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<th>First Name</th>
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<th>Title</th>
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<tr>
<td>Emily</td>
<td>True</td>
<td>Cognitive Considerations in Conservation Agriculture in India</td>
<td>In an effort to depart from environmentally-damaging agriculture, international development organizations have started to promote conservation agriculture in developing countries. However, relying solely on technical expertise—largely generated outside the rural communities in which they are applied—often does not consider whether local ecological and culturally influenced beliefs are consistent with the technologies being promoted for adoption. Hence, long term adoption of conservation agricultural practices in many rural farming communities remains low. We hypothesize this disconnect may be linked to differing modes of thinking between rural agricultural communities and scientific experts about the new farming practices that are being promoted. Using case data collected from 100 surveys in two rural villages outside Kendujhar in the state of Odisha, India, we instigated how farmers’ perceptions and subsequent confidence levels towards introduced agricultural techniques such as minimum tillage, crop rotation, and intercropping match expert-based assumptions.</td>
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<td>Lars</td>
<td>Anders</td>
<td>Geomorphically-driven cycling between fresh and saltwater environments in a small back-barrier basin</td>
<td>Historical map analysis has shown that the area occupied by a small salt marsh at Long Beach in Rockport, Massachusetts, was a coastal freshwater pond as recently as 1831. A breach of the sandy barrier fronting the pond likely transformed it into a tidal marine environment sometime in the mid-19th century. The rapid growth of salt marsh over the former lakebed suggests that it may have been a salt marsh prior to the pond phase and that the relatively anoxic pore water of the bottom sediments in the pond may have preserved much of the peat of the high marsh platform. A combination of natural barrier overwash and an anthropogenically armored and narrowed inlet appear to be moving the marsh back toward another pond phase. Further study, including marsh coring, will help determine whether this cycling of environments has occurred repeatedly in the past and help predict how the marsh will evolve in the future.</td>
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<tr>
<td>Roger</td>
<td>Hart</td>
<td>Characterizing the End-Permian Mass Extinction in the Neo-Tethys through organic geochemistry</td>
<td>The end of the Palaeozoic marks the largest environmental disaster in the Phanerozoic, the Permian-Triassic Mass Extinction (PTME; ~252 million years ago). The PTME is distinguishable by the extinction of approximately 90% of marine biota over a very short period of time (&lt; 0.5 Ma). Biomarkers, atomic and molecular fossils, can persist through diagenesis and are especially useful in reconstructing paleoenvironmental conditions and dynamics. Using biomarkers to understand the Palaeozoic-Mesozoic boundary provides important inferences on understanding the marine ecosystem and paleoenvironment. Studies of biomarkers at the PTME do not provide a complete global model. We provide a low resolution preliminary biomarker investigation of the southern Neo-Tethys. The section includes the Permian black shale from the Gungri formation, the superimposed ferruginous layer, and the Triassic interbedded shale limestone from the Mikin formation (Spiti Valley, India). Evaluating the biomarkers provides information on the extent of the extinction horizon and recovery of the shelf primary producing and microbial ecosystems, paleoenvironmental conditions, and chemostratigraphic correlations.</td>
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<tr>
<td>Jillian</td>
<td>Dunic</td>
<td>Identifying anthropogenic drivers of changes in local scale marine diversity</td>
<td>Biodiversity is declining—globally. Locally, however, recent syntheses have revealed that, on average, species richness has not changed over time. The data is highly variable. This variability indicates that local scale drivers determine the magnitude and direction of species richness change. Human impacts affect local species richness, yet datasets recording species richness trajectories are often biased to include low or moderately impacted areas. To evaluate the effect of human impacts and climate on local marine diversity we performed a meta-analysis on a novel dataset collected from the literature, of species richness change over time in marine ecosystems. We tested the effects of local, direct events, cumulative human impacts, and changing climate on local marine diversity. Our dataset contained 290 sites from 77 studies of which 95 sites come from studies where direct impacts (e.g., dredging) were explicitly identified by authors. Initial results suggest that changes in local diversity are context dependent and can be driven by the level of human impact, rate of climate change, and initial community properties. Our findings begin to explain the high variability that has been observed in species diversity at local scales and reframe previous findings in a human context.</td>
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<td>10:30 - 11:30 am</td>
<td>Helenmary, Dimino: A LANDSCAPE GENETICS APPROACH TO MEASURING THE EFFECTS OF STREAM RESTORATION ON BIODIVERSITY IN COASTAL MASSACHUSETTS</td>
<td>Bryan, McCormack: Born from Fire; Shaped by Water - 4 days on Sao Miguel, Azores - Day 1</td>
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**Anthropogenic alterations are known to stress stream systems and cause loss of biodiversity. Stream restoration projects are often conducted as a response to impact and therefore may restore biodiversity to a pre-impact state. In this study, we propose that by looking at changes in population genetics of four taxa with differing dispersal strategies before, during, and after restoration, we will better understand how, and at what scale genetic diversity changes occur in response to restoration. To achieve this, we will sample over a 3-year period across three treatments: an agricultural restoration, an urban restoration, and a pristine reference site. We will use next-generation sequencing (NGS) techniques to calculate nucleotide diversity in each treatment annually. We expect to find that genetic diversity is greater at the reference site than the restoration stations, and restored site stations will gradually increase in genetic diversity after restoration. By taking a landscape genetics approach to measuring the efficacy of stream restoration, it will be possible to understand how restorative changes in landscape are affecting genetic structure of communities within a stream system.**

**Global change drivers such as land use land cover (LULC) within a watershed affect water quality directly and indirectly. By determining independent and dependent variables contributing to water quality, we aim to develop effective management recommendations for the highly urbanized Charles River Watershed for the Charles River Watershed Association. We will fit 2012 and 2013 water quality data from 10 stations within the Charles River watershed sub-basins to an appropriate water quality path flow analysis. Regional, reach, and local scale parameters to be investigated include, but are not limited to, % impervious cover, reach scale LULC and % impervious cover, USEPA habitat assessment scores, physico-chemical concentrations, and benthic invertebrate index scores. We expect to see a direct linkage between land use and impervious cover within each sub-watershed to nutrient supply. Therefore, indicating an indirect correlation between land use and dissolved oxygen, affecting quality of habitat and the biotic index within a reach. We expect our results to contribute to the management of water quality in the Charles River Watershed with the goal to improve water quality.**

**Freshwater systems are among the most managed ecosystems globally, with streams and wetlands being impounded and drained for a multitude of uses. As agriculture diminishes in many coastal watersheds, active restoration of wetland-stream systems promises to improve ecosystem benefits and restore biological integrity. Tidmarsh Farms in Manomet, Massachusetts is a 192-acre former cranberry bog, undammed and in fallow since 2010, awaiting active restoration of the original stream channel and wetland features during summer 2015. We will examine the restoration through 1 lenses: landscape and habitat, biological structure, and stream function. The restoration site will be compared to both a reference and actively farmed system. We expect that baseline comparison data will demonstrate reduced complexity of community structure and food web dynamics in the restoration site and significant differences in habitat and water quality. Evaluating during and after restoration allows us to extrapolate the system’s equilibrium state and document the successes and shortcomings of active restoration. Since many of Southern Massachusetts’ cranberry bogs are being retired from service, this project has potential to shape policy for future wetland and stream restorations.**

**Haiti is affected by global drivers of natural and anthropogenic origins. Since 2004, increased incidence and intensity of tropical storms has resulted in a 20.6% lake level rise of Étang Saumâtre, Haiti’s largest lake. Lansats imagery and topography are analyzed to assess lake expansion, to predict future rate of lake level rise, and to locate areas most at risk for flooding. Analysis shows the Cul de Sac plain, which includes densely populated Port au Prince, to be an area of vulnerability.**

**The Azores are a Portuguese island archipelago 850 mi west of Portugal in the Atlantic. Nine islands formed near the intersection of the Mid-Atlantic, Terceira, and Gloria ridges. Vesicular basalt makes up a large portion of the islands, though it is only one of many types. The rich soil is used for farming and grazing. The land has been vastly influenced by invasive species. Observations included geographic features that were created through volcanic processes and altered; including calderas, basalt beaches and hot springs. The ridge of a large caldera that contained six other calderas was examined to see how vegetation and erosion form the rim of the landscape. Through research and guidance, many volcanic processes and fundamentals of island formation were examined and explained. The ability to determine relative age due to surrounding features was established and practiced. We also observed coastal erosion features very different to those of Massachussets. A new observational skill set was learned and implemented, which will be beneficial for all future endeavors. We also gained a new appreciation for the sheer power and majesty of natural creation. Over the trip one of the greatest things we learned was the nuances of human-to-human interaction in the field.**
<p>| Joy Tramontozzi | Born from Fire; Shaped by Water - 4 days on Sao Miguel, Azores - Day 2 | The Environmental Seminar group departed for the mid-Atlantic island of Sao Miguel. Accompanied by Professor Allen Gontz, we had the opportunity to identify and define the geological forces, which dominate the island. With the assistance of Green Zone jeep tours, we were able to visit many of the relevant areas surrounding Ponta Delgada, such as the Sleeping Dog, formed from the discharge of an ancient spatter cone. We visited Lagoa Das Furnas with its embankments of pumas. We also had the chance to walk through and observe plants species from the Terra Nostra garden. Many of the students in the group never had the opportunity to venture out to see another country, let alone another place with a unique geography like the Azore Islands. We hoped to gain a hands-on field experience as well as the opportunity to explore a new culture. Combining our foreknowledge of the natural sciences with raw observation, we were able to piece together the geological origins of each site. While interesting even without regard for the educational value, these elucidations represent the nascence of a new perspective for us as students of natural science: the inclination, if not desire, to explain the world around us. |
| Ibrahim Abutaleb | Born from Fire; Shaped by Water - 4 days on Sao Miguel, Azores - Day 3 | The trip to the Azores was an enlightening experience for everyone. Each student had different reasons for going there, but our end result was that we all learned a lot of information about the island and the native culture. The purpose of the trip was to help students understand what being an environmental scientist entails, what we could do in the future. Our third day started by hiking down into Lagoa do Fogo. While hiking down, we talked about how the caldera used to be a volcanic mountain that collapsed in on itself; that the water in lake is from rain water and how the mountain erodes and gives us a time capsule of the area. Our second location was the botanical garden in Furnas. There was a lot to see, from plant life taken from across the globe to the iron rich hot springs as the main attraction. The third location was the black sand beach of Santa Barbara. This beach was a special topic of discussion, because the sand was a result of nearby eroded basalt rocks. The wave energy, caused by the distance from other land, were strong enough to break the volcanic flow that formed centuries ago. We relearned the ability to observe and interpret information given to us. Thanks to this rediscovery, we were able to find out more than we ever could have in a classroom. |
| Angela Erb | Post-fire changes in albedo and snow cover of high latitude systems | The North American albedo product currently under development couples 30m resolution near-nadir Landsat surface reflectances with concurrent coarser resolution (500m) MODIS surface Bidirectional Reflectance Distribution Functions (BRDF) products to fully capture the surface anisotropy and produce higher resolution surface albedo than from MODIS alone (Shuai et al., 2011). Albedo, the proportion of solar energy that is reflected by the Earth’s surface, is an essential climate variable, and is required for accurate climate, biogeochemical, and surface energy budget modeling studies. This product uses of Landsats 5, 7 and 8 generate time series data from 2000 to present. In addition, we take advantage of the increased radiometric resolution of Landsat 8 to look at the contribution of snow to albedo dynamics and the energy balance. This higher resolution albedo product can capture finer scale variability and heterogeneity within fire scars to provide a fuller picture of recovery dynamics. We apply the Shuai et al algorithm to pre- and post-fire ecosystems over a variety of land cover types in Alaska. The influences of the normalized difference burn index, initial land cover and latitude are considered when tracking albedo trends post-fire. |
| Edgar Franck | THE EFFECTS OF CRANBERRY BOG RESTORATION ON PHYSICAL HABITAT, AQUATIC INVERTEBRATE COMMUNITIES, AND ECOSYSTEM PROCESSES AT TIDMARSH FARMS, PLYMOUTH, MASSACHUSETTS | The River Continuum Concept (RCC) models the expected relationship between in stream biota and the surrounding physical habitat in a pristine forested stream. Global change drivers such as land use land cover (LULC) change influences stream assemblages and ecosystem processes. River restoration can play an important role in counteracting LULC effects. Tidmarsh Farms Study Area (TFSA), including Beaver Dam Brook (BDB) and its surrounding wetland, was actively farmed for cranberries from the mid-1800s until 2010. Passive restoration was implemented in 2010 with a headwater dam being removed and bog going fallow. Active restoration will commence in spring/summer 2015. We established 8 sampling stations along 1st - 3rd order stream reaches of BDB and sampled for physical habitat, physical-chemical water column, benthic macro invertebrates (BMI), and nutrient limitation. Because Beaver Dam Brook is not a forested headwater system, we expected the stream structure and function at TFSA will not follow RCC expectations. By monitoring and assessing the physical, chemical, and biological conditions of TFSA, we will have some picture of the effectiveness of passive and active restoration. |</p>
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<td>11:30 - 12:45 pm</td>
<td>Lucy Lockwood</td>
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<td>Patrick Sheldon</td>
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<td>Guoqing Wang</td>
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<td>J. Michael Denney</td>
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While many geographic areas consider future climate change impacts, within the Gulf of Maine such impacts are already happening and have the potential for profound changes in marine and coastal ecosystems which in turn would have major impacts on human uses of the Gulf. Already the Gulf of Maine region has experienced increased water temperatures throughout the water column, shown evidence of increased acidification of both sea water and benthic sediments, and has areas of lowered salinity due to meltwater inflows and heavy precipitation events. This research project considers which organisms within typical Massachusetts rocky intertidal community assemblages may be most negatively sensitive to climate change impacts such as increased water temperature, lowered water pH, and lowered salinity, and which could thus be used as sentinel species for climate change within the Gulf. Some consideration will also be given to which organisms may be most able to tolerate changing conditions and which organisms might benefit from altered abiotic conditions and the resultant shifts in community structure.

Boston Harbor is home to not only the beautiful UMB campus, but also one of the largest urban-environment restoration projects of the past century. The main project goal is to use Landsat-scale imagery to monitor water quality in Boston Harbor. The problems with using satellite imagery to monitor coastal water quality (lack of in-water measurements coordinated with satellite observations, a relatively low radiometric sensitivity, and lack of understanding of the dynamic coastal environment) have prohibited this type of research from proceeding in the past. This can now be accomplished by using the vast historical data record collected by the MWRA over the past 25 years along with the corresponding Landsat image set over that time span. Once this complex coastal system is better understood, this research can lead to future monitoring of the harbor (and other coastal areas) to maintain water quality.

The light absorption by phytoplankton pigments play an important role in modulating the appearance of water color, and some of the absorbed photons provide photosynthesis pigments the energy to fix inorganic carbon to organic compounds. Some pigments are even markers for phytoplankton classes or species. Thus, to better characterize phytoplankton ecology in the wide marine ecosystems, it is strongly desired to have tools to retrieve phytoplankton pigment absorption from water color remote sensing. Decades ago Hoepfner and Sathyendranath (1991) developed a system to retrieve the pigment absorption from measured hyperspectral phytoplankton absorption coefficient. Due to the interference from water molecules and dissolved organic matters, remote sensing does not provide a direct measurement of phytoplankton absorption spectrum. Here, with SeaBASS, IOCCG dataset and measurements made in phytoplankton bloom waters, we assess the effectiveness of retrieving these pigments from hyperspectral remote sensing reflectance (Rrs) with the Gaussian model developed by Hoepfner and Sathyendranath (1991). After refinement of the Gaussian models, the absorption coefficient of chlorophylls a, b and c, carotenoid, phycoerythrin and phycocyanin can be effectively determined from Rrs.

The FAO and the World Bank are in a unique position regarding the international agricultural regime because they are the international organizations that deal most directly with agricultural development. As such, they are thought leaders and their programs directly impact a host of agrarian and food-related issues in the developing world. Additionally, these organizations are highly technical and professional, suggesting that they should have agricultural programs that reflect empirically driven scientific agendas that, in line with their mandates, support food security, economic development, and environmental sustainability. Despite their highly technical and international professional staffs, their commitments (in particular the FAO’s) to food security, and the addition of environmental sustainability to their mandates in the 1970’s, international agricultural policy has changed very little since its introduction in the first decades of the twentieth century. There is, in fact, a gap in our understanding of how the international agricultural regime was formed and how it ended up in the state it is today.
### The Most Significant Threat to Human Existence

The most significant threat to human existence is the impact of climate change. The "science" of climate change is well documented and acknowledged by international regimes as diverse as the United Nations and the Pentagon. Climate change impacts will be not so much mediated through diplomatic arrangements, by geopolitical centers of influence, but by the resilience capacity of organizations responding to "realignment" of human and non-human based systems. Climate Change Impact on Islands, Coasts and Coastal Communities in concurrence with extreme weather events like tornadoes, hurricanes and ice storms, natural and anthropogenic-caused climatic interventions can stress on human coastal settlements, particularly those situated at low elevations (three to twenty-five feet) and with higher population density. Prolonged elevated temperatures resulting in sea level rise, heat waves, extreme rainfall, and coastal flooding and storm surge are expected to increase significantly in the Northeast and Gulf Coast regions of the United States. Flooding and storm surge events will inundate and permanently reclaim land areas. Land loss includes not only the disappearance of terrain but the inability to access essential ecosystem services, i.e. clean water, as well as sanitation, energy, and habitat. Within the context of climate change land loss, displacement of urban coastal populations is more likely to permanent, instead of historical "return and -rebuild scenarios". (Brookings, 2014). Scholarly journals in the fields of finance, economics, the natural, management and social sciences have produced volumes of studies on organizational responses to disasters. However, it is increasingly clear that each of the disciplines define disaster quite differently. I argue that fundamental discomfort in cognition and "tensions" in social science discourse situate the human experience on a temporal scale, that is, the before, during and after event, shifting the concept of disaster to that of a process rather than singular occurrence. The goals of this paper are threefold. The first is to provide develop a conceptual basis for re-framing organizational response cycles from fast to slow onset phenomenon. Second, this paper will introduce the dynamics of power and contestation in alternative scenarios of "no return/rebuild", and develop an operational locus for internal displacement due to climate change land loss. Lastly, having attempted a critical reading of canonical management theory as well as current interdisciplinary journals, scientific reports, state and federal emergency preparation/response roadmaps, I offer exploratory questions for organizational imagination, innovation and alternatives to the current "inertia" of academic and managerial discourse regarding climate change, organizational adaptation and resilience response.

### Alexander Metzger

"Socially-downscaling" the hydrological impacts of climate change

Recent advances allow climate models to be "downscaled," providing insight into how local hydrologic conditions vary under different climate change projections. While downscaled models describe physical impacts of climate change, the output fails to translate changes into terms that are socially or economically important to local stakeholders. Our research bridges this gap through a 'social-downscaling' approach in which information generated from climate and hydrological models is integrated with priorities and knowledge of local communities to make impacts more relevant to local resource decision-makers. To demonstrate, we present a case study of the Charles River Watershed. Interviews with local water resource managers and stakeholders using FCM software helped identify locally important factors to inform a hydrological model and define socio-ecological dynamics relevant to the watershed community. We ran climate-change simulations to create a range of scenarios for increasing flood impacts. We then combined model outputs with FCM's to analyze sensitivity of key factors and expected socio-ecological outcomes. In this talk, we discuss how 'social-downscaling' can make predictive climate models more useful for local management and adaptation.

### Monica Velez-Ortiz

Preliminary Research Plan for integrating relationships of coastal features, kauri trees, and climate variation

Coastal features on the coast of New Zealand preserve records of climate variation as the sea level has varied over time. Long-lived and well preserved kauri trees (Agathis australis) from the North Island of New Zealand possess a potential to preserve high-resolution temporal responses to climate variation including El Niño-Southern Oscillation and provides an ideal location to study variations to the coastal and wetland system driven by climate change and anthropogenic impacts. Together, the wetlands, beaches and kauri trees form a unique dataset that presents a suite of climate proxies. Previous studies have used kauri trees to reconstruct ENSO conditions over > 4,000-year period. A detailed chronology of kauri trees and climate conditions could provide an understanding of the development of the coastal system over decadal to millennial to ice age scales to determine a longer impact on the dynamics of beach systems. The objectives of this study are: 1) to determine and understand how past variation in climate have impacted the beach and wetland systems, 2) to develop a method to extract the archived former beach deposits, and 3) to correlate local beach and wetland climate proxies with known regional and global records. The team will employ a MALA Geosciences GTX HDR ground penetrating radar system with 160, 480 MHz antenna arrays to survey beach and wetland systems that range in age from modern to MIS 7. The GPR data will be correlated spatially to known excavations and boreholes. Newly acquired hand- and vibration-driven sediment cores will augment the ground truthing and provide samples to correlate GPR horizons and develop chronological control using 14C or OSL on key horizons. Initial locations for study may include east-facing beaches and associated wetlands of the far northern area of Doubtless and Rangaunu bays and the more centrally located Marsden Point and Ruakaka. Locations will be refined during a January 2015 reconnaissance survey.
Cognitive Considerations in Conservation Agriculture: Understanding the influence of farmer mental models on farming practices and adoption

Departing from the traditional agricultural model of input-heavy, intensive agriculture via the use of agrochemicals and irrigated water, many international development projects have started to promote conservation agriculture in developing countries. However, relying solely on technical expertise, largely generated outside the rural communities in which they are applied, often does not consider whether local ecological and culturally influenced beliefs are consistent with the technologies being promoted for adoption. We suggest these disconnects can be linked to differing ‘mental models’ of scientific experts and rural agricultural communities regarding the nature of farming dynamics and predicted impacts of introduced farming practices. Using case data collected from rural farmers engaged in an international agricultural development project in India, this research seeks to understand the relationship between trends in farmer reasoning and predictions regarding the outcomes associated with development technology. Further, we compare variation in farmer mental models with their current farming practices, behavioral intentions and willingness to adopt new practices.

Willingness to Pay for Conservation Philanthropy

Conversation philanthropy globally, specifically involving non-governmental organizations that seek funding from western donors, has a considerable impact on the local-scale social and ecological dynamics in underdeveloped economies. However, the individual social or ecological motivations that underlie participation in conservation philanthropy are not well understood. This study aims to investigate the factors that affect people’s willingness to pay for conservation philanthropy. We administered a pilot survey that detailed a hypothetical scenario understand the motivations of individuals who contribute to conservation philanthropy; specifically, we tried to isolate whether willingness to pay is influenced by environmental literacy or the implications related to different IUCN categories based on social and ecological outcomes. Further, we sought to understand whether these motivations varied reliably by demographic, attitudes, and other individual characteristics. Based on our findings we recommend that NGOs seeking public sponsorship for conservation become informed about the cognitive processes that affect the public’s willingness to pay for conservation.

Evaluation of the VIIRS daily BRDF, NBAR, and Albedo product as compared to the MODIS V006 daily BRDF, NBAR, and Albedo product and in situ measurements

MODIS has been providing BRDF, NBAR and albedo product since 2000. A continuity product is being prepared for VIIRS on the Suomi-NPP satellite, launched on October 28, 2011, by utilizing a similar approach to the Collection V006 daily MODIS product. This daily product continues to use multiday period multispectral, cloud-cleared, atmospherically-corrected surface reflectances to fit the Ross-Thick/Li-Sparse-Reciprocal semi-empirical BRDF model. The design for VIIRS is not identical with that of MODIS. The spectral, angular and spatial differences of the specific land surface reflectance data can potentially cause differences in the BRDF, Albedo and NBAR product. Thus the two products are compared for continuity over the Sahara desert, New England forests and the Greenland ice sheet at the identical narrowbands. In order to ensure that the VIIRS product can continue to meet the requirements of land surface, climate, and biosphere models, VIIRS albedo is also compared with in situ albedo from Surface Radiation Budget Network (SURFRAD), Ameriflux, Baseline Surface Radiation Network (BSRN) and Greenland Climate Network (GC-Net) sites. The VIIRS results are shown to agree well with both the MODIS and in situ data at these spatially representative locations.

Applying the Regional Hydro-Ecological Simulation System (RHESSys) to simulate land to the water carbon export from the Penobscot Watershed into the Gulf of Maine

Dissolved Organic Carbon (DOC) leaches from terrestrial watersheds to serve as one of the largest source of marine DOC. Thus the movement of DOC from the terrestrial system into the aquatic system plays an important role in terrestrial carbon cycling and carbon sequestration in aquatic systems especially in northern latitudes (Neff and Asner, 2001;Freeman et al., 2001; Benner et al., 2004). The Penobscot River basin, located in north-central Maine which drains into the Gulf of Maine, is the second largest watershed in New England. The Regional Hydro-Ecological Simulation System (RHESSys) is a physical, process based terrestrial model that has the ability to simulate both the source and transport of DOC by combining both hydrological and ecological processes. The focus of this study is to use the RHESSys model on the Penobscot watershed to simulate the DOC flux from the land to the water. The simulated results are then compared with field measurements of DOC from the watershed and with model results from the LOADEST regression model. Also, an analysis of the sensitivity of the DOC fluxes to variation in the DOC control parameters are included in this study.
Amelia Atwood

**PHYSICAL-CHEMICAL ANALYSIS AND CHARACTERIZATION OF HARDY POND, MASSACHUSETTS: A CITIZEN SCIENCE AND INTERNSHIP PROJECT**

Hardy Pond, a freshwater pond located in suburban Waltham, Massachusetts, has undergone changes in depth and clarity and fish kills have occurred. Fertilization, storm runoff, and other anthropogenic effects are theorized to be leading to these anoxic conditions and reduction of depth. From October 2013 through September 2014, we collected water column physical-chemical data (e.g. temperature, dissolved oxygen, salinity, pH, and conductivity), Secchi depth, and a surface water grab sample in the middle of the pond. Water samples were process for total suspended solids, non-volatile suspended solids, chlorophyll, particulate CNP, total dissolved N and P, and dissolved inorganic N and P. We plotted depth profiles by month for each parameter, and characterized the pond using summer chlorophyll a concentrations, Secchi disk data, and total phosphorus. Hardy Pond was largely hypertrophic in the summer months (June – September 2014) based on the use of a trophic classification system with the bottom half of the pond going hypoxic/anoxic during later summer months. This information is reported to the HPLA board on an annual basis so they can make management decisions.

Bonnie Blalock

**The Coastal Biosensor for Endocrine Disruptor (C-BED) assay reveals changes in Mytilus edulis sex specific transcripts**

Endocrine disrupting compounds (EDCs) such as 17α-ethinylestradiol (EE2) and 4-nonylphenol (4NP) interfere with natural hormone function and cause sublethal effects such as gender reversal, reproductive and developmental effects. Currently, there are challenges associated with monitoring these compounds in the marine environment because they elicit effects at concentrations close to detection limits, and are often found in mixtures with other EDCs. Our approach is to use genomic methods to develop robust and specific biomarkers for measuring EDCs in the blue mussel, Mytilus edulis. We developed a “whole transcriptome” M. edulis microarray, through RNA sequencing of multiple libraries representing different life stages and toxicant exposures, and are using the microarray to identify novel gene expression biomarkers for 4NP and EE2. Following transcriptomic analysis of male and female mussels candidate biomarkers were identified based on specificity to either EE2 or 4NP, correlation with tissue concentration, and consistent expression patterns at 4 and 5wk time points. M. edulis exposed to EE2 had 82 fold change induction of femaleGspecific transcripts, suggesting that EE2 may cause intersex in male M. edulis, a finding that has not been linked to a specific sex steroid previously.

Kaley Major

**Gene expression variation in Hyalella azteca laboratory populations under standardized conditions**

Although Hyalella azteca has been widely used as a model organism in toxicity tests, there is a lack of genetic data available for the laboratory strain. However, the H. azteca genome has been sequenced, and once assembled, will provide a platform for the union of ‘omic methods and more traditional toxicity testing methods. H. azteca has been proposed for use in water-only toxicity tests. A group of government and academic laboratories in the United States and Canada have reviewed and refined current reproductive toxicity test guidelines to provide specific direction on water-only test methods for H. azteca. This group also coordinated an interlaboratory round-robin test to evaluate the 42-day reproductive water-only test. Twelve sampled 10-day old H. azteca from the test and preserved them for gene expression analysis. These samples provide a unique opportunity to assess the variability of gene expression in H. azteca reared under standardized conditions, but from different laboratories across North America. RNAseq will be used to assess the differences in gene expression and potential genetic variability that occurs across laboratory populations. This work will provide the basis for the incorporation of ‘omics methods into the framework of standardized toxicity methods.

Jeremiah Asaka

**Understanding Global Implications of Local Impacts of Desertification in Kenya**

The United Nations Convention to Combat Desertification defines desertification as land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors including climatic variations and human activities. In Kenya, desertification is a major environmental and socio-economic problem affecting about 80% of the country. The country’s drylands population alone is estimated to be between 7-10 million people, translating roughly to about 20% of the country’s population of 38.6 million based on the 2009 estimates. With climate variability as a key driver, desertification continues to have significant negative impacts in Kenya. Climate change is expected to have an exacerbating effect. Moreover, understanding indirect impacts of desertification is essential in highlighting the global dimensions of desertification. The work presented here is an attempt at developing a framework for understanding the global dimensions of desertification using Kenya as a case study.
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<td>Steven Nye</td>
<td>Environmental life history reconstruction of the Nantucket bay scallops Argopecten irradians using LA-ICP-MS to determine shell geochemical fingerprinting</td>
<td>Nantucket Island, MA, is home to the last wild bay scallop (Argopecten irradians, Lamarck 1819) fishery in the world. Declining trends in commercial catch over the last thirty years have had severe socioeconomic impacts on the fishermen and permanent residents of Nantucket. The short life span of the bay scallop makes successful recruitment and survival during every spawning event necessary to maintain the wild population. Environmental life history reconstruction through the analysis of the geochemical composition of the scallop shells provides important insight to aid propagation, seeding and management of the existing Nantucket bay scallop population. Bay scallop and seawater samples were collected from thirty-two sites in the waters around Nantucket Island. Retrospective identification of essential habitat is constructed through analytical analysis of the correlation between shell trace element compositions (Sr, Ba, Mg, Cu, Zn, Pb, La, Co and Mn) via laser ablation inductively coupled mass spectrometry (LA-ICP-MS) and harbor water chemistry. Determination of optimal spawning habitat is essential to quantifying conditions necessary for larval recruitment, juvenile survival and long-term sustainability of the bay scallop population.</td>
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<td>Robert Holmberg</td>
<td>Impacts of Ocean Acidification on Otolith Development in Larval Haemulon chrysargyreum</td>
<td>Ocean acidification is expected to have myriad consequences for calcifying biota, including impaired mineralization of calcified structures and dissolution of existing structures. Of particular interest is the mineralization of (internally calcified) otoliths in teleost finfish. In fish, otoconial malformation is associated with behavioral abnormalities, and removal of otoliths impairs navigation. Thus, ocean acidification could have profound consequences for hearing and gravisense. This study investigates the morphological development of otoliths in Haemulon chrysargyreum under acidified conditions. Using a novel method for pH-stat CO2 dosing controllers, we reared fish in four pCO2 treatments for approximately 30 days until settlement. We analyzed stereomicrographs for circularity, area, and perimeter. We analyzed scanning electron micrographs qualitatively for crystal core development. We observed decreasing somatic growth, increasing circularity of sagittae and asterisci, and decreasing circularity of right lapilli with increasing pCO2. Our study is the first of its kind to observe an effect of acidification on asterisci in fish.</td>
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<td>Alan Stebbins</td>
<td>The Early Triassic sulfur isotope curve of seawater sulfate from marine carbonates in the Neo-Tethys</td>
<td>Few aspects of the long-term (~2 Myr) Early Triassic recovery interval following the end-Permian mass extinction, the largest extinction in Earth’s history, are completely understood. Previous studies suggest that the Early Triassic marine realm was characterized by intervals of lethally hot temperatures, widespread anoxia, and carbon cycle perturbations. The marine sulfur cycle can provide further insights into environmental conditions during this time-period. Marine carbonates contain a reliable proxy for seawater sulfate δ34S termed carbonate-associated-sulfate (CAS) and when analyzed in conjunction with pyrite (a sulfide mineral), insights into the two major pools of sulfur in the marine realm are provided. In this study, we present a new sulfur isotope dataset of CAS (δ34SCAS) and pyrite (δ34Spyr) for Neo-Tethyan sections (Spiti Valley, Himalachal Pradesh, India) to better understand the recovery period of the Early Triassic. Results are evaluated in the context of global sea-surface temperature and carbon isotope curves. Previously published δ34SCAS datasets from the eastern Paleo-Tethys (South China) for the same time interval allow for an assessment of δ34SCAS trends across the entire Tethys ocean.</td>
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<td>Felicia Woods</td>
<td>Developing a Competitive Enzyme-Linked Immunosorbent Assay (ELISA) to Measure the Concentration of 17α-Ethynylestradiol (EE2) in Marine Mussel Tissue.</td>
<td>17α-ethynylestradiol (EE2) is a synthetic estrogen used in oral contraceptives, and the potential for EE2 to act as an endocrine disruptor has raised concerns in the aquatic environment. Marine organisms are exposed to EE2 from human excretion, improper disposal, and a lack of waste treatment techniques in place to address EE2 concentrations in sewage effluents. The goal of this research project is to develop a competitive enzyme-linked immunosorbent assay (ELISA) to measure EE2 in mussel tissue. There are two objectives; (1) the development of an easier, yet rigorous, way to measure low concentrations of EE2 in both whole body and individual mussel tissues and (2) use this technique to address the hypothesis that chronically exposed wild mussels will display an identical tissue distribution of EE2 to that shown in the laboratory using moderately high concentrations of radiolabeled EE2, and that analyzing digestive glands would be a more sensitive index of environmental exposure to EE2 than the analysis of whole body tissues. This research is important in both social and natural sciences because of the potential affects of EE2 on marine bivalve populations and the cascading effect that it could have on their availability as a food resource and its accompanying economic impacts.</td>
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Brian Duphily

Uptake, Bioaccumulation and Depuration of 14C-labeled 17α-ethinylestradiol and 4-nonylphenol in Individual Organs of the Marine Bivalve, Mytilus edulis L.

Many Endocrine Disrupting Compounds (EDCs) enter coastal environments through the effluents of Waste Water Treatment Facilities, and are ubiquitous in marine surface waters, sediments and biota. Two of the most widely detected EDCs in coastal environments are 17α-ethinylestradiol (EE2) and 4-nonylphenol (4NP). We conducted uptake, bioaccumulation and depuration experiments using 3.4 nM of 14C-labeled EE2 and 254 nM of 14C-labeled 4NP in the blue mussel, Mytilus edulis. Mussels were sampled periodically during the 38 d exposure and the 35 d depuration periods, and 6 tissues were assayed (blood plasma, adductor muscle, gill, digestive gland (DG), gonad and remaining viscera) by liquid scintillation counting. Uptake of EE2 and 4NP was curvilinear during exposure, but bioburdens showed no signs of approaching a plateau. Tissue concentrations generally followed the same pattern for both compounds: DG > gill > remaining viscera > gonad > adductor > plasma. Based on our model, blood plasma appears to play an important role in both uptake and depuration, receiving EDCs from the gill during uptake and delivering EDCs back to the gill during depuration. Binding of EDCs to plasma proteins elevates the concentration of both EDCs in the plasma well above seawater concentrations.

Sarina Syed
Alycia Steele
Mackenzie MacDonald
Vincent Milone
Farah Ahmad

Engagement by firms with climate change issues likely to generate climatic surprise: Preliminary results

We employ fuzzy set qualitative comparative analysis to examine which climate change issues appear to carry more potential for climatic surprise, and examine the degree to which companies are engaging with climate change issues. Extreme weather, stakeholder pressure, other (non-CO2) regulation related to climate change, and increasing development of alternative energy emerged as issues sufficient to cause climatic surprise on their own if firms do not engage with them. We also found that current levels of engagement with climate change issues are minimal, leaving much potential for climatic surprise in future.

Shaina Colon

2014 Water and Habitat Quality of Select Stations in the Charles River Watershed

The Charles River and watershed includes 23 towns and cities in eastern Massachusetts, being the most densely populated watershed in New England. The Charles River Watershed Association (CRWA) was established over 50 years ago to help protect the watershed from urbanization and improve water quality. One way to assess water quality is to assess stream habitat quality and organism composition. In the summer of 2014, water and habitat quality were assessed for seven stations in the Charles River watershed by the CRWA and the Freshwater Ecology Lab (FEL) at UMass Boston. At each station, we measured habitat quality and sampled macroinvertebrates following the U.S. EPA Habitat Rapid Bioassessment and Streamside Biosurvey protocols. The habitat assessment scores ranged from 72 to 146 (i.e. marginal to suboptimal habitat quality). The Streamside Biosurvey results ranged from 13.6 to 36.6 (poor to fair water quality). Thus, none of the habitat or macroinvertebrate scores were found to be in the highest assessment category of “optimal” or “good”, respectively. Continuing to monitor our local freshwater with different methods such as biomonitoring and creating annual reports on the condition of the watershed will aid the CRWA in making informed management decisions.

Ram Barankin

Assessing the Vulnerability of Transportation Infrastructure to Climate Change

Background: coastal areas are experiencing climate change (CC) consequences, such as sea level rise and more frequent and more intense storms. These consequences affect the quality of life and pose danger to coastal communities. Transportation infrastructure is highly affected by CC consequences, increasing communities’ vulnerability to CC. Research Question: how to assess the vulnerability of transportation infrastructure in order to enhance coastal communities’ resilience to the effects of CC? Research Goals: (1) provide an infrastructure’s vulnerability assessment for the Boston area, introducing a framework that could be implemented in other regions; (2) propose a qualitative-quantitative method to assess latent variables, such as “resilience” and “vulnerability” (by integrating the stakeholders engagement method, known as BIG, and statistical methods such as Structural Equation Modeling); and (3) develop a framework that combines different types of data and incorporates different attributes of data quality into decision-making processes. Chapters: (1) the establishment of the vulnerability concept as the predictor of resilience; (2) assessment of the best indicators that measure transportation infrastructure vulnerability; (3) assignment of new types of data to indicators.
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<tr>
<td>Edward Saenz</td>
<td>Utilizing Highly Portable Terrestrial Lidar to Improve Spatial and Temporal Resolution of Carbon Flux Monitoring via Structural Assessment</td>
<td>Terrestrial lidar data have played an increasing role in validation of satellite and airborne observations of ecosystem structure relevant to carbon stocks and fluxes, as well as providing independent estimates of carbon cycle parameters. Spatial and temporal coverage of terrestrial lidar scanning is often limited by the cost and logistics of deployment, particularly in ecosystems which are difficult to access or traverse, or present a risk to equipment. Tropical forests with dense understorey; mountainous ecosystems or similarly difficult terrain; and coastal systems such as saltmarshes and mangroves are especially challenging for terrestrial lidar. However the opportunity to collect high spatial and temporal resolution data in such environments is afforded by ultra-portable lidar such as the University of Massachusetts Boston Canopy Biomass LiDAR (CBL). The CBL is an inexpensive, highly portable, fast-scanning, time-of-flight, terrestrial laser scanning (TLS) instrument, originally conceived by the Katholieke Universiteit Leuven (KUL) and refined in collaboration with the Rochester Institute of Technology (RIT). Portable terrestrial LiDAR such as the CBL can be used to validate and even augment satellite and airborne data in all terrestrial and coastal ecosystems, since a much higher temporal repeat can be achieved. The higher temporal resolution is particularly useful in coastal ecosystems which have fine-scale temporal dynamics, and measurements can also be taken in response to potentially geochemically significant events, such as storm-caused surges from river or ocean, or point-source contamination. We will present the deployment strategies, sampling schemes, analytical approaches and preliminary results from our efforts to derive carbon cycle parameters from a range of terrestrial and coastal ecosystems with the CBL.</td>
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<td>Zach Mertz</td>
<td>Evolution of Flood Driven vulnerabilities to Human Coupled Systems on the Charles and the Mystic River</td>
<td>Goal: In order to assess vulnerabilities and optimize current flood control measures, it is essential to understand the evolution of the system. Defining the motivations, events, and parameters by which the system was constructed will inform the establishment of preferred system state as it exists in the minds of stakeholders, and provide evidence that the system and its constituents are facing. Objective 1: To develop a comprehensive timeline denoting the changes to infrastructure, management practices, and user groups on both the Charles and the Mystic. This will be augmented with data from extreme storm/flood events that have affected the system in the last 100 years. The endpoint of this exercise is to identify any cause and effect relationships exist between storm impacts and mitigation actions.</td>
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<td>Kerry McNally</td>
<td>The prevalence of pneumonia in cold-stunned Kemp’s ridley turtles (Lepidochelys kempii) justifies an understanding of the respiratory microbiome</td>
<td>Kemp’s ridley sea turtles are a critically endangered species. Each year New England Aquarium (NEAQ) hospitalizes approximately 50 Kemp’s ridley turtles that are found stranded on beaches of Cape Cod in late autumn (range 30 - 700 turtles). These turtles are affected by a variety of medical problems, ranging from simple hypothermia to life threatening physiologic derangements and sepsis. Over 50% of these turtles are affected by pneumonia. Our previous studies have illustrated a high prevalence of often fatal bacterial and fungal pneumonia in this species. Clinicians have relied on conventional culture-based detection of bacteria and fungi in samples collected from the respiratory tract of suspected pneumonia patients. However, recent human and veterinary metagenomic studies of respiratory samples indicate large and varied respiratory bacterial populations exist in healthy individuals and it is altered in patients with pulmonary diseases, including pneumonia. An evaluation of the bacterial and fungal respiratory microbiome of hospitalized Kemp’s ridley turtles may allow for improved therapy, increased treatment success, and increased survival rates for these endangered turtles.</td>
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<td>Jack Payette</td>
<td>Modeling and analyzing seasonal trends and patterns in Boston Harbor phytoplankton</td>
<td>An understanding of phytoplankton trends is important for understanding water quality, human health, the marine food web, and especially how anthropogenic climate change will impact coastal ecosystems. Long term water quality and plankton monitoring conducted by measuring Chlorophyll pigment concentrations provides novel insight into temporal patterns of phytoplankton. Changes to plankton and other marine life driven by climate change are better understood within a context of seasonal trends and patterns in phytoplankton, in particular because of the role phytoplankton play as the foundation of the marine food web. Data collected at UMass Boston’s Fox Point Dock as part of a long term water monitoring program in Professor Juanita Urban-Rich’s laboratory provides a key opportunity for modeling and analysis. Modeling using MATLAB, employing linear or additive modeling, as well as statistical analyses of Chlorophyll a time series will further an understanding of temporal patterns and trends in phytoplankton abundance in Boston Harbor.</td>
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<td>Tyler O’Brien</td>
<td>Microplastics in Savin Hill Cove</td>
<td>Microplastics are infiltrating the world’s oceans and causing horrendous problems for the organisms they come in contact with. Understanding how these microplastics both accumulate in specific local areas and travel through multiple oceanic trophic levels via primary consumers like zooplankton is important and the goal of this study. Data will be collected at Savin Hill Cove near UMass Boston over a period of eight months in order to establish a base level understanding of the abundance of microplastics at that site. Several different analytical techniques will be used to classify the types of microplastics found within the collected samples. Further investigation will measure the amount of digested plastic within zooplankton species. Understanding the amount and nature of microplastic digestion in zooplankton will allow further understanding of the ability of microplastics to travel through multiple trophic levels. Implications of possible findings include effects on education/policy, organism health, and human consumption health hazards.</td>
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<td>Charles Major</td>
<td>Nanoplastics as a Pollutant and Potential Vector for Organic and Metal pollutants in Oyster Larval growth - A Preliminary experiment</td>
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<td>Lauren Laskey</td>
<td>Stress Physiology of Cold-stunned Kemp’s Ridley Sea Turtles</td>
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<td>Amy Johnston</td>
<td>Paleoclimate reconstruction of the Gulf of Maine during the recent Holocene (past 5000 years) using Archaeological Mollusk Shells</td>
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<td>Zhehai Shang</td>
<td>Ocean color remote sensing of shallow water seagrass, coral reef and sand</td>
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Plastics entering marine ecosystems and the ocean is at an all time high. High density polyethylene is a commonly used plastic in marine aquaculture, and a common form of plastic that degrade over time. Plastics have been shown to have the ability adsorb metals and other contaminants, and degraded nanosized particles have a higher surface area to weight ratio than larger particles. An Oyster seedbag made of HDPE was blended creating nano-sized particles in artificial sea water. These particles were then put on a plankton wheel for 36 hours along with containers carrying the particles and ionic Cadmium or Phenanthrene. Afterwards the particles were filtered to remove the Cadmium and Phenanthrene that had not adsorbed onto the nanoplastics. They were then placed into flasks containing live oyster veligers. After a 48 hour acute exposure, a 2 week latent effect toxicity study of veliger stage oyster larvae using growth as a measurement endpoint is underway. Results are yet to be seen as the experiment is underway right now, but should be available for the poster.

Kemp’s ridley sea turtles are critically endangered. Each fall, cold-stunned juvenile turtles (hypothermic-like) strand on Cape Cod. Rescue teams bring these turtles to the NEAQ for rehabilitation. Most of the rescued turtles survive (~80%) and are released. However, there is great variability in recovery times for each turtle, and some turtles consistently exhibit deficits of activity and feeding. Concentrations of 2 hormones, corticosterone and thyroxine, have been observed to greatly change during recovery. Upon admission, corticosterone (stress hormone) concentrations appear abnormally high while thyroxine (driver of metabolism) levels are very low. Both hormones return to presumed normal levels in most recovered turtles. Persistently inactive and/or not feeding turtles appear to have depressed thyroid hormones. Prolonged abnormal levels of hormones have unknown effects. A behavioral study of recovering turtles is being conducted, and hormone assays will be performed on blood samples. Do stress and metabolic hormones inhibit feeding/activity in Kemps ridley turtles? This study will assess how endocrine changes track indices of behavior and health, and could help to develop treatment methods for turtles in clinics and methods for assessing the stress/health of wild turtles.

The paleoclimate of the Gulf of Maine (GOM) during the recent Holocene can be examined through archaeological shell middens in Maine (Turner Farm) and Nantucket Island, MA. We aim to reconstruct the ocean conditions across the Holocene occupation at these sites (~5000 years) using trace element chemistry and stable isotopic composition of eastern oyster (Crassostrea virginica), soft-shell and hard-shell clams (Mya arenaria and Mercenaria mercenaria), and blue mussel (Mytilus edulis). Each site is located at the extreme north and south of the GOM providing boundary conditions for the ocean chemistry across this time period. We will analyze trace element composition along the growth axis using laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) and stable isotopic composition using gas bench isotope ratio mass spectrometry (GB-IRMS). Moreover, since the midden species are extant in these regions, it is possible for us to ground-truth temperature, salinity, and pH proxy data with modern specimens. This research seeks to discover whether variations in stable isotopic and elemental composition in midden shells can be used to reconstruct the recent Holocene climate of the Gulf of Maine.

Remote-sensing reflectance (Rrs) for shallow water is coupled by at least three parts: 1. Inherent Optical Properties (IOP): Absorption and scattering coefficient of all substance within water; 2. Bottom reflectance and the depth of water; 3. Zenith angle of sun. A method has been developed by Lee, 1999 to retrieve IOP and depth by using optimization process with bottom reflectance, Rrs, Zenith Angle as inputs. In this research, three classic types of bottom (seagrass, coral reef and sand) are chosen. Then this approach is verified by continuous field measurement match with videos taken by Gopro Camera. Current results from optimization approach fits well with field measurement and eye-ball observation from video. In future study, more Rrs-related characteristics of bottom types will be derived. And this information will be used to help determine the depth of water, portions of these three classic bottom types in a rough scale by shallow water remote sensing.