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1. Poster Title: *The External Data Project: Harvesting Stream Biomonitoring Data from Citizen Monitors*

Principle Investigators: Alene Onion[1], Alexander Smith, and Margaret Novak, NYSDEC Division of Water

[1]*Corresponding author:* Hudson River Estuary Program, NYS Dept. of Environmental Conservation, 4th Floor, 625 Broadway, Albany, NY 12233-3502, amonion@gw.dec.state.ny.us

Abstract: The New York State Department of Environmental Conservation (NYS DEC) is piloting a project in the Hudson River Estuary to harvest stream monitoring data collected by Citizen Monitors. This project is called the External Data Project and will accept stream monitoring data from two categories. Data accepted from citizens with professional credentials will be used equivalent to data collected by the NYS DEC. "*Wadeable Assessments by Volunteer Evaluators*" (WAVE) provides a simple yet valuable analysis for volunteers that identifies stream segments which satisfy the "unimpaired" assessment category in the Waterbody Inventory. This method cannot identify "impaired" stream segments but volunteers are encouraged to report samples that contain mostly the "Least Wanted" category for further investigation. If this project is successful, it will extend to the rest of the state the following year pending funding and staff time.

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2. Poster Title: *Citizens' Water Monitoring Project: The River Project and the New York City Water Trail Association*

Principal Investigators: Rob Buchanan[1], Nina Zain[2], Nancy Brous[3]

[1]Eugene Lang College, The New School for Liberal Arts
[2]The River Project
[3]New York City Water Trail Association

[1] *Corresponding author:* Eugene Lang College, The New School for Liberal Arts, 65 West 11th Street, New York, NY 10011, buchanan@newschool.edu

Abstract: Last fall, The River Project and the New York City Water Trail Association teamed up to run a pilot water-testing program specifically aimed at detecting *Enterococcus*, a bacterium that's generally considered the best indicator of the presence of human sewage in salty or brackish water. For six weeks, volunteers from community boathouses up and down the West Side of Manhattan and in Brooklyn collected weekly water samples and brought them to The River Project lab, on Pier 40 in lower Manhattan, for bacterial testing. Our poster will show the results of our testing and the locations where we sampled, as well as the expanded list of sites where we will be testing this season.

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3. Poster Title: *Keepin' it eel: fish conservation through multiple levels of life stages, stream habitats, and community involvement*

Principal Investigators: Chris Bowser[1], Sarah Mount[2], Zoraida Maloney[3]

[1] NYSDEC Hudson River Research Reserve and Estuary Program, Cornell Water Resource Institute
[2] NYSDEC Hudson River Research Reserve and Constitution Marsh Audubon
[3]NYSDEC Hudson River Estuary Program and Student Conservation Association

[1] *Corresponding author:* NYSDEC Hudson River Research Reserve and Estuary Program, with Cornell Water Resource Institute; chbowser@gw.dec.state.ny.us

Abstract: Eels are important migratory fish along the entire Atlantic Coast, yet recent declines are poorly understood. The Eel Project, initiated by the New York State's Hudson River Estuary Program and Research Reserve, involves over 300 diverse community members in shared goals and methodologies to study juvenile eels during their migrations from sea to stream. In part one, fyke nets staked in nine tidal stream mouths are checked daily to provide a quantitative assessment of which streams support the largest ingresses of young eels. In part two, total fish diversity of stream reaches above and below dams are determined through electroshock surveys, which has demonstrated that dams strongly limit eel densities. In part three, simple trap-and-pass eel ladders are used to get eels of multiple ages and sizes above unnatural barriers so that greater numbers can exploit more habitat area, in the hopes that those streams can support a higher egress of adult breeding eels. At all levels, the project uses trained students, interns, watershed groups, and non-profits as citizen-scientists to increase the geographic range and diversity of sites and community involvement. Species face conservation challenges not just in "far-away" places but in our local waterways as well. This project connects outreach, research, and multi-level management with a unique migratory fish that many scientists feel is imperiled coast-wide.

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4. Poster Title: *The Effects of Organic Matter on Metal Cycling in Wetland Soils*

Principle Investigators: Heili Lowman[1]; Alison Keimowitz

[1] *Corresponding author, Vassar College;* heili.lowman@gmail.com

Abstract: In 2010, the *Deepwater Horizon* oil spill released 206 million barrels of oil into the Gulf of Mexico, much of which washed ashore into coastal wetlands. With such a sizeable addition of organic matter to the natural system, both the water and soil chemistry can feasibly change. The following study aimed to discover the relationship between the addition of organic matter and the presence of metals in solution in a wetland ecosystem. Soil and water samples were collected from Constitution Marsh in Garrison, New York and used to create a series of microcosm incubations. The following microcosm conditions were investigated to establish a spectrum of carbon availability: no added organic matter, sodium acetate, humic acid, decane, and crude oil. Measurements were taken periodically for pH, alkalinity, and total iron concentration. Samples were also extracted for analysis using ion chromatograph (IC) and inductively coupled plasma mass spectrometer (ICPMS) instruments. Iron concentrations were found to noticeably increase over the course of the project, and a distinct difference in concentrations of various chemical species could be seen among the different treatments. However, the more labile carbon sources did not consistently yield greater concentrations of dissolved metals.

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5. Poster Title: *Ranking sinkholes for protection by watershed delineation*

Principle Investigators: Jamye Babosci, David Boehm, Trisha Cockey, Alanna Dolen, Molly Stetz and Paul L. Richards[1]

[1] *Corresponding author: Department of Geosciences, The College at Brockport, 350 New Campus Drive, Brockport, NY 1445,* prichard@brockport.edu

Poster in support of the NYSWRI funded project entitled:
Adapting SWAT for the Assessment of thinly-soiled karst and sinkhole features

Abstract: Twenty five karst features were ranked for management by extracting their watershed divide area and dividing by the area covered by thin soils in order to calculate an index for gauging their sensitivity to groundwater contamination. The study was conducted on the Onondaga escarpment in western New York in an area that has suffered several well contamination events in the past. In this presentation, we discuss the performance of two automated watershed delineation algorithms for performing this analysis: the Jensen and Domingue (JD) and PCSA algorithms. These approaches can be considered to be at opposite ends of the spectrum in their treatment of internally-drained and zero slope regions. The algorithms were tested against the "true" watershed divide mapped in the field to determine if automated approaches can be successfully employed in this landscape. The results suggest that both approaches had issues which occasionally caused inaccurate watershed delineation. The JD algorithm performed well in areas dominated by convergent flow; however it was difficult to apply to linear karst features where flow was down straight hillslopes. Both approaches had issues with road berms, ditches and culverts which led to inaccurate watershed delineation. Catchment / Effective areas indices ranged from 621 to 1. Despite their issues, the automated methods performed well in ranking the sites, with spearman's rho coefficients of 0.95 and 0.93 for JD and PCSA respectively. Road berms, ditches and culverts tend to decrease the effective size of the catchments; however, they may be a source for runoff and pollutants.

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6. Poster Title: *Baseline evaluation of groundwater quality in central New York in the face of shale gas development*

Principle Investigators: *Lauren E. McPhillips[1], Creamer, Anne Elise[2], Walter, M. Todd[2], Rahm, Brian[3], Riha, Susan[3]*

[1,2] Department of Biological and Environmental Engineering, Cornell University, Ithaca NY
[3]New York State Water Resources Institute, Ithaca NY

[1]*Corresponding author:* B62 Riley-Robb Hall, Cornell University, Ithaca NY 14853, lem36@cornell.edu

Abstract: Though New York has had some conventional natural gas drilling for over a century, new drilling technologies are being considered to access potentially vast natural gas resources in the Marcellus shale formation. In order to economically harvest the gas trapped in the tiny pores of this deep formation, high-volume slickwater hydraulic fracturing ("fracking") technology is being combined with horizontal drilling techniques. Currently this practice is prevented by a moratorium in New York as potential environmental impacts of the process are being considered. One of the biggest concerns is the potential for groundwater contamination by chemicals used in the fracking process, or by methane. In the event that this technology is allowed in New York, it is critical that we have a water quality baseline in order to adequately assess the occurrence of any groundwater contamination due to this process. We are currently collecting such baseline data across Chenango County in central New York. Groundwater samples collected from about 125 homes across the county are being analyzed for dissolved solids and dissolved gases. Results on the metals and salts in these water samples will allow future assessment of contamination from fracking fluid. Results from dissolved gases will provide information on how much methane is currently dissolved in the water as well as its source, which will be determined by assessing the ^{13}C composition of the methane. Gathering such baseline water quality data is essential to ensuring the integrity of our state's valuable water resources.

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7. Poster Title: *An assessment of U.S. stream mitigation policy: Necessary changes to protect ecosystem functions and services*

Principal Investigators: Colleen E. Bronner[1,2], Amy M. Bartlett[2], Sarah L. Whiteway[3], Doug C. Lambert[2], Sean J. Bennett[3], Alan J. Rabideau[2]

[2]Civil, Structural and Environmental Engineering, University at Buffalo
[3]Geography, University at Buffalo

[1]*Corresponding author:* 204 Jarvis Hall, Department of Civil, Structural and Environmental Engineering, University at Buffalo, Buffalo, NY 14260; cbronner@buffalo.edu

Abstract: Compensatory mitigation of impacted streams and wetlands has increased over the past two decades, with the associated mitigation industry spending over $2.9 billion in aquatic restoration annually. Despite these large expenditures, evaluations by the National Research Council (NRC) and U.S. Government Accountability Office (GAO) have provided evidence that compensatory mitigation practices are failing to protect aquatic resource functions, and vague federal policy and inadequate evaluation of compensation projects are to blame. An update to federal guidance on compensatory mitigation was released in 2008: the *Compensatory Mitigation for Losses of Aquatic Resources*. Additionally, the *2012 Reissuance of Nationwide Permits* was recently updated and published. Current policy, as reflected in these documents, still uses vague language to direct compensatory stream mitigation leaving most implementation decisions to the local U.S. Army Corps of Engineers (USACE) District. The majority of mitigation federal policy has focused on wetland compensation, paying minimal attention to other aquatic resources and mitigation alternatives. Interest in stream compensatory mitigation is growing. In this poster, weaknesses of current policy and recommended changes to minimize the loss of stream ecosystem services are presented. Compensatory mitigation policy should contain more detailed criteria, to prevent large implementation variations between USACE Districts, and provide clear guidance for watershed scale compensatory stream mitigation. In addition, stronger and more detailed criteria for avoidance and minimization alternatives should be enacted to reduce the need for compensatory mitigation for difficult to restore aquatic resources.

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8. Poster Title: *Vegetation Monitoring in the Tivoli Bays*

Principle Investigators: Sarah Fernald[1,2], Christopher Mitchell[2], Laurel Walker[3], James Schloemer[4]

[2]Hudson River National Estuarine Research Reserve
[3]University of Kentucky
[4]Dutchess County Community College

[1]*Corresponding author:* Hudson River National Estuarine Research Reserve, NYSDEC, Norrie Point Environmental Center, 256 Norrie Point Way, Staatsburg, NY 12580, shfernal@gw.dec.state.ny.us

Abstract: The focus of this study is to assess the impact of climate change stressors, specifically sea level change and increased storm surges, on emergent tidal marsh within the Hudson River National Estuarine Research Reserve (HRNERR) site at the Tivoli Bays, a freshwater tidal system. In the Hudson River Estuary, the anticipated increase in water level of about 50 cm by the end of this century is close to the existing elevation difference between the vegetated lower intertidal community and the *Typha angustifolia* high marsh community. With sea level rise, a conversion of *Typha angustifolia* high marsh to vegetated lower intertidal community is anticipated. There are differences in plant productivity, organic matter dynamics, and biogeochemical processes among these vegetation classes, so changes in cover may affect overall wetland function. The Tivoli Bays were divided into study segments including Outer Tivoli North (OTN), a reference site, Inner Tivoli North (ITN), a site of potential marsh migration, and Tivoli South Bay (TSB), a site impacted by invasive *Trapa natans*. Vegetation transects were established along an elevation gradient from open water to high marsh. Baseline differences detected in the year one results include: 1) In OTN, the percent cover of *Typha angustifolia* within plots absent of the invasive *Lythrum salicaria* was higher than where *Lythrum salicaria* was present; 2) In ITN, plots adjacent to the wooded swamp had the highest species diversity across all study segments; 3) In TSB, there was no difference between the average percent cover of *Acorus calamus* and *Typha angustifolia.*

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9. Poster Title: *Water Level Monitoring in the Tivoli Bays*

Principle Investigators: Sarah Fernald[1,2], Christopher Mitchell[2], Laurel Walker[3], James Schloemer[4]

[2]Hudson River National Estuarine Research Reserve
[3]University of Kentucky
[4]Dutchess County Community College

[1]*Corresponding author:* Hudson River National Estuarine Research Reserve, NYSDEC, Norrie Point Environmental Center, 256 Norrie Point Way, Staatsburg, NY 12580, shfernal@gw.dec.state.ny.us

Abstract: The focus of this study is to assess the impact of climate change stressors, specifically sea level change and increased storm surges, on emergent tidal marsh within the Hudson River National Estuarine Research Reserve (HRNERR) site at the Tivoli Bays, a freshwater tidal system. In the Hudson River Estuary, the anticipated increase in water level of about 50 cm by the end of this century is close to the existing elevation difference between the vegetated lower intertidal community and the *Typha angustifolia* high marsh community. With sea level rise, a conversion of *Typha angustifolia* high marsh to vegetated lower intertidal community is anticipated. There are differences in plant productivity, organic matter dynamics, and biogeochemical processes among these vegetation classes, so changes in cover may affect overall wetland function. To monitor long term changes in water level and marsh inundation, groundwater wells containing tide gauges were installed at the beginning, middle, and end points of vegetation transects along an elevation gradient from open water to high marsh within the Inner Tivoli North (ITN) segment, a site of potential marsh migration. RTK GPS was used to survey the marsh surface elevation to sub-decimeter accuracy, allowing tide gauge data to be converted to water elevation. ITN baseline inundation data was collected from 6/3/11 to 6/17/11, and the storm surge from Tropical Storm Irene was captured 8/26/11 to 9/9/11. A comparison between these two data sets showed that water levels during the storm were 1 meter greater that baseline levels.

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10. Poster Title: *A Regional Earth System Model of the Northeast: Analyzing 21st Century Climate and Environment*

Principle Investigator: Bernice Rosenzweig

City College of New York, bernice.rosenzweig@gmail.com

Abstract: The Northeast region of the United States exhibits many of the changes taking place across the nation, but also provides a unique lens through which to assess options for managing large-scale natural resource systems. This region has a long history of strategic environmental transformations- from early settlement, deforestation and land clearing to industrialization, urbanization and mega-city growth to post-industrialization. Such human actions will continue and arguably be more difficult to manage under the region's rapidly changing climate. Since the atmosphere, terrestrial and aquatic systems are closely linked, a change to any one of these entities holds the potential for system-wide feedbacks, thresholds, and unintended consequences. In the context of climate change and long-term ecosystem response times, environmental management decisions made today will reverberate throughout the remainder of this century. In spite of this, the current capacity of scientists to understand human-environment systems over the regional domain and over multiple decades is limited, as are the tools for planners to formulate sound decisions. This project assembles an interdisciplinary research team from academia and government with expertise in physics, biogeochemistry, engineering, energy, economics, and policy to build a Northeast Regional Earth System Model (NE-RESM) that improves understanding and capacity to forecast the implications of planning decisions on the region's environment, ecosystem services, energy systems and economy through the 21st century.

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11. Poster Title: *Diversity and distribution of antibiotic-resistant bacteria in the Hudson River Estuary*

Principle Investigators: Suzanne Young[1], Gregory O'Mullan[1,2], Andrew Juhl[2]

[1]Queens College CUNY
[2] Lamont-Doherty Earth Observatory, Columbia University

[1]*Corresponding author:* Queens College CUNY, 6530 Kissena Blvd., Flushing, NY, 11367, sdotyoung@gmail.com

Abstract: Sewage indicators and heterotrophic bacteria resistant to tetracycline and ampicillin, two commonly prescribed antibiotics, were assessed in the Hudson River Estuary. Samples were collected from Flushing Bay, an urban watershed of New York City prone to combined sewer overflow, and 10 sites in the Hudson River. The abundance of the fecal-indicator bacteria, *Enterococci*, positively correlated with levels of resistant bacteria, suggesting a shared sewage-associated source. The temporal patterns of sewage indicators and antibiotic-resistant microbes under both dry- and wet-weather conditions were examined. The abundances of culturable ampicillin-resistant and tetracycline-resistant bacteria were positively correlated with one another in paired samples and increased following precipitation events. This correlation supports use of *Enterococcus* as an indicator of water quality conditions potentially hazardous for human contact. Analysis of 16S rRNA genes from isolated microbes identified a phylogenetically diverse group of resistant bacteria, including the genera *Aeromonas*, *Pseudomonas*, *Stenotrophomonas*, and *Escherichia/Shigella*. All of these genera include opportunistic pathogens and have been associated with antibiotic-resistant infections, especially in immuno-compromised individuals. This study is the first to document antibiotic-resistant bacteria in the Hudson River Estuary and to demonstrate a linkage between the abundance of antibiotic-resistant bacteria and levels of sewage contamination. The detection of antibiotic-resistant bacteria poses a threat to the local ecosystem and to public health. Results demonstrate the need for restorative measures in the Hudson River Estuary regarding stormwater management and sewage overflows.

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12. Poster Title: *How is the Water? Measuring sewage contamination in the Hudson River Estuary, 2006 -2012*

Principle Investigators: Gregory O'Mullan[1,2], Andrew Juhl[2], John Lipscomb[3], Tracy Brown[3,4]

[1]Queens College CUNY
[2]Lamont-Doherty Earth Observatory, Columbia University
[3]Riverkeeper, Inc.

[4]*Corresponding author:* Riverkeeper, Inc., 20 Secor Road, Ossining, NY 10562
TBrown@riverkeeper.org

Abstract: Riverkeeper's Water Quality Program runs an ongoing water quality study on the Hudson River Estuary that seeks to characterize and report on the highly variable water quality conditions in the estuary through testing for sewage indicating microorganisms, oxygen and turbidity levels, and other indicators of water quality. Aboard the Riverkeeper patrol boat we collect samples at 75 locations spread along the 155-mile long stretch of river from New York Harbor to Troy, once a month, May through November. Our primary focus is testing for the sewage-indicating bacterium *Enterococcus*. The results of our monthly sampling are posted online, along with precipitation data, as soon as possible. Our single sample data can be viewed at www.riverkeeper.org/water-quality/locations. This project is conducted in collaboration with scientists from Columbia University's Lamont-Doherty Earth Observatory and Queens College, City University of New York. Since the summer of 2006, this study has collected and analyzed more than 2,000 water quality samples.

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13. Poster Title: *Patterns of Net Anthropogenic N and P inputs to the Hudson-Mohawk Basin*

Principle Investigators: Dennis P. Swaney[1,2], Robert W. Howarth[1], Bongghi Hong[1]

[1]Department of Ecology & Evolutionary Biology, Cornell University

[2]*Corresponding author:* Department of Ecology & Evolutionary Biology, Corson Hall, Cornell University, Ithaca, NY 14853, dps1@cornell.edu

Abstract: Our ongoing work in the Hudson-Mohawk watershed aims to provide methods of integrating data from existing monitoring networks and other sources using watershed models and nutrient accounting methods. Recent work has focused on estimating anthropogenic nitrogen (N) and phosphorus (P) inputs to the watershed using a software toolbox designed for watershed-scale nutrient accounting. Fertilizer applications and the net inputs of human food and livestock feed comprise the net anthropogenic P inputs (NAPI) to a watershed. For N (NANI), additional terms for crop N fixation and model-based estimates of atmospheric deposition of N are also included. Here, we report on the magnitude and variation of county-level estimates within the watershed, with possible implications for water quality and nutrient loading to the New York Harbor/Hudson Estuary.

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14. Poster Title: *"Dr. Jekyll and Mr. Hyde" – The Two Divergent States of an Urban Stream*

Principal Investigators: Karin E. Limburg[1], Dennis P. Swaney[2]

[1]SUNY College of Environmental Science and Forestry
[2]Dept of Ecology & Evolutionary Biology, Cornell University

[2]*Corresponding author:* SUNY College of Environmental Science and Forestry, Syracuse, NY 13210. Phone: 315-470-6741; email: klimburg@esf.edu

Abstract: Highly resolved (30-minute period) measurements of dissolved oxygen, temperature, conductivity, and turbidity in streams over 2-6 days during dry and wet periods within and outside the heavily urbanized city of Syracuse, NY were used to calculate gross primary production (GPP), total ecosystem respiration (ER) and total and net ecosystem production (NEP). Based on results, it is proposed that a city's stream metabolism and water quality may be regarded in a "Jekyll-Hyde" analogy, i.e., under dry conditions, this stream behaved much like a headwater system (Jekyll), but had far greater discharge as well as rapid swings in conductivity, turbidity, temperature, and oxygen concentrations during storm events (Hyde). Such dynamics could be damped by increasing soft, absorbent surfaces (green infrastructure) within the city.

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15. Poster Title: *Riparian Buffer Restoration for Clean Water*

Principle Investigators: Danielle Laberge[1,2], Beth Roessler[1]

[1]Hudson River Estuary Program, NYSDEC

[2]*Corresponding author:* Hudson River Estuary Program, NYSDEC, 21 S Putt Corners Rd, New Paltz, NY 12561, dmlaberg@gw.dec.state.ny.us,

Abstract: Trees for Tribs (tribs as in tributaries), an initiative of the NYSDEC Hudson River Estuary Program, provides native trees, shrubs and technical expertise for stream buffer restoration to landowners along tributaries of the Hudson River estuary (150 miles from Manhattan to the Troy Dam). "Stream buffers," consisting of native trees and shrubs growing in vegetated corridors that protect streams from human activity, improve water quality by filtering pollutants and sediment from storm runoff, absorbing high velocity flows to reduce flooding, stabilizing stream banks and reducing erosion. Stream buffers improve fish habitat by shading the stream and providing decomposing leaf litter as food for insects. Stream buffers also improve wildlife habitat by providing food and shelter, and by connecting habitat patches to allow greater movement. In five years, Trees for Tribs has planted 24,000 trees and shrubs at 215 planting events along 11.7 miles of stream (62,200 feet) with the help of 3,708 volunteers and 220 partners across 13 counties within the Hudson River estuary watershed. The poster will cover what we have learned in five years of stream restoration.

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16. Poster Title: *Dissolved Organic Matter Export from a Forested Stream during Hurricane Irene, Catskill Mountain, New York*

Principle Investigators:: Byungman Yoon[1,2], Peter A. Raymond[1]

[1]School of Forestry and Environmental Studies, Yale University

[2]*Corresponding author:* School of Forestry and Environmental Studies, Yale University, 195 Prospect St., New Haven, CT 06511, bman2901@gmail.com

Abstract: We incorporate high resolution time-series data to calculate the total amount of dissolved organic carbon (DOC) and dissolved organic nitrogen (DON) transported by Hurricane Irene in Esopus Creek in New York (August 2011). During this 500-yr event that resulted in precipitation of 29.3 cm, Esopus Creek experienced 350-fold discharge rate increase and exported roughly 41% and 28% of its average annual DOC and DON total export in just 5 days, respectively. The large flux of DOM also underwent compositional change as the source of organic matter shifted during the event, and increased the percent humic substance from ~20 to 32%. We conclude that more frequent large events due to climate change will increase the terrigenous export of dissolved organic matter and potentially impact the water quality and biogeochemistry of lakes and coastal systems.

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17. Poster Title: *Greenhouse Gas Production in Response to Nutrient Loading with Wetland Soils from Piermont Marsh, New York*

Principle Investigators: Brian Brigham[1,2], Gregory O'Mullan[1]

[1]Queens College

[2]*Corresponding author:* Queens College, NSB D217, 6530 Kissena Blvd, Flushing, NY 11367; bbrigham@gc.cuny.edu

Abstract: Hudson River Estuary wetland systems receive significant inputs of nitrogen (N) and carbon (C) due to fertilizer runoff from agricultural land, partially treated wastewater effluent, and combined sewer overs from urban centers during storm events. Nutrient deposition to wetland microbial communities may increase utilization of stored C pools, consequently resulting in increased greenhouse gas (methane and carbon dioxide) production via enhanced anaerobic activity in saturated soils. However, these microbial responses to nutrient fertilization remain poorly constrained. We hypothesized that the addition of both C and N would stimulate anaerobic microbial metabolism as indicated by increased production of greenhouse gases. To test this hypothesis, soil cores were removed from Piermont Marsh (Piermont, NY) and incubated over 35 days under anaerobic conditions. At the onset of incubation, experimental treatments were established including: C added, N added, no addition, and sterilized controls. The addition of both C and N resulted in 10X higher methane production compared to controls. Further, the addition of C yielded 2X greater carbon dioxide production between days 6 and 10 of the experiment. The high efflux greenhouse gases observed compared with the level of C added indicates that nutrient additions stimulated C mineralization of native organic C and the subsequent production of greenhouse gases. Future experimentation and an improved understanding of the microbial response to anthropogenic nutrient additions will help better predict ecosystem scale consequences to altered watershed management practices.

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18. Poster Title: *The North River Sewage Spill: A Test Case for NYHOPS Waterborne Pathogen Forecasts*

Principle Investigators: Philip Orton[1,2], Greg O'Mullan[3], Andrew Juhl[3], Nickitas Georgas[3], Alan Blumberg[1]

[1]Stevens Institute of Technology
[3] Lamont-Doherty Earth Observatory, Columbia University

[2]*Corresponding author*: Postdoctoral Research Associate, Stevens Institute of Technology, Maritime Security Laboratory, Babbio Building, Castle Point on Hudson, Hoboken, NJ 07030
http://philiporton.com; philip.orton@stevens.edu

Abstract: Thanks to extensive sewage indicator sampling campaigns by Riverkeeper and city and state government agencies, our understanding of sewage pollution risks in the Hudson is rapidly increasing. However, our ability to inform the public of events as they happen or as forecasts is limited because observations of sewage indicators require one-day incubation periods. A useful next step is to begin incorporating observations and CSO forecasts into hydrodynamic models, enabling us to provide water quality nowcasts and forecasts for the region's waterways and swimming areas. An interesting test case for this concept came last summer when a fire at the North River Wastewater Treatment Plant in New York City disabled the facility and caused a 3-day sewage spill. New York City area observations of the sewage indicator microbe *Enterococcus* will be presented, and comparisons will be made with simulations using Stevens ECOM, the model utilized for the New York Harbor Observing and Prediction System (NYHOPS). A future goal is to fund a broader project to refine the pathogen modeling and set up a real-time forecast system and webpage within NYHOPS that displays our nowcasts and forecasts. The project could also seek to expand experimental work associated with pathogen persistence in the environment, a crucial aspect of the modeling effort. As with the Stevens Storm Surge Warning System, it could have the capability to notify the public of water quality problems at selected sites by text message and email.

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19. Poster Title: *Sediment Dynamics and the Fate of Heavy Metals from Troy to New York Harbor*

Principle Investigators: Sanpisa Sritrairat[1,2], Timothy Kenna[1], Dorothy Peteet[1,3].

[1]Lamont-Doherty Earth Observatory of Columbia University, Palisades, NY
[3]NASA Goddard Institute for Space Studies, New York, NY

[2]*Corresponding author:* Lamont-Doherty Earth Observatory of Columbia University, Palisades, NY 10964, sanpisa@ldeo.columbia.edu

Abstract: In industrialized or urbanized estuaries such as the Hudson River estuary, fine-grained sediments are important dispersal agents for particle-reactive contaminants, and sediment dynamics play an important role in overall environmental quality. We measured heavy metals, inorganic matter, and carbon in 27 sediment cores collected from Hudson Estuary wetlands and tributaries along a north-south transect from Troy to New York harbor, encompassing a gradient in salinity regimes, vegetation and hydrodynamic condition. To date, our results indicate; 1) Jamaica Bay and the East River sediments from New York City were the most contaminated with heavy metals, including Pb, Cu, and Zn, among the sites analyzed. At depth, the concentrations of these metals at many sites are elevated above EPA and NYS regulated standards. 2) Based on pollution chronologies coupled with radiometric methods, we found that the sedimentation rate ranges from 0.26 – 2.63 cm/yr during the last century. A majority of cores taken from non-vegetated areas or those designated as high-energy reveal a disturbed sedimentation pattern, and thus there is a higher risk of contaminant re-suspension at those locations. 3) Inorganic matter (IM) content at most sites is significantly higher than that found prior to the European settlement at the same location in the last century, suggesting increasing erosion and disturbance over time. However, more than eighty percent of marsh sites show increasing OM sequestration and declining IM content in the last 50 years. Wetland restoration can serve as a way to prevent contaminant re-suspension and reduce sediment load to the estuary.

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20. Poster Title: *The Impacts of Irene and Lee – as seen through the eyes of the Hudson River Environmental Conditions Observing System (HRECOS)*

Principle Investigators: Stuart E. G. Findlay[1], Alene Onion[2], Gary Wall[3], Sarah Fernald[4], Alan Blumberg[5], Wade McGillis[6]

[1]Cary Institute of Ecosystem Studies, Millbrook, NY
[2]Hudson River Estuary Program, NYSDEC, Albany, NY
[3]US Geological Survey, Troy, NY
[4]Hudson River National Estuarine Research Reserve, NYSDEC, Staatsburg, NY
[5]Stevens Institute of Technology, Hoboken, NJ
[6]Lamont-Doherty Earth Observatory, Columbia University, Palisades, NY

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Abstract: The Hudson River Environmental Conditions Observing System (HRECOS) monitors weather and water conditions on the Hudson and Mohawk Rivers. Every fifteen minutes, HRECOS stations at various sites–including a mobile station on the sloop Clearwater – record information (data) and relay it to a website for anyone to see and use (www.hrecos.org). Tropical storms Irene and Lee caused major changes in the Hudson River. Just like many human residents of our river valley, the river ecosystems are still feeling the effects of these storms. Most HRECOS stations continued to record data even during the worst of the storm conditions. These data surprised our collaborating scientists. For example, oxygen levels in the Hudson rose quickly after the rain began. One possible explanation is that the creeks and streams draining to the Hudson River had higher-than-normal oxygen levels. HRECOS is operated by a consortium of government and research partners. Funding is provided by the U.S. Environmental Protection Agency, the National Oceanic and Atmospheric Administration, Hudson River Foundation, and the Hudson River Estuary Program of the N.Y.S. Department of Environmental Conservation.

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21. Poster Title: *The Hudson River Submerged Aquatic Vegetation Project: A template for successful citizen science*

Principle Investigators: Stuart E.G. Findlay[1,2], David Fischer[1], Stephen D. Smith[3], Catherine A. McGlynn[3,4], Susan Hoskins[3], Elizabeth A. Blair[4], and Nordica Holochuck[5]

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[3]Cornell University Institute for Resource Information Sciences
[4]Hudson River National Estuarine Research Reserve, NYSDEC
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Abstract: Submerged aquatic vegetation (SAV) is an important part of the Hudson River Estuary ecosystem. SAV beds provide shelter and food for young-of-the-year fish, resources for migrating water fowl, and increased dissolved oxygen in the river during the summer. One of the main objectives of the Hudson River Submerged Aquatic Vegetation (HRSAV) Project is to monitor the distribution and abundance of SAV in the Hudson River and to understand what factors affect these two dependent variables. The HRSAV Project began in 2003. The team consists of a lead scientist, several GIS/Mapping specialists, members of the granting agency, two educators, and a volunteer coordinator. Data from more than 1,800 sampling locations have been collected by the volunteers over the past nine seasons.

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22. Poster Title: *Movement and Habitat Use of Hudson River Estuary Adult Atlantic Sturgeon (Acipenser oxyrinchus)*

Principle Investigators: Amanda Higgs[1] , Gregg Kenney[2], Kathryn Hattala[2], Andrew Kahnle[2], Jerre Mohler[3], John Ladd[1,4], Eric Shyer[5]

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Abstract: Atlantic sturgeon *Acipenser oxyrinchus* of the Hudson River Estuary have supported some level of commercial fishing since colonial times. The New York Atlantic sturgeon fishery grew rapidly and then collapsed in the late 1800's. Landings started to increase in 1980. The resurgent fishery targeted mature fish for both caviar and flesh. In 1996 a harvest moratorium was adopted for the Hudson River. Hudson River Atlantic sturgeon still face many problems. Their spawning habitat is always at risk of being altered or destroyed by dredging and construction. This project will help us understand suspected spawning areas, aggregation/congregation areas and immigration/emigration timing. The data collected allows managers to make educated decisions to protect important areas these fish use for the various purposes. Forty-two fish were caught with gill nets and tagged from 2006-2008. Fish were tracked from 2006-2011. Twenty two tags were 5 year tags, allowing us to collect multiple years of data to examine repeat spawning interval and residence time. The remaining 20 tags were short term tags to help us understand seasonal movement for one season. The fish locations were overlaid on a benthic and bathymetry map of the Hudson River. Dynamic mud habitat was the most preferred habitat for all years followed by depositional mud. A previously unknown spawning area was discovered near Diamond Reef.

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23. Poster Title: *What Can Macroinvertebrate Sampling Tell Us About the Water Quality of the Hudson River Estuary Watershed?*

Principle Investigators: Christy Caulfield[1], Emily Vail, Andrew Meyer, Beth Roessler

NYS DEC Hudson River Estuary Program, New Paltz, NY

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Abstract: The 1972 Clean Water Act provided the basis for protection and restoration of the nation's waters. Since then, the New York State Department of Environmental Conservation Stream Biomonitoring Unit (NYSDEC SBU) has been assessing water quality through sampling of benthic macroinvertebrate communities, which are good indicators of stream health. The NYSDEC SBU sampled macroinvertebrates at 436 sites on 189 streams in the Hudson Valley from 1973-2011. The most recent samples taken of the streams show the Hudson Valley had 30% non-impacted sites, 50% slightly impacted, 18% moderately impacted, and 2% severely impacted. Compared to the earliest samples, 41 sites have improved and 32 have degraded. Using this sampling record, we investigated streams that had the most variability in the Hudson Valley: the Kromma Kill, Patroon Creek and Quassaick Creek. The Kromma Kill (Albany County) is currently assessed as moderately impacted, but has undergone variations since the first samples taken in 1987. The Patroon Creek (Albany County) improved from severely impacted in the early 1990s, to slightly impacted in 2002, but was classified again as severely impacted in 2007. The Quassaick Creek (Orange County) showed dramatic variations in water quality at different testing sites during 1987.

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24. Poster Title: *Barriers to Green Infrastructure in the Hudson Valley: An Electronic Survey of Implementers*

Principle Investigators: Emily Vail[1,2], Andrew Meyer[1]

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Abstract: Despite the progress made since the Clean Water Act was passed, nonpoint source pollution remains a major issue for water quality in the Hudson Valley. According to NYS DEC, stormwater runoff is the leading cause of stream impairments in the Hudson River estuary watershed. Green infrastructure practices (such as rain gardens, porous pavement, green roofs, and vegetated swales) maintain or restore stormwater's natural flow pattern by allowing water to slowly soak into the ground and be used by plants. These practices can improve many of the water quality and quantity problems affiliated with traditional stormwater management. While there are successful examples of green infrastructure practices being implemented in the Hudson Valley, there are also potential difficulties to its being adopted as a routine aspect of development and redevelopment, including local government regulations, site constraints, engineer training, developer enthusiasm, public perception, and more. The Hudson River Estuary Program conducted a survey to identify the largest roadblocks to green infrastructure implementation in the ten counties of our program area. We received 127 completed responses with information from a wide range of green infrastructure practitioners—geographically broad, with diverse positions in their communities and having experience with many different types of practices. Respondents cited cost, lack of knowledge, and resistance from local, municipal officials as the top barriers. The responses make it clear that in addition to more funding sources, there is a great need for outreach and education to local governments to familiarize them with green infrastructure practices.

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25. Poster Title: *Non-point source pollutants in an urban stream: The next challenge for the CWA*

Principle Investigators: Mary Ann Cunningham[1], Peter Grauman, Clara Cardillo

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Abstract: The Clean Water Act has made significant progress in addressing point-source pollutants, but non-point source pollutants continue to cause dramatic chemical, physical, and biological impairments in US waterways. Among these NPS pollutants, road salt is a dominant factor in many urban systems, both for surface water and for subsurface water. Within these systems, the role of subsurface (soil) storage in watershed chloride budgets remains relatively understudied. We examined concentrations of chloride during the winter of 2011-2012 in a small urban stream in Poughkeepsie, NY, in order to evaluate the contribution of subsurface storage as a source for stream contamination. Because road salt was applied only approximately twice in this unusually warm and dry winter, we were able to examine both immediate and previous-year (stored) contributions to runoff. Previous-year chloride was abundant in the stream, and concentrations were also higher downstream of a moderately-high use traffic thoroughfare, even when short-term impacts were absent. We conclude that impacts of non-point urban impairments are (1) persistent, even for seemingly short-term impacts such as road salt, (2) important in the stream system, and (3) important for ground water and soil water. Addressing this problem will require new strategies and reward/penalty structures for strategies that improve water quality, such as better land use planning that reduces road impacts on water resources. New reward/penalty structures are difficult to imagine, but a previous generation invented them for the 1972 act, and that is the task that requires focus now.

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26. Poster Title: *Watershed Bridges and Watershed Divides: An examination of issues of scale in the implementation of the watershed based approach*

Principle Investigator: Amanda LaValle

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Abstract: Landmark environmental legislation of the 1970s, including the Clean Water Act, was very effective at addressing the well-defined environmental policy problems of that era. In recent times, we rely on other policy mechanisms to address our more amorphous environmental problems such as non-point source pollution. One such popular method, the watershed based approach, is often seen as a logical technique for water resource management since watersheds are perceived to reflect discrete physical systems. However, little attention is given to the great variety in scale of watershed management efforts or the social / political context of watershed identification. This poster presentation examines issues related to watershed scale with respect to the application of the watershed based approach. The examination includes: a brief historical review of water resource and watershed based management, a discussion of the challenges faced in implementing watershed based management, a review of select opportunities to improve watershed based management, and finally an examination of challenges and opportunities as they relate to watershed scale. The scale at which a watershed management effort is being undertaken is of paramount importance. Scale will affect the characterization of natural process, relative importance of various social dynamics and the overriding political context. These factors impact both the problem definition- which forms the basis of the management activity -as well influencing as the feasibility of the resulting management recommendations.

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27. Poster Title: *Using smart growth to protect environment and foster economic development: A review of water infrastructure in the Hudson River valley*

Principal Investigators: Sridhar Vedachalam[1], Brian Rahm, Susan Riha

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Abstract: Development of water resources infrastructure, including water and wastewater treatment facilities, occurs over the span of many decades and is vital to the environmental and economic well-being of a region. Maintaining infrastructure and addressing the needs of evolving communities present a huge challenge for local and state government entities. In 2010, New York enacted the Smart Growth Public Infrastructure Policy Act which stipulated that state agencies prioritize funding to public infrastructure projects that are consistent with smart growth criteria as laid out in the Act. Our focus here is on water resource infrastructure in New York's Hudson River valley within the context of environmental water quality, promoting smart growth, and economic development. Preliminary investigation reveals multiple areas for improving management of water resource infrastructure, including: 1) enhancing current state efforts to replace, upgrade and/or decommission wastewater treatment facilities by developing relationships between facility characteristics such as design capacity, violations, etc. and environmental and social indicators such as water quality and population change; and 2) exploring the potential for replacing small wastewater treatment plants (design flow capacity <0.1 MGD) with appropriately designed decentralized treatment systems that may offer significant benefits to communities through groundwater recharge, lower private and public costs, and reduction of suburban sprawl. Initial results indicate that opportunities exist for more effectively synthesizing smart growth concepts with current management approaches to water resource infrastructure in the region, with the goal of providing environmental, economic and public health services that are appropriate for current and anticipated demographic conditions.

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28. Poster Title: *Baseline evaluation of water quality in the Hudson River Valley in the face of Emerald Ash Borer infestation*

Principle Investigators: *Brian P. Buchanan[1], Lauren E. McPhillip[2], M. Todd Walter[1], Suzanne C. Beyeler[3], Elizabeth A. Kreitinger[1], Meghan B. Fitzgerald [1]*

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Abstract: The removal or death of trees in stream riparian areas has the potential to impact soil and water nutrient cycling. One potential impact is an increase in stream nitrate levels due to decreased nitrate uptake by riparian vegetation. Thus, the recent confirmation of Emerald Ash Borers (EAB) in the Hudson River watershed may have important consequences on water quality. In order to assess these potential impacts, it is important to have baseline information on water quality, with which future data can be compared. We established eight different water quality monitoring sites, covering a gradient of ash tree cover from 7 to 61%. The sites were located in two clusters, one north of Saugerties, NY and the other near Woodstock, NY in Ulster County. All eight sites were instrumented with groundwater monitoring wells, and stream water, soils and stream macroinvertebrate samples were collected between August and November 2011. Results were analyzed to determine any potential patterns between water quality and ash cover. Several stream macroinvertebrate parameters (dispersal ability, size at maturity, and trophic habit) were correlated with overstory ash cover, as well as calcium in stream and groundwater at the north site cluster. Collectively, these data (water quality & soil parameters) will provide valuable baseline information for future study of the impacts of EAB-induced ash tree death.

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29. Poster Title: *The Potential Effects of Agrilus planipennis (Emerald Ash Borer) on the Vassar Ecological Preserve*

Principle Investigators: Sara Gabrielson[1], Meg Ronsheim, Keri VanCamp

Vassar College

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Abstract: *Agrilus planipennis*, the Emerald Ash Borer (EAB), is an invasive beetle that feeds on the phloem of ash trees, eventually causing widespread mortality. EAB was introduced into the United States from Asia and Russia through shipping pallets made of ash. Since first confirmed in Michigan in 2002, EAB has spread into 15 states including New York. The EAB was just confirmed in Dutchess County in March 2012. To assess the potential impact of EAB on the Vassar Ecological Preserve, I completed a survey of *Fraxinus Americana*, white ash trees on the Preserve. A grid of points, 100 meters apart, was laid out over the forested areas of the Preserve. I located the closest ash tree from each point and collected the diameter at breast height (DBH), health, canopy size, and distance from the point. With this data, we used GIS interpolation techniques to create maps showing densities of ash tress across the Preserve. The largest ash trees were found in the areas of highest densities, along the Casperkill stream in the flood plain, and in a handful of upland sites. Potential consequences from the loss of ash along the flood plain are increased coarse woody debris and increased light into the stream, and bank destabilization. For the upland areas we may see increase in invasive vines which will monopolize on the light gaps, and changes in seedling and sapling abundance of ash.

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30. Poster Title: *New York Harbor School Oyster Restoration Project*

Principle Investigators: Pete Malinowski[1], Alimot Yusuff, Florence Bloomfield, Derek Thompson, Denzel John

New York Harbor School

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Abstract: Since its inception as a New York City public high school, The New York Harbor School has been involved in oyster restoration in the New York harbor. Over the last four years the school has become a leading force in the efforts to restore oyster reefs to New York Harbor by pioneering a new form of restoration-based education. We are doing so using a large-scale, environmental restoration project as a means of student engagement and a lens to teach a variety of aquaculture, scientific and on-water skills. These activities have placed the school on the forefront of environmental research in the area. The oyster project has created a platform that allows for the study of: (1) oyster growth and survival; (2) water quality conditions and oysters' effect on water quality; (3) the feasibility of oyster restoration in the harbor; (4) artificial reef design and materials; and (4) the potential benefits of using remnant New York harbor oyster populations as breeders. This poster focuses on the reef research and results to date as well as the current aquaculture activities, including the new oyster nursery in the Brooklyn Navy Yard. The New York Harbor School is in the process of developing a new technology for growing oysters in reef slabs in an attempt to address the issues of transport off the reefs.