NEERS SPRING 2011 MEETING
May 5 – 7, 2011
Danfords Hotel and Marina, Port Jefferson, NY

Hosted By
School of Marine and Atmospheric Sciences of Stony Brook University

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MEETING PROGRAM

All events at the Danfords Hotel and Marina unless noted otherwise
All oral and poster sessions are in the Diplomatic Ballroom

Thursday, May 5th

12:00 – 1:30 pm	Meeting registration (G-Library)
1:30 – 5:30 pm	Long Island Sound Symposium
5:30 – 6:30 pm	Meeting Registration (G-Library)
5:45 – 8:00 pm	Welcoming Social (Brookhaven Ballroom)

Friday, May 6th

7:00 – 8:00 am	Meeting registration (G-Library)
8:15 – 10:10 am	Oral presentations: Ecology of Phytoplankton
10:30 – 11:50 am	Oral presentations: Conservation Planning
11:50 am – 1:10 pm	Lunch (Bayles Room and Wilse Room)
11:50 am – 1:10 pm	Executive Committee Meeting
1:00 – 5:00 pm	SoMAS R/V available for tours (Harbor Front Park)
1:15 – 2:35 pm	Oral presentations: Ecosystem and Landscape Interactions
2:35 – 4:00 pm	Poster presentations
4:00 – 5:00 pm	Oral presentations: Ecology and Management of Fish(eries)
5:00 – 6:00 pm	NEERS Business Meeting
6:00 – 9:30 pm	Social and NEERS Awards Banquet (Brookhaven Ballroom)
9:30 pm - ??	Music and dancing at Port Jazz (201 Main Street)

Saturday, May 7th

8:15 – 10:10 am	Oral presentations: Estuarine Habitats
10:30 am – 12:15 pm	Oral presentations: Estuarine Variability
12:30 pm	Field trip to Riverhead Foundation (meet at Danfords front desk)
12:30 pm	Field trip to Wertheim Natl. Wildlife Ref. (meet at Danfords front desk)

Thursday, May 5th

SPECIAL SYMPOSIUM:
Long Island Sound Science and Management: A Quarter Century Synthesis

Chair: Jim Latimer
* Presenter

1:30 Welcome and Introduction – Jim Latimer
EPA Office of Research and Development, Narragansett, RI

1:45 Weigold, Marilyn E.
Department of Economics, History and Political Science, Pace Univ., Pleasantville, NY
LONG ISLAND SOUND: ITS PEOPLE, PLACES AND ENVIRONMENT

2:10 Lewis, Ralph S.
Long Island Sound Resource Center, UCONN-Avery Point, Groton, CT
GEOLOGIC INVESTIGATIONS IN THE LIS BASIN: AN OVERVIEW

2:35 O'Donnell, J.[1], Robert Wilson*[2], K. Lwiza[2] and M. Whitney[1]
[1]University of Connecticut, Groton, CT; [2]Stonybrook University, Stonybrook, NY
PHYSICAL OCEANOGRAPHY OF LONG ISLAND SOUND

3:00 Cuomo*,Carmela[1], J. K. Cochran[2], R. A. Aller[2],and J. A. Aller[2]
[1]Dept. of Biology & Environmental Sci., Univ. of New Haven, New Haven, CT
[2]School of Marine & Atmospheric Sciences, Stonybrook University, Stony Brook, NY
LONG ISLAND SOUND GEOCHEMISTRY: PAST, PRESENT AND FUTURE

3:25 **BREAK**

3:50 Varekamp*, Johan (Joop) C.[1], A. E. McElroy[2], J. R. Mullaney[3], B. J. Brownawel [2], V. T Breslin[4], M. A. Altabet[5], and M. R. Buchholtz ten Brink[6]
[1]EES, Wesleyan University, Middletown CT; [2]SoMAS, SBU, Stony Brook, NY
[3]USGS, Hydrology, Hartford CT; [4]ENVS, SCU, New Haven CT
[5]SMAST, University of Massachusetts, Dartmouth MA; [6]EPA, Narrangansett, RI
CONTAMINANTS IN SEDIMENT FROM LONG ISLAND SOUND

4:15 Lopez, Glenn R.
School of Marine and Atmospheric Sciences, Stony Brook University, Stony Brook, NY
BIOLOGY AND ECOLOGY OF LONG ISLAND SOUND

4:40 Tedesco*, Mark A.[1], C. Garza[2], J. Latimer[3], R. L. Swanson[4], and C. Yarish[5]
[1]EPA Long Island Sound Office, Stamford, CT; [2]California State Univ. Monterey Bay
[3]EPA Office of Research and Development, Narragansett, RI
[4]University of Connecticut, Stamford, CT; [5]Stony Brook University, Stony Brook, NY
SCIENCE AND ADAPTIVE MANAGEMENT FOR LONG ISLAND SOUND

5:05 Discussion

5:45 – 8:00 **NEERS WELCOMING SOCIAL** – Brookhaven Ballroom
8:00 Dinner on your own in Port Jefferson

Friday, May 6th

8:15 Welcome and Introductory Remarks – Steve Hale, NEERS President

Ecology of Phytoplankton

Chair: Steve Hale
* Presenter; **(K)** Ketchum Prize candidate for best graduate student presentation

8:30 Gobler*, Christopher J. and T. K. Hattenrath-Leman
School of Marine and Atmospheric Sciences, Stony Brook University, Stony Brook, NY
PHASE SHIFTS AMONG PRIMARY PRODUCERS WITHIN LONG ISLAND SOUND: WILL ANTHROPOGENIC STRESSORS CONTINUE TO EXPAND THE NICHE OF PSP- AND DSP-PRODUCING DINOFLAGELLATE BLOOMS?

8:50 **(K)** George*, Jennifer, C. J. Gobler, and D. J. Lonsdale
School of Marine and Atmospheric Sciences, Stony Brook University, Stony Brook, NY
IMPACTS OF CLIMATE CHANGE ON THE SPRING BLOOM IN LONG ISLAND SOUND

9:10 **(K)** Koch*, Florian and C. J. Gobler
School of Marine and Atmospheric Sciences, Stony Brook University, Southampton, NY
IMPORTANCE OF B-VITAMINS AS NUTRIENTS CONTROLLING PHYTOPLANKTON COMMUNITIES IN COASTAL ECOSYSTEMS

9:30 **(K)** Bell*, Sheryl L.[1], E. A. Walker[1,2], C. J. Gobler[1,2], and J. L. Collier[1]
[1]School of Marine and Atmospheric Sciences, Stony Brook University, Stony Brook, NY
[2]School of Marine and Atmospheric Sciences, Stony Brook Univ., Southampton, NY
INTERACTIONS BETWEEN PLANKTON COMMUNITY STRUCTURE AND ENVIRONMENTAL FACTORS IN BROWN TIDE IMPACTED LONG ISLAND EMBAYMENTS

9:50 **(K)** Liu*, Yuan and J. L. Collier
School of Marine and Atmospheric Sciences, Stony Brook University, NY
HOW DOES THE PLANKTONIC MICROBIAL COMMUNITY STRUCTURE DIFFER IN GREAT SOUTH BAY WITH AND WITHOUT *AUREOCOCCUS ANOPHAGEFFERENS* (BROWN TIDE)?

10:10 BREAK

Conservation Planning

Chair: Steve Hale
* Presenter; **(K)** Ketchum Prize candidate for best graduate student presentation

10:30 **(K)** Torio*, Dante D. and G. L. Chmura
Department of Geography and Global Environmental and Climate Change Centre, McGill University, Montreal, QC
USING FUZZY LOGIC TO MAP THE THREAT OF COASTAL SQUEEZE TO MARSHES AT WELLS RESERVE AND PORTLAND, MAINE

10:50 **(K)** Kras*, Lauren A. and G. E. Moore
Department of Biological Sciences, University of New Hampshire, Durham, NH
THE STATUS OF FIVE STATE-LISTED TIDAL PLANT SPECIES IN NEW HAMPSHIRE WITH EMPHASIS ON POTENTIAL IMPACTS OF SEA LEVEL RISE

11:10 **(K)** Landi*, Alicia[1], J. Vokoun[1], P. Auster[2], and P. Howell[3]
[1]Dept. of Natural Resources and the Environment, University of Connecticut, Storrs, CT
[2]Dept. of Marine Sciences, University of Connecticut at Avery Point, Groton, CT
[3]Marine Fisheries Div., Connecticut Dept. of Environmental Protection, Old Lyme, CT
SELECTION OF SPAWNING HABITATS BY HORSESHOE CRABS (*LIMULUS POLYPHEMUS*) ALONG THE COMPLEX CONNECTICUT COAST

11:30 **(K)** O'Connell, Christine A.
School of Marine and Atmospheric Sciences, Stony Brook University, Stony Brook, NY
IDENTIFYING SOCIAL PERSPECTIVES AS THE BASIS FOR COASTAL AND MARINE SPATIAL PLANNING (CSMP) FOR LONG ISLAND SOUND

11:50 – 1:10 **LUNCH** - Bayles Room and Wilse Room

Ecosystem and Landscape Interactions

Chair: Darcy Lonsdale
* Presenter; **(K)** Ketchum Prize candidate for best graduate student presentation

1:15 **(K)** Coverdale*, Tyler C.[1], A. H. Altieri[1], M. D. Bertness[1], N. C. Herrmann[1], and C. Holdredge[2]
[1]Department of Ecology and Evolutionary Biology, Brown University, Providence, RI
[2]Department of Biology, University of Florida, Gainesville, FL
RECREATIONAL FISHING TRIGGERS SALT MARSH DIE-OFF ON CAPE COD, MA

1:35 **(K)** Carroll*, John M. and B. J. Peterson
School of Marine and Atmospheric Sciences, Stony Brook University, Stony Brook, NY
BALANCING THE EDGE EFFECTS BUDGET: BAY SCALLOP SETTLEMENT AND RECRUITMENT ALONG A SEAGRASS EDGE

1:55 **(K)** Cao*, Zhenrui R., Q. Z. Zhu, R. C. Aller and J. Y. Aller
School of Marine and Atmospheric Sciences, Stony Brook University, NY
ANNUAL EXTRACELLULAR ENZYME ACTIVITIES REVEALED BY HIGH RESOLUTION TWO-DIMENSIONAL PLANAR FLUOROSENSORS IN GREAT PECONIC BAY

2:15 **(K)** Brown, D. Steven and R. Zajac
Dept. of Biology and Environmental Science, Univ. of New Haven, West Haven, CT
THE INFLUENCE OF HABITAT HETEROGENEITY ON FAUNAL COMMUNITIES IN NEARSHORE SOFT SEDIMENTS, NEW HAVEN HARBOR, LONG ISLAND SOUND

2:35 **BREAK AND POSTER SESSION**
Tours of the SoMAS Research Vessel – Harbor Front Park
Poster titles are listed at the end of the program

Ecology and Management of Fish(eries)

Chair: Darcy Lonsdale
* Presenter; **(K)** Ketchum Prize candidate for best graduate student presentation

4:00 **(K)** Gao*, Jin[1] and S. B. Munch[2]
[1]Department of Ecology and Evolution, Stony Brook University, NY
[2]School of Marine and Atmospheric Sciences, Stony Brook University, NY
ESTIMATING GENETIC CORRELATION BETWEEN SIZE AT AGES AND FECUNDITY IN ATLANTIC SILVERSIDES

4:20 **(K)** Divver*, Martha M., G. Frisk, and R. M. Cerrato
School of Marine and Atmospheric Sciences, Stony Brook University, Stony Brook, NY
ASSESSMENT OF THE ECOLOGICAL ROLE OF ADULT WHITE PERCH (MORONE AMERICANA)USING HYDROACOUSTIC TELEMETRY IN THE GREAT SOUTH BAY SYSTEM

4:40 **(K)** Nichols*, Owen C.[1], E. Eldredge[2], and S. X. Cadrin[1]
[1]School for Marine Sci. and Technol., Univ. of Mass. – Dartmouth, Fairhaven, MA
[2]Chatham Fisheries/Monomoy Trap Company, West Chatham, MA
NOCTURNAL SEAL DEPREDATION IN A NEARSHORE FISHERY AND IMPLICATIONS FOR ANALYSES OF ENVIRONMENTAL EFFECTS ON CATCH

5:00 **NEERS BUSINESS MEETING**

6:00 **SOCIAL AND NEERS AWARDS BANQUET –** Brookhaven Ballroom
Presentation of Awards for Best Student Papers

9:30 Music and dancing at Port Jazz, 201 Main Street, Port Jefferson

Saturday, May 7th

Estuarine Habitats

Chair: Sara Grady
* Presenter

8:15 Gather for session

8:30 Peterson*, Brad J. and A. M. Stubler
School of of Marine and Atmospheric Sciences, Stony Brook University, NY
CUMULATIVE IMPACTS OF MULTIPLE STRESSORS ON *ZOSTERA MARINA* POPULATIONS IN NEW YORK ESTUARIES

8:50 Davey*, Earl[1], C. Wigand[1], R. Johnson[1], A. Hanson[1], C. Roman[2] and N. Maher[3]
[1]US EPA NHEERL, Atlantic Ecology Division, 27 Tarzwell Drive, Narragansett, RI
[2]National Park Service, University of Rhode Island, Narragansett, RI
[3]The Nature Conservancy, 250 Lawrence Hill Road, Cold Spring Harbor, NY
APPLICATION OF COMPUTER-AIDED TOMOGRAPHY (CT) TECHNOLOGY TO VISUALLY COMPARE BELOWGROUND COMPONENTS OF SALT MARSHES IN JAMAICA BAY AND LONG ISLAND, NEW YORK

9:10 Adamowicz*, Susan C. [1], D. Burdick[2], J. Kramer [1], and L. Wagner[1]
[1] US Fish and Wildlife Service, Rachel Carson National Wildlife Refuge, Wells, ME
[2]University of New Hampshire, Jackson Estuarine Laboratory, Durham, NH
THE EFFECTS OF DITCH PLUGGING ON SALT MARSHES: 2005 AND 2009

9:30 Rochlin, I.[1], M.J. James-Pirri[2], S. C. Adamowicz[3], M. E. Dempsey[4], T. Iwanejko[1], and Dominick V. Ninivaggi[1]*
[1]Division of Vector Control, Suffolk County Dept. of Public Works, Yaphank, NY
[2]Graduate School of Oceanography, University of Rhode Island, Narragansett, RI
[3]Rachel Carson National Wildlife Refuge, Wells, ME
[4]Suffolk County Dept. of Environment and Energy, Yaphank, NY
INTEGRATED MARSH MANAGEMENT AT WERTHEIM NATIONAL WILDLIFE REFUGE (NWR), LONG ISLAND, NEW YORK, 2003-PRESENT: EFFECTS ON NEKTON AND VEGETATION

9:50 da Silva Quintal*, Sara N. and Lara Pomi-Urbat*
Nelson, Pope & Voorhis, Melville, NY
A METHOD FOR MAPPING AND PRIORITIZING DIADROMOUS FISH HABITAT RESTORATION

10:10 BREAK

Estuarine Variability

Chair: Sara Grady
* Presenter

10:30 Liebman*, Matthew[1] and E. Dettmann[2]
[1]US EPA New England, Five Post Office Square, Boston, MA
[2]US EPA, NHEERL, Atlantic Ecology Division, Narragansett, RI
COASTAL NUTRIENT CRITERIA AND TREND MONITORING IN NEW ENGLAND

10:50 McNamara*, Marianne E., D. J. Lonsdale, and R. C. Aller
School of Marine and Atmospheric Sciences, Stony Brook University, Stony Brook, NY
SEASONAL DIFFERENCES IN C:N:P CONTENTS OF THE CTENOPHORE *MNEMIOPSIS LEIDYI* (AGASSIZ) IN RESPONSE TO CHANGES IN POPULATION SIZE STRUCTURE AND NUTRITIONAL STATUS

11:10 Zarnoch*, Chester B.[1] and T. J. Hoellein[2]
[1]Dept. of Natural Science, Baruch College, City University of New York, NY
[2]Department of Biology, Loyola University Chicago, Chicago, IL
THE INFLUENCE OF OYSTER FEEDING AND BIODEPOSITION ON SEDIMENT NITROGEN CYCLING IN JAMAICA BAY, NEW YORK

11:30 Thomas, Ellen[1,2] and J. C. Varekamp[2]
[1]Geology and Geophysics, Yale University, New Haven, CT
[2]Earth and Environmental Sciences, Wesleyan University, Middletown, CT
BENTHIC FORAMINIFERA IN LONG ISLAND SOUND

11:50 Zajac, Roman[1], R. Whitlatch[2], B. Gibbons[2], A. Bergmann[1], L. Stefaniak[2], and D. Pinho[1]
[1]Dept. Biology and Environmental Science, University of New Haven, West Haven, CT
[2]Dept. Marine Sciences, Univ. Connecticut, Groton, CT
DEVELOPMENT OF A LONG ISLAND SOUND (LIS) BENTHIC INDEX FOR ENVIRONMENTAL ASSESSMENT AND ECOSYSTEM MANAGEMENT

12:10 Closing Remarks – Steve Hale, NEERS President

12:30 Field trip to Riverhead Foundation for Marine Research and Conservation departs from Danfords Hotel front desk

12:30 Field trip to Wertheim National Wildlife Refuge departs from Danfords Hotel front desk

POSTER PRESENTATIONS

* Presenter; **(D)** Dean Prize candidate for best graduate student poster

Adamowicz*, Susan C.[1], P. Drobney[2], G. Guntenspergen[3], J. Culpepper[4], M. Gregg[5], B. Johnson[6], J. Reinman[7], D. Sharp[8], C. Craft[9], C. Cambardella[10], J. Kush[11], S. Faulkner[3], J. Morgan[10], P. Shafroth[3], and B. Wang[3]
[1] Rachel Carson National Wildlife Refuge; [2] Neal Smith NWR; [3] USGS; [4]Carolina Sandhills NWR; [5]Saddle Mountain NWR; [6]Tetlin NWR; [7]St. Marks NWR; [8]White River NWR; [9]Indiana University NWR; [10]USDA-ARS; [11] Auburn University
ASSESSING CARBON SEQUESTRATION IN MULTIPLE ECOSYSTEMS: A NATIONAL LMRD COOPERATIVE PROJECT

(D) Bauer*, Cassandra L., R. L. Swanson, and R. E. Wilson
School of Marine and Atmospheric Sciences, Stony Brook University, Stony Brook, NY
PHYSICAL FACTORS CONTRIBUTING TO SUMMERTIME HYPOXIA IN THE BOTTOM WATERS OF SMITHTOWN BAY, LONG ISLAND SOUND

Bernhard*, Anne E., D. Marshall, and L. Yiannos
Department of Biology, Connecticut College, New London, CT
INCREASED VARIABILITY OF MICROBIAL COMMUNITIES IN RESTORED SALT MARSHES NEARLY 30 YEARS AFTER TIDAL FLOW RESTORATION

Charpentier, M.[1], Cathleen Wigand[2]*, and J. Hyman[3]
[1]Raytheon, 27 Tarzwell Drive, Narragansett, RI
[2]US EPA NHEERL, Atlantic Ecology Division, 27 Tarzwell Drive, Narragansett, RI
[3]University of Rhode Island, Kingston, RI 02881
ESTIMATES OF CARBON SEQUESTRATION AND STORAGE IN TIDAL COASTAL WETLANDS ALONG THE US EAST COAST

(D) Furman*, Bradley T.[1], D. R. Deis[2], and B. J. Peterson[3]
[1]Department of Marine and Atmospheric Sciences, Stony Brook University, NY
[2]PBS&J an Atkins Company, Jacksonville, FL
[3]School of Marine and Atmospheric Sciences, Marine Sci. Research Center, Southampton, NY
TEMPORAL EFFECTS OF INLET MODIFICATION AND PROTECTIVE SIGNAGE ON THE FRACTAL GEOMETRY OF A SEAGRASS MEADOW: A 3-YR STUDY OF SEBASTIAN INLET, FL

Gilman, M.[1], D. J. Drew[2], Beth Patrizzi[1]*, and S. P. Grace[3]
[1]Cedar Island Marina Research Lab, P.O. Box 181, Clinton, CT
[2]Peabody Museum, Dept. of Invertebrate Zoology, P.O. Box 208118, New Haven, CT
[3]Southern Connecticut State University, Biology Department, 501 Crescent St., New Haven, CT
ANNOTATED LIST OF MARINE MACRO FAUNA IN CEDAR ISLAND MARINA, CLINTON HARBOR, CT, LONG ISLAND SOUND

Knowles, I.[1], Beverly J. Johnson[1]*, P. Dostie[1], and W. Locke[2]
[1]Department of Geology and [2]Department of Biology, Bates College, ME
A BIOGEOCHEMICAL STUDY OF DITCHPLUG AND NATURAL POOLS IN THE SPRAGUE RIVER MARSH, PHIPPSBURG, ME

(D) Lamb*, Annesia L.[1], R. B. Boger[2], and B. F. Branco[1,2]
[1]Aquatic Research and Environmental Assessment Center, Brooklyn College, NY and Department of Earth and Environmental Sci., The Graduate Center, CUNY, NY
[2]Department of Earth and Environmental Sciences, Brooklyn College, NY
ANALYZING THE TRENDS OF WATER QUALITY INDICATORS IN JAMAICA BAY, NY

MacLachlan, Andrew
U.S. Fish and Wildlife Service, Coastal Program, Charlestown, RI
EELGRASS IN EASTERN LONG ISLAND SOUND -- ASSESSMENT FROM INVENTORIES

(D) Mass*, Allison S.[1,2], W. G. Wallace[2], and C. B. Zarnoch[3]
[1]The Graduate Center, City University of New York; [2]Biology Dept., College of Staten Island
[3]Department of Natural Sciences, Baruch College
THE EFFECTS OF CHRONIC HABITAT DEGRADATION ON THE PHYSIOLOGY AND METAL ACCUMULATION OF EASTERN OYSTERS, *Crassostrea virginica*

(D) Mora*, Jordan W. and D. M. Burdick
Department of Natural Resources and the Environment, Univ. of New Hampshire, Durham, NH
THE EFFECTS OF BERMS ON NORTHERN NEW ENGLAND TIDAL MARSHES

Poppe*, Lawrence J.[1], W. W. Danforth[1], K. Y. McMullen[1], C. E. Parker[2] and E. F. Doran[3]
[1]USGS, Woods Hole, MA; [2]AHB, NOAA, Norfolk, VA
[3]Connecticut Department of Environmental Protection, Hartford, CT
COMBINED MULTIBEAM AND LIDAR BATHYMETRY DATA FROM EASTERN LONG ISLAND SOUND AND WESTERNMOST BLOCK ISLAND SOUND – A REGIONAL PERSPECTIVE

Rochlin, I.[1], M. E. Dempsey[2], T. Iwanejko[1], and Dominick V. Ninivaggi[1]*
[1]Div. of Vector Control, Suffolk Co. Dept. of Public Works, 335 Yaphank Ave., Yaphank, NY
[2]Suffolk County Department of Environment and Energy, 335 Yaphank Avenue, Yaphank, NY
AQUATIC INSECTS OF NEW YORK SALT MARSH

(D) Salazar*, Camilo E.
New York Suffolk County Departments of Environment and Energy, Public Works and Division of Vector Control, Health Services, and Parks and Recreation and
Dept. of Environment and Energy, School of Marine Sciences, Stony Brook University, NY
TIDAL WETLAND RESTORATION AT THE SUFFOLK COUNTY INDIAN ISLAND PARK, NEW YORK

(D) Suter*, Elizabeth A., G. T. Taylor and K. M. M. Lwiza
School of Marine and Atmospheric Sciences, Stony Brook University, NY
EVIDENCE OF CHANGING NUTRIENT REGIMES IN LONG ISLAND SOUND

Wigand*, Cathleen[1], E. Davey[1], R. Johnson[1], R. S. Warren[2], and D. S. Johnson[3]
[1]US EPA NHEERL, Atlantic Ecology Division, 27 Tarzwell Drive, Narragansett, RI
[2]Connecticut College, New London, CT
[3]Marine Biological Laboratory, 7 MBL Street, Woods Hole, MA
USE OF CT IMAGING TO EXAMINE THE COARSE ROOTS, RHIZOMES, AND PEAT ASSOCIATED WITH CREEK BANK SPARTINA ALTERNIFLORA IN FERTILIZED AND CONTROL CREEKS IN PLUM ISLAND (MA)

ABSTRACTS

Adamowicz*, S. C.[1], D. Burdick[2], J. Kramer[1], and L. Wagner[1]. [1]US Fish and Wildlife Service, Rachel Carson National Wildlife Refuge, Wells, ME; [2]University of New Hampshire, Jackson Estuarine Laboratory, Durham, NH <susan_adamowicz@fws.gov>

THE EFFECTS OF DITCH PLUGGING ON SALT MARSHES: 2005 AND 2009

Most East Coast salt marshes have been ditched since Colonial times either for salt haying or mosquito control. These ditches drain both surface and subsurface water from the marsh in order to increase salt hay production or reduce mosquito-breeding areas. One consequence of ditching is the loss of surface water habitat suitable for waterfowl, wading birds and shore birds as well as fish and crustacean. Another consequence has been changes in vegetation community structure. Ditch plugging, has been employed widely in East Coast *Spartina* marshes as a means of increasing surface water habitat on previously ditched marshes. Ditch plugs are formed by excavating peat from the surface of a salt marsh and packing it in a narrow portion of a ditch. Water then is impounded in the ditch channel on the upstream side of the plug. We examined 2 physical soil parameters (bulk density, percent organic matter), interstitial hydrogen sulfide concentration, groundwater levels, vegetation community, and above-ground biomass at ditched and unditched marshes at 2 sites each in Maine, Massachusetts and Connecticut in 2005. The study was repeated in 2009 with the addition of 1 unditched marsh (with natural creeks) in Maine. Ditch plugs were installed from 1 to 11 years prior to the study except at 1 Connecticut site where ditches had filled in naturally over a period of decades. Results are given in light of long-term consequences for maintaining peat integrity and salt marsh accretion processes in the face of sea level rise.

Adamowicz*, S. C.[1], P. Drobney [2], G. Guntenspergen[3], J. Culpepper[4], M. Gregg[5], B. Johnson[6], J. Reinman[7], D. Sharp[8], C. Craft[9], C. Cambardella[10], J. Kush[11], S. Faulkner[3], J. Morgan[10], P. Shafroth[3], and B. Wang[3]. [1]Rachel Carson National Wildlife Refuge; [2]Neal Smith NWR; [3]USGS; [4]Carolina Sandhills NWR; [5]Saddle Mountain NWR; [6]Tetlin NWR; [7]St. Marks NWR; [8]White River NWR; [9]Indiana University NWR; [10]USDA-ARS; [11]Auburn University <Susan_Adamowicz@fws.gov>

ASSESSING CARBON SEQUESTRATION IN MULTIPLE ECOSYSTEMS: A NATIONAL LMRD COOPERATIVE PROJECT

The US Fish and Wildlife Land Management Research and Demonstration (LMRD) areas are places where new habitat restoration and management techniques are developed, implemented and showcased. Their reach spans across the continent – from Atlantic coastal marshes to the boreal forests of Alaska. This provides a unique framework for addressing global issues such as climate change. In 2010, the LMRD biologists and subject matter expert partners participated in two workshops to develop a common means of evaluating carbon stores and carbon sequestration rates in the 7 LMRD ecosystems. This poster describes that process and a pilot project for salt marshes. With the assistance of Dr. Craft (Indiana University) we are proposing to assess carbon stores and sequestration rates at several National Wildlife Refuge salt marshes that will include both reference sites and those under a restoration or other management regime. Our goal is to highlight the role salt marshes have in carbon cycling and the effects different management techniques may have on that process.

Bauer, C. L.*, R. L. Swanson, and R. E. Wilson. School of Marine and Atmospheric Sciences, Stony Brook University, Stony Brook, NY <clbauer@ic.sunysb.edu>

PHYSICAL FACTORS CONTRIBUTING TO SUMMERTIME HYPOXIA IN THE BOTTOM WATERS OF SMITHTOWN BAY, LONG ISLAND SOUND

Summertime hypoxia occurs in the bottom waters of Smithtown Bay, Long Island Sound. Hypoxia (<3.5mg O2/L) is plaguing many of our coastal estuaries and can be detrimental to aquatic organisms. Major causes of hypoxia in coastal waters are excessive anthropogenic nitrogen loading from sewage treatment plants, use of fertilizers, runoff, etc. However, there are no major sources of anthropogenic nitrogen that discharge directly into Smithtown Bay. Despite great effort to reduce nitrogen loading into Long Island Sound, summertime hypoxia is still occurring in Smithtown Bay. While hypoxic conditions continue to be prevalent in the bay, the surrounding bottom generally waters have considerably higher concentrations of dissolved oxygen. This study looks at how the cause of hypoxia in Smithtown Bay is more complex than just the introduction of anthropogenic nitrogen. The two headlands, Crane Neck and Eatons Neck, may be creating a partial barrier between the bay and the rest of the Sound, limiting flushing and aiding hypoxic conditions. Physical factors including wind, currents, and tides affect the vertical

structure of the water column. These factors can either induce or impede mixing, which may control the distribution and occurrence of hypoxia.

Bell*, S. L.[1], E. A. Walker[1,2], C. J. Gobler[1,2], and J. L. Collier[1]. [1]School of Marine and Atmospheric Sciences, Stony Brook University, Stony Brook, NY; [2] School of Marine and Atmospheric Sciences, Stony Brook University, Southampton, NY <sbell@ic.sunysb.edu>

INTERACTIONS BETWEEN PLANKTON COMMUNITY STRUCTURE AND ENVIRONMENTAL FACTORS IN BROWN TIDE IMPACTED LONG ISLAND EMBAYMENTS

Embayments of the south shore of Long Island have experienced blooms of *Aureococcus anophagefferens* "brown tides" since the 1980's. Their detrimental effects on shellfisheries and seagrasses are well known, however minimal research has looked at the influence of brown tides on the rest of the plankton community. To examine the plankton community, urease (*ureC*) genes, bacterial 16S and eukaryotic 18S rRNA genes (rDNAs) were PCR amplified and analyzed by terminal restriction fragment length polymorphism (TRFLP). Plankton samples were collected from Great South Bay in 2008 during an intense bloom of *A. anophagefferens*, during 2009 under non-bloom conditions, and in Quantuck Bay in 2009 and 2010 during moderate bloom conditions. Non-metric multidimensional scaling (NMS) did not show clear separation of samples by sampling location or on the basis of bloom vs. non-bloom conditions. However, a clear seasonal trend in community structure was observed. Environmental data were correlated to TRFLP distance matrices using a BIOENV procedure; results indicate that urea concentrations and total chlorophyll are important factors influencing 18S, 16S, and *ureC* profiles in both GSB and QB. The 1-5µm Chl*a* fraction appeared more important in GSB communities while temperature was important in QB. Correlations to environmental variables were stronger in GSB than QB for all communities. *A. anophagefferens* cell counts emerged as an important factor for 18S and 16S profiles from QB. Analysis of similarities (ANOSIM) revealed that interannual variability was highest in *ureC* profiles, and confirmed highly significant changes in communities between seasons.

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INCREASED VARIABILITY OF MICROBIAL COMMUNITIES IN RESTORED SALT MARSHES NEARLY 30 YEARS AFTER TIDAL FLOW RESTORATION

We analyzed microbial community diversity from sites impounded for 40-50 years and subsequently restored and undisturbed salt marsh sites in southeastern Connecticut over one growing season. Community diversity was assessed by terminal restriction fragment length polymorphism (TRFLP) and sequence analysis of 16S ribosomal RNA (rRNA) genes. Communities were diverse, representing 18 different bacterial divisions, with *Gammaproteobacteria* and *Bacteroidetes* comprising the majority of sequences. Multivariate analysis of the TRFLP data suggested significant site, sample date and disturbance effects, but the exact causes of these effects are not clear. Sites that had been impounded and subsequently restored showed greater variability of bacterial communities compared to undisturbed sites and variability in diversity was greatest at sites more recently restored. Additionally, bacterial abundance in restored sites was significantly lower than in undisturbed sites. Community differences were not correlated to differences in salinity, pH, water content, or nitrogen, but may likely be influenced more by the degree of tidal flooding and oxygen availability in addition to restoration status. In summary, our study suggests there may be long-lasting disturbance effects on the bacterial communities in restored salt marshes and raises questions about the resilience and ultimate recovery of the communities after chronic disturbance.

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THE INFLUENCE OF HABITAT HETEROGENEITY ON FAUNAL COMMUNITIES IN NEARSHORE SOFT SEDIMENTS, NEW HAVEN HARBOR, LONG ISLAND SOUND

Nearshore benthic environments are dynamic systems at the interface between land and sea. As a result, they are subject to chronic natural and anthropogenic disturbances creating a spatially and temporally variable mosaic of successional patches. Seasonally, the emergence of complex habitat elements, such as shell and algae, may generate habitat diversity in unstructured soft sediments, and affect species distribution patterns, and abundances, and biodiversity at local and system spatial scales. A combination of mensurative and experimental studies was carried out to examine the influence of changing habitat

elements on epifaunal and infaunal community structure. The study was performed from May to September when the colonization and successional process are most intensive. Shifts in community assemblages occurred with the presence of algae (Ulva lactuca), while remaining less variable in both shell and bare patches. Algae and shell patches provided opportunities for recruitment of many epifaunal and infaunal species spanning a wide taxonomic and size spectrum. In the experimental study, treatments exhibited distinct successional patterns, which appear to be related to change in small-scale habitat heterogeneity. In general, density and diversity was greatest in complex patches, although declined with time, reaching similar abundance levels, but with significantly different community structure at the end of the summer. Information on how organisms respond to changes in emergent structures will be discussed. The topographically varied and ephemeral nature of some structural habitat elements makes them important features in coastal sedimentary landscapes.

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ANNUAL EXTRACELLULAR ENZYME ACTIVITIES REVEALED BY HIGH RESOLUTION TWO-DIMENSIONAL PLANAR FLUOROSENSORS IN GREAT PECONIC BAY
Bacteria release extracellular enzymes to acquire carbon and nutrients from insoluble organic polymers . This enzyme catalyzed hydrolysis is generally considered as a rate-limiting step in nutrient mineralization. Traditional methods for measuring extracellular enzyme activity in sediments involve detailed sectioning or dissection of sediment cores, followed by homogenization, and measurement of enzyme activity after addition of a fluorogenic substrate. Here we describe the development of novel transparent planar sensor foils for resolving two-dimensional sub-millimeter scale enzyme activity patterns over large areas (~ 100 cm^2). This new technology has been applied to study annual extracellular enzyme activity profiles in Great Peconic Bay sediments. The direct visualization of two-dimensional enzyme activity has shown obvious heterogeneities, both horizontally and vertically, as well as pervasive 'hot spots' of microbial activity. In addition, during the spring bloom period (February), a thick zone of high enzyme activity and elevated pCO_2 at the sediment surface was revealed by fluorosensors, presumably related to recently deposited phytoplankton. The enzyme sensor measurements were contrasted with the traditional method. The spatially averaged patterns estimated by the two methods were comparable.

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BALANCING THE EDGE EFFECTS BUDGET: BAY SCALLOP SETTLEMENT AND RECRUITMENT ALONG A SEAGRASS EDGE
Understanding the impact of landscape on species is becoming increasingly important as anthropogenic habitat fragmentation is accelerating. Habitat edge effects have received considerable attention in this area. However, organism responses are highly variable along habitat edges, and the perception of whether edges are beneficial or detrimental varies throughout the literature. Edge effects are often predicted to be either positive (enhancement at the edge) or negative (enhancement within the interior), and neutral effects are often considered to be incorrect results. In seagrasses, edges, while enhancing settlement and increasing organism abundance, can also increase interspecific interactions, particularly predator-prey interactions. Bay scallops have a life cycle that includes a passively drifting larval stage, rapid growth rate, and a strong seagrass association, making the scallop an ideal model organism for investigating edge effects. By simultaneously collecting settlers (those viable larvae available to settle and metamorphose) and recruits (those settlers which survive some period of time, in this case, 6 weeks) on the same collectors, we are able to demonstrate a balance between positive and negative edge effects, resulting in a net neutral effect. In addition, post-settlement loss, most likely due to predation, appears to be the dominant mechanism structuring scallop abundance, not patterns in settlement. Since predation is highest along the seagrass edge, it is possible that edges may represent an 'ecological trap' for bay scallops.

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ESTIMATES OF CARBON SEQUESTRATION AND STORAGE IN TIDAL COASTAL WETLANDS ALONG THE US EAST COAST

Globally, salt marshes are reported to sequester carbon (210 g C m^{-2} y^{-1}), and along with mangroves in the US, they are reported to account for 1–2 % of the carbon sink for the conterminous US. Using the published salt marsh carbon sequestration rate and National Wetland Inventory areal estimates for estuarine intertidal wetlands in the eastern US, we calculated approximately 1.9 Tg C y^{-1} is sequestered (1 Tg = 10^{12} grams = 1 million metric tons), which is equivalent to CO_2 emissions from approximately 4.6 billion gallons of gasoline consumed. The coastal tidal wetlands of the U.S. east coast account for about 4% of the North American wetlands soils sink (49 Tg C y^{-1}). In addition, we used attributes from the Soil Survey Geographic (SSURGO) and US General Soil Map (STATSGO) databases developed by the NRCS (Natural Resources Conservation Service) to estimate the storage and stocks of carbon in the soils in coastal wetlands from Florida to Maine. The amount of carbon stocks in the coastal tidal wetlands of the U.S. east coast (117 Tg C) is equivalent to the CO_2 emissions from over 1 billion barrels of oil consumed or 48 billion gallons of gasoline consumed. For comparison, the April 2010 BP Gulf of Mexico oil spill released an estimated 4.9 million barrels of oil which is equivalent to 233 million gallons of gasoline consumed. In future studies the carbon stocks determined from the NRCS databases will be compared with soil carbon content measured from cores collected from selected northeastern marsh locations.

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RECREATIONAL FISHING TRIGGERS SALT MARSH DIE-OFF ON CAPE COD, MA
For decades, salt marsh communities were thought to be structured solely by bottom-up forces, and nearly all salt marshes are currently managed with no consideration for the potential role of consumers. Recent consumer-driven salt marsh die-offs throughout the western Atlantic, however, have led to an increasing appreciation of the role of top-down forces in these ecosystems. The most recent example of salt marsh die-off, first reported in 2006, is occurring on Cape Cod (MA). Extensive areas of low marsh cordgrass have been consumed by the native, herbivorous crab *Sesarma reticulatum* in marshes throughout Cape Cod. Recent experimental work, coupled with historical analysis of aerial photographs, has shown that the emergence of *Sesarma* as a major driver of salt marsh loss is caused by the depletion of local *Sesarma* predator populations as a result of concentrated recreational fishing pressure. Marshes with significant pre-1970's development, especially the construction of marinas, dredged channels and private homes, experience greater subsequent recreational fishing pressure as a result of the increased access afforded by these structures. Our findings support the emerging realization that consumers play a dominant role in salt marsh communities and can cause ecosystem collapse when their impacts are amplified by human activities, including recreational fishing. These results are particularly significant given the recent reports of salt marsh die-off spreading into Long Island Sound.

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LONG ISLAND SOUND GEOCHEMISTRY: PAST, PRESENT AND FUTURE
The geochemistry of LIS is strongly influenced by its geological history, physical oceanography, and human usage; the geochemical processes occurring in the Sound's sediments and waters are further influenced by the organisms living within them as well as by climate change. This paper presents an overview of the geochemical processes that are known to occur in both the sediments and water column of LIS, the coupling that exists between sediment and water column geochemical processes, and their historical relationships to LIS's geological, physical, and biological systems. Examination of data from the last twenty years reveals certain dominant trends, particularly in the Western Sound. Radionuclide data for this time period indicates that non-atmospheric sources are dominant for metals in WLIS while atmospheric sources dominate in CLIS and ELIS. Bottom water and pore water measurements reveal a shift from aerobically-dominated sediment processes towards anaerobically-dominated sediment processes in certain regions of the WLIS; TOC values for specific sites within WLIS have also increased over the same twenty year time period. Such shifts appear to be accompanied by bioturbational changes. Water column data from the same time period reveal changes in nutrient chemistry, as well as in dissolved oxygen levels. These trends are discussed relative to temperature and rainfall patterns. Consideration is also given to potential changes that may occur within LIS's geochemical environments

and processes relative to future shifts in climate and human usage.

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A METHOD FOR MAPPING AND PRIORITIZING DIADROMOUS FISH HABITAT RESTORATION

An inventory of six Long Island South Shore Estuary Reserve streams was conducted by NP&V in 2007 in order to map and prioritize barriers to diadromous fish passage. A points system was determined to score and rank barrier priorities for removal or modification. Potential barriers to fish passage were carefully characterized and inventoried according to criteria determined at the onset of the project. Each potential barrier was measured and documented in the field, assessed according to the USEPA Rapid Bioassessment Protocol for wadeable streams, characterized as either a temporary, partial or permanent barrier, and compiled into a GIS database. Each barrier was then subjected to a series of metrics within the following five categories: Hazard Mitigation & Public Safety, Ecological Value, Cultural Value, Recreational Value, and Project Feasibility. The composite scores were used to rank and prioritize the barriers for remediation. This project was prepared in participation with the New York State Department of State Division of Coastal Resources and South Shore Estuary Reserve (SSER) Council with funds provided under Title 3 of the Environmental Protection Fund. Since this inventory was completed, implementation has proceeded. Progress on fish barrier restoration projects in the SSER, including within the Carmans River, will be discussed.

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APPLICATION OF COMPUTER-AIDED TOMOGRAPHY (CT) TECHNOLOGY TO VISUALLY COMPARE BELOWGROUND COMPONENTS OF SALT MARSHES IN JAMAICA BAY AND LONG ISLAND, NEW YORK

Computer-aided Tomography (CT) technology demonstrated that rapidly deteriorating marshes in Jamaica Bay (JB) had significantly less belowground mass and abundance of coarse roots and rhizomes at depth (10 to 20 cm)compared to more stable areas in the JB Estuary (JBE). In addition, the rhizome diameters and peat particle densities were significantly greater in the deteriorating soils at JB. We compared these JBE results with belowground cores collected from marshes in the Peconic and Long Island Sound Estuaries. Marsh cores were first collected at the Nature Conservancy Mashomack Preserve on Shelter Island; however, the CT analysis of these samples indicated this location had a much higher mineral content than the JB stations and was not ideal for direct comparison. Therefore, to look for a more suitable control field site for comparison with JB, in September 2010 we collected cores from three more Long Island marshes, which were in the vicinity of Hubbard, Frost and East creeks on the south shore of the Long Island Sound Estuary. After a brief description of the CT technology applied, we will present some of our results from each of these marshes primarily as 2 and 3D visualizations of various belowground components.

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ASSESSMENT OF THE ECOLOGICAL ROLE OF ADULT WHITE PERCH (MORONE AMERICANA)USING HYDROACOUSTIC TELEMETRY IN THE GREAT SOUTH BAY SYSTEM

The semi-anadromous white perch (*Morone americana*) inhabits both the estuary and rivers in the Great South Bay system. The species has been shown to be ecologically important in other habitats, for instance through multi-level trophic feeding and fish egg predation, but little is known about its ecological role in Great South Bay, NY. The goal of this project was to determine essential fish habitat, migratory pathways, seasonal variability in movement, and dietary preferences. In particular, it was predicted that white perch would exhibit two types of behaviors, with some fish semi-anadromous but essentially resident to the river, while others showing population divergence through partial migration to other rivers and creeks. Thirty Vemco™ VR2W acoustic receivers were deployed, with fifteen in the Carmans River and the rest divided among seven locations throughout the Bay. The receivers in the Carmans River

provided 100% coverage from freshwater to the mouth of the bay. Twenty-five fish were tagged in the Carmans River, beginning in August 2010, with Vemco™ V9 acoustic transmitters. A SEACAT SBE-16 profiler was also deployed in the Carmans River to monitor temperature, salinity, and tidal level. Results suggest a variety of behaviors, including diel migration, individual centers of activity, and shifts in habitat use with seasonal temperature variation. Fish movement was restricted to the Carmans though a few fish left the system. Further analysis will determine the correlation between environmental factors and movement and pinpoint critical habitat locations. This assessment contributes to the Great South Bay Project, an effort to implement an ecosystem-based approach to the management of this system.

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TEMPORAL EFFECTS OF INLET MODIFICATION AND PROTECTIVE SIGNAGE ON THE FRACTAL GEOMETRY OF A SEAGRASS MEADOW: A 3-YR STUDY OF SEBASTIAN INLET, FL

Sebastian Inlet, Florida provides an important point of tidal exchange between the Atlantic Ocean and the Indian River Lagoon, and currently supports a diverse and highly productive mixed-seagrass meadow on its flood tidal shoal. During the spring of 2007, the Sebastian Inlet District successfully: (1) constructed a navigation channel connecting the Inlet westward to the Intracoastal Waterway, (2) excavated 64,987 m3 of beach replenishment material from the Inlet sand trap, and (3) established a 58.7 ha seagrass mitigation zone bounded by 39 cautionary signs. To quantify resultant changes in submerged aquatic resources within the mitigation zone, a GIS-based approach using low-level digital aerial photography was implemented in June of 2007 and continued annually thereafter. Here, the results of supervised and groundtruthed seagrass habitat classifications were analyzed for spatiotemporal patterns in fractal geometry following the methods of Cunha and Santos (2009). Calculated fractal dimensions and Hurst exponents were used to infer the degree of persistent or anti-persistent behavior for various patch size ranges, and to track relevant scale domains and threshold values through time. Ongoing analysis will attempt to link these process scales to potential forcing functions responsible for generating the temporal coverage patterns. This work is ongoing and preliminary results will be presented. Conference attendees are cordially invited to discuss past experiences with fractal-based approaches and to offer opinion on their utility in this regard.

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ESTIMATING GENETIC CORRELATION BETWEEN SIZE AT AGES AND FECUNDITY IN ATLANTIC SILVERSIDES

Fast growth and large size in fish early life history is strongly favored by natural selection. However, variation in growth rate has been observed in many taxa, both among and within populations. One hypothesis to explain why such variation still occurs despite strong selection is that the genetic basis of growth itself is low and therefore strong selection does not lead to evolution. Alternatively, selection may act on multiple correlated traits throughout the life history. To test these hypotheses we used Atlantic silversides *Menidia menidia*, a common estuarine fish as a model system. We used a full factorial mating design to estimate genetic variance in, and heritability of, size at age through the first 200 days. 120 full- and half-sib families were reared on unlimited food in a common 21 degree C laboratory environment. Total lengths were recorded by digital photography on a weekly to monthly basis. A function-valued trait approach was employed to estimate the genetic covariance function for size at age and fecundity. We found that heritability is substantial across all ages and there is a difference between maternal and paternal estimated genetic components indicating the presence of maternal effects.

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IMPACTS OF CLIMATE CHANGE ON THE SPRING BLOOM IN LONG ISLAND SOUND

It has been hypothesized that during warm winters, the winter-spring bloom in temperate coastal waters is suppressed due to increased zooplankton grazing. However, this hypothesis has not been tested in LIS. Our project is examining the role of temperature-enhanced, zooplankton grazing in mitigating the

development of the LIS spring bloom. We conducted field studies of the physical and chemical characteristics, phytoplankton and zooplankton composition and abundance, and primary productivity and grazer-induced mortality rates of phytoplankton in LIS during winter and early spring. Mesocosm experiments which manipulated seawater temperatures were conducted to further investigate the impacts of elevated and reduced seawater temperatures ($\pm 3^{\circ}$C of ambient) on the magnitude and composition of the spring bloom. The 2010 spring phytoplankton bloom occurred in early February during which chlorophyll *a* concentrations in central LIS exceeded 10 ug L^{-1}. The bloom consisted of > 1,000 diatoms ml^{-1} but was also comprised of smaller phytoplankton (nano- and picophytoplankton; > 50% of total chlorophyll *a*). In a two-week mesocosm experiment, higher temperatures yielded lower chlorophyll *a* and diatom levels and higher abundances of ciliates and other microzooplankton grazers. Microzooplankton community grazing rates were significantly higher in the elevated-temperature mesocosms compared to the ambient-temperature mesocosms ($p<0.05$). Such a suppression of the spring bloom would alter benthic-pelagic coupling and have implications for coastal fisheries. Data from the 2011 spring bloom will also be presented.

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ANNOTATED LIST OF MARINE MACRO FAUNA IN CEDAR ISLAND MARINA, CLINTON HARBOR, CT, LONG ISLAND SOUND

Sixty-one marine species (42 vertebrate and 19 invertebrate) were documented within a Long Island Sound boat marina during 14 survey years between 1989 and 2009. Capture methods including fish traps, beam trawling, eel pots, and angling were employed in various studies providing data for this annotated list. Notes on taxonomy, species abundance, and presence in different surveys are presented here.

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PHASE SHIFTS AMONG PRIMARY PRODUCERS WITHIN LONG ISLAND SOUND: WILL ANTHROPOGENIC STRESSORS CONTINUE TO EXPAND THE NICHE OF PSP- AND DSP-PRODUCING DINOFLAGELLATE BLOOMS?

During the past decade the composition of primary producers in Long Island Sound (LIS) has undergone a fundamental phase shift as intense blooms of toxin-producing dinoflagellates have become annual events in several coastal systems. For example, since 2006, blooms of the paralytic shellfish poisoning (PSP) dinoflagellate, *Alexandrium fundyense*, have achieved densities exceeding 1,000,000 cells per liter and have produced concentrations of saxitoxin that have annually closed thousands of acres of LIS shellfish beds. More recently, blooms of the diarrhetic shellfish poisoning (DSP) dinoflagellate, *Dinophysis acuminata*, have reached densities exceeding 100,000 cells per liter and have produced water column concentrations of the toxin, DXT1, exceeding 10 ppm in nearshore LIS. Beyond nearshore PSP and DSP events, the relative abundance of dinoflagellates within some open water regions of LIS has concurrently increased by two-fold. It is hypothesized that this phase shift among primary producers has been initiated by a series of anthropogenic alterations to LIS ecosystems including nitrogen loading, organic matter loading, and factors related to climate change including increasing temperatures and increasing concentrations of CO2. Details of the expansion of dinoflagellate populations in LIS and the relative importance of the factors responsible for these changes will be discussed.

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A BIOGEOCHEMICAL STUDY OF DITCHPLUG AND NATURAL POOLS IN THE SPRAGUE RIVER MARSH, PHIPPSBURG, ME

Many of the marshes in New England currently have a network of small, hand-dug ditches (put into place by the first European settlers 300+ years ago). These ditches are very efficient at draining and flooding the marsh surface during the tidal cycle. In an effort to restore these ditched marshes, the U.S. Fish and Wildlife Service plugged eleven ditches in the southern end of the Sprague River marsh beginning in the early 2000s. The purpose of this research is to study the biogeochemical cycling of carbon in ditchplug and natural pools in the Sprague River Marsh in Phippsburg, Maine. In the summer of 2010 mummichogs

(*Fundulus heteroclitus*), surface sediment, vegetation, biomass cores, and other marine organisms were collected for stable isotope analysis from three natural and ditchplug pools. General water quality parameters and nutrient data were also monitored. The vegetation surrounding the pools was mapped and the elevation of the marsh surface was analyzed using LIDAR. The natural pools were at a slightly higher elevation and were surrounded by more C4 vegetation than the ditchplug pools. Isotopic results indicate that the local vegetation composition plays a key role in determining the isotopic composition of mummichog diets, whereas nutrient concentrations and primary production rates play a key role in determining the isotopic composition of POM. The differences in biogeochemical cycling between the natural and ditchplug pools may, in part, be due to the location of the pools on the marsh, in addition to the nature of the ditchplug pools. Further work should focus on hydrologic and geochemical indicators in addition to carbon and sulfur cycling on the surface of the marsh.

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IMPORTANCE OF B-VITAMINS AS NUTRIENTS CONTROLLING PHYTOPLANKTON COMMUNITIES IN COASTAL ECOSYSTEMS

Phytoplankton biomass in coastal marine systems is often determined by the availability of nitrogen. Recent evidence suggests that in addition to macronutrients, larger phytoplankton in coastal and open ocean environments can also be limited or colimited by the availability of micronutrients such as B-vitamins. To date, however, there has been only one study which measured utilization of vitamins directly, with previous authors inferring vitamin use by measuring vitamin disappearance in the environment. This study, for the first time, measured direct uptake of vitamins B12 and B1 two contrasting coastal Long Island ecosystems, central Long Island Sound and eutrophic eastern Shinnecock Bay. Surprisingly and contrary to previous hypotheses, we found that the majority of vitamin uptake occurred in the picoplankton, even at times when larger, potentially vitamin auxotrophic, phytoplankton were abundant. Analysis of the plankton community revealed that heterotrophic and cyanobacteria were responsible for the majority of B12 utilization while nutrient/vitamin amendment experiments showed that, in the summer and fall, vitamin B12 was either primary limiting nutrient for both sites or colimited phytoplankton biomass in addition to nitrogen. Together these observations suggest that picoplankton harbor a competitive edge over larger phytoplankton and are better able to utilize the picomolar concentrations of vitamin present. Size fractionated vitamin uptake rates and primary production rates also revealed that, in addition to supplying vitamins to the eukaryotic plankton community, prokaryotes actively compete with eukaryotes for vitamins and may limit the growth of certain auxotrophic phytoplankton in Long Island Sound.

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THE STATUS OF FIVE STATE-LISTED TIDAL PLANT SPECIES IN NEW HAMPSHIRE WITH EMPHASIS ON POTENTIAL IMPACTS OF SEA LEVEL RISE

New Hampshire’s tidal habitats are home to 27 state-listed plant species despite being restricted to 162 miles of coastal and estuarine shoreline. Anthropogenic impacts such as development, dredging, siltation, and invasive species threaten and may limit populations of these rare species. The current status of four threatened species: *Eleocharis parvula, Samolus valerandi, Lilaeopsis chinensis,* and *Agalinis maritima* and one endangered species *Salicornia bigelovii* were examined over a two year period to determine their current stability, and predict their status into the near future. Populations were mapped in the field (area and density) and associated native and invasive species noted. In addition, parameters such as pore water salinity, land slope, and proximity to development were documented. These data were combined with elevation surveys of marsh zones and perimeter of *S. valerandi* and *L. chinensis* populations to determine potential effects of rising sea levels on those species. As inhabitants of inherently narrow high marsh and transitional habitats of brackish tidal marsh, migration will be restricted due to physical and topographical barriers. Comparison of population data over time suggests that all five species are stable under current conditions. However, analysis of sea-level rise model predictions show that an increase in sea level of 0.56 m for *S. valerandi* and 0.96 m for *L. chinensis* could result in complete loss of habitat at the sites surveyed in this study. Use of this model will help identify sites particularly vulnerable to loss of rare species and help managers prioritize restoration and conservation efforts.

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ANALYZING THE TRENDS OF WATER QUALITY INDICATORS IN JAMAICA BAY, NY
Jamaica Bay is a eutrophic, shallow, coastal lagoon that receives 90% of its nitrogen from Waste Water Treatment Facilities (WWTF). Various organizations have collected water quality monitoring data in the Bay with varying spatial resolution and temporal frequency and duration. We have begun an in depth analyses of these existing data to identify significant trends in and relationships between variables. Preliminary results focus on the summer monitoring conducted by the National Park Service at 13 stations from 2001 to 2009. On the annual timescale, there is a significant increase in nitrate concentration driven by increases at poorly-mixed stations in proximity to WWTF outfalls. In 2007, there was a significant negative correlation at the weekly timescale between chlorophyll-a and orthophosphate averaging over all stations. This trend is absent when grouping data at the annual timescale, and the relationship between nitrate and chlorophyll-a is not significant. We will discuss the implications of choosing temporal and spatial scales when analyzing long-term monitoring data.

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SELECTION OF SPAWNING HABITATS BY HORSESHOE CRABS (*LIMULUS POLYPHEMUS*) ALONG THE COMPLEX CONNECTICUT COAST
The Atlantic horseshoe crab (*Limulus polyphemus*) is both commercially harvested and ecologically important to coastal food webs, particularly to migrating shorebirds that feed on their eggs during migration stopovers. Horseshoe crabs spawn along the coast, primarily at sandy estuarine beaches in late spring and early summer. Recently, several states have enacted protective conservation measures such as closing commercial seasons. Towards a better understanding of spawning distribution and habitat selection along the complex northern coastline of Long Island Sound, we characterized coastal habitats in Connecticut by various traits (slope, wave exposure, and sediment composition) using remotely sensed data and GIS technologies. Repeated field surveys at a subsample of coastal segments were conducted over two summers and used with these habitat characteristics to develop a statistical resource selection function based on spawning crab abundances. The resource selection function allows predictive categorization of 12,648 coastal segments relative to the likelihood of use by spawning horseshoe crabs.

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GEOLOGIC INVESTIGATIONS IN THE LIS BASIN: AN OVERVIEW
Glacial deposits overlie and nearly fill an inner lowland (LIS Basin) which is floored by crystalline rocks in the north and is bounded to the south by the Cretaceous coastal plain remnant, capped by glacial deposits. The thick glacial section in the LIS Basin consists of sediment that was deposited in glacial Lake Connecticut during the systematic retreat of the last (late Wisconsinan) ice sheet. Ice retreat from the north shore of Long Island began about 19,000 years ago. Ice-marginal lacustrine fans and submerged moraines mark former positions of the ice margin in the LIS basin. By about 17,600 years ago, the ice margin had retreated to what is presently the south shore of Connecticut. At that time, glacial Lake Connecticut was roughly the size of LIS today. The lake spillway was located at the lowest point along the Roanoke-Fishers Island moraine in the vicinity of The Race. Lake levels progressively lowered as the spillway was erosionally deepened, and gradually the lakebed became subaerially exposed. An eastward-flowing river system developed on the exposed lake bed and, as glacial melting proceeded, this became the route for the rising sea to enter the LIS basin via the spillway notch at The Race. As the interplay between the rising sea and the rebounding land sorted itself out, a transgressive, wave-cut surface (ravinement) also began to form. Extensive deposition associated with the draining of glacial Lake Hitchcock (through the Connecticut River valley), followed by a continuation of the marine transgression,

and remobilization of glacial sediments by tidal energy, factor into the continuing reshaping of the modern LIS Basin.

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COASTAL NUTRIENT CRITERIA AND TREND MONITORING IN NEW ENGLAND
Nutrients exported to the coastal ocean result in the potential for expression of eutrophic symptoms. Can we detect these changes over time and space and establish coastal numeric criteria that protect against adverse effects of nutrient enrichment? One approach to developing coastal nutrient criteria is to compare minimally impacted nearshore reference stations to stations impacted by riverine or wastewater sources (and to offshore stations). Surveys in 2009 and 2010 in coastal Massachusetts, New Hampshire and Maine tested this reference approach, and were compared to results from 2004 and 2005. We added stations in 2010 to determine whether a stressor-response relationship of nutrient impacts could be established among coastal bays of similar typology. We measured total nitrogen, total phosphorus and chlorophyll and conducted a water column profile for optical water properties at 55 to 65 stations per year. Most stations sampled exhibited coastal characteristics; surface salinities were typically 30 to 32 ppt. Median levels of total nitrogen in nearshore surface samples were about 0.21 mg/l, with little differences among stations classified as unimpacted nearshore, riverine, or bay. Offshore stations, however, were lower in total nitrogen and chlorophyll Riverine influences were not strongly detected possibly due to sampling after the majority of nutrients had been exported or due to the strong tidal exchange in the Gulf of Maine. Some coastal bays with high nutrient loadings expressed elevated levels of total nitrogen and chlorophyll, suggesting a gradient of nitrogen loading and responses could be revealed. Total nitrogen levels in 2009 and 2010 also appeared to be lower than in 2004 and 2005.

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HOW DOES THE PLANKTONIC MICROBIAL COMMUNITY STRUCTURE DIFFER IN GREAT SOUTH BAY WITH AND WITHOUT *AUREOCOCCUS ANOPHAGEFFERENS* (BROWN TIDE)?
The picophytoplankton ‘brown tide’ species *Aureococcus anophagefferens* has been a major environmental issue since it first struck Great South Bay (GSB) in the 1980s. Brown tide is believed to have caused the loss of hard clams, seagrass and bay scallops in GSB, but its effects on planktonic microbial community structure have not been described. For this study, water samples were collected weekly from May to October in 2008 (a brown tide year) and May to December in 2009 (a no brown tide year). Terminal restriction fragment length polymorphism (TRFLP) of 18S and 16S rDNA amplicons was used as a fingerprinting technique to follow changes in plankton community structure temporally. Cloning and sequencing of 18S and 16S PCR products were also performed to help identify at least the major TRFs observed. Results show that the contribution of *A. anophagefferens*-specific terminal restriction fragments (TRFs) to the total TRFs correlates well with the abundance of *A. anophagefferens* determined microscopically. Multidimensional statistical analyses (NMS) conducted for each year separately show that microbial community structure changed throughout the sampling season during both 2008 and 2009. Temperature, salinity and wind were important for shaping the microbial planktonic community structure in GSB. While wind was an important environmental factor in 2008 and was associated with the relative abundance of *A. anophagefferens*, it was not as important in 2009 when *A. anophagefferens* was not abundant in GSB.

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BIOLOGY AND ECOLOGY OF LONG ISLAND SOUND
I will present an overview of the biology and ecology of Long Island Sound, describing the major habitats, biota and ecological dynamics in the Sound. Community structure, life histories, diversity, seasonality, spatial gradients and long term trends will be briefly discussed for each major habitat. Habitats to be covered include salt marshes and seagrasses, harbors and bays, intertidal and shallow subtidal regions, and the water column and seabed of the basins. General controls of primary and secondary production, trophic dynamics and key biotic interactions will be presented. I will also discuss the major environmental challenges to the biota, including biological development and consequences of

seasonal hypoxia, the effects of biological invasions, biological responses to benthic disturbances such as dredge spoils, the roles of diseases of commercially important species, development and effects of harmful algal blooms, and the role of climate change (in particular changes in temperature minima and maxima and increased carbon dioxide levels). I will end with a brief discussion of trends and patterns of ecological processes in LI Sound and the research and monitoring needs of the scientific and regulatory communities.

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EELGRASS IN EASTERN LONG ISLAND SOUND -- ASSESSMENT FROM INVENTORIES
The U.S. Fish and Wildlife Service conducted eelgrass inventories in the eastern end of Long Island Sound in 2002, 2006, and 2009. Using aerial photography, GIS tools, and field inspections these inventories examined the distribution and temporal changes in this habitat important for many coastal marine animals. Eelgrass is a rooted vascular sea grass living fully submerged in shallow coastal marine waters in patches ranging from individual plants to beds covering many acres. The plant provides numerous ecological services including altering water flow and nutrient cycling, is an important food source for some birds, fish, marine turtles, invertebrates, and provides critical habitat and nursery grounds for many animals including commercially, recreationally and ecologically important fish species. The 2009 work surveyed 172 eelgrass beds covering 1,980 acres. The work supports the interest of many stakeholders in Long Island Sound including the State of Connecticut's Office of Long Island Sound Programs and U.S. Environmental Protection Agency. This presentation outlines the methods used in the surveys, summarizes inventory results, and compares the findings over time.

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THE EFFECTS OF CHRONIC HABITAT DEGRADATION ON THE PHYSIOLOGY AND METAL ACCUMULATION OF EASTERN OYSTERS, *Crassostrea virginica*
Prior to the urbanization of the Hudson River Estuary (HRE), Eastern oysters (Crassostrea virginica) were significant contributors to the ecological and economic health of the region. However, due to overharvesting, pollution, and declining water quality, this ecosystem engineer has become 'functionally extinct' in the lower HRE. Recent restoration efforts have yielded mixed results, mainly due to the unique suite of pollutants seen in the HRE. Changes in physiology (i.e., energy reserves, mitochondrial energetics) and metal storage (i.e., storage in subcellular fractions) may lead to changes in the overall health of the oyster, and affect growth, reproduction, and survival. A field-based study examining juvenile C. virginica at a variety of sites within the urbanized HRE was conducted in the summer of 2010. Juvenile oysters were placed along a contaminant gradient, and subsampled over time to determine changes in physiology and metal storage. Significant, site specific differences were seen between sites with respect to condition index, biochemistry, energy usage, and metal accumulation. Significant correlations between metal accumulation (Hg, Cd) and energy usage indicates that habitat degradation has an influence on the overall physiology of C. virginica, and that any potential future restoration of C. virginica to the urbanized HRE must take into account the differences in energy budgets and condition of juveniles. Laboratory exposures are underway to isolate the effect of metal pollutants from the overall habitat.

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SEASONAL DIFFERENCES IN C:N:P CONTENTS OF THE CTENOPHORE *MNEMIOPSIS LEIDYI* (AGASSIZ) IN RESPONSE TO CHANGES IN POPULATION SIZE STRUCTURE AND NUTRITIONAL STATUS
The ctenophore *Mnemiopsis leidyi* (Agassiz) is an ecologically important gelatinous predator in temperate coastal environments. *M. leidyi* populations are characterized by considerable seasonal fluctuations in abundance, serving as sinks of nutrients (C, N, and P) during bloom formation, but as sources of regenerated nutrients during population collapse. The total C, N, and P contents of *M. leidyi* populations are likely to change over time due to changes in prey abundance and *M. leidyi* population size structure and biomass. Because population collapse is most likely to occur following a period of insufficient prey densities, elemental composition of ctenophore populations cannot necessarily be inferred from well-fed,

laboratory-reared individuals as previously described. Although the role of ctenophores in nitrogen cycling has been extensively studied, less is known about their role in regulating the flow of carbon and phosphorous. Individual *M. leidyi* of varying size were collected for C, N, and P analysis over two sampling years (2008 and 2009) in Great South Bay, NY. Weight percent carbon and nitrogen values of *M. leidyi* collected at the start of the ctenophore bloom were significantly greater than in individuals sampled towards the collapse of the population when zooplankton abundances were low. Preliminary data suggests a similar trend with phosphorus. Size-specific compositions were used to estimate the amount of C, N, and P released by *M. leidyi* populations during biomass remineralization. To our knowledge, this is the first study documenting *in situ* elemental composition (C, N, and P) of *M. leidyi* as a function of size class and prey availability.

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THE EFFECTS OF BERMS ON NORTHERN NEW ENGLAND TIDAL MARSHES
Berms, defined as historic earthen barriers, represent one type of hydrological modification introduced by humans in the tidal marshes of northern New England. Three different research approaches (observational, experimental, and predictive) were applied to study the impact of parallel-oriented berms on various tidal marsh dynamics. The observational study shows that restricted flooding from berm interference can result in significantly altered physical gradients in addition to landward pool development. The transplant experiment results indicate that the altered physical structure in the landward section of the marsh affects the relative importance of biological interactions, namely herbivory, in controlling plant species distribution. The predictive GIS-based analyses illustrate the location of 34 berm sites within the Great Bay Estuary and highlight the bermed marshes which are most at risk of invasion by the non-native variety of *Phragmites australis* (common reed) and submergence during sea level rise. Based on the overall results, berms have the potential to reduce the resiliency of many tidal marshes in the Great Bay Estuary.

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NOCTURNAL SEAL DEPREDATION IN A NEARSHORE FISHERY AND IMPLICATIONS FOR ANALYSES OF ENVIRONMENTAL EFFECTS ON CATCH
Marine mammal depredation can have significant negative effects on the performance of fixed fishing gears. Gray seals (*Halichoerus grypus*) feed on fish weir catches in Nantucket Sound (Massachusetts, USA), and partially consumed longfin inshore squid (*Loligo pealeii*) and finfish in the nets are attributable to seal depredation. A Dual-frequency Identification Sonar (DIDSON) was deployed in a weir to monitor diel patterns of squid and fish catches, as well as seal presence and behavior. Daily squid and finfish landings, discards, partially consumed catch, and fishing effort were documented using logbook data from weirs in May 2007 and 2008. Oceanographic data was recorded using data loggers at each weir, and meteorological data was collected from a nearby weather station. Partially consumed catch documented in logbooks was used as a proxy for a depredation event and incorporated as a factor in analyses of environmental effects on daily squid catches. Generalized additive models (GAMs) were applied to examine the relative influence of environmental variables, seal depredation, and date. Seal occurrence in the weir was observed throughout 24-hour periods, most frequently at night. Behavioral observations indicated that seal presence likely affected the efficiency of the weir, disrupting the passage of schooling squid and finfish into the catch chamber. Including depredation as a factor in GAMs did not improve model performance. Environmental variables had a more pronounced effect (greater explained deviance) in models that did not include data collected on days during which depredation was observed, indicating that depredation should be considered in analysis of catch rates.

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IDENTIFYING SOCIAL PERSPECTIVES AS THE BASIS FOR COASTAL AND MARINE SPATIAL PLANNING (CSMP) FOR LONG ISLAND SOUND
Existing piecemeal marine policy efforts (largely reactionary) are not sustainable for Long Island Sound (LIS), especially as it continues to face increasing coastal development pressure and new interest in

commercial exploitation of resources. Both nationally and regionally, marine policy is shifting towards a more comprehensive ecosystem based management approach such as coastal and marine spatial planning (CMSP). Integrated CMSP is a useful tool to assess tradeoffs between various human uses and services in marine systems. Countless examples exist supporting the involvement of stakeholders early on in the CMSP process. In addition, identifying current social and ecological conflicts and compatibilities, and where and what conflicts exist among the various human uses, are among the first steps in creating a CMSP. There are many active stakeholder groups, associations, and agencies working in LIS. This project was developed to document perceived conflicts and relative values of ecosystem uses and services in LIS. A targeted stakeholder survey (pilot) was developed and administered this past fall. The results presented here are from the pilot study. The goal of the pilot survey was to identify preliminary trends and patterns, and decide which questions to further explore. This data will help drive the questions we ask next regarding CMSP in LIS and give us a rationale for doing so.

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PHYSICAL OCEANOGRAPHY OF LONG ISLAND SOUND
We present a summary the available observations and analyses that inform our understanding of the how physical processes influence the waters of Long Island Sound with particular emphasis on those that have an important influence on the ecosystem. Since much of the variability in the conditions in the Sound is caused by fluctuations in river flow and winds, we summarize observations and discuss evidence of trends. Using an extensive data set, we describe the structure and variability of the distributions of temperature, salinity, density, vertical stratification, and dissolved oxygen at tidal, seasonal and inter-annual scales. Evidence of long term trends in these variables are also summarized. Recent measurements and models of currents in the Sound are summarized. The frequencies, amplitudes and phases of tidally forced motions are reported and the mechanisms that lead to these responses are discussed. The role of meteorological forcing and the bathymetry of the Sound on the structure and variability of the circulation is summarized. Recent observations and model results that describe the interaction of tidal mixing, buoyancy forced circulation, and wind on the near-bottom dissolved oxygen concentration in the western Sound are compared and discussed. Outstanding questions and recommendations for future study are outlined.

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CUMULATIVE IMPACTS OF MULTIPLE STRESSORS ON *ZOSTERA MARINA* POPULATIONS IN NEW YORK ESTUARIES
The south shore estuaries of Long Island have undergone substantial ecosystem changes in the last three decades. Once possessing the most productive hard clam fisheries in the nation, the ecosystem now is characterized by the loss of this filter feeder, high phytoplankton biomass and harmful algal blooms, and subsequent low light penetration to the sediment surface. Concomitant with this fishery induced habitat modification has been the loss of eelgrass. *Zostera marina* is the foundational species of NY's estuaries and it is the services provided by these plants that largely determine ecosystem structure and function. Because of their recognized importance, eelgrass is targeted for management and restoration strategies. The primary potential stressors on eelgrass populations in NY coastal waters include eutrophication-related light shading, sulfide toxicity and increased water temperature. This research project quantified the effects of these three specific natural and anthropogenic stressors both individually and when combined on eelgrass productivity and survival through a series of mesocosm and field experiments. The data from this study will allow the effectiveness of alternative ecosystem-based management strategies for eelgrass to be assessed.

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COMBINED MULTIBEAM AND LIDAR BATHYMETRY DATA FROM EASTERN LONG ISLAND SOUND AND WESTERNMOST BLOCK ISLAND SOUND – A REGIONAL PERSPECTIVE
Detailed bathymetric and interpretive maps of Long Island Sound are of great interest to the research and management communities because of this estuary's ecological, recreational, and commercial importance. Although each of our previously completed, geologically interpreted, 2-m digital terrain models (DTMs)

individually provides important benthic environmental information, many applications require a geographically broader perspective. For example, the usefulness of individual surveys is limited for planning and construction of cross-sound infrastructure, such as cables and pipelines, or for testing regional circulation models. To address this need, we integrated 12 multibeam and 2 LIDAR contiguous bathymetric DTMs, generated by NOAA, into one dataset covering much of the eastern sound and extending into Block Island Sound. The new dataset is gridded to 4 m, and will be provided as raster grids and GeoTIFFs in UTM and geographic projections. This resolution is adequate for feature and process interpretation, but results in datasets small enough to be queried and manipulated with standard GIS programs. Natural features visible in the data include exposed bedrock outcrops, bouldery moraines, sand-wave fields, and scour depressions that reflect the strength of the oscillating tidal currents. Bedform asymmetry allows interpretations of net sediment transport. Anthropogenic artifacts include channels, shipwrecks, dredge spoils, mooring anchors, prop-scour depressions, buried cables, and bridge footings. Together the merged data reveal a larger, more continuous perspective of benthic topography than previously available, providing a fundamental framework for research and resource management activities in this estuary.

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AQUATIC INSECTS OF NEW YORK SALT MARSH

The aquatic insect fauna of salt marshes is poorly characterized excepting the biting Diptera. Aquatic insects play an important role in salt marsh ecology and thus may be useful as biological indicators for assessing impacts to marsh health from anthropogenic changes, altered hydrology, or pesticide application. This study was the first taxonomic survey of salt marsh aquatic insects on Long Island, New York, and it also evaluated their utility for non-target pesticide impacts and environmental biomonitoring. A total of 18 species from 11 families and five orders were found more than once during the five month study. Diptera was the most diverse with nine species from four families, followed by Coleoptera with four species from two families, Heteroptera with three species from three families, Odonata and the hexapod Collembola with one species each. Water boatmen, *Trichocorixa verticalis* (Heteroptera), and a shore fly, *Ephydra subopaca* (Diptera), were the most common species. An additional six species, *Anurida maritima* (Collembola), *Mesovelia mulsanti* (Heteroptera), *Enochrus hamiltoni* (Coleoptera), *Tropisternus quadristriatus* (Coleoptera), *Dasyhelea pseudocincta* (Diptera), and *Brachydeutera argentata* (Diptera) were found regularly. *Erythrodiplax berenice* (Odonata) was rare. These nine species were identified as the most suitable candidates for pesticide and environmental impact monitoring due to abundance, position in the food chain, and seasonal occurrence. This study represents a first step towards developing an insect-based index of biological integrity (IBI) for salt marsh health assessment.

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INTEGRATED MARSH MANAGEMENT AT WERTHEIM NATIONAL WILDLIFE REFUGE (NWR), LONG ISLAND, NEW YORK, 2003-PRESENT: EFFECTS ON NEKTON AND VEGETATION

Wertheim NWR and the adjacent areas contain the largest continuous salt marsh on Long Island, New York in a highly urbanize watershed. Wertheim NWR integrated marsh management (IMM) project aimed to mitigate some of the existing environmental and public health problems at the refuge by restoring the marsh surface, preserving and enhancing native marsh vegetation, fish, and wildlife, reducing the invasive *Phragmites australis*, and controlling salt marsh mosquitoes. The grid ditch network at two experimental marshes was eliminated and replaced with naturalized tidal channels and ponds. The effects of the hydrologic alterations were monitored and compared with two reference marshes utilizing BACI approach. Post modification, nekton abundance and diversity significantly increased in the experimental marshes, with higher abundances of *Fundulus heteroclitus*, *Cyprinodon variegates*, *Callinectes sapidus*, and *Menidia* sp., and lower abundances of *Lucania parva* and *Palaemonetes* sp. Changes in salt marsh vegetation were limited to the fringe areas in the most brackish

and tidally restricted experimental marsh. Post modification, percent cover of *P. australis* and *Iva frutescens* was reduced more than 4-fold with the corresponding increase in percent cover of *Spartina* sp and other high marsh vegetation. Wertheim NWR IMM project demonstrated that a successful integrated approach adapting marsh restoration techniques incorporated with mosquito control open marsh water management components can produce positive environmental and public health changes. The novel conceptual approach may be relied on for similar large-scale integrated salt marsh restoration projects.

Salazar*, C. E. New York Suffolk County Departments of Environment and Energy, Public Works and Division of Vector Control, Health Services, and Parks and Recreation; and School of Marine and Atmospheric Sciences, Stony Brook University, NY <camilo.salazar@suffolkcountyny.gov>
TIDAL WETLAND RESTORATION AT THE SUFFOLK COUNTY INDIAN ISLAND PARK, NEW YORK
This project is for the restoration of a functional tidal wetland/marsh at Indian Island County Park, located within the Peconic Estuary Watershed, New York. The current status is planning stage to be implemented in 2012. The project includes the removal of approximately 25,000 cubic yards of previously placed dredge materials and restore ~7 acres of tidal wetland. Tidal connection to Terry's Creek will be also re-established. Approximately 5.15 acres of marsh will be re-graded to match similar local reference high and low marsh elevations; with particular focus to allow for marsh migration and vegetation shifts in response to sea level rise. A series of internal ponds and creeks will be constructed and will allow for and ensure appropriate tidal flow and circulation. Native salt marsh plants will be re-planted and all excavated material will be removed and disposed of off-site. Replicate Surface Elevation Benchmarks (SETs) will be installed in both High Marsh and Intertidal Marsh habitats to measure how these restored habitat elevations change relative to local sea level rise. From 1948 to 1975, the park served as surplus-material deposit area receiving approximately 1.1 million cubic yards of dredge material altering the habitat. Thus, the park is ideal for restoration because the records of a former marsh habitat and because the land is protected in perpetuity ensuring the protection of restored wildlife corridors and critical habitats. The pre-design and location of the project aims for self-sustainability and the resulting marsh system will possibly become a productive estuarine habitat, nursery and spawning ground for numerous species of finfish, shellfish, migratory and wading birds and Bio-control of mosquitoes.

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EVIDENCE OF CHANGING NUTRIENT REGIMES IN LONG ISLAND SOUND
Trends in chlorophyll *a*, nutrients, particulates, and bottom dissolved oxygen were examined along an axial transect in western and central Long Island Sound. Analysis of seasonally detrended 15-year time series show that chlorophyll, and dissolved inorganic phosphorus have all significantly increased while dissolved N:P ratios, biogenic silica, particulate nitrogen, and particulate carbon have decreased. The most dramatic changes were observed in western Long Island Sound, where seasonal hypoxia occurs most frequently. These results are indirect evidence of a regime shift from a diatom-dominated phytoplankton community to one dominated by flagellated phytoplankton. This is the first reported evidence of nitrogen limitation of the Long Island Sound phytoplankton community since Total Maximum Daily Loads (TMDLs) have been implemented on nitrogen loading in 1994. Paradoxically, trends in nutrients do not consistently correlate with hypoxia indices.

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SCIENCE AND ADAPTIVE MANAGEMENT FOR LONG ISLAND SOUND
President Obama's 2010 Executive Order on Ocean Policy established ecosystem-based management (EBM) as a foundational principle for federal coastal management. While many elements of EBM are already incorporated into coastal and watershed management, there are challenges to putting others into practice at the estuary scale. For example, the governing statutes for water quality management under the Clean Water Act were established more than 20 years ago; some conflict in practice with EBM principles. This presentation will review the obstacles and opportunities to facilitating cross-jurisdictional planning for Long Island Sound. Specific examples of where current program policies are in synchrony or conflict

with EBM will be given, along with recommendations for accommodating EBM within the constraints of current statutes and policies. The presentation will also highlight the priority data and science needs specific to Long Island Sound, recommending specific actions to support adaptive management.

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BENTHIC FORAMINIFERA IN LONG ISLAND SOUND
Benthic foraminifera (unicellular, eukaryote heterotrophs) in estuarine settings are very abundant but have low diversity. In the 1940s-1960s assemblages were dominated by *Elphidium excavatum*, with *Buccella frigida*, *Eggerella advena*, and *Elphidium incertum*. The species distribution was mainly correlated with depth, with *E. excavatum* dominant (>75%) at depths of less than 15m. This species consumes diatoms, and uses diatom chloroplasts in photosynthesis in the photic zone. Faunas were strikingly different in the 1990s: species richness declined, *Eggerella advena* decreased in abundance everywhere, and *Ammonia parkinsoniana* strongly increased in abundance west of 73.5^{o}, where it was dominant in some locations (75% and more). Assemblages had become latitude rather than depth related. Core studies place the change-over in faunas in the late 1960s-early 1970s. The high abundance of *A. parkinsoniana* persists until today, with high abundances of the species moving further to the East. *E. advena* remains very rare, and its decrease in abundance probably is related to a decrease in salinity since the very dry 1960s. The increase in relative abundance of the omnivorous *A. parkinsoniana* relative to the diatom consumer *E. excavatum* is probably not caused by hypoxia, but related to a combination of increasing temperatures, increasing turbidity due to eutrophication, and high N/Si due to influx of waste water treatment plant effluent. The high N/Si values give advantage to non-Si using primary producers such as cyanobacteria and dinioflagellates. Such changes at the bottom of the food chain are expected to resonate throughout the food chain.

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USING FUZZY LOGIC TO MAP THE THREAT OF COASTAL SQUEEZE TO MARSHES AT WELLS RESERVE AND PORTLAND, MAINE
The coastal landscape is where sea level rise and land development meet. This convergence narrows with rising sea level and urbanization creating a coastal squeeze. Barriers protecting coastlines from rising sea level prevent or reduce tidal flows and impermeable surfaces prevent marsh establishment. The combination of variable anthropogenic barriers and landscape features cause the impact of coastal squeeze to vary in time, space, and intensity. Coastal squeeze will not only limit the future sustainability and area of many salt marshes but is expected to modify the structure, composition, edge pattern and connectivity of marsh patches. In the context of conserving 'squeezed' tidal marshes, it is important to locate and quantify the intensity of coastal squeeze on the landscape to determine their impacts. In this study we ask to what degree the current landscape around salt marshes contributes to coastal squeeze for the next 100 years. We apply fuzzy logic membership functions with topographic and land cover variables derived from LiDAR and ASTER imagery to analyze and map coastal squeeze as a continuous gradient or index. Fuzzy logic will assign a grade, from 0 to 1, that corresponds to the threat of coastal squeeze posed by each of the landscape variables. With this approach, we are able to combine both the crisp (i.e., fixed barriers such as walls) and continuous(e.g., terrestrial slopes above the marsh) representation of coastal squeeze. We will compare coastal squeeze indices of marshes within and outside protected areas using spatial analysis and geo-statistical techniques. We then investigate how coastal squeeze will cause shifts from high to low marsh, and impact marsh connectivity.

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CONTAMINANTS IN SEDIMENT FROM LONG ISLAND SOUND
Long Island Sound (LIS) is an urban estuary receiving waste fluids from millions of people that live in the watershed. Contaminant metals or organic pollutants enter the sound through waste water treatment plants (WWTP), riverine inputs, surface run-off, and atmospheric deposition, as well as from select deposits associated with dredge material dumps. With this multitude of sources we observe a complex

spatial pattern of contaminant abundances in LIS sediment, which is also influenced by sedimentary properties such as grain size, organic matter, hydrous Fe-oxides, and redox conditions. Samples from dated sediment cores provide contamination histories, with indicators for sewage input (e.g., Clostridium perfringens, and other sewage tracers), and nitrogen isotope data aid in identifying the assimilation of the increased WWTP nitrogen flux over time. Radioisotope inventories help to distinguish between patterns produced by sediment focusing versus in-situ deposition. River water flux data combined with nutrient analyses provide insight in time trends for major nutrient inputs (N, P, Si) over the last 30-40 years, showing clear evidence for decreasing total N fluxes. Transport and mixing of fine-grained sediments provides a patchy distribution of contaminants over much of the western and central LIS.

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LONG ISLAND SOUND: ITS PEOPLE, PLACES AND ENVIRONMENT
A brief overview of the socio-economic history of Long Island Sound, this presentation will include the following topics which are featured in the history chapter of the Long Island Sound Study's forthcoming book on the management of Long Island Sound: land use patterns, transportation, industrialization, suburbanization, electrical power generation and waterfront access.

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USE OF CT IMAGING TO EXAMINE THE COARSE ROOTS, RHIZOMES, AND PEAT ASSOCIATED WITH CREEK BANK SPARTINA ALTERNIFLORA IN FERTILIZED AND CONTROL CREEKS IN PLUM ISLAND (MA)
We used computer-aided tomography (CT) to quantify the wet mass, abundance, and diameter of coarse roots and rhizomes as well as the wet mass and particle density of marsh peat in 7-year fertilized and control creeks in Plum Island (MA). In shallow soils (0 – 10 cm) and at depth (10 – 20 cm) there were significantly higher ($P < 0.05$; one-tailed t-test) peat particle densities and higher peat masses ($P < 0.1$; one-tailed test) in the cores ($n = 4$) collected from the fertilized Sweeney Creek compared with those collected from the control West Creek. Marsh peat particle density is inversely related with soil organic matter. The higher peat particle densities in the fertilized creek suggest that the soils are more decomposed than the control soils. We measured trends ($P < 0.15$; one-tailed t-test) of decreased abundance and mass of the coarse roots and rhizomes in the fertilized creek at depth (10 – 20 cm) in the cores, but found no detectable difference in the coarse roots and rhizomes at shallow depths. There appears to be high natural spatial variability in the masses of coarse roots, rhizomes, and peat between the branches at the control creek, which suggests that more replication is needed to detect differences between the control and fertilized creeks. The trends of low abundance and mass of coarse roots and rhizomes at depth and the significantly higher peat particle densities in the fertilized creeks, support the findings reported at other highly fertilized estuaries such as Jamaica Bay NY, where organic-rich marshes are disappearing at alarming rates, as high as 40 acres per year.

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DEVELOPMENT OF A LONG ISLAND SOUND (LIS) BENTHIC INDEX FOR ENVIRONMENTAL ASSESSMENT AND ECOSYSTEM MANAGEMENT
Numerous benthic indices have been developed to encapsulate complex sets of species and community responses to disturbances and environmental challenges in order to assess estuarine conditions and to aid in communicating these conditions to non-science based stakeholders. Many indices have been shown to reasonably correlate with impacted or non-impacted conditions, thus making them useful management tools. We evaluated the application and/or development of benthic indices for gauging benthic community conditions in LIS. We found that existing benthic indices reflect the geographic environments where they were developed and/or programmatic and sampling frameworks, thus limiting their applicability to LIS. Also, overreaching assumptions about species sensitivity, limited knowledge of benthic successional dynamics in different habitats, and the potential implications of a changing climate, may compromise the usefulness of existing benthic indices as assessment / management tools. We explored these issues using

data from EPA EMAP and NCA studies, and developed an LIS-specific, meta-community index that employs community-level characteristics and potential successional / degradation pathways. Due to large-scale spatial differences in the benthic landscape of LIS and limited knowledge of benthic community structure and dynamics in eastern LIS, the index currently only applies to the central and western basins of LIS. Continuing development and testing of the index are discussed, as well as applications to ecosystem based management and marine spatial planning.

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THE INFLUENCE OF OYSTER FEEDING AND BIODEPOSITION ON SEDIMENT NITROGEN CYCLING IN JAMAICA BAY, NEW YORK

Bivalve suspension feeding results in the removal of water column particulates and promotes the transfer of nutrients to the benthos that can enhance sediment nitrogen (N) cycling including N removal via denitrification. Management plans for the Hudson-Raritan estuary (NY/NJ) include the restoration of oyster reefs to improve ecosystem functioning, however, the environmental conditions under which oysters could influence N cycling have not been previously examined. In this study, oysters (3 densities) were deployed in May 2010 at four sites along a nutrient gradient in Jamaica Bay, NY. We measured oyster feeding and excretion rates in summer and fall, water quality monthly, and sediment nitrification, denitrification, and organic matter bimonthly. Nitrification and denitrification were positively correlated across density treatments. Oysters increased sediment organic matter, nitrification, and denitrification initially, but had no effect or inhibited denitrification as summer progressed. Oyster clearance rates were negatively correlated with the high total particulate loads typical of high nutrient sites. In addition, feeding rates and efficiencies were low when food quality was poor and during hypoxic events. Our initial results show that the desirable impacts of oyster restoration may not be attained under the hypereutrophic conditions occurring seasonally in Jamaica Bay. Continued analysis will help elucidate the environmental drivers of these ecological processes and guide future management actions.