

State of the Reserve 2013
“Preserving Public Lands to Sustain Healthy Communities”

The studies in this document represent but a few of the many research, monitoring, education and conservation activities that have taken place over the past year at the GTM NERR. Some programs are of a short duration while most are long-term and lend themselves to future research and monitoring needs and practices, and all contribute to the growing body of scientific knowledge.

“Oyster Reef & Living Shoreline Restoration: Community oyster shell recycling and living reef project”

Presenter: Lauren Flynn

Oyster reefs throughout the mid-Atlantic and southeastern United States have been declining in number for over a century. Along with increasing public awareness of the impacts of losing this valuable fishery, a growing recognition of the vital ecological role of the Eastern oyster (*Crassostrea virginica*) has spurred various restoration efforts both nationally and worldwide.

To combat declining oyster populations in NE Florida and an accompanying increase in shoreline erosion, the GTM NERR initiated the Community Oyster Shell Recycling and Living Reef Restoration project in February 2012. This community project includes the efforts and contributions of local restaurants, citizen volunteers, and various schools within St. Johns County.

The system begins with teams collecting discarded oyster shells weekly from participating restaurants. After a quarantine period, prepared shells are placed into bags and used to construct a reef in the Tolomato River along 1,075 feet of Guana Peninsula shoreline. As the reef is built, consistent biological monitoring measures its effects on oyster recruitment and survival, faunal biodiversity, and stabilization of an eroding shoreline.

This restoration project is the first of its kind in NE Florida. It is turning out to be highly successful due to the abundance of community support. From February through November 2012, 70 volunteers generated approximately 50,000 pounds of reclaimed oyster shell. Coordinated reef building events attended by project partners, including St. Johns Technical High School, other Department of Environmental Protection branches, local businesses, and community volunteers have constructed nearly half of the oyster reef needed to complete the project.

BIOGRAPHY

Lauren Flynn serves as the Community Oyster Shell Recycling and Living Reef Restoration Project Coordinator at the GTM Research Reserve. She has a BA degree from the University of Massachusetts and an MA degree in Marine Resource Management from Texas A&M University. She has worked at the Reserve for over two years. Her project is funded by both the Reserve and the Friends of the GTM Research Reserve.

“Collaborative Science at the GTM NERR: Integrating graduate education, professional training, and long term research”

Presenter: Eric G. Johnson

As part of the National Estuarine Research Reserve system, the GTM Research Reserve is charged with implementing coordinated long-term research programs at local, regional, and national scales. These programs generate comprehensive baseline data, provide a better understanding of coastal ecosystems, and allow for the evaluation of population and community level changes at large spatial scales over long time-periods.

The GTM NERR currently implements a broad array of research programs to monitor physical and environmental conditions as well as the biological communities within the Reserve; however, with limited resources, much of this important long-term data has yet to be comprehensively examined and analyzed. A collaborative partnership formed between the GTM NERR and the University of North Florida (UNF) is designed to provide hands-on research opportunities to enhance graduate education and address meaningful research questions using real data from long-term Reserve research programs.

In close coordination with research mentors within the Reserve, students enrolled in an intensive, graduate level marine ecology course at UNF developed research questions and participated actively in field, laboratory, and analysis components of several long-term research programs. As part of a capstone project for this course, students were required to present a formal research seminar on their findings and to prepare a final research manuscript. Further anticipation is that many of the students will present research posters or talks at local, regional, and national conferences. This ongoing collaborative partnership highlights the value of pairing research institutions with universities to achieve common goals.

BIOGRAPHY

Eric Johnson currently serves as an Assistant Professor in the Department of Biology at the University of North Florida, where he applies the principles of marine ecology, and fisheries management and conservation to important marine and estuarine fishery species. He is active in the field of fishery management, serving as a member of numerous regional and national advisory committees. Ultimately, his research goal is to advance understanding of the population dynamics of fishery species and provide sound scientific information to managers and decision makers as a basis for effective management, conservation, and restoration of coastal living resources.

“FLORIDA STATE PARKS WITHIN THE GTM NERR”

Presenter: Melissa Kafel

Faver-Dykes State Park improvements in 2012 include remodeling the ranger station, pump house, shop office building, and a ranger residence within the park. Other activities included utilizing prescribed fire as the main resource management tool, though high drought conditions allowed for burning only 30 acres. The plan is to burn over 1,000 acres in 2013 weather conditions permitting. In a restoration effort, the park entered into partnership with the Florida Forest Service to conduct a Timber Harvest Project on 800 acres of planted pine for thinning the rows and allowing more sunlight to penetrate the understory. In addition, the Faver-Dykes water quality monitoring station collected data for the GTM Research Reserve along Pellicer Creek on a daily basis.

Washington Oaks Gardens introduced a self-guided educational interpretive tour of the Washington Oaks Historic District to educate park visitors. The Gardens continued environmental educational programming throughout the year, including conducting a large-scale education initiative at the Earth Day Event in April, again reaching over 2,000 visitors as in past years. Scientific research in the park included a native bee study by GTM NERR biologist Jaime Pawelek, the results of which are now online at www.floridiasnativebees.com/resarch.html.

PARK BACKGROUND

Melissa Kafel is a Park Services Specialist at Faver-Dykes and Washington Oaks Parks. Faver-Dykes consists of over 6,000 acres of 13 different natural Florida communities in southern St. Johns County along Pellicer Creek. Five staff members operate the park, including a 30-acre campground, a boat ramp, two islands, and a picnic area. Washington Oaks Gardens encompasses 425 acres from the Atlantic Ocean to the Matanzas River, and is the southern boundary of the GTM NERR. The Park is unique within the Reserve with 20-acres of formal gardens that require planting non-native species throughout the year.

“Oyster Reef & Living Shoreline Restoration: Developing the next generation of environmental stewards”

Presenters: Linda Krepp, Wayne King

St. Johns Technical High School's (SJTHS) Academy of Coastal and Water Resources, in partnership with the GTM NERR, received a SARP/NOAA grant to build a living shoreline within the Reserve's boundaries. SJTHS Academy and Summer School students receive hands-on, work-relevant training by bagging oyster shells, collecting scientific data, and building an oyster reef. The project's scope has further developed to include the students growing *Spartina alterniflora* (marsh grass). Through an additional US Fish and Wildlife Service Coastal Program grant, the students collected seeds from the grasses and are cultivating them for planting plugs at the restoration site in the spring, which will help stabilize the eroding shoreline. Many of the students had never been as exposed to the natural environment as they now are, since participating in this restoration initiative. Through these opportunities, the students are gaining a true appreciation of the importance of protecting coastal resources.

BIOGRAPHIES

Linda Krepp is Career Specialist for St. Johns Technical High School's Academy of Coastal Water Resources. She has a BS degree from Kent State University. After working a number of years in marketing and technical support for the chemical and telecommunications industries, she pursued a career in teaching, most recently in environmental education. In her current position, she is actively developing next generation environmental stewards.

Wayne King has worked in various schools throughout St. Johns County for over 18 years and is currently serving as principal at St. Johns Technical High School. He has a BA degree from Flagler College and a MEd in Education Administration from Jacksonville University.

“Preserving Public Lands to Sustain Healthy Communities”

Presenter: Emily Montgomery

The last 250 years of human culture are defined by unprecedented economic and population growth. Throughout the industrial revolution new technology has allowed for a previously unimaginable velocity of production and consumption, increasing the pressures on natural resources at unsustainable rates. In a new world where all our needs are seemingly met by manufactured goods and services, we have lost a fundamental connection with natural systems that sustain all life. The term ecosystem services refers to the benefits of healthy natural ecosystems to communities and economies.

Among the most basic ecosystem services is the provisioning of raw materials, the food supply, and clean air and water. Healthy natural systems also serve to stabilize the earth's climate, control pests and diseases, and buffer built environments. On an intangible level, many cultural and aesthetic services are derived from nature. The Millennium Ecosystem Assessment, conducted from 2001 – 2005 and involving the work of more than 1,360 experts worldwide, used the concept of ecosystem services as a framework to assess the consequences of ecosystem change to human well being. Among the most resounding findings of this work is the fact that approximately 60% of the ecosystem services evaluated were considered degraded or being used unsustainably, both of which often cause significant harm to human well-being.

Specific to estuarine environments, the USFWS recently stated that from 2004-2009, U.S. coastal wetlands experienced an 110,000-acre decline, which is a rate of loss far surpassing that of all other wetland types. This is dire considering that coastal estuaries are the cornerstone of oceanic fisheries, they provide invaluable shoreline stabilization and protection, and they support local economies through ecotourism and other natural resource-related industries. In fact, the National Ocean Economics Program estimates the non-market economic value from the nation's ocean and coastal resources to be over \$100 billion a year.

The benefits we derive from natural systems can be defined through highly complex economic and ecological models or through cultural meaning as in the Iroquois "Ohenton Kariwahtekwen" (Thanksgiving Prayer) which says, *"We are all thankful to our Mother, the Earth, for she gives us all that we need for life. She supports our feet as we walk about upon her."* No matter the language spoken or jargon used, one of the great challenges of our time is to create a cultural shift that recognizes the fundamental importance of preserving healthy natural systems to sustain healthy and happy communities. We must understand and integrate the role of ecosystem services into our economy, our social structures, and our daily lives. Through fundamental cornerstones of research, stewardship, and education, the GTM NERR contributes to this movement at both the local and national levels.

"Effects of Environmental Conditions on Estuarine Organism Genetics"

Presenter: Daphne Pariser, Kassi Ferguson, Terri Seron, PhD

Global warming and ocean acidification affects the ecological diversity of marine habitats. Northeastern Florida is particularly at risk due to its highly diverse habitats and ecological niches. Therefore, the prediction is that multiple crab and small fish species have a unique molecular physiology allowing them to inhabit such varying environments.

The use of protein analysis compared both vertebrate and invertebrate species in the surrounding St. Augustine region. Results of examining differences and similarities both between and among species put in different environmental conditions indicate relatively stable protein expression (presence of proteins in a cell or tissue) in different species of fish. Under similar conditions, several crab species exhibit interesting and different protein expression profiles. This study has given us baseline data for further analysis of vertebrate and invertebrate species within the vicinity of St. Augustine.

BIOGRAPHY

Daphne Pariser is a Psychology Major and Environmental Science Minor at Flagler College. She spent 10 weeks last summer conducting scientific research into the neuroscience of emotion, learning, and memory. She was one of 10 undergraduates chosen from approximately 300 applicants to participate in the National Science Foundation Summer Research Experience for Undergraduates program at the Center for Neural Science at New York University. Her supervisor was Liz Phelps, PhD. Daphne is currently working with Dr. Terri Seron at Flagler College to identify changes in protein expression that are due to environmental disturbances. She intends to pursue graduate studies in psychobiology with a research focus on the neurology of post-traumatic stress disorder.

“Making the Ecosystem Connection: Taking undergraduate science education outdoors”

Presenter: Dr. Melissa Southwell

With the great acceleration in internet technology and social networking, students today are in some ways more globally connected than ever. However, these same students are often not connected to their own local environment and are ignorant of the challenges it faces in the near future. As Flagler College is a small, liberal arts institution, we have placed a special focus on helping non-science major students understand their own physical, economic, and personal connections to the local environment. A goal is for students to see themselves as active rather than passive components of the ecosystem. The GTM Research Reserve has been a key partner in this endeavor in all aspects. Our students have participated in a variety of field explorations and independent research projects that range from introductory hikes to ambitious independent studies suitable for publication. Results include both undergraduate research findings and students' reflections on their own attitudes and experiences during the outings. These reflections show how the natural world can inspire and motivate students academically, yet also show the lack of awareness and experiential knowledge that characterizes many students' initial outlooks on the environment. It is our hope that this hands-on approach to undergraduate education will help to improve science literacy among students, and provide them with the critical thinking skills needed to become good decision makers.

BIOGRAPHY

Melissa Southwell is a professor of Environmental Science at Flagler College in St. Augustine. She did her undergraduate work at the University of Virginia and then spent two years in the Peace Corps in Cameroon. She returned to do graduate work in Marine Sciences at the University of North Carolina at Chapel Hill. Her specialty is nutrient biogeochemistry, and she has published papers ranging from rainwater photochemistry to nitrogen cycling by coral reef sponges.

“Seasonal Dynamics of Epiphytic Algae Collected from *Spartina alterniflora*”

Presenter: Stephanie Verhulst

Epiphytes are organisms living on plants and other surfaces and are responsible for the majority of primary productivity in many aquatic systems. While epiphytes serve as a valuable food source to herbivores, they may also prove harmful to the host plant by competing for light and nutrients and by increasing sheer stress. This study examines the seasonal dynamics of the epiphytic algal community attached to *Spartina alterniflora* (saltmarsh grass) over the course of two growing seasons. Algal samples were collected monthly (April-November) by removing the bottom, 10-20cm of *Spartina* stems from three islands in the Tolomato River (located within the GTM NERR). Biomass, ash-free dry mass (AFDM), chlorophyll-a levels, cell counts, and community diversity were examined by algal division to assess community development. One hundred genera (ca.150 infra-generic taxa) were identified.

Biomass tended to be dominated by diatoms and red algae while cyanobacteria were most abundant. In both years, biomass was highest in the spring with a second, smaller pulse in the fall. Conversely, chlorophyll-a levels varied between the years and did not show the same seasonal patterns as AFDM. Nutrient additions (nitrogen, phosphorous, and combination of the two) did not elicit any significant changes in community structure. Overall, the epiphytic algal community is rich and diverse, thus contributing to a robust microbial food web.

BIOGRAPHY

Stephanie Verhulst is from Milwaukee, Wisconsin and attended the University of Wisconsin-Madison. She graduated with a BS in Wildlife Ecology in 2005, after which she took an environmental consulting job in Bakersfield, California and remained there for a year. She then relocated to Jacksonville and continued working as an environmental consultant. In 2010, she returned to school to obtain her MS degree in Biology from the

University of North Florida. Her research has focused on the effects of elevated nutrient levels on epiphytic algae found in the salt marshes of northeast Florida.