State of the Reserve 2015
"Science to Management" Poster Presentations

Physical and biological effects of oysters on sediment characteristics.
Charles Dustin Adams et al., Flagler College.

Oyster reefs are known to produce biodeposits rich in organic matter which they transfer to the sediment for use by benthic communities (Newell, Cornwell, & Owens 2002; Chamberlain et al 2001). At the Wright's Landing oyster restoration site sediment samples and oyster abundance data were obtained to study organic matter content changes from biological and physical processes. Organic matter content was analyzed via loss-on ignition method and oyster abundance was recorded using a point-intercept method via 0.25 square meter quadrats to determine if abundance correlated with organic matter. Analysis of sediment samples revealed that organic matter was higher behind reef segments compared to controls, and is highest 2 meters behind the reef with a maximum of 7% organic matter. Live oyster abundance was converted to percent cover and ranged from 12-76% of the reefs yet no correlation was found between abundance and organic matter content. Therefore the physical reduction of wave energy behind the reef is probably the primary factor determining organic matter accumulation. The findings in this study support the need for greater oyster reef establishment to continue to provide coastal protection against erosion and to create nutrient rich habitats for benthic communities and juvenile organisms that utilize these habitats.

Sea level rise impact on a salt marsh system of the Lower St. Johns River.
Peter Bacopoulos et al., University of North Florida.

The impact of sea-level rise on salt marsh sustainability is examined for the lower St. Johns River and associated salt marsh (*Spartina alterniflora*) system. A two-dimensional hydrodynamic model, forced by tides and sea-level rise, is coupled with a zero-dimensional marsh model [1] to estimate the level of biomass productivity of *S. alterniflora* across the salt marsh landscape for present day and anticipated future conditions (i.e., when subjected to sea-level rise) [2]. The hydrodynamic model results show mean low water (MLW) to be highly spatially variable with a SD of ±0.18 m

and mean high water (MHW) to be less spatially variable with a SD of ±0.03 m. The spatial variability of MLW and MHW is particularly evident within the tidal creeks of the salt marsh. MLW and MHW are sensitive to sea-level rise and respond in a nonlinear fashion (i.e., MLW and MHW elevate by an amount that is not proportional to the level of sea-level rise). The coupled hydrodynamic-marsh model results illustrate the spatial heterogeneity of biomass productivity and indicate marsh vulnerability to sea-level rise. The model is then used to demonstrate an application of engineered accretion that can help sustain a marsh that is exposed to sea-level rise.

***Comparison of benthic faunal abundance and diversity on restored and non-restored sites along the Tolomato River in the GTM NERR*. Nadja Capps et al., University of Florida.**

Oyster reefs are an invaluable resource both locally and nationally. They provide an array of ecosystem services which include stabilizing shorelines and supporting recreational and commercial fishing. Due to human impacts such as increased wave erosion and overfishing, oyster reef habitat has significantly decreased. Along the Tolomato River in the Guana Tolomato Matanzas National Estuarine Research Reserve, oyster shell reefs and fiber logs were used to restore habitat and prevent further shoreline erosion. To assess the assemblage of benthic fauna, an important component of the estuarine food web, this study compared benthic invertebrate and fish abundance and diversity in restored and non-restored sites. Settlement trays were used to collect the benthic fauna. Four trays were placed at each of the five sites. At each site, three trays were collected monthly while the fourth was collected every three months to look at effect of disturbance on settlement assemblages. Abundances, species richness, and Shannon-Wiener diversity index values among treatments and seasons were used to analyze the potential impacts of the restorations on the benthic faunal community. The dominant species included *Palaemonetes pugio* (shore shrimp) and *Petrolisthes armatus* (green porcelain crab). There were some differences in abundance and diversity seasonally and among treatments. Further analysis may be needed to fully understand the impacts of these restoration projects, but the results showed that the oyster shell reefs and

fiber logs create valuable habitat that has the ability to support a relatively diverse and abundant benthic faunal community in comparison to eroding river edge habitats.

***GTM NERR Internship, Summer 2014*. Julia Faherty, Creekside High School.**

The Guana Tolomato Matanzas National Estuarine Research Reserve (GTM NERR) summer camps focused on a unique estuarine theme each week. For three weeks the campers, ages seven to ten, participated in activities mirroring the Research and Stewardship sectors in the GTM NERR. The first week was focused on the beach ecosystem, the second week was focused on the estuary ecosystem, and the third week was focused on the uplands ecosystem. The campers collected meaningful data and conducted real scientific experiments each week.

One of the most important duties was helping campers collect and understand their data. During beach week, there was plankton towing, measuring the status of the beach, and seining. During estuary week, campers measured water quality and created lifesize boats. During uplands week, campers identified organisms found on the trails and in water samples. Through this internship, the ecosystems at the GTM NERR were explored. One of the highlights of the internship involved leadership of a lesson on phytoplankton. They are a vital species and their importance was discovered and studied during the internship.

***Finding a home among the mangroves: crab recruitment within the expanding ecotone.* Cora Ann Johnston et al., University of Maryland.**

Mangroves are appearing in the historically Spartina-dominated marshes of north Florida. As species shift geographic ranges with climate change, it becomes pertinent to investigate what form assembling communities take when species encounter habitats out of context. When habitat-forming species establish in novel areas, who will recruit into the habitat? I investigated the assembly of marine crustaceans in structurally and spatially shifting mangrove and marsh wetlands. Using a latitudinal ecotone from pure mangrove to mixed wetland to pure marsh, I surveyed

larval supply and post-larval settlement to determine the relative influences of landscape context and habitat associations on community formation. Despite differences in settlement, species supply was comparable across sites, suggesting minimal influences of landscape context and dispersal limitation. Only a subset of arriving species settled, so community composition was not supply-driven. Settled communities clustered by habitat type, regardless of latitude, with marsh inhabitants nested within the more diverse mangrove assemblages. Thus, crab community assembly along this wetland ecotone is apparently dominated by habitat associations. As mangroves move northward in response to retreating cold limitation, I expect mangrove-associated species to accompany them, increasing wetland inhabitant biodiversity rather than displacing marsh grass associates.

***Variation in growth and biomass partitioning of mangroves in response to flotation time and light availability*. Lorae T. Simpson et al., Smithsonian Environmental Research Station.**

Mangroves are migrating northward and displacing salt marsh around the world due to a combination of biotic and abiotic factors. We hypothesized that propagule flotation time and light availability strongly influences initial seedling establishment and subsequent productivity of Avicennia germinans, Laguncularia racemosa and Rhizophora mangle. Propagules were collected along a latitudinal gradient on the east coast of Florida and floated in seawater for 0,1,2,3, or 4 weeks. Propagules were then planted and grown under two light levels (sun and shade) following pre-determined flotation times. Flotation time, light availability and site all significantly affected growth and biomass partitioning of the mangrove species. We suggest that mangrove seedling productivity is driven in part by spatial and temporal factors. The most productive seedlings will float for short periods and establish in areas where they are not limited by light. Understanding the factors mediating mangrove establishment and productivity gives insight into the mechanisms behind their poleward

range expansion and helps forecast the future range of this important ecosystem.

Building a better GTM: Increasing access for researchers and visitors through a new NOAA grant. Gary Raulerson, PhD et al., GTM NERR.

Fish biodiversity in the GTM NERR: explaining trends with scientific illustration and ecology. Ed McGinley, PhD et al., Flagler College.

Potential techniques for increasing American Oystercatcher hatch success through shell rake enhancement. Andrea Small et al., Northeast Florida Aquatic Preserves.

Numerical modeling and analysis of tidal variance, flow through vegetation, and marsh accretion and evolution in the GTM NERR. Amanda Tritinger et al., University of North Florida.

Teaching research: a UNF and GTM NERR collaboration in marine ecology. Eric Johnson et al., PhD, University of North Florida.