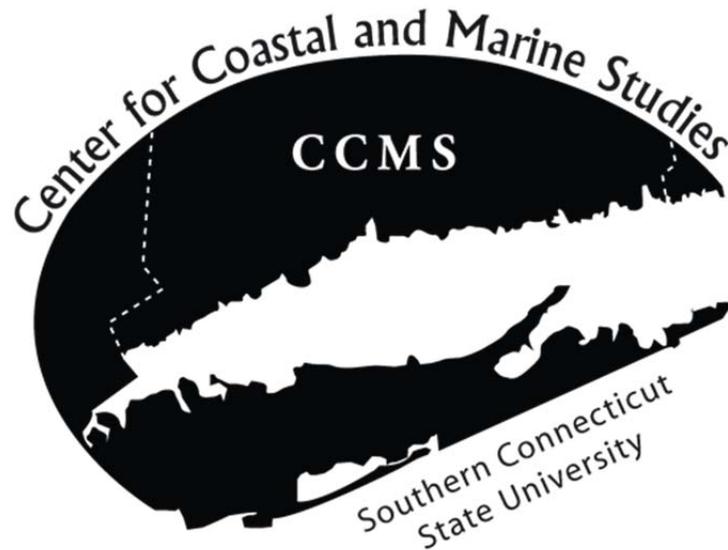


Southern Connecticut State University

Center for Coastal and Marine Studies



CCMS Annual Report 2012-2013

Prepared by:

Vincent T. Breslin, Professor
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Biology

Prepared for:

The Werth Family Foundation, Woodbridge, CT

February 2013

CCMS Annual Benchmark/Evaluation Report 2012-2013

Each year the participating faculty of the CCMS will prepare and submit to the Werth Family Foundation an annual report describing the Center activities. This report will be generated each year and will be made available in electronic and hard copy form. It will provide definitive information and detailed summaries of all yearly projects, events, activities, forums, and accomplishments conducted/achieved by the Center and its personnel. The CCMS Annual Report will be completed and submitted to the Werth Family Foundation during February of each year. Contents of the CCMS 2012-2013 Annual Report are described below.

I. Research Projects

Quantifying the Relationship between Metal Concentration, Grain Size, and Sediment Organic Content

Faculty Dr. James Tait
 Science Education and Environmental Studies
 Dr. Ezgi Akpınar-Ferrand
 Geography Department

Student Participants

Summer 2012; Fall 2012; Spring 2013

Megan Coyne, Undergraduate Student, Marine and Environmental Studies
Elyse Rossignol, Undergraduate Student, Biology and Marine Studies

Project Description

Previous research has shown a direct correlation between heavy metal concentration and loss-on-ignition (LOI), a proxy for organic content, in sediment samples. It has also shown an inverse correlation to sediment grain size. Using sediment copper concentrations, grain size data, and loss-on-ignition (organics content) data, a multivariate linear model was created that allowed prediction of copper concentration at sample stations from grain size and loss-on-ignition data alone.

The importance of other possible controlling factors, such as proximity to a current or historical source for copper, can be examined using the *residuals* of the model, i.e., the difference between the model predictions and the actual observed copper concentration values. In this study, samples in which the observed value is significantly larger than the value predicted value are defined as *hot spots*. A hot spot indicates that grain size and organic content are insufficient to explain the copper concentration. Such a hot spot might indicate a nearby source of copper.

The project has been expanded to include more sites and additional harbors so that between-harbor variability can be examined and geographic dependencies identified. It has also been expanded to measure zinc concentrations along with copper so that variability that is a function

of metal can be examined. Further expansions include examination of the relationship between NOAA National Sediment Quality Guidelines (which estimate the level of concentrations that may be harmful to benthic organisms) and Norwalk Harbor copper and zinc concentrations. A second expansion is the investigation of the mathematical nature of the correlation between metal concentrations and grain size.

Results to Date/Significance

The application of a simple model to copper concentrations sampled from Norwalk harbor produced promising results. The observed copper concentrations and the copper concentrations predicted by the model were mapped using spherical interpolation techniques. The similarity between the two maps is visually striking. Statistically speaking, correlation between model and observations of copper concentrations had a correlation coefficient (“r”) of 0.812, indicating “strong” correlation.

Additional research on Norwalk Harbor sediments by Megan Coyne expanded the available data base and expanded the nature of the study to include the use of Geographic Information System modeling (with the help of Geography Professor Ezgi Akpınar-Ferrand). Megan has generated contour maps of copper and zinc concentrations along with contour maps of mean grain size and organic content. The correlations between grain size and metal concentrations, the correlations between organic content and grain size, and the correlations between copper concentrations and zinc concentrations (covariance of metals) are all very strong. Four distinct metal concentration provinces can be defined for Norwalk Harbor with concentration decreasing as a function of distance from the inner portion of the Harbor and the Norwalk River. Assessment of potential damages to oyster beds from metal contamination via application of NOAA Sediment Quality Standards shows that the vast majority of oyster tracks are located within the low metal concentration and low potential risk provinces. Furthermore, it appears that the relationship between grain size and metal concentrations follows a power law function (at least in this locality). This needs to be expanded to other harbors for confirmation. A poster presentation proposal has been accepted for this spring’s Long Island Sound Research Conference. Ms. Coyne is first author and presenter of record.

Lipofuscin concentrations at varying temperatures in the American Lobster

Faculty Dr. Sean Grace
 Biology, SCSU

Student Participant(s)

Callie Gecewicz, Biology, Graduate Student (Graduated Spring 2012)

Lipofuscin concentration analysis has been supported as a useful way to estimate age in crustacean populations and has been shown to be more reliable than traditional age determination by body size. This study examines the lipofuscin concentration from the brains of twenty-five, 2-year-old American lobsters held *in situ* at six sites off the coast of Maine, representing different temperature regimes. Lobsters were collected and preserved in 10% neutral buffered

formalin. After dissection, brain tissues were prepared through a series of dehydrating ethanol baths and cleared with xylene. The brain tissue was embedded in paraffin wax, sectioned and slide mounted for analysis using a confocal microscope and image analysis software (Image J™). The lipofuscin concentrations did not differ significantly between the site locations therefore suggesting lipofuscin concentration is not temperature dependent. This is important as it represents the first study completed which examines the most basic abiotic factor, temperature, and its lack of an effect on lipofuscin concentrations in the olfactory-lobe cell masses of lobsters.

Causes and Remediation of Chronic Beach Erosion at Hammonasset Beach State Park

Faculty Dr. James Tait
 Science Education and Environmental Studies

Student Participants

Summer 2012; Fall 2012; Spring 2013

Joseph Manion, Undergraduate Student, Earth Science and Marine Studies
Elyse Rossigol, Undergraduate Student, Biology and Marine Studies.

Spring 2013

Catherine Cota, Undergraduate Student, Honors College
Kaitlyn Stobierski, Undergraduate Student, Honors College

Project Description

Beach and dune erosion has been an issue at Hammonasset since the 1920's. Erosion is particularly intense along the west end of the park. Current thinking is that beach sand is being carried to the east end of the 2-mile beach from the west end of the beach by tidal currents. Based on preliminary studies, we believe this is incorrect and that most of the eroded beach sand has been carried offshore and deposited in low, broad underwater bars. We intend to test this hypothesis by surveying beach and nearshore topography using a total station (laser-based surveying instrument).

Results to Date/Significance

A total station was acquired via successful application for a CSU research grant (\$5,000). We have examined the study area via aerial photos and have determined the locations for cross-shore transects to be surveyed in order to determine the volume and other dimensions of the offshore sand bars. We have also set up a liaison with Mr. John Hine, superintendent of Hammonasset State Beach.

Thirty beach and nearshore topographic profiles have been collected and analysis is underway. Benchmarks have been established to tie the profiles into a standard elevation reference frame. The volume of the sand in the bars is being calculated using the end-area method, and then

compared with beach erosion volumes. The hypothesis is that simple beach-based dredging operations could return eroded sand to the beach at the end of each winter before the park opens at a minimal cost to the taxpayer, and with a minimal disruption of the natural beach environment. A current challenge that we are working on is how to define the “bottom” of the beach or offshore bar. This is particularly important for the offshore bar since the volume of sand contained in this bar is being presented as a source of beach sand.

Hurricane Sandy has put an additional emphasis on beach erosion. Our efforts have provided us with pre-Sandy beach conditions. We are in the process of collecting post-Sandy beach and bar volumes.

Assessment of Beach Erosion and Coastal Storm Damage Vulnerability at East Haven and West Haven, CT

Faculty Dr. James Tait
 Science Education and Environmental Studies
 Dr. Scott Graves
 Science Education and Environmental Studies

Student Participants

Fall 2012; Spring 2013

Joseph Manion, Undergraduate Student, Earth Science and Marine Studies
Elyse Rossigol, Undergraduate Student, Biology and Marine Studies.

Project Description

Immediately after Hurricane (TS) Irene struck the CT coast in August of 2011, beach survey profiles were collected in East Haven and West Haven, cities that suffered property loss and severe beach and/or dune erosion. Monitoring of beach stability was initiated and liaisons were created with appropriate city officials. Observations of post-storm impacts were made for the coastlines of each city. Ultimately, we would like to assess vulnerability to damage from large storms to these and other cities along the CT coast.

Results to Date/Significance

Post Irene profiles provided us with baseline data for Hurricane Sandy. These profiles were augmented with immediate pre- and post-Sandy profiles in fall of 2012. These profiles are currently being analyzed. Post-Irene observations and profiles pointed out the critical role of beaches in protecting shorelines from storm wave damage. The critical point of impact for Irene in CT was the Cosey Beach area of East Haven. The principle reason for this is that residents of the area had allowed their fronting beach to erode to the point of having no beach at high tide. The presence of a beach, even a relatively small one as it turns out, allows wave energy to be dissipated before interacting with structures such as coastal homes.

Outer Island Website Development

Faculty Dr. Scott Graves
 Science Education and Environmental Studies
 Dr. Vincent T. Breslin
 Science Education and Environmental Studies

Project Description

Outer Island is the outermost island in the Thimble Island chain off the coast of Branford, Connecticut. Outer Island was privately owned until October 1995 when Elizabeth Hird donated the island to the U.S. Fish and Wildlife Service, in memory of her husband Basil Rauch. The island is now managed by the U.S. Fish and Wildlife Service as part of the Stewart B. McKinney National Wildlife Refuge. A partnership between the McKinney NWR and the Connecticut State University system has been established to provide access for educational and research programs on the island. Several existing websites feature Outer Island, but each of these websites have glaring deficiencies and a comprehensive website needs to be established to serve our research and educational programs. The Outer Island website is designed to accomplish the following goals: (1) to increase the awareness of educators in Connecticut of the opportunity to accompany CSU faculty and staff on an educational experience to Outer Island and to integrate Long Island Sound environments into their science curriculum; (2) to increase the number of individuals and groups (schools, nature centers, youth groups, etc.) visiting Outer Island each year; (3) to provide a pre-visit and post-visit tool for educators to use in support of their curriculum for increasing student knowledge concerning the ecology of Outer Island and Long Island Sound; and (4) to serve as a general introduction to marine ecology and increase student awareness of the importance of protecting and preserving the diverse natural habitats within Long Island Sound.

Results to Date/Significance

The website development started during the Spring 2012 with the conceptual design of the website. We selected iPage (ipage.com) to host the website (3 year initial contract) and the domain name outerisland.org has been registered for our use through 2022. The website is now fully functional and serves as an important portal for communicating Outer Island programs and activities with the Connecticut Shoreline community. We continue to upgrade the capabilities of the website to improve our outreach and educational activities in the classroom and on the island.

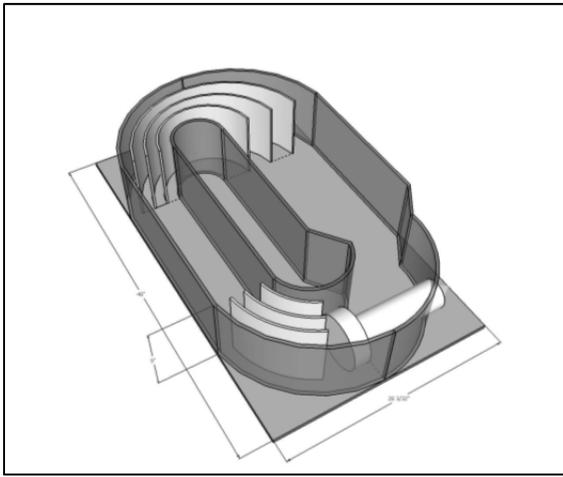
Effects of water flow on the capture ability of the temperate coral *Astrangia poculata*

Faculty Dr. Sean Grace
 Biology, SCSU

Student Participant(s)

Sarah Koerner, Biology, Undergraduate Student (Biology Honors Major)

Recent work suggests that water flow is important in explaining many aspects of a sessile organism's ecology and physiology. Small, sessile aquatic organisms like corals, anemones and sponges carry on simple respiration, in which dissolved oxygen diffuses into their cells from the surrounding water and carbon dioxide diffuses out of their cells back into the water, so that no specialized respiratory structures are needed. In addition to renewal of essential gases, water flow and mixing provide a continuous supply of nutrients and prey which allows some animals (for example, anthozoans like anemones, corals and hydroids) to feed as passive suspension feeders. Though this may appear to be an ideal feeding mechanism energetically, it has clear mechanical constraints. When water flow is very high, holding structures such as tentacles into the flow to capture prey may be difficult or impossible and polyps may collapse because of the water strain. Laboratory studies will be designed to determine the relative importance of water flow on the feeding biology of *A. poculata*. Laboratory experiments will be completed in a recirculating flume, (Vogel style racetrack flume) pictured below powered by a 3hp trolling motor.



Water Quality Monitoring in New Haven Harbor

Faculty Dr. Vincent T. Breslin
 Science Education and Environmental Studies
 Dr. James Tait
 Science Education and Environmental Studies

Student Participants

Summer 2012; Fall 2012; Spring 2013

Hollie Brandstatter, Undergraduate Student, Marine Studies

Spring 2013

Tiffany Ng, Undergraduate Student, Environmental and Marine Studies
Alex Fertel, Environmental and Marine Studies

Long Island Sound is an ecologically diverse environment with rich and varied ecosystems for marine organisms while also providing important environmental and recreational services for Connecticut and New York residents. Despite its ecological and economic importance, water quality throughout the Sound is vastly under-monitored, particularly in the especially vulnerable and densely populated coastal embayments. The Long Island Sound Study recently highlighted the importance of expanding and integrating water quality monitoring efforts throughout the Sound to provide uniform, reliable near-shore monitoring data to watershed managers and the broader scientific/technical community. In response, students and faculty of the Center for Coastal and Marine Studies at SCSU recently established a long-term water quality monitoring program at Long Wharf Pier, New Haven harbor. Weekly water quality testing began at this location in January 2012. Water quality testing at this location occurs once per week coinciding with high tide. Water quality and meteorological parameters measured include salinity (ppt), specific conductance (mS/cm), dissolved oxygen (mg/L), air and water temperature (°C), wind speed (m/s), relative humidity (%), light intensity (lux), secchi disk depth (m), turbidity (NTU), and pH. Chlorophyll *a* measurements at this location will begin in March 2013.

Results to Date/Significance

Water quality monitoring was initiated on January 31st, 2012. To date, we have completed one continuous year of monitoring and are now monitoring water quality at this location for a second year. Water temperature (4.6-25.9 °C) at the pier at Long Wharf, New Haven displays a typical seasonal trend. Dissolved oxygen concentrations (1.65 – 13.25 mg/L) at this location also vary with temperature as oxygen solubility in water is a function of water temperature (greater solubility at lower water temperature). Salinity at this location at high tide varies within a narrow range from (19.2 – 26.9 ppt). Water clarity at this location, as measured using a secchi disk, ranges from 0.5 – 2.3 meters. The ranges of these values for these water quality parameters are typical for similar water parameters reported for other LIS coastal embayments. The water quality monitoring program will be networked with other similar citizen/scientist water quality

monitoring programs throughout LIS. Towards this goal, Dr. Breslin attended the Long Island Sound Embayment Monitoring Project Eastern Connecticut Regional Stakeholder Meeting, UCONN Avery Point Campus, December 17, 2012. Results of the water quality monitoring program will be presented at the Long Island Sound Research Conference, April 2013.

The purchase of a Shimadzu UV-2600 UV/VIS Spectrophotometer was completed in January 2013 with additional funding from the Werth Family Foundation. The Shimadzu UV-2600 features a wide UV/VIS wavelength range (185-1400 nm) and is an optically true double beam instrument, ensuring long-term photometric stability and improved precision. The Shimadzu UV-2600 also features a high bandwidth resolution (variable from 0.1 to 5.0 nm) sufficient to resolve the absorbance peak of narrow bandwidth typical of chlorophyll-*a*. The water quality monitoring program includes the analysis of chlorophyll-*a*. Chlorophyll is the key biochemical component in marine phytoplankton (microscopic plants) responsible for photosynthesis. SCSU purchase a Dell desktop computer and monitor to run the UVProbe software in support of the Chlorophyll *a* analyses. Chlorophyll-*a* measurements will begin in March 2013.

Spatial Variation of Sediment Metals in Bridgeport and Black Rock harbors

Faculty Dr. Vincent T. Breslin
 Science Education and Environmental Studies

Student Participants

Summer 2012; Fall 2012; Spring 2013

Hollie Brandstatter, Undergraduate Student, Marine Studies
Damian Grzybko, Undergraduate Student, Biology and Marine Studies

Bridgeport Harbor is one of the largest ports of entry in Connecticut and plays a pivotal role in the transportation infrastructure and future economic development of the state. Black Rock harbor, immediately to the west of Bridgeport harbor, is essentially a heavily industrialized tidal inlet. Both Bridgeport and Black Rock harbors have been historically characterized by industrial development and are urbanized throughout their respective watersheds. This study examines the physical characteristics and metal contamination in sediments within Bridgeport and Black Rock harbors. The specific objectives of this research are to: (1) conduct a high spatial resolution sampling of the sediment representative of the entire length of the river and harbor areas; (2) measure the chemical (zinc, copper, manganese and iron) and physical (texture, grain size, loss on ignition) properties of the sediment; and (3) determine the extent of anthropogenic metal contamination in the sediment through a comparison of the results of this study with other similar coastal rivers and embayments in Long Island Sound.

Results to Date/Significance

Surface sediment samples were collected from each harbor using a ponar grab aboard the R/V Catherine Moore on August 8, 2012. Ten sediment samples were collected within Black Rock harbor ranging from the northern reaches of the harbor south out into Long Island Sound.

Similarly, eleven sediment samples were collected from within Bridgeport harbor, primarily focusing on sampling the navigation channels within the harbor. Bridgeport harbor was last sampled by CCMS researchers in 2002. Sediment metal concentrations in both Bridgeport and Black Rock harbors are among the highest measured in Connecticut coastal embayments. In particular, Black Rock harbor sediment metal contents ranged from 1.60-3.59% for iron, 60-2170 mg/kg for copper, 0.14-1.65 mg/kg for mercury and 84-1440 mg/kg for zinc. Sediment loss on ignition varied from 3.77-14.8%. These highest measured copper, zinc and mercury concentrations are 30-100 times their respective crustal abundances. Similar to other coastal harbors, variations in sediment metal concentrations generally reflected differences in sediment type, with higher metal concentrations associated with high loss on ignition, well sorted, fine-grained sediment.

Sediment Metal Contamination in the Lower Connecticut River Estuary

Faculty Dr. Vincent T. Breslin
 Science Education and Environmental Studies

Student Participants

Summer 2012; Fall 2012; Spring 2013

Hollie Brandstatter, Undergraduate Student, Marine Studies
Damian Grzybko, Undergraduate Student, Biology and Marine Studies

Summer 2012; Fall 2012

Gene Wenkert, Undergraduate Student, Environmental and Marine Studies

The CT river contributes about 70% of the total upstream load of most pollutants to LIS. Many New England towns and cities have a long history of industrial activity and legacy deposits of contaminants in upland watershed sediments continue to be a strong source for LIS. During high river flows, water velocities are sufficient to re-suspend sediment-associated contaminants and deposit them downstream in another reach of the river. The recent CT river flows associated with tropical storm Irene in August 2010 transported tremendous volumes of sediment to the mouth of the Connecticut river. Fine-grain, metal rich sediment containing legacy pollutants are remobilized during flood events and deposited preferentially in sheltered coves along river estuaries. Research has shown that the marsh and cove sediments in the tidal areas of the Housatonic river estuary are strongly enriched in Hg, Zn and Cu remobilized by floodwaters from upstream deposits. As such, the chemical and physical characteristics of tidal cove sediments in the lower CT river estuary will be a focus of this study. This study will test the following hypotheses: (1) physical properties of the river channel and cove sediments will vary from fine-grain, high organic matter content in the river coves to coarser, low organic matter content in the river channels and outside the mouth of the river in LIS; (2) metal contamination will be highest in fine-grained high organic matter content sediment proximate to point sources of contamination; and (3) metal contamination, particularly in the river coves, throughout the

lower CT river estuary will be greater than both their respective crustal abundances and the extent of metal contamination in sediment sampled from LIS.

Results to Date/Significance

Fifteen surface sediment samples were collected on June 19th, 2012 aboard the R/V Lowell Weicker from 13 stations along the Connecticut River estuary from Hamburg Cove south to Long Island Sound. Results show that the sediment metal contents ranged from 0.49-3.93% for iron, 2.5-57.9 mg/kg for copper, 0.005-0.214 mg/kg for mercury and 35.4-189 mg/kg for zinc. Sediment loss on ignition varied from 6.31-10.2%. Although sediment metal concentrations varied greatly, they generally reflected differences in sediment type, with higher metal concentrations associated with high loss on ignition, well sorted, fine-grained sediment. Results show that sediment copper and zinc contents are slightly elevated above their respective crustal abundances and are similar to previously reported NOAA (1994) mean sediment metal concentrations

Two sediment cores were also collected from Hamburg cove during the June 19th cruise. The cores have been sectioned into 4 cm layers over the length of each respective core. The core sections have been freeze-dried and are in the process of being acid-digested prior to metal analysis by atomic absorption spectrophotometry.

II. Center-Directed/Sponsored Seminars

A goal of the Center is to conduct interactive faculty/student research and educational outreach programs that elucidate findings and provide public education on Long Island Sound and environs at all levels, including public schools, parochial schools, communities, and governmental agencies. As such, the Center sponsors an annual seminar series in the spring of each year. Center faculty invited four regional experts during the Spring 2012 to discuss topics concerning the health and quality of Long Island Sound and its environs as part of the **Ninth Annual Seminar Series on Environmental Issues of Long Island Sound 2012**. Partial support for the seminar series was provided by a \$2,500 SCSU Faculty Development Grant awarded to Drs. Breslin, Tait and Grace.

The seminar series was consisted of four separate one-hour seminars by invited experts on Long Island Sound environmental issues during the Spring 2012 semester. The list of speakers and topics is given below. A number of faculty teaching marine science, marine biology, geography, zoology, environmental science and earth science courses during the Spring 2012 semester attended and encouraged their students to attend the seminar series. A primary goal of the seminar series is to distribute information about Long Island Sound research among faculty and to encourage interdisciplinary collaborative research at SCSU.

Date	Seminar	Attendance
3/27/12	Climate Change and Vulnerabilities in Long Island Sound: What Should We Do? Jennifer J. Pagach Office of Long Island Sound Programs, Connecticut Department of Energy and Environmental Protection, Hartford, CT	26

EPA's Long Island Sound Study allocated funds for the development of a dynamic Sentinel Monitoring Strategy for Climate Change in Long Island Sound to answer questions we all have, like what will Long Island Sound (LIS) be like 50 or even 100 years from now? Will blue crabs completely replace lobsters? Will palm trees grow along our shores? A core team of scientists and resource specialists from EPA's Long Island Sound Study (LISS), Connecticut Department of Environmental Protection (DEP), the Connecticut Sea Grant Program, New York Department of Conservation, and New York Sea Grant are leading the strategic planning effort with funding provided by EPA. The strategic plan will form the basis for a specially designed, long-term monitoring program to identify LIS resources that are most vulnerable to climate change and most critically in need of management. These efforts will ultimately enable us to develop appropriate adaptation strategies to protect the Sound's biodiversity and significant natural resources. The seminar examined the vulnerability of Connecticut's shorelines and coastal infrastructure to predicted sea level rise and flooding due to hurricanes. Online mapping tools are now available to examine coastal flooding scenarios due to sea level rise and coastal storms out to 2080. While Groton and state and federal government agencies have initiated adaptation strategies, it will take additional and continued stakeholder involvement and support for coordinated and successful adaptation to occur. This seminar discussed lessons learned and identified resources so other coastal communities can begin or continue their adaptation planning process.

4/18/12	Tropical Cyclones and Paraglacial Landscapes: Hurricane Irene's Impacts on the Connecticut River Jonathan D. Woodruff Assistant Professor, Department of Geosciences, University of Massachusetts, Amherst, MA.	29
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In 2011 Hurricane Irene inundated the uplands of the Connecticut River watershed with as much as 250 mm of rain in less than 12 hrs. Flooding was extreme within the Deerfield tributary (1440 km²), reaching 3100 m³/s, the flood of record for the river. Landslide and gully erosion along the Deerfield valley walls, as well as scour and incision within the main channel mobilized clays and silts within glaciolacustrine and till deposits. Once suspended, fines were routed directly to the Connecticut River mouth, resulting in record-breaking sediment loads 5-times greater than predicted from the pre-existing rating curve. Over the 3 days of peak flooding approximately 1.2 Mtonnes of sediment were transported through the low-lying reach of the Connecticut River. As much as 40% of this total load was derived directly from the Deerfield River, resulting in a sediment yield of 350 tonnes/km² for the tributary (one-to-two orders of magnitude greater than annual yield estimates for glaciated tributaries in the region). When

compared to sedimentation from the preceding spring freshet, resultant deposition from Irene in off-river ponds and coves is anomalously low in organics, is finer grained, and exhibits higher K/Zr ratios. This unique sedimentary imprint is consistent with the enhanced fluvial supply of glacial fines from upland tributaries during the event, which served to dilute particulate organics during transport, and cap contaminated industrial depocenters downstream with a relatively clean, inorganic, clay/silt layer. Results point to the important role of tropical cyclones in removing glacial sediments from the uplands for major North American rivers along the western Atlantic slope, as well as their unique depositional signature within lower-lying reaches.

4/25/12 Sustainable Seafood from Long Island Sound 30

Bun Lai

Sushi Chef and Owner of Miya's Sushi, New Haven, CT

Chef Bun Lai described his philosophy of preparing locally accessed, sustainable sushi, often prepared using invasive species to Long Island Sound. Chef Lai began to think about how serving invasive species could help curb their dominance in the ecosystem while also reducing the stress on more commonly served fish. For example, Chef Lai described Asian shore crabs as one of the crown jewels of his menu. He catches thousands in early December when they molt and become soft shell and freeze them for winter use. In spring he forages and serves Japanese knotweed. Japanese knotweed is listed as one of the world's 100 worst invasive species and typically crowds out other herbaceous species. Chef Lai describes it as crunchy, juicy and tart and it's one of the best natural sources of resveratrol, which has been shown to have anti-cancer, anti-inflammatory and blood-sugar-lowering benefits. But it isn't just about fish. Miya's Sushi doesn't want to be sustainable in one way but not another. They use only organic produce, compostable take-out containers and reusable metal chopsticks. Miya's Sushi also features a "Sushi for the Masses" menu to show that sustainable and affordable are not mutually exclusive concepts. Chef Lai brought samples of his sushi for the students to sample during the seminar presentation.

5/2/12 The Urban Estuary: What Doesn't Kill Ya, Only Makes Ya Cancel
Stronger (a case study of contaminants in the Arthur Kill,
NY/NJ Harbor Estuary)

William G. Wallace

**Professor, Biology Department, College of Staten
Island, Staten Island, NY**

This seminar unfortunately had to be canceled due to an illness. Dr. Wallace has been rescheduled to present a seminar during the Spring 2013 Long Island Sound seminar series.

III. Collaborations and Partnerships

As part of our continuing efforts to strive for excellence in research and public education and outreach the Center will focus on establishing working relationships with different local, state, and federal groups and agencies that share this common interest and focus. Each year, the Center provides information concerning the number and nature of collaborations established. Examples of recent and on-going Center partnerships include:

Department of Earth and Environmental Sciences, Wesleyan University: Dr. Tait has established research collaborations with Dr. Suzanne O’Connell and Dr. Johan Varekamp focused on salt marsh dynamics, coastal erosion, and marine sedimentation. He has also served as a thesis advisor to Tracy Krueger, a master’s student, who studied erosional processes at Griswold Point in Old Lyme. Dr. Breslin has collaborated with Professor Johan Varekamp in the preparation of a manuscript titled “Contaminants in Long Island Sound: Sources, Magnitudes, Trends and Impacts. The manuscript is being prepared for inclusion as a chapter in the Long Island Sound Synthesis book scheduled for publication in August 2013.

Department Energy and Environmental Protection – Hammonasset State Beach: Dr. Tait is working with Jack Hine, superintendent of Hammonasset State Beach to monitor beach erosion and estimate potential offshore sands supplies that could potentially be used for beach nourishment.

Cities of East Haven and West Haven: Dr. Tait and his research assistants are working with Mark Paine, Assistant Commissioner of Public Works for the city of West Haven in documenting and assessing on going beach erosion problems. Communications with Kevin White, City Engineer, and Peter Leonardi, Flood and Erosion Commissioner for the city of East Haven is pending completion of beach profile and storm flood plain analysis. The goal is to provided erosion and storm assessment and planning advice.

Department of Natural Resources, State of Maine, Boothbay Harbor: Dr. Grace has had an ongoing relationship with this marine center for the lobster aging study for the past 4 years. This center provides the laboratory space and equipment needed for the dissection of lobster brains in support of the grant awarded to Dr. Grace. See for reference:
<http://www.maine.gov/dmr/index.htm>.

Department of Biology, University of Maine, Machias: Dr. Grace has recently collaborated with Dr. Brian Beals, professor in the biology department at the University of Maine at Machias. Specifically, Dr. Beals has provided Dr. Grace and the center with known age lobsters that have been held in cages along the coast of Maine representing varying temperature regimes. These lobsters will be used to examine the question of how do lipofuscin concentrations differ in known age animals raised at different temperatures. See for reference:
<http://www.umm.maine.edu/>.

School of Marine and Atmospheric Sciences, SUNY at Stony Brook, NY

Dr. Breslin worked collaboratively with Dr. Bruce Brownawell on a research project examining quaternary ammonium compounds as sewage-source specific tracers of processes affecting the

distribution of contaminants and sediments in Hempstead Bay, a Long Island coastal lagoon. Dr. Breslin and his students examined sediment metal concentrations in Hempstead Bay in an effort to correlate patterns in trace metal concentrations with organic sewage tracers at these same locations.

Department of Chemistry, Coast Guard Academy, New London, CT: Capt. Richard Sanders, has agreed to assist Dr. Grace and Sarah Koerner with the collection of corals from Narragansett Bay and Long Island Sound in support of the coral feeding studies.

Norm Bloom and Son, LLC. 7 Edgewater Place, Norwalk, CT.

Norm Bloom provided two boats equipped with oyster dredges to support Dr. Breslin's oyster sampling in Norwalk harbor in June 2011. Oysters were collected from oyster beds leased and cultivated by Norm Bloom and Sons, LLC.

IV. Community Outreach, Education, and Research Communication

A continuing goal of the Center is to establish and maintain a variety of community outreach programs that include educational activities at many levels, as appropriate. An important function of the Center will be to prepare and distribute educational materials, including new curriculum, that focus on the importance of Long Island Sound and environs. Communication of research results will be an important role for this Center. It is an expectation that all participating faculty and students will communicate the results of their research to the scientific community, appropriate government agencies and the local community. A list of 2012-2013 research presentations is listed below:

Presentations

Brandstatter, H. and V.T. Breslin. 2013. (Poster). New Haven Harbor Water Quality Monitoring Program. *Long Island Sound Research Conference*, Danfords Hotel & Marina, Port Jefferson, NY. April 19th, 2013.

Wenkert, G. and V.T. Breslin. 2013. (Poster). Spatial Variations in Surface Sediment Mercury in Connecticut Coastal Embayments. *Long Island Sound Research Conference*, Danfords Hotel & Marina, Port Jefferson, NY. April 19th, 2013.

Breslin, V.T., M. LaVallee and G. Wenkert. 2013. (Poster). Mercury Accumulation in Long Island Sound Bluefish. *Long Island Sound Research Conference*, Danfords Hotel & Marina, Port Jefferson, NY. April 19th, 2013.

Schubel, J. R., Fraser, J. and V.T. Breslin. (2013). Town Hall: Informal Ocean Science Education: Trends and Opportunities. ASLO 2013 Aquatic Sciences Meeting, Ernest N. Morial Convention Center, New Orleans, LA. February 20, 2013.

Breslin, V.T. (2012). Legacy and Emerging Contaminants in Long Island Sound: Are We Fouling Our Own Nest? Invited Speaker, Pathways to Academic Excellence Program (PAcE), Southern Connecticut State University, New Haven, CT October 12, 2012.

Coyne, M. and J. Tait. (2013). Sediment copper and zinc zonation at Norwalk Harbor and the Norwalk Islands. *Long Island Sound Research Conference*, Danfords Hotel & Marina, Port Jefferson, NY. April 19th, 2013.

Tait, J. (2012). Energy Asymmetry, Urbanization, and the Fate of the Connecticut Coast. Invited Speaker, Pathways to Academic Excellence Program (PAcE), Southern Connecticut State University, New Haven, CT. March 2, 2012.

Tait, J. (2012). SENCER 101 – Engaging students in science through having students *do* science of value to the community. SENCER New England Regional Meeting, Wheelock College, Boston, MA. October 27, 2012

Tait, J. (2012). Institutionalizing SENCER at a State University - Strategies and Pedagogies. SENCER Summer Institute, Santa Clara University, Santa Clara, CA. August 2 – 6, 2012.

Publications

Varekamp, J.C., A.E. McElroy, J.R. Mullaney, B.J. and V.T. Breslin. (*in press*). Metals, Organic Compounds, and Nutrients in Long Island Sound: Sources, Magnitudes, Trends and Impacts. Chapter 5. *Long Island Sound: Prospects for an Urban Sea*. Editors: Latimer, Swanson, Tedesco, Yarish, Stacey and Garza. Publisher: Springer Series on Environmental Management.

LaVallee, M.E., D. Oshana and V.T. Breslin (2012). Trends in eastern oyster tissue metals in Connecticut harbors and estuaries. Abstracts of Technical Papers, Milford Aquaculture Seminar, *Journal of Shellfish Research*, 31(1): 221.

Participation

Breslin, V.T. (Invited Participant). Centers for Ocean Sciences Education Excellence (COSEE) Inquiry Group on Ocean Literacy Resources Meeting. New York Hall of Science, New York, NY. October 23-24, 2012.

Breslin, V.T. (Invited Participant). Long Island Sound Embayment Monitoring Project. Eastern Connecticut Regional Stakeholder Meeting, UCONN Avery Point Campus, December 17, 2012.

Student Theses and Reports/Advisors

Callie Gecewicz, Biology, Graduate Student (Master's Thesis: Spring 2012)

Lipofuscin concentrations at varying temperatures in the American Lobster

Megan Coyne, Honors Thesis, Marine and Environmental Studies. (Advisor: Tait)

A Study of the Spatial Relationships Amongst Grain Size, Organic Content and Metal Contamination in the Sediments of Norwalk Harbor, Connecticut. May 2012.

Neil Geist, Masters Thesis, Environmental Education. (Advisor: Breslin)

Incidence of Disease and Growth Abnormalities in Eastern Oysters (*Crassostrea virginica*) vs. Incidence of Heavy Metal Tissue Content from Three Sites in Long Island Sound. August, 2013.

Grants

Sediment Metal Contamination in the Lower Connecticut River Estuary. Connecticut State University 2012 Research Grant. Project Duration: June 1, 2012– May 30, 2013. PI – V.T. Breslin. Total Funds \$4,000.

Contaminant Metal Analysis of Hempstead Bay Sediment, Long Island Sound. Subcontract: Bruce Brownawell, SOMAS, SUNY at Stony Brook. Project Duration: June 1, 2012– September 1, 2012. PI – V.T. Breslin. Total Funds \$2,500.

Ninth Annual Seminar Series on Environmental Issues in Long Island Sound. Southern Connecticut State University Faculty Development Grant. Spring 2012. PIs – V.T. Breslin, S. Grace and J. Tait. Total Funds \$2,500.00.

VI. Accounting, Budget Expenditures and Grant Writing

Academic Year 2012-2013 Itemized Budget Justification

Funds totaling \$55,000 were requested for Year 7 to support the research and educational mission of the Center (see attached budget spreadsheet). Three columns are shown in the budget sheet showing the Werth Foundation request, the Werth Foundation Fund Disbursement (how dollars were actually spent) and the SCSU Matching Funds (dollars committed by the University or obtained from other sources).

Professional Salaries

Werth Foundation funds were used in support of salaries for faculty mentoring students during the Summer 2012 and Spring 2013. Professors Breslin (\$3,000) and Tait (\$2,000) were compensated for mentoring student research projects. Fringe benefits on faculty salaries totaled \$900. CCMS will contract a web designer (\$1,500; Janet Colandrea) to update and maintain the CCMS website during Spring 2013. CCMS provided salary (\$1,000) during the Spring 2013 for Dr. Scott Graves, Science Education and Environmental Studies, to provide expertise and oversight of the Outer Island website development. The website is an important component of our education and outreach activities. The SCSU Dean of Arts & Sciences provided faculty reassigned time (3 credits time each for Breslin and Tait) during the academic year in support of

managing the CCMS activities and programs. The reassigned time allows faculty a lesser teaching credit load and the 6 credits time are valued at \$11,934.

Student Research Fellowships

A major portion of the Center budget consists of funds in support of undergraduate and graduate student summer research stipends. A major goal of the Center is to increase undergraduate student participation in the processes of “doing science” through participation in faculty guided research projects. The CCMS awarded fellowships during Summer 2012 (5 students; \$8,600), Fall 2012 (5 students; \$5,800) and Spring 2013 (8 students; \$5,900). Fellowship amounts per student ranged from \$500-\$2,000 per semester (25-200 hours @ \$10/hour). The CCMS has a system-wide mission to support student research. This past year, the CCMS supported ten different students in five different academic fields (Biology, Chemistry, Marine Studies, Geography and Honors) in support of faculty-directed research projects during this past year totaling \$20,300.

Travel Funds

Travel funds totaling \$1,500 were budgeted to reimburse costs associated with travel in support of field sampling activities and attendance at local, regional and national scientific meetings. Students and faculty completing their research projects are expected to give talks or poster presentations at scientific meetings. Travel funds (\$344) have been encumbered to support the travel of one faculty member and two students presenting posters at the Long Island Sound Research Conference, Port Jefferson, NY, April 19, 2013. Additionally, CCMS funds supported Dr. Breslin’s travel (\$1,802) to American Society of Limnology and Oceanography Aquatic Sciences Meeting in New Orleans, LA March 18-21, 2013. Dr. Breslin will be attending a session concerning Long Island Sound science and management and presenting work at a Town Hall Session concerning Informal Science Education Opportunities on Wednesday March 20.

Permanent Equipment and Service Contracts

Funds in this budget category were used to purchase a service contract for fiscal year 2012-2013 for the PerkinElmer Analyst 800 Atomic Absorption Spectrophotometer (\$6,720). SCSU provided matching funds support by purchasing a one year service contract (2012-2013) for the Milestone DMA 80 Direct Mercury Analyzer (\$4,350). The Werth Foundation generously provided additional funds (\$13,221) to allow for the purchase of a Shimadzu UV-2600 UV-VIS Spectrophotometer. The purchase and installation of a Shimadzu UV-2600 UV/VIS Spectrophotometer was completed in February 2013. SCSU provided additional funds (\$1,458) to support the purchase of computer equipment for use in support of the spectrophotometer. The Shimadzu UV-2600 features a wide UV/VIS wavelength range (185-1400 nm) and is an optically true double beam instrument, ensuring long-term photometric stability and improved precision. The Shimadzu UV-2600 also features a high bandwidth resolution (variable from 0.1 to 5.0 nm) sufficient to resolve the absorbance peak of narrow bandwidth typical of chlorophyll-*a*. The spectrophotometer will be used for chlorophyll-*a* analysis in support of the New Haven harbor water quality monitoring program.

Ship Time

Funds for chartering ship time were budgeted (\$4,500) to provide access to field sample sites for research and education along the Connecticut shoreline and in Long Island Sound. Werth Foundation funds supported two research/education cruises in New Haven harbor (\$1,050). CCMS researchers chartered the R/V Island Rover, Sound School, New Haven, CT. The cruises were chartered in support of sediment sampling activities. Funds totaling (\$1,049) were used to charter the R/V Lowell Weicker, UCONN Avery Point, in support of the Connecticut River sediment sampling cruise on June 12, 2012. Funds totaling \$700 were used to charter the R/V Catherine Moore, Bridgeport Aquaculture Vocational Technical School, in support of sediment sampling in Bridgeport and Black Rock harbors on August 8, 2012. We anticipate using remaining funds later this spring 2013 to charter the R/V Island Rover in support of educational cruises in New Haven harbor for the graduate EVE 552 Long Island Sound course.

Publication Costs

A total of \$600 was budgeted for publication costs for FY 2012-2013. Funds (\$80) were used to support the printing of large format posters for presentation at regional meetings. Funds totaling \$506 were used to purchase textbooks, including Standard Methods for the Examination of Water and Wastewater. The textbooks will be used in support of CCMS research programs.

Expendable Supplies

Funds for laboratory and office supplies (\$5,000) were budgeted to allow the purchase of materials in support of the CCMS research and educational initiatives. Supply funds were used to purchase laboratory chemicals and supplies for the sediment metals research and laboratory supplies and field supplies for the sediment grain size and beach surveying research (\$3,869). Supply purchases include the purchase of a wet suit (\$440) for students surveying beaches and navigation software (\$768) for use in planning sediment sampling cruises and for the determination of tide height times in support of the water quality monitoring program. Additional funds were used for the purchase of chemicals, supplies and reagents for chlorophyll *a* determinations and general office supplies. Additional supply funds will be used in support of student-faculty research projects during Spring 2013.

Balance of Funds

To date, CCMS has a balance of \$4,519. The majority of the unencumbered funds are earmarked for ship time (\$1,700), laboratory supplies (\$1,131) and student stipends (\$1,700). We anticipate utilizing the remaining student stipend funds and laboratory supply funds prior to the end of the fiscal year in June. CCMS faculty are also scheduling a research/educational New Haven harbor cruise for SCSU graduate students later this spring 2013.

Matching Funds

Each of the following grant awards listed have been used in support of CCMS research and education activities.

Connecticut State University Research Grant Award 2012

Sediment Metal Contamination in the Lower Connecticut River Estuary. Connecticut State University 2012 Research Grant. Project Duration: June 1, 2012– May 30, 2013. PI – V.T. Breslin. Total Funds \$4,000.

Contaminant Metal Analysis of Hempstead Bay Sediment, Long Island Sound. Subcontract: Bruce Brownawell, SOMAS, SUNY at Stony Brook. Project Duration: June 1, 2012– September 1, 2012. PI – V.T. Breslin. Total Funds \$2,500.

SCSU Faculty Development Grant 2012

Ninth Annual Seminar Series on Environmental Issues in Long Island Sound. Southern Connecticut State University Faculty Development Grant. Spring 2012. PIs – V.T. Breslin, S. Grace and J. Tait. Total Funds \$2,500.00.