caused significant mortality events in a wide diversity of fish species as well as restrictions on the commercial transport of live fish in the Great Lakes Basin.

In New York, the non-treatable viral fish pathogen poses a potential threat to the sportfishing industry which contributes $1.4 billion annually to the State's economy, according to recent U.S. Census Bureau estimates.

"Receiving such an award was a true honor," said Bowser, a faculty member of Cornell University's College of Veterinary Medicine since 1985. "Having the research results benefit the end user is very satisfying."

Through funding by NYSG and other sources, VHSV research by Bowser and the members of the Aquatic Animal Health Program at Cornell have provided detailed information about the virus, its spread, and its impact on Great Lakes fisheries, as well as sensitive detection methods. This information has been used by MacNeill and others to inform the fishing community and other important stakeholders of methods to limit virus spread and minimize its impact.

"This is a compelling example of the application of Sea Grant research to an important coastal problem," said MacNeill, who is working with Bowser to develop a NYSG fact sheet on the strain of VHSV being studied in the Aquatic Animal Health Program at Cornell.

Also, in December 2009 and June 2010, NYSG partnered with Lake Champlain and Pennsylvania Sea Grant programs to run, respectively, regional aquaculture workshops in Albany, NY and Lamar, PA. While the virus has not been found in fish culture facilities, the adverse impact of VHSV in aquaculture could be significant.

Based on workshop evaluations, all of the workshop attendees indicated that they would utilize Sea Grant's suggested guidelines in their own fish-rearing facilities and share the information with other aquaculture practitioners.

—Paul C. Focazio

New York Sea Grant NEMO Program Addresses Peconic Water Resource Protection

On September 20, 2010, **Eileen Keenan,** Manager of the New York Sea Grant Non-point Education for Municipal Officials (NEMO) Program, participated as a panelist at the Peconic Estuary Program's Call to Action Conference in Southampton, NY. Attended by over 200 municipal officials and local stakeholders, the conference offered action-oriented discussions that covered stormwater and nitrogen management, eelgrass protection, and habitat restoration.

Among the actions identified, were preservation of parcels in nitrogen sensitive watersheds, reduction of managed turf at government properties, establishment of additional eelgrass sanctuaries, mitigation of eelgrass disturbances, and allocation of funding for habitat restoration projects.

In addressing the pressing need for cost-effective stormwater management, Keenan acknowledged the continuing work of the Peconic Estuary Program's Stormwater Workgroup and called for strengthened support of watershed-based inter-municipal stormwater initiatives. The panel further highlighted the need for stormwater education, incentive programs, increased vegetative preservation requirements, reduction of impermeable surface allotments, increased buffer size regulations, establishment of a sustainable long-term funding mechanism, and adoption of Harbor Protection Overlay Districts.

In the final session, local officials expressed their intent to work together to advance priority action items. Following the conference, attendees expressed very positive feedback and strong support for carrying the important objectives of the Peconic Estuary program forward.

Photos, press coverage, and formal proceedings can be accessed on the Peconic Estuary Program's Web site at: www.peconicestuary-program.org/CAC2010.html

—Eileen Keenan

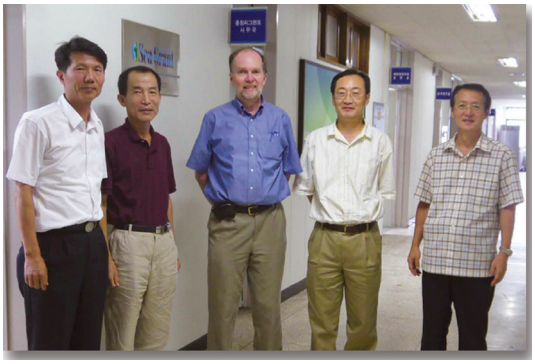
Members of the Peconic Estuary Call to Action Conference Stormwater Panel; left to right: Robert DeLuca, Group for The East End; Eileen Keenan, NYSG NEMO Program; Lorne Brousseau, Cornell Cooperative Extension of Suffolk County; Mark Terry, Town of Southold.

Ammerman in Korea

New York Sea Grant Director **Jim Ammerman** took part in a two-day "2010 Korea - U.S. Sea Grant Collaboration International Workshop" late last September at South Korea's Jeju National University.

Presenting twice during the meeting, Ammerman first discussed the impacts of nitrogen loading on estuaries in the New York Bight based on a regional Sea Grant planning workshop held last summer. He then switched gears for a talk the next day on the impacts and mitigation of storm surge and sea level rise on the South Shore of Long Island, focusing on the outreach work of NYSG Coastal Processes and Facilities Specialist **Jay Tanski**.

Ammerman's invitation to participate in the workshop came in part from **Moon-Jin Park**, a former Stony Brook University (SBU) Sea Grant Scholar and current Professor and Chairman of the Department of Oceanography at the College of Natural Sciences, Chungnam National University, one of 10 flagship Korean National Universities. Park, who graduated from SBU's School of Marine and Atmospheric Sciences in May 1990 under Professor **Dong-Ping Wang**, was a speaker at the conference for Chungcheong Sea Grant. His presentation examined the impacts of manmade tidal barriers in western Korea on tides and coastal currents, and the changes these caused in navigation and other features.



NYSG's Jim Ammerman (c.) visits Chungcheong Sea Grant (CSG) at Chungnam National University. CSG staff includes Director Man Sik Choi (far left) and Moon-Jin Park (right of Ammerman). Photo courtesy of Jim Ammerman

In other presentations at the workshop, Delaware Sea Grant Associate Director **James M. Falk** and Maine Sea Grant's **Natalie Springuel** addressed Sea Grant's role in promoting and developing ecotourism. South Korea's Gyeonggi Sea Grant Advisory Scientist **Jong-Geel Je** discussed ecotourism and its connections to coastal wetlands conservation. "Ecotourism would seem to be an important new area for the Korean Sea Grant programs to develop," said Ammerman.

The Korea Sea Grant Program (KSGP) was established in 2000 by the Ministry of Maritime Affairs and Fisheries (MOMAF) as a part of "Ocean Korea 21," Korea's comprehensive plan to improve the management of coastal resources. The National Oceanic and Atmospheric Administration (which invited NYSG to participate in the workshop) and the National Sea Grant Office (NSGO) continue to work with KSGP on their mission "to promote the involvement of universities in marine research through granting programs, outreach, and education," a mission similar to that of the NSGO.

There are currently six entites under KSGP – YoungNam Sea Grant, based at the Korea Maritime University in Busan; HoNam Sea Grant, in Mokpo; GyeongGi Sea Grant, in Incheon; Chungcheong in Daejeon; GyeongBuk on the eastern coast; and Jeju on Jeju Island, the sponsors of this international workshop.

—Paul C. Focazio

Sea Grant responds to Gulf Oil Spill

The 40th anniversary of Earth Day last sping was marred by the blow-out of British Petroleum's Macondo oil well, followed by the largest oil spill in history. Since then, a number of questions have been posed – Will the Gulf recover from this? Could it happen again? How could we have learned better from past oil spills in our response this time?

"The potential for disaster was great," says New York Sea Grant (NYSG) Director **Jim Ammerman** of the Gulf oil spill, "but so far environmental impacts have been less than feared." Ammerman shared his impressions on the subject both during his talk as part of Stony Brook Southampton's fall lecture series and as a panelist for Stony Brook University's Living World lecture last October.

Photo courtesy of Virginia Sea Grant

Ammerman, like many scientists, is quick to remind us that much is still unknown about the oil spill and its impacts and will remain so for some time. "Although shoreline impacts by the spill have been limited, partly due to dispersant use, the ultimate effects of deep water dispersant use are unclear," says Ammerman. While damaged marshes already appear to be re-growing and bird mortality is less than after prior spills, other uncertainties include the impacts on the region's turtle and tuna populations. Also, seafood appears safe (from open fishing areas in the Gulf), but additional testing is needed.

"This oil spill certainly makes us wonder if a similar situation could happen here and, if it did, how we would respond," says NYSG's Long Island Sound Educator **Larissa Graham**, the Editor for last fall's oil spill-themed *Sound Update* newsletter. According to one of the *Sound Update* articles, the Area Contingency Plan for Long Island Sound documents how the Coast Guard will work with federal, state and local governments to prepare for and respond to oil spills. In late February, Graham, along with NYSG's **Paul C. Focazio**, will lead teachers from the New York State Marine Educators Association for a five-day trip to the New Orleans area to learn about restoration efforts and talk with experts about wildlife rehabilitation. The group will also engage in some restoration work, similar to efforts made last fall by Sea Grant staff from throughout the national network's 32 programs. During their planting, coordinated by Louisiana Sea Grant Extension Associate **Caitlin Reilly**, Sea Grant-ers contributed about 55 volunteer hours for a planting effort along 200 feet of shoreline in New Orleans' City Park. "In the face of land loss, we see a lot of need for restoration in Louisiana, especially after Hurricane Katrina," says Reilly.

— Paul C. Focazio

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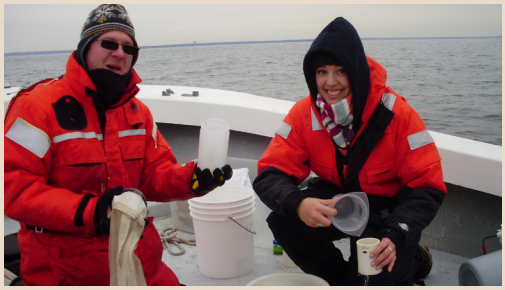
Shivering in the Sound



Well prepared for winter sampling in their survival gear, lab assistant Lucas Merlo (left) and Sea Grant Scholar Laura Treible are looking at the diet of tiny invertebrates called copepods to determine the effects of climate change on the food web of Long Island Sound. They've found fairly large copepods in their sample and gut analysis will show just how much microscopic plankton is in their diet. Increases in the Sound's winter temperature may increase winter grazing by the copepods and thus suppress the usual spring plankton bloom. These dynamic changes in production caused by a changing climate have serious implications for the development of the condition of reduced oxygen (hypoxia), feeding relationships, and ultimately fisheries production in Long Island Sound.

Saying Goodbye

Robert J. Kent

I was hired first by Cornell Cooperative Extension of Suffolk County to teach environmental education to 4-H kids. Wondering how to get them interested in nature, I thought, "We live on an island; let's study marine life!" The Sea Grant staff was very helpful to me in getting these programs going, and later when a position opened up to be the Marine District Program Coordinator, I was urged to apply. Now, 30 plus years later when I look back at a rewarding career I say to myself, "A life well spent." Extension, whether Land Grant or Sea Grant, is designed to improve the lives of people and communities by bringing the resources of our nation's Land Grant and Sea Grant colleges directly to people. One dean of a Land Grant College once said, "Never pass up an opportunity to help someone." I've lived by that motto my whole career. Sea Grant has made a difference by "Bringing Science to the Shore," and the anecdotal testimonies we all receive from people with whom we have worked are the best evidence. I want to say goodbye to all my colleagues and friends, and to wish you well. What a treasure you are to audiences with which you work.

Robert J. Kent *has been "Bringing Science to the Shore" since he began with New York Sea Grant Extension in 1989 as our Marine Program Coordinator. Bob has also shown leadership statewide as NYSG's Interim Associate Director and nationally with his dedication to Sea Grant's marine education and habitat restoration efforts. You will be missed, Bob. Enjoy fair winds in your retirement.*

Last Wave

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From the Director...

Welcome to New York Sea Grant's (NYSG's) winter *New York Coastlines* issue, the first of 2011. Despite the snow piling ever higher on Long Island (a record 35 inches in January), NYSG research, outreach, and education activities have continued at a brisk pace. In mid-November 2010 the National Sea Grant Office conducted a two-day site visit of NYSG, when a six-member team visited Stony Brook. This was a review of NYSG that involved numerous NYSG staff, Board members, Program Advisory Council members, and university administrators, as well as many stakeholders. I again want to thank all those who participated for their time and effort. The site visit report was extremely favorable and recommended a broad "visioning" exercise to carry NYSG forward into the future. Since 2011 is also the 40th anniversary of NYSG, it is an appropriate time to take stock of our program as we celebrate this anniversary year and look ahead.

This *New York Coastlines* highlights a recently completed research project funded by NYSG which mathematically modeled the effects of sediment flocculation (the aggregation of particles) on the trapping of sediments in turbid estuaries. While this may at first seem obscure, it can be important in maximizing the efficiency of projects like the dredging of the upper Hudson River to remove PCBs from the sediment. This newsletter also spotlights a recent Sea Grant Association award to **Dr. Paul Bowser**, a researcher at Cornell, and **Dave MacNeill**, a NYSG Great Lakes fisheries specialist. They received this first-ever award for their NYSG-supported research and outreach on the Viral Hemorrhagic Septicemia Virus of fish in the Great Lakes, an issue previously described in Summer 2010 *NY Coastlines*. Also highlighted are NYSG outreach activities related to the Gulf of Mexico oil spill, my participation in a joint US-Korean Sea Grant meeting in Korea, and stormwater-related outreach by NYSG's **Eileen Keenan** at the Peconic Estuary Conference.

We are currently soliciting pre-proposals for new NYSG and regional research; please see our Web site for details. Finally, we must say goodbye to two long-time extension specialists, **Bob Kent** and **Chuck O'Neill**. Both had recently served as Interim Associate Directors for Extension and both recently retired from NYSG. Bob is briefly profiled in this issue and you will hear more about Chuck in the next. We hope to fill Bob's position in the next year. NYSG's **Helen Domske** has graciously agreed to serve as the Interim Associate Director until early April, at which time a new Associate Director will start.