



## **Environmental Cooperative Science Center**

Florida A&M University - Lead Institution



**Performance Report for Cooperative Agreement No: NA06OAR4810164**

**For the period from September 1, 2011 to February 29, 2012**

**Submitted By:**

**Florida Agricultural and Mechanical University (Lead Institution)**

Bethune-Cookman University, Creighton University, Delaware State University, Jackson State University,  
Morgan State University, Texas A&M University-Corpus Christi, the University of Miami;  
and the University of Nebraska-Lincoln

**National Oceanic and Atmospheric Administration  
Environmental Cooperative Science Center**

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## Executive Summary

The period September 1 2011 through February 29 2012 is the focus for this report. This award was scheduled to end on August 31 2011. However, we applied for and received a no-cost extension to complete various activities that were detailed in the original proposal. During this reporting period, we worked toward completing student projects that began during the award period. Existing funds were used to support student stipends and tuition costs, and to fund ECSC faculty and staff salaries necessary to complete award activities. The funds were also used to purchase supplies and consumables to finish student research projects, and travel to field sites and meetings. Many of the students supported by this no-cost extension are expected to graduate before the end of the extension period. If they do not, and if their institution is a participant in the new ECSC Cooperative Award that began in September 2012, they may be funded on the new cooperative agreement. Since its inception, the primary goal of the center has been to train students, particularly from under-represented minorities, in the STEM disciplines relevant to NOAA's mission. Through programs that integrate education, research, and outreach, we have worked to create a pipeline to advance students from the middle grades through high school, undergraduate and graduate degrees. Our purpose is to provide a pool of students who are broadly trained in environmental sciences, with the skills needed by NOAA and other employers to address 21<sup>st</sup> century issues. In this context, the success and accomplishments of our students continues to be the Center's major achievement.

## **Section I: Status of Award Tasks**

The Environmental Cooperative Science Center (ECSC) mission is to educate a new generation of environmental scientists, particularly from under-represented minority groups, in NOAA-related sciences and to develop natural and social science tools for integrated assessments of ecosystem health to support coastal and environmental decision making. The ECSC has employed research based strategies and methods to recruit, train, and promote students in NOAA sciences and related fields that support the development of a next generation workforce. ECSC collaborates with NOAA's National Ocean Service (NOS) and partners with strategically-selected National Estuarine Research Reserve System (NERRS) sites along the Atlantic and Gulf coasts. To date the ECSC has acquired over \$50,000,000 in funds leveraged with NOAA EPP funds. Our accomplishments to date include:

- **Received a 90% score during the 2009 Cooperative Science Center Evaluation process**
- **Trained over 235 post-secondary students trained in NOAA-related sciences**
  - 178 students graduated in NOAA core science areas (27 *Ph.D.*, 49 *M.S.*, 4 *M.A.*, 97 *B.S.*, and 1 *B.A.*) with an additional 85 currently in the pipeline
  - 10 former ECSC students obtained employment with NOAA (*NOS*, *OAR*, *NMFS*)
  - 8 former ECSC students are now Federal (other than NOAA), state, or local employees conducting work/research related to NOAA sciences
  - 13 former ECSC students are now Federal (other than NOAA), state, or local government employees
  - 5 former ECSC students have joined academia (post-secondary and K-12)
- **Over 166 peer reviewed publications in NOAA-related sciences by faculty and students**
- **Examples of ECSC Management Products**
  - Comprehensive ecological risk assessment is underway at ANERR addressing sea-level rise and water management scenarios
  - Grand Bay NERR conceptual model is being used to assist manager and research coordinator to develop a site plan and research plan
  - Delaware NERR conceptual model is being used to introduce members of the St. Jones Watershed Tributary Action Team (forming in response to a Clean Water Act judgment involving the State of Delaware) to major environmental issues found within the watershed
  - Established hyper-spectral geospatial data base from aerial flyovers at 5 NERRs
- **Examples of ECSC Education and Outreach Products**
  - Developed a peer-reviewed post-secondary Ocean Science Concept-driven Interactive (OSCI) teaching model available on-line. This teaching model in its entirety was published in 2011 in ASLO's new Limnology and Oceanography e-Lecture publication series

- Produced video, ‘From Education to Exploration: Students at Sea’. To be shown in NOAA’s Ocean Today Kiosk (*a multi-media interactive exhibit that was shown in 15 museums and aquariums around the country including The Smithsonian-Ocean Hall in Washington D.C.*)
- Annual Summer Camps for K-12 teachers and students at several partner universities.

## **I:1) Education and Outreach**

### **Michael Abazinge and Bernadette Kelley, Thematic Area Leaders**

Education and outreach continues to be the thread connecting the thematic areas of research across the ECSC, and training the next generation of environmental scientists and managers is the major focus of our efforts. Each thematic area focused on training students in the methods of scientific inquiry, research analysis, and professional and community outreach related to the mission and goals of NOAA and the EPP. Over the entire period of funding, the ECSC has recruited and trained over 250 students at the undergraduate and graduate levels. Student projects across the center that were funded during this reporting period are detailed in Appendix D. Student projects provide clear evidence of our ongoing success in meeting the educational goals and objectives of the ECSC: educating the next generation of scientists and other professionals, and preparing them to serve the mission and goals of NOAA, other STEM agencies and in related careers.

ECSC staff and students have continued collaborations with NOAA scientists, NERR's, other related agencies, including

- NOAA's Center for Human Health Risk at the Hollings Marine Lab
- NOAA Chesapeake Bay Program Office
- NOAA's National Geodetic Survey COASTAL program
- NOAA CREST group at the City University of New York.

Such collaborations have provided significant opportunities for students to expand their knowledge, skills, and abilities as they pursue careers in environmentally focused positions. The working relations that grow from such collaborations have also had an impact at each of the partner institutions, by providing education and development opportunities for students and faculty. These collaborations have also enhanced our capabilities to conduct research that addresses NOAA and NOAA related critical themes. This work has led to publications, presentations, and recruitment of new students.

## I:2) Ecological Processes and Indicators of Ecological Health

Jennifer Cherrier and Elijah Johnson, Thematic Area Leaders

A comprehensive understanding of ecosystem structure and function is necessary to evaluate the overall status and health of an ecosystem. Thus, understanding the biogeochemical, ecological, and physicochemical factors that define estuarine ecosystems is essential to achieve NOAA's ecosystem management objectives. The purpose of the ECSC Ecological Processes and Indicators of Ecosystem Health Thematic Area (EPIEH-TA) is to train students in advanced environmental research. The research activities in this thematic area are designed to engage students in projects relevant to NOAA's mission, to ensure that students complete their degrees, and to prepare them for careers with NOAA or in NOAA-related fields. Accordingly then, the two main objectives for EPIEH-TA activities are:

1. *To engage students in advanced environmental, coastal and ocean science research by providing a focused and rigorous training program.*
2. *To provide a scientific basis for improved forecasting capabilities of the impact of natural and anthropogenic stressors on the health and function of the targeted ECSC estuarine ecosystems*

Table 1.2 is a listing of students and other personnel in this thematic area that were financially supported during this reporting period.

**Table I.2A. Students and other EPIEH-TA personnel that received support from this cooperative agreement September 1 2011 – February 29 2012.**

Name	Faculty/Student/Other	Institution	Work/Activity Res. Focus
Dr. Charles Jagoe	Professor ECSC Distinguished Scientist	Florida A&M University	Ecosystem Status and Health/ecotoxicology
Dr. Younes Errahali	EPIEH-TA Post-Doctoral Res. Associate	Florida A&M University	Ecosystem Status and Health
La Trisha Allen	Ph.D./Env Sci	Florida A&M University	Ecosystem Status and Health/Ecotoxicology
Erik Davenport	Ph.D./Biology	Morgan State University	Integrated Ecosystem Modeling/ ecological modeling
Amy E. Edwards	Ph.D./Env Sci	Florida A&M University	Ecosystem Status and Health/Chemical Transport
Zakiya Hoyett	Ph.D./Env Sci	Florida A&M University	Ecosystem Status and Health/transport chemistry
Ariana Marshall	Ph.D./Env Sci	Florida A&M University <i>**works in both EPIEH- TA and IA-TA</i>	Ecosystem Status and Health/coastal zone management
Mark Duggo	Ph.D Env Sci	Jackson State University	Ecosystem Status and

**Table I.2A. Students and other EPIEH-TA personnel that received support from this cooperative agreement September 1 2011 – February 29 2012.**

(Continued)

Name	Faculty/Student/Other	Institution	Work/Activity Res. Focus
			Health/Fisheries
Christina Nica	Ph.D./Env Sci	Jackson State University	Ecosystem Status and Health/coastal zone management
Judith Sarkodee-Adoo	Ph.D./Env Sci	Florida A&M University	Ecosystem Status and Health/ food webs, biogeochemistry
Melissa Schutte	M.S./Nat Res	Delaware State University	Ecosystem Status and Health/ coastal zone management, restoration
Katherine Whitaker	M.S./Civ & Env Eng	Florida A&M University	Integrated Ecosystem Modeling/ hydrologic, ecological
Jessica Wise	M.S./Env Sci	Florida A&M University	Ecosystem Status and Health/ food webs, toxicology
Frank Johnson	B.S./Env Sci	Florida A&M University	Ecosystem Status and Health/
Tiffany Baskerville	PhD/Env Sci	Florida A&M University	Ecosystem Status and Health/ food webs, biogeochemistry
Christina Mohrman	Research Coordinator	Grand Bay NERR, and Florida A&M University	Ecosystem Status and Health
Megan Lamb	Research Coordinator	Apalachicola NERR, and Florida A&M University	Ecosystem Status and Health

Research in the EPIEH-TA is aligned with NOAA’s ecosystem approach to management with two major two focus areas are a) Ecosystem Status and Health and b) Integrated Ecosystem Modeling (Fig I.2A). The Ecosystem Status and Health research focus area incorporates biogeochemistry and bioindicators, and the Integrated Ecosystem Modeling focus area incorporates several topical areas including, estuarine transport processes and ecological modeling. The research areas in the EPIEH-TA were intentionally selected such that they could conform to changes in NOAA’s mission and focus. The 2 research foci of the EPIEH-TA are designed to be interactive and continuously draw on and support the other. The empirical data generated from laboratory and field studies is meant to populate ecosystem response models which in turn are intended to drive models of risk assessment. Ultimately all of this data can then be used to inform coastal zone policies.

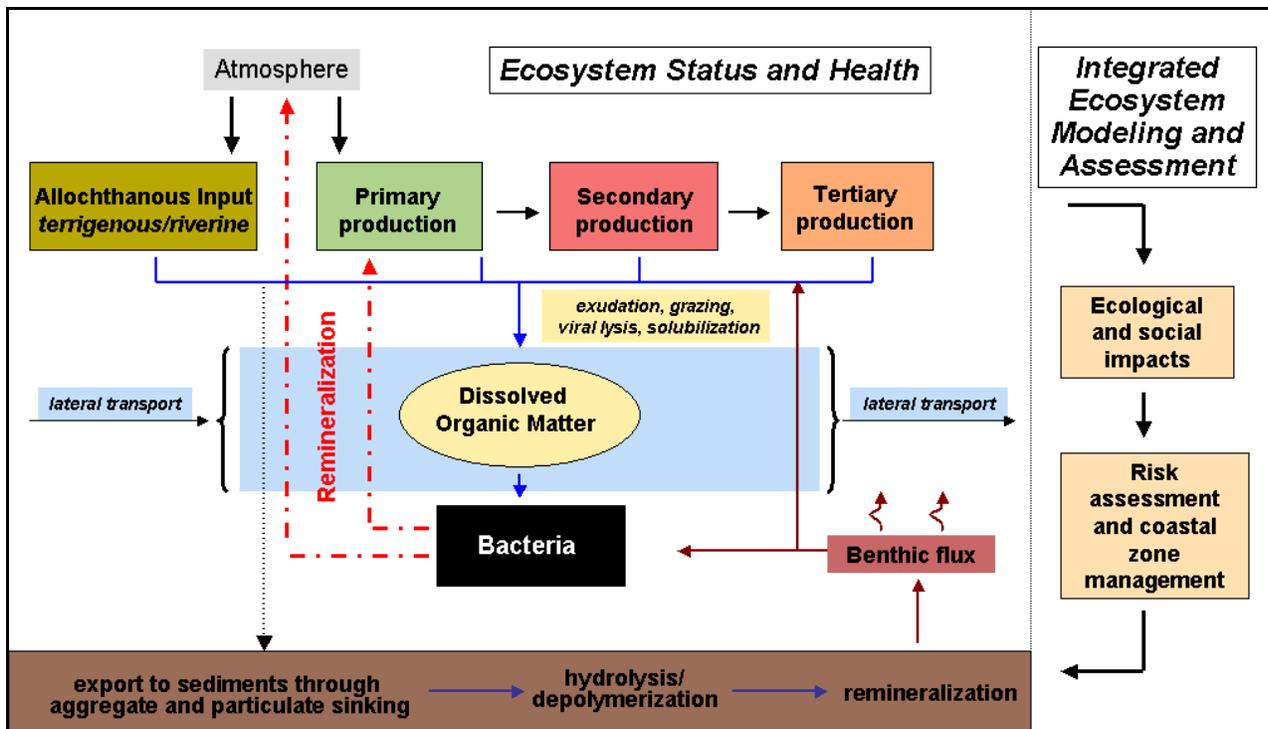


Fig. I.2A. Conceptual illustration showing the connectivity between the two EPIEH-TA research foci a) Ecosystem Status and Health in the EPIEH-TA and b) Integrated Ecosystem Modeling and Assessment and how this research then meant to inform other ECSC thematic area research.

Several EPIEH-TA faculty, students and staff have been actively engaged in research and public outreach efforts in response to the Deepwater Horizon oil spill. Monitoring activities were designed to capture and assess the impact of oil on the various trophic levels in these two systems (i.e. where oil would be substituted into the allochthonous input box as shown in the Fig. I.2A conceptual illustration). Center wide EPIEH-TA monitoring efforts are outlined on the ECSC website. An outreach presentation about the spill, developed by ECSC students under the direction of ECSC faculty and post docs, can also be viewed at this site. We are currently in the process of updating this presentation.

Two performance objectives for the EPIEH-TA implementation plan were generated in year one of this grant cycle. These EPIEH-TA objectives are listed below. Following each objective are the accompanying performance indicators (or measures), the respective indicator target goals for this reporting cycle, and the accomplishments for each indicator to date.

**EPIEH-TA Objective 1:** *To engage students in advanced environmental, coastal and ocean science research by providing a focused and rigorous training program*

**Performance Indicators for Objective 1**

Performance indicators (PI) and targeted goals for objective 1 were identified in the EPIEH-TA implementation plan. These indicators include core competency training, development of NOAA/NERR relevant research proposals (including the inclusion of NOAA and NERR scientists on theses/dissertation committees), successful completion and defense of senior projects/masters

theses/dissertations, presentation of research findings at the department level as well as at national meetings, and publication of these findings.

PI 1) *ECSC partner institutions engaged in EPIEH research activities will develop and implement a core competency training program to ensure that the ECSC students will be effectively prepared to embark on their research activities.* The goal for this reporting period was that all ECSC partners engaged in EPIEH-TA research would have a curriculum in place to ensure that EPIEH-TA students would receive training in core competencies. The two sets of core competencies that were identified were a) coastal and marine ecosystem dynamics (classroom-based) and b) field research methodologies (field based). This goal has been achieved. Each partner institution has curriculum requirements for their students that address classroom-based competency. Field based competency is provided by ECSC faculty/ staff and NERR scientists by various means, including traditional semester-long courses, special topics short courses, or arranged internships at NERR sites.

PI 2) *EPIEH-TA students at each of the ECSC institutional partners will demonstrate successful mastery of core competencies.* The goal this reporting period was that all EPIEH-TA students could demonstrate successful mastery of core competencies. This goal has been achieved as all EPIEH-TA students (listed in table I.2A) have taken the necessary courses at their respective institutions and have received a passing grade.

PI 3) *EPIEH-TA B.S. students will develop a senior thesis or capstone report based on their ECSC research activities.* The goal for this reporting period was that all EPIEH-TA BS students would develop a senior thesis or capstone project based on their ECSC research activities. Only one BS student was supported during this reporting period. He is a rising senior and will develop a senior thesis during the next academic year.

PI 4) *EPIEH-TA B.S. students will present the findings of their senior thesis or capstone project at the university departmental level.* The goal for this reporting period was that all EPIEH-TA BS students graduating with BS degrees would present the findings of their ECSC research at the university departmental level. Only one BS student was supported (see above), and we anticipate that he will present his results at the completion of his senior year.

PI 5) *EPIEH-TA B.S. students will present their research findings at one or more national meetings.* The goal for this reporting period was that at least half of the EPIEH-TA BS students would present their research findings at a national meeting. Only one BS student was supported during this period, and he did not make any presentations at national meetings.

PI 6) *EPIEH-TA M.S. and PhD. will either participate in the development of an EPIEH-TA proposal or develop a research prospectus that is in line with the EPIEH-TA proposal they have been assigned to work on.* The goal for this reporting period was that all EPIEH-TA M.S. and Ph.D. students would develop a research proposal for their ECSC related research. This goal has been achieved as all graduate students at all of the ECSC partner institutions are required to write and defend a research thesis/dissertation prospectus.

PI 7) *EPIEH-TA graduate students will be required to include a NOAA or NERR scientist on their thesis/dissertation committees to both benefit from the expertise and perspectives of these scientists,*

as well as to ensure that their research remains relevant to NOAA's mission and goals and to NOAA/NERR members. The goal for this reporting period was that all EPIEH-TA graduate students have a NOAA or NERR scientist on their thesis or dissertation committees. This goal has been achieved, as it has been a requirement since year one of the present grant cycle that all EPIEH students have either a NOAA or NERR scientist on their committee.

PI 8) *EPIEH-TA M.S. and Ph.D. students will develop a thesis or dissertation, respectively, based on their ECSC research activities.* The goal for Yr 5 was that all EPIEH-TA M.S. and Ph.D. students would develop a thesis or dissertation based on their ECSC research activities. This goal has been achieved as all EPIEH-TA students develop, present and defend their ECSC related research to their committee.

PI 9) *EPIEH-TA graduate students will present their research findings at one or more national meetings.* There were 3 presentations by EPIEH-TA students at national meetings during this reporting period

PI 10) *EPIEH-TA graduate students will publish their research findings in a peer-reviewed journal.* There were no publications by EPIEH-TA students during this reporting period. We anticipate that several papers with student authors from this thematic area will be submitted during the next reporting period.

**Performance Summary:** For this reporting period (March '11- Sept '11) EPIEH-TA participants have been successful in meeting most performance indicators associated with the first objective for this thematic area: *To engage students in advanced environmental, coastal and ocean science research by providing a focused and rigorous training program.* During this reporting period many of the EPIEH-TA students and personnel continue to be actively engaged in research and monitoring activities at the Grand Bay and Apalachicola NERRs as well as other sites within the GOM in response to the Deepwater Horizon Oil Spill.

**EPIEH-TA Objective 2:** *Provide a scientific basis for improved forecasting capabilities of the impact of natural and anthropogenic stressors on the health and function of the targeted ECSC estuarine ecosystem.*

### **Performance Indicators for Objective 2**

The series of performance indicators (PI) and targeted goals most relevant to achieving objective #2 are summarized below. These PI's were identified in the EPIEH-TA implementation plan to ensure that the research projects that EPIEH-TA students are engaged in are both scientifically rigorous and NOAA relevant, and also that this research is disseminated to scientific community. To assist with this an in-house proposal submission and review process was developed and initiated. Steps to this process include: a) institutional level review & budget check (coordinated by institutional TA point people); b) partner NERR review and ranking; c) ECSC level review including budget check by Director (coordinated by ECSC TA leads); d) final review and assessment of relevance to NOAA mission by NOAA scientists. Only research activities that have been approved at every level of this review process are approved for ECSC funding. This process was developed during the first year of this grant cycle and has been implemented and adhered to within the EPIEH-TA since then.

PI 1) *EPIEH-TA scientists will submit a research proposal to carry out EPIEH-TA related research.* The goal for this reporting period was that all EPIEH-TA scientists would submit in-house research proposals to carry out their EPIEH-TA related research. This goal has been achieved as all EPIEH-TA faculty have submitted in house proposals (see <http://www.ecsc.famu.edu/ecsc2010/summaryep1.html> ) on ECSC website for EPIEH-TA proposal titles, summaries, and PI contact information.

PI 2) *EPIEH-TA research proposals will demonstrate a formal collaboration with a NOAA or NERR scientist.* The goal for this reporting period was that all EPIEH-TA proposals would demonstrate a formal collaboration with either a NOAA or NERR scientist and this goal has been achieved. All ECSC students are required to have a NOAA or NERR scientist on their advisory committees.

PI 3) *EPIEH-TA research proposals will be peer reviewed by a EPIEH-TA committee.* The review process includes 1. NERR Ranking (where applicable), 2. ECSC Internal Review, and 3. NOAA Relevance Ranking. The goal for this reporting period was that all EPIEH-TA proposals would be vetted through this process. Summaries and PI contact information for ECSC approved proposals can be viewed on the ECSC website (<http://www.ecsc.famu.edu/ecsc2010/summaryep1.html> ).

PI 6) *EPIEH-TA funded research projects will include a student training component.* The goal for this reporting period was that all EPIEH-TA proposals would include a student training component. This goal has been achieved, as all work performed included student participation and training.

PI 8) *EPIEH-TA funded research project results will be posted on the ECSC website.* The goal for this reporting period was that results from all EPIEH-TA funded research projects would be posted on the ECSC website. This goal is not yet achieved. However the ECSC team has posted all approved EPIEH-TA project summaries and all pertinent PI contact information on the ECSC website. As results become available and general conclusions about the findings are made, summaries of these findings will similarly be posted on the ECSC website.

PI 9) *EPIEH-TA institutional partners will establish and maintain a required database according to ECSC standards.* A spreadsheet was developed in Yr 3 of the grant cycle and was disseminated to all EPIEH-TA Institutional Leads and they, in turn disseminated this to their respective Institutional Project PI's. Additionally, to ensure consistency and data quality among all of the partner institutions, the EPIEH-TA team also developed an ECSC Standard Sampling and Analytical Protocols manual that has also been disseminated to all EPIEH-TA Institutional Leads and disseminated this to their respective Institutional Project PI's.

PI 10) *EPIEH-TA funded research project results will be disseminated to NCCOS and NOAA.* In reporting cycle, the ECSC Director, Deputy Director, and Distinguished Scientist continued to work with the ECSC Program Manager and technical monitors to develop methods to more effectively disseminate ECSC research with NCCOS, NOS and NOAA. We posted the EPIEH-TA proposal summaries and PI contact information on the ECSC website as well as summaries and PI contact information for Deepwater Horizon Oil Spill related ECSC leveraged research (<http://www.ecsc.famu.edu/ecsc2010/summaryep1.html> & <http://www.ecsc.famu.edu/ecsc2010/summaryep2.html> , respectively). As results become available

and general conclusions about the findings are made, summaries of these findings will also post on the ECSC website.

PI 13) *EPIEH-TA funded research results will be presented at national meetings.* There were 3 presentations by EPIEH-TA students at national meetings during this reporting period. An additional 4 presentations were made by EPIEH-TA faculty and staff funded during this reporting period

PI 14) *EPIEH-TA funded research results will be published in peer-reviewed journals.* EPIEH faculty funded during this reported period published 2 papers in peer reviewed journals.

**Performance Summary:** For this reporting period (Sept. '10 to March '11) EPIEH-TA participants have been successful in meeting most performance indicators associated with the second objective for this thematic area: *Provide a scientific basis for improved forecasting capabilities of the impact of natural and anthropogenic stressors on the health and function of the targeted ECSC estuarine ecosystem.* Areas for improvement during the next reporting period include a) disseminating EPIEH-TA research results to NOAA and NOS scientists and b) posting summaries of EPIEH-TA research results.

### I.3: Geospatial Analysis and Data Development

#### John F. Schalles, Thematic Area Lead

The past six months were used to complete work in progress, provide continuation of support for graduate students working to complete their plans of study and degrees. Current students Philemon Kuru (Jackson State), Christina Nica (Jackson State), and John Olley (Creighton) all made significant progress and are currently on track to complete their degrees this year. Even with a reduced number of participants in this final, completion stage of the second NOAA-ECSC award, progress towards the thematic areas objectives continued. Remote sensing classification products were completed and made available our NERR partners and other collaborating groups. Finally, transition activities to new NOAA-ECSC activities were accomplished.

**Table 1.3A Students and other personnel in the GADD Thematic area supported by this award Sept 2011 – Feb 2012.**

Name	Faculty/Student/Other	Institution	Work/Activity Res. Focus
Drew Seminara	Geospatial Analyst	Florida A&M University	Analysis of coastal habitats
Christina Mohrman	ECSC Site Coordinator	Grand Bay NERR and Florida A&M University	Vertebrate Habitat Analysis
Philemon Kirui	Ph.D. Candidate	Jackson State University	Remote detection of sea grasses
Christina Nica	Ph.D. Candidate	Jackson State University	Sea grass habitat modeling
John Olley	M.S. Student	Creighton University	Phytoplankton remote sensing

The following section is organized to address progress towards the seven objectives of our thematic area, as established in the five-year plan for this NOAA-ECSC award.

**GADD-TM Objective 1:** *Geospatial science training will be provided to all ECSC funded students to achieve a set of core competencies (GPS measurements, GIS, image analysis, and field spectroscopy)*

Table 1.3B summarizes the coursework available to students at our partner institutions.

**Table 1.3B. ECSC partner institution course listings for that address/teach GADD-TA core competencies.**

<b>Bethune Cookman University</b>
<i>Classroom:</i> ES 335 - GIS and Remote Sensing
<i>Field:</i> ESL 335L - GIS & Remote Sensing Lab
<b>Creighton University</b>
<i>Classroom:</i> EVS 481 - Terrestrial Ecology; EVS 555 - Meteorological Remote Sensing; EVS 570 - Geographic Information Systems; ATS 644 - Remote Sensing Theory; ATS 660 - Advanced Terrestrial Remote Sensing
<i>Field:</i> EVS 435 - Coastal & Estuarine Ecology; EVS 486 - Freshwater Ecology Laboratory
<b>Delaware State University</b>
<i>Classroom:</i> Natural Resources 30-484 - Advanced Wildlife Biology

<b>Florida A&amp;M University</b>
<i>Field:</i> EVS 5930, Special Topics Aquatic Sciences Field Techniques @ FAMU & ANERR
<b>Jackson State University</b>
<i>Classroom:</i> SCI 220 - Earth System Science and Changing Earth; SCI 430 - Intro to Remote Sensing for Earth; BIO 617/EVS 618 - Intro to Remote Sensing for Environmental Science
<i>Field:</i> JSU/Grand Bay NERR ECSC Core Competencies Field Course @ JSU & GBNERR
<b>Morgan State University</b>
<i>Classroom:</i> EASC 205 - Introductory Earth Science; TRSS 319 - Geographic Information Systems; CEGR 498 Fundamentals of Remote Sensing
<i>Field:</i> MSU summer internship training @ MSU Estuarine Research Center
<b>University of Nebraska - Lincoln</b>
<i>Classroom:</i> GEOG 812 - Introd. to Geographic Information Systems; GEOG 818 - Introd. to Remote Sensing I GEOG 819 - Applications of Remote Sensing in Agriculture and Natural Resources; GEOG 820 - Remote Sensing III, Digital Image Analysis; NRES 908 - Solar Radiation Interactions at the Earth's Surface
<i>Field:</i> NRES 821 - Field Techniques in Remote Sensing
<b>Texas A&amp;M University - Corpus Christi</b>
<i>Classroom:</i> GISC 1470 - Geospatial Systems I; GISC 4335 - Geospatial Systems III; GISC 4431 - Remote Sensing; GSEN 5386 - Problems in Remote Sensing of the Environment; CMSS 6330 - Spatial Systems Science

In their training, our students learn (1) the use of field spectroradiometers to collect spectral library data from both water and vegetation survey sites, (2) position locations of measurements and sample collection using WAAS-correction or differential-correction GPS instruments and post-processing procedures, and (3) use of ARC-GIS and ENVI or ERDAS-Imagine imagery analysis software. Software training occurs in courses at our respective schools, through individual instruction and mentoring, through self-teaching modules that come with each software program and, or the ECSC's own modules. These modules were developed by our two former geospatial analysts, Christine Hladik and Sudhir Shesthra. Our current geospatial analyst, Drew Seminara has updated these materials and is now working to integrate them into the new, center-wide training course that will contain elements from the new focus areas.

No center-wide field exercises were attempted since the survey work at Grand Bay NERR in May, 2011 in support of a World View 2 satellite image acquisition. One notable event was the hiring of Dr. H.J. Cho to join Dr. Mike Reiter's expanding program at Bethune-Cookman University. Dr. Cho will teach existing and new geospatial courses at BCU. In turn, Jackson State University undertook a search to hire a geospatial replacement for Dr. Cho.

**GADD-TM Objective 2:** *Students undertaking research in the Geospatial thematic area will complete a final, summary report (undergraduates) or thesis and present their work in a local, regional, or national meeting.*

Five current or recent former students were authors or coauthors for past six months at regional or national meetings Marvin Washington was first author of a paper based on his M.S. thesis that appeared in printed form in early 2012. Paul Merani was first author of a manuscript, in review, that was submitted to Wetlands.

**GADD-TM Objective 3:** *Acquire additional AISA hyperspectral data in support of Center research and provide products for NERR managers.*

No new AISA missions were planned or executed in 2011 - 2012, because of cost constraints. However, work was ongoing to produce products for NERR managers and others, to incorporate existing AISA data into thesis and dissertation projects, and to prepare manuscripts for peer reviewed publications. A synoptic map of Black Mangrove cover and canopy height from 2008 AISA imagery for the Redfish Bay unit of the Mission-Aransas NERR was completed in late summer 2011 using validation data collected in March 2011. The imagery data were submitted to the Mission-Aransas NERR in October.

The 8 color band, 2 m resolution World View 2 satellite imagery acquired for the entire Grand Bay reserve in the spring of 2011 is currently being analyzed, with a series of iterative marsh vegetation maps produced by Drew Seminara and Tom Strange, the geospatial scientist at the Grand Bay NERR. He and Drew have collected more field data to assist in their classification, and accuracy has been improved. An initial map product was presented at the Grand Bay NERR Research Symposium in October 2011. This project is very important to the planned image acquisitions and data analysis for the new NOAA-ECSC Ecosystem Characterization projects with our NERR partners. The new projects involve data from the same World View 2 satellite sensor.

**GADD-TM Objective 4:** *Prepare and distribute a suite of baseline research products for each NERR site from previous and planned flyover missions*

The Geospatial group’s products, including vegetation and other habitat maps and change detection analysis continue to be delivered to and used by NOAA NERR researchers and site managers. Examples of new phytoplankton chlorophyll mapping products (Figures 3.1A and 3.1B) reveal significant differences in algal abundance related to site-specific hydrology and nutrient sources.

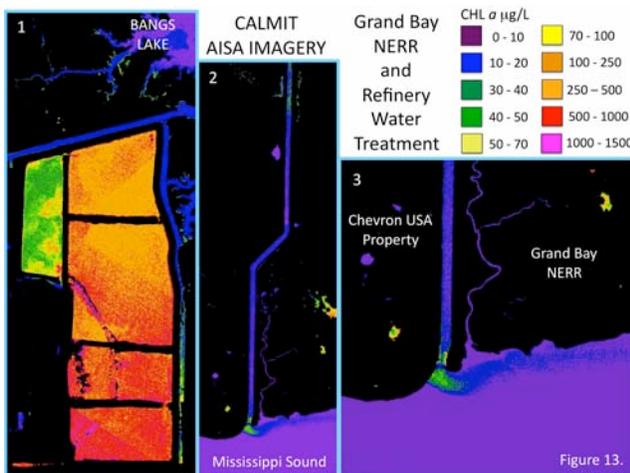


Figure 3.1a. Algal chlorophyll distribution in the southwest corner of Grand Bay NERR and the adjacent Pascagoula Chevron Mission refinery (2008 NOAA-ECSC AISA imagery)

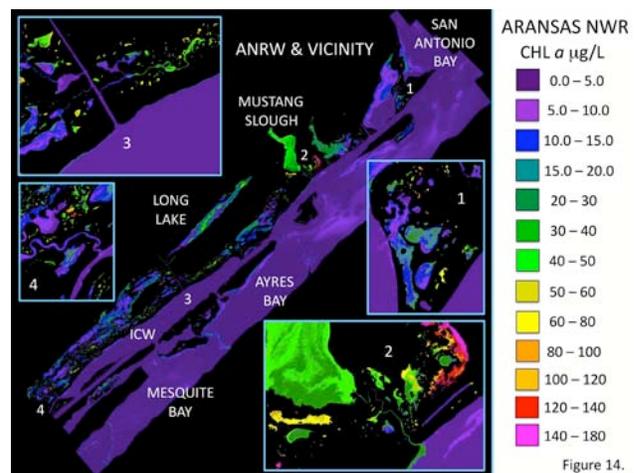


Figure 3.1b. Chlorophyll distribution in the surface waters of the Aransas National Wildlife Refuge component of the Aransas NERR (2008 AISA imagery).

Grand Bay AISA Eagle imagery from 2010 was masked for marsh and upland vegetation. Substantially higher Chl *a* were revealed in the Chevron Refinery waste water treatment ponds (about 30 mg/L to levels approaching or exceeding 1,000 mg/L), as compared to Bangs Lake, most of the water in the outfall canal, and in Mississippi Sound (Fig. 1A). When this imagery was captured on May 6, 2010, the effluent discharged across the Refinery's outfall weir into Mississippi Sound had modestly elevated Chl *a*, and a discharge plume formed and flowed east, along the southwest shore of Grand Bay NERR (Insets 2 and 3). There appeared to be rapid dilution of this plume water, judging from the pixel classifications in water to the east. We also noted elevated Chl *a* in a subset of smaller, isolated ponds and channels on both the Reserve's and Refinery's properties. At Mission Aransas NERR, inshore waters when AISA imagery was acquired in October 2008, had low algal abundance (Fig. 1B). However, there are highly variable chlorophyll levels ( $\sim 5$  to  $> 150$  mg/m<sup>3</sup>) in shallow ponds on the refuge (Insets 1 to 4), some of which are isolated most of the time from surface drainages and others have direct connections. These ponds are critical foraging habitat for the highly endangered wild flock of Whooping Cranes that overwinter at ANWR. Refuge managers are very interested in this ability to synoptically map the algal chlorophyll patterns, which reveal important differences in the food chain support of these ponds.

Examples of new salt marsh vegetation mapping are shown in Figures 3.2A and 3.2B. Vegetation maps for the Grand Bay salt marshes (Fig. 3.2A) and Sapelo Island, Georgia (Fig. 3.2B) reveal

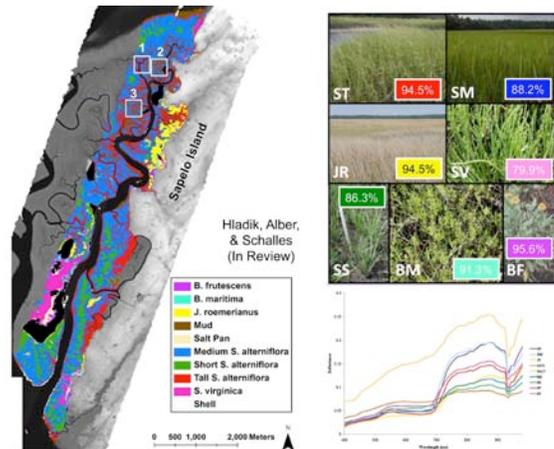
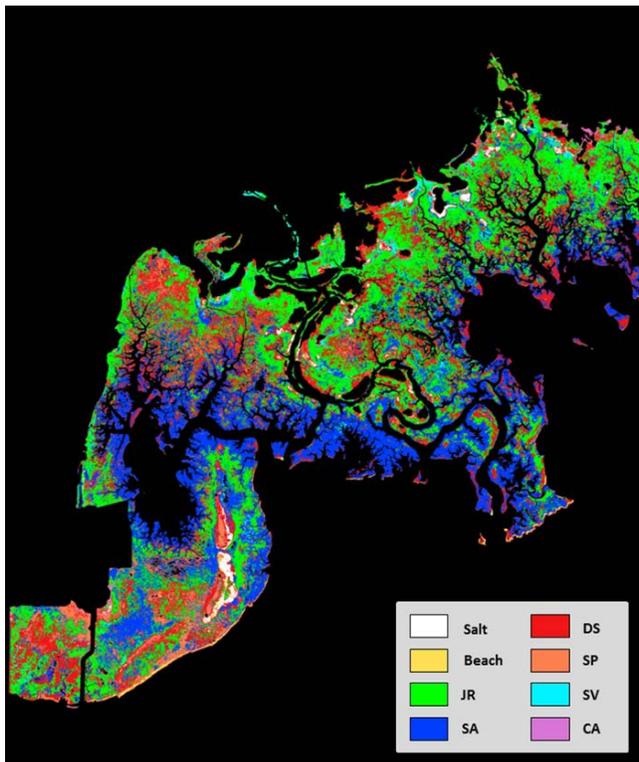


Figure 3.2 (A) Salt marsh species vegetation map for Grand Bay NERR from World View 2 image classification and (B) Salt marsh species vegetation map for the Duplin River tidal watershed Sapelo Island NERR from AISA imagery.

significant structural differences between the two sites, with a dominance of *Juncus roemerianus* at Grand Bay (see JR) and *Spartina alterniflora* at Sapelo Island. For both analyses, the Maximum Likelihood Classifier (MLC) procedure in the ENVI software program was used. Structurally, Grand Island lacks a tall, creek bank *Spartina* growth form that widely occurs at Sapelo Island and there are

much more extensive intertidal mud flats exposed at low tide at Sapelo Island. The overall classification accuracy for the current iteration of Grand Bay marsh vegetation is 80.4% (Figure 3.3), although the *Juncus* category was only 65% accurate. The overall accuracy for the Sapelo classification was 90%. In the Sapelo project, three size classes of *Spartina alterniflora* were used, with a much higher overall accuracy for this species (97.0%, calculated as a weighted average accounting for differences in cover frequency of the three height classes). Further iterations of the Grand Bay classification are planned, which will include

Grand Bay NERR WorldView-2 Species Classification – February 2012								
Class	Ground Truthing							
	<i>J. roemerianus</i> (JR)	<i>S. alterniflora</i> (SA)	<i>S. patens</i> (SP)	<i>D. spicata</i> (DS)	<i>Salicornia spp.</i> (SV)	<i>Cladium spp.</i> (CA)	Salt pan (Salt)	Beach
<i>J. roemerianus</i> (JR)	65.32	0.00	0.00	5.63	1.13	0.00	0.00	0.00
<i>S. alterniflora</i> (SA)	16.55	95.99	0.00	2.82	58.60	0.00	0.00	0.00
<i>S. patens</i> (SP)	0.00	0.59	33.80	0.00	0.00	4.01	0.00	0.00
<i>D. spicata</i> (DS)	8.50	3.31	53.70	84.51	26.70	5.09	0.00	3.73
<i>Salicornia spp.</i> (SV)	9.40	0.00	0.00	7.04	4.75	0.00	0.00	0.00
<i>Cladium spp.</i> (CA)	0.00	0.00	7.87	0.00	0.00	90.90	0.00	0.00
Salt pan (Salt)	0.00	0.00	0.00	0.00	8.37	0.00	99.67	11.94
Beach	0.00	0.00	4.63	0.00	0.00	0.00	0.33	84.33
Unclassified	0.22	0.12	0.00	0.00	0.45	0.00	0.00	0.00
<b>Total</b>	100	100	100	100	100	100	100	100

Overall Class Accuracy = 80.35%, K = 0.7505

Figure 3.3. Confusion matrix with results for the Grand Bay 2011 World View 2 imagery, using the ENVI Maximum Likelihood Classifier.

additional field survey data and a stratification of the *Juncus* habitat data in two or three size classes, based on measured canopy heights of both classification and validation data sets.

**GADD-TM Objective 5:** *Enhance and sustain research productivity of ECSC faculty, post-doctoral scientists, and students*

Two papers were published by GADD-TM students. GADD-TM students and staff supported during this reporting period made seven presentations at regional and national meetings. John Schalles and ECSC Distinguished Scientist Charles Jagoe were co-organizers for a special thematic session at the Coastal and Estuarine Research Federation meetings at Daytona Beach on November 9, 2011. The session, Comparative Studies of Estuarine and Coastal System Properties featured twelve papers (oral presentations), including three presented by ECSC scientists (John Schalles, Drew Seminara, and Christina Mohrman).

**GADD-TM Objective 6:** *Disseminate geospatial data and products to the wider public, with an emphasis on educational outreach. Principal activities include the production of posters and fact sheets that display and explain our geospatial techniques, data analysis, products, and applications (via printed and electronic media, utilizing the Center's server capabilities).*

Significant, ongoing efforts were directed in the past six months to updating and upgrading our section of the ECSC website: (see <http://www.ecsc.famu.edu/ga.html> ). Analyst Drew Seminara compiled imagery, produced metadata summaries, and solicited mapping products, poster presentation files, and other materials produced in various geospatial analysis projects using ECSC AISA hyperspectral imagery and other sources (satellite imagery and GIS databases) used in recent projects. Requests for data and product results should be directed to Drew. The website will continue to be used as a public portal for our thematic area.

**GADD-TM Objective 7:** *Establish and sustain collaborations with other NOAA and NERR partner scientists for joint research projects*

Our thematic group retained active collaborations with other thematic groups and NERR partners within our center, as well as a number of collaborations with other EPP Centers and academic and government research laboratories and centers. Collaborations that involved students supported during this funding period include:

- John Olley and John Schalles's joint work in water optics and algal bloom detection with the NOAA CREST group at the City University of New York, with Drs. Alex Gilerson and Sam Ahmed's water remote sensing group at City University of New York. John received initial training with the CREST group in the winter of 2011, and follow up work is planned as part of John Olley's thesis research for improved remote detection of algal bloom composition in turbid coastal waters.

- John Schalles and Drew Seminara began collaboration with an NSF funded project on carbon exports from a Northern Gulf of Mexico salt marsh at Snipe Island, located in Taylor County, Florida. Planning work was undertaken during the winter of 2011-2012 for an April survey of vegetation composition in the marsh, in order to classify the vegetation composition and distribution of the Snipe Island research site and adjacent salt marshes using World View 2 satellite imagery to be acquired in the spring of 2012. Senior investigators on this project include Bob Chen and Bernie Gardner (University of Massachusetts - Boston), Jaye Cable (University of North Carolina), Jennifer Cherrier (Florida A&M University), and Cristof Meile (University of Georgia) as well as graduate students at each of these schools. John and Drew planned their work to coincide with high resolution elevation measurements of the Snipe Creek watershed using an RTP GPS instrument operated by Maggie Esch, a graduate student working with Cristof Meile at the University of Georgia. The vegetation mapping project segues very well with the projects discussed above at the Grand Bay and Sapelo Island NERRs.

**I:4) Integrated Assessment in Support of Environmental Decision Making**  
**Michael Reiter, Thematic Area Lead**

No students or other personnel were supported in this thematic area during the reporting period. Results and accomplishments of this thematic area will be detailed in the final report for this cooperative agreement at the end of this no-cost extension.

## I:5) Integrated Social Sciences

**Kelton Clark, Thematic Area Lead**

The purpose of the ECSC Integrated Social Science thematic area (ISS) is to train students on issues of equity and economic efficiency in the allocation of environmental services and natural resources. This thematic area trains students in methodologies to understand human/ecosystem linkages that lead to NOAA’s strategic Ecosystem Mission Goal of “A well-informed public that acts as stewards of coastal and marine ecosystems.”

The ISS thematic area provides NOAA with a unique source of expertise with participants including faculty and students from Morgan State University, Florida A&M University, and the University of Miami.

In this thematic area, a multidisciplinary faculty representing natural resource/agricultural economics, community planning, sociology (demography, environmental sociology), history and management provides expertise in various methodologies, including qualitative (e.g., ethnographic research, participatory action research, and oral and visual history) and quantitative (e.g., cost/benefit analysis, environmental valuation) techniques to assess social values and attitudes, policies for efficiency, equity and/or sustainability.

Objectives for the ISS-TA were generated in the first year of this cooperative agreement. The objectives are listed below, and following each are the accompanying performance indicators (or measures) and accomplishments for each indicator during this reporting period.

**Table I.5A. Students and other personnel in the GADD Thematic area supported by this award Sept. 2011 – Feb 2012.**

Name	Faculty/Student/Other	Institution
Jolvan Morris	Ph.D. Student	Florida A&M University
Ariana Marshall	Ph.D. Student	Florida A&M University
Edgar Chambers	BS Student	Morgan State University
Yasuan Young	BS Student	Morgan State University
Karlisa Callwood	Ph.D. Student	University of Miami

**ISS-TA Goal 1:** *Demonstrate expertise of faculty and students in areas of social science and management research*

### **Performance Indicators for Goal 1:**

1) Number of ISS research projects approved by ECSC.

There are two projects approved in the ISS thematic area: the MSU Oyster Micro-hatchery Project and the FAMU Environmental Justice Analysis project in Port St. Joe, Florida

## 2) Additional student training

Two ISS-TA students from Morgan State University were funded during this reporting period. They were Yasaun Young, and Edward Chambers. Their funding supported EPP CSC goals of educating, and training students, particularly from underrepresented communities, in NOAA sciences. The funding supports the NOAA goals of workforce diversity in particular the support of a NOAA staffer's pursuit of his Ph.D. NOAA environmental literacy goals were supported by the creation of a marine science club on the campus by one of the ECSC students. Yasaun Young is an undergraduate in the Biology department with an interest in conservation biology. His expected graduation date is spring of 2012. Yasaun has primary responsibility for the creation of a sustainable marine science based student organization. Yasaun has overseen the formation of the club, registration with the University, member recruitment, creation of the charter and election of officers. Other activities included for the past period included an email distribution list to send notices of opportunities, and an internship workshop. Edward Chambers is an undergraduate in the Biology department with a stated interest in marine biology. His projected graduation is Fall 2012.

Karlisa Callwood is a second year PhD student in the University of Miami's Abess Center for Ecosystem Science and Policy. Her dissertation work, titled "Connectivity, Condos, and Catches: An analysis of the ecological, socioeconomic, and management impacts of dispersal and condo fishing in The Bahamian Lobster Fishery," will focus on an in depth examination of the increased use of condos (artificial aggregation habitats) as a lobster fishing method in The Bahamas. The goal of this project is to further examine connectivity of lobster in The Bahamas and to evaluate the findings in the context of marine resource management approaches. Emphasis will be placed on an analysis of the increased usage of condos, including assessing impacts on the Bahamian lobster fishery, estimating the effects on lobster dispersal characteristics, and weighing the implications of defining and enforcing property rights. The Connectivity Modeling System will be used to predict the dispersal characteristics of spiny lobster and to evaluate the potential spatial scales over which lobster can be distributed. A spatial bioeconomic model will also be developed to compare the possible benefits and costs of condos. Finally, this project will explore lobster political ecology in The Bahamas, including the importance of various factors affecting choices and decisions related to lobster fishing, consumption, and in the acceptance of policies.

3) Number of conference presentations by students resulting from ECSC-approved ISS projects. No presentations were made by students from ISS-TA supported during this reporting period

4) Number of publications by students in refereed journals based on ECSC-approved ISS research. . Students from ISS-TA supported during this reporting period had no publications.

**ISS-TA Goal 2:** *Enhance the academic performance and placement of underrepresented minority students in fields related to social science and management.*

### **Performance Indicators for Goal 2:**

1) Percentage of students working on ECSC-approved ISS research that present at conferences and/or publish in recognized journals. Goal for this reporting period- 100% of the students working on ISS related projects present at conferences and/or publish journals.

- 1) We have students working on ISS projects and plan to have them prepare presentations for conferences in the upcoming year.

2) Percentage of students working on ECSC-approved ISS projects receiving internships at NOAA or related agencies/firms. Goal for this reporting period- 50% of the students working on ISS related projects receiving internships at NOAA.

- 1) No ISS students are presently interning with NOAA

3) Percentage of students working on ECSC-approved ISS projects employed by NOAA or related agencies/firms. Goal for this reporting period- 50% of the students working on ISS related employed by NOAA.

- 1) To date we have not had any ISS student graduate and qualify for full time employment with NOAA.

**ISS-TA Goal 3:** *Collaborate with the researchers within cooperative institutions and with NOAA social scientists.*

**Performance Indicators for Goal 3:**

1) Percentage of ECSC-approved ISS projects that include partnerships with NOAA affiliated agencies. Goal for this reporting period- 75% of the projects will have NOAA collaborations.

Currently all ISS projects have a NOAA collaboration. The MSU Oyster Harvesting project has collaboration with the NOAA Chesapeake Bay Program Office. It also includes partnership with a Maryland Sea Grant economist. We began partnership with MD Sea Grant on extension and outreach.

Also, the FAMU project that will examine the social, economic and environmental justice implications of waste disposal by the St. Joe Company has a collaboration with a social scientist with NOAA's Center for Human Health Risk at the Hollings Marine Lab.

# Appendix A.

## **Publications by students and personnel supported during this reporting period. \* indicates an ECSC student author**

Bryan, A.L. Jr., Brant, H.A. Jagoe, C.H., Romanek, C.S. and I.L. Brisbin Jr. 2012 Mercury concentrations in nestling wading birds relative to diet in the southeastern United States: A stable isotope analysis. *Archives of Environmental Contamination and Toxicology in press*

Lewis, D.E., Chauhan, A., White, J.R., Overholt, W., Green, S., Jarostia, P., Wafula, D., and C.H. Jagoe. 2012. Microbial and geochemical assessment of bauxitic unmined and post-mined chronosequence soils from Mocho Mountains, Jamaica. *Microbial Ecology, in press*

Mishra, D., Hyun J. Cho, S. Ghosh, A. Fox, C. Downs, \*P. Merani, \*P. Kirui, \*N. Jackson, and S. Mishra, 2011. Post-spill State of the Marsh: Impact of the Gulf of Mexico oil spill on the health and productivity of Louisiana salt marshes. *Remote Sensing of Environment* 118: 176-185.

\*Washington, M.C., \* P. Kirui, Cho, H.J., and Wafo-Soh. 2012. Data-driven correction for light attenuation in shallow waters. *Remote Sensing Letters* 3(4) 335-342, ISSN 2150-7058.

## Appendix B.

**Presentations by students and personnel supported during this reporting period. \*indicates an ECSC student author.**

Baskerville, T., Cherrier, J., Chauhan, A., Rosanbalm, J., and W. Jeffrey. The effects of Deepwater Horizon contamination on microbial community structure and biogeochemical cycling in oil impacted Gulf of Mexico. Ocean Sciences Meeting. Salt Lake City UT. , February 2012

Jagoe, C.H. Assessing Mercury and Other Contaminants in Grand Bay: Initial reconnaissance and long term needs. Grand Bay National Estuarine Research Reserve Research Symposium, Moss Point MS, October 2011

Johnson, D., L. Allen, K. Faris, W. Patterson, J. Tarnecki and C.H. Jagoe. Detection of fish bile PAH metabolites from the Deepwater Horizon oil spill by fluorescence. Ocean Sciences Meeting. Salt Lake City UT. , February 2012

\*Kirui, P., \*M. Washington\*, H.J. Cho, and C. Wafosoh, 2011. Data-Driven Modification Algorithm for Light Attenuation in Shallow Waters. The 8<sup>th</sup> International Symposium on Recent Advances in Environmental Health Research, Jackson, Mississippi, September, 2011.

Mohrman, C. NOAA's Environmental Cooperative Science Center: A Regional Ecosystem Approach for the Conservation and Sustainable Management of Coastal and Marine Resources. Grand Bay National Estuarine Research Reserve Research Symposium, Moss Point MS, October 2011

Mohrman, C., T. Mohrman, R. Cooley and M. Woodrey. Nesting Ecology of the Mississippi Diamondback Terrapin (*Malaclemys terrapin pileata*) in Southeastern Mississippi. Grand Bay National Estuarine Research Reserve Research Symposium, Moss Point MS, October 2011

Mohrman, C., T. Mohrman, R. Wood and C.H. Jagoe. Comparative studies of Diamondback Terrapin (*Malaclemys terrapin*) across their range. Coastal and Estuarine Research Federation Biannual Meeting, Daytona Beach FL, November 2011

\*Olley, J.T., J.P. O'Donnell, and J.F. Schalles. Close-range remote sensing and HPLC analysis of coastal phytoplankton on the Atlantic and Gulf Coasts. TOS/ASLO/AGU\_Ocean Sciences Meeting. Salt Lake City, Utah. February, 2012.

Sarkodee-Adoo, J., Cherrier, J., and J. Chanton. Tracing the deepwater horizon oil spill into fauna along coastal and offshore contamination gradients in the Gulf of Mexico using natural <sup>14</sup>C and <sup>13</sup>C abundances. Ocean Sciences Meeting. Salt Lake City UT. , February 2012

Schalles, J.F., D. Seminara, P. Merani, J.H. Cho, and J. Olley. Geospatial Analysis of Habitat Data at Grand Bay NERR. Grand Bay National Estuarine Research Reserve Research Symposium, Moss Point MS, October 2011

Schalles, J.F., D.N. Seminara, \*P. Merani, and H.J. Cho. Geospatial analysis of habitat data at Grand Bay NERR. Grand Bay National Estuarine Research Reserve – Research Symposium. Moss Point, Mississippi, October, 2011. (Invited).

Schalles, J.F., \*Olley, J.T., C.M. Hladik, and J.P. O'Donnell. Comparing algal chlorophyll spatial patterns within and between Gulf and East Coast National Estuarine Research Reserves. Coastal and Estuarine Research Federation Biennial Meeting. Daytona Beach, Florida, November, 2012.

Seminara, D. and J.F. Schalles. Intersite comparison of marsh spatial patterns using hyperspectral imagery at NERR sites along the Gulf and Atlantic coasts. Coastal and Estuarine Research Federation Biannual Meeting, Daytona Beach FL, November 2011

Seminara, D., J.F. Schalles, and T. Strange. Salt Marsh Feature Extraction Using High Resolution Satellite and Aerial Imagery. Grand Bay National Estuarine Research Reserve Research Symposium, Moss Point MS, October 2011

## Appendix C.

### **External Funding that supported students funded by the ECSC no-cost extension during this reporting period.**

Acute effect of oil on northern Gulf of Mexico reef communities. Florida Institute of Oceanography/BP. Co-PIs: W. Patterson (UWF) and Jagoe C. (FAMU) \$167,376 (2010-2012)  
Note: Grant provided partial support for work done by student L. Allen (FAMU)

Assessing the impact of the Deepwater Horizon oil spill on coastal waters of the Florida panhandle: water, sediment and fish. Florida Institute of Oceanography/BP. Co-PIs: C. Jagoe (FAMU), R. Snyder (UWF) and J. Cherrier (FAMU) \$193,518 (2010-2012) Grant provided partial support for work done by J. Wise (FAMU)

Tracing the intrusion of the GOM-2010 oil spill on coastal and marine food webs using radiocarbon and stable isotopes. Co-PIs: J.P. Chanton (FSU), J Cherrier (FAMU), and K. Craig (FSU). Florida Institute of Oceanography/BP. \$297,258 (2010-2012) Note: Grant provided partial support for work done by J. Sarkodee-Adoo (FAMU)

Impacts from MC252 oil on ecologically and commercially important plankton of the Gulf of Mexico. Florida Institute of Oceanography/BP. Co-PIs: D. Rumbold (FGCU) and Jagoe, C. (FAMU). \$ 350,779 (2010-2012). Note: Grant provided partial support for work done by student L. Allen (FAMU)

## Appendix D.

### ECSC Student Projects and expected graduation dates.

Allen, LaTrisha. (Ph.D. FAMU) *Effects of crude oil on coastal fish and invertebrates*. Expected Graduation date May 2015. [Dr. C. Jagoe, advisor; NOAA Committee member Paul Pennington, NCCOS, Hollings Marine Lab, rest of committee to be formed].

Baskerville, Tiffany Ph.D Student (FAMU). *Uncoupling of Autotrophy and Heterotrophy: effects of the deepwater horizon oil spill on microbial food webs*. (Dr. J. Cherrier, advisor. Committee members: Dr. C. Jagoe, Dr. W. Jeffrey (UWF), rest of committee to be formed

Callwood, Miami, Ph.D. Student, University of Miami. *Connectivity, Condos, and Catches: An analysis of the ecological, socioeconomic, and management impacts of dispersal and condo fishing in The Bahamian Lobster Fishery* Expected graduation date 2015. (Dr. D. Letson, advisor, remainder of committee to be formed.

Chambers, Edgar (BS, Morgan State University). Topic to be determined. Expected Graduation date 2013. Dr. K. Clark, Advisor

Davenport, Erik. (Ph.D., MSU). *Assessing the vulnerability of the Chesapeake Bay and Northern Gulf of Mexico to impacts from hurricanes*. Expected Graduation date 2013. [Dr. C. Fan-MSU - advisor, and committee members J. Anderson- MSU, Dr. J. Govoni-NOAA and Dr. J. Xu-NOAA/NOS].

Dugo, Mark. (Ph.D., JSU). *Variable signal of endocrine disruption by 17 $\beta$ -estradiol, and PAH metabolism by flavin-containing monooxygenase in a brackish water *Fundulus* – Laboratory tests across a salinity gradient*. expected graduation December 2014 [Advisor Dr. P. Tchounwou-JSU, committee members-TBA].

Edwards, Amy E. (Ph. D.). *Modeling and predicting nutrient loading to Apalachicola Bay, Florida*, expected graduation date May 2015 [Advisor Dr. E. Johnson-FAMU and committee member Katherine Milla-FAMU, rest of committee to be formed]

Hoyett, Zakiya (Ph.D., FAMU). Tentative title- *The occurrence of pharmaceutical and personal care product residues in Apalachicola Bay, Florida* , expected graduation, April 2012 [Advisor Dr. M. Abazinge-FAMU, Dr. C. Jagoe, Dr. D. Apeti-NOAA/NCCOS, rest of committee to be formed].

Johnson, Frank. (B.S, FAMU). Title yet to be determined. Expected graduation date May 2013. [Advisor Dr. M. Abazinge -FAMU, rest of committee to be formed].

Kirui, Philemon. (Ph.D., JSU). *Improved Usage and Application of Remote Sensing Data in Studies of Shallow Aquatic and Coastal Environmental Resources at Grand Bay National Estuarine Research Reserve, Mississippi*. Expected graduation date April 2012 [Advisor Dr. H.J. Cho, Dr. P. Tchounwou, Dr. D. Mishra External Advisor, Mississippi State Univ.)]

Marshall, Ariana (Ph.D., FAMU). *An Evaluation of Public Participation in Florida's Coastal Development Policies in Response to Sea-Level Rise*. Expected graduation date August 2012. [Advisor Dr. M. Owens-FAMU, and committee members Drs. E. Johnson-FAMU, D. Worthen-FAMU, Dr. R. Gragg-FAMU, rest of committee to be formed].

Morris, Jolvan (Ph.D. FAMU): *Shrimper Acceptance of Bycatch Reduction Regulation: A Case Study of the Gulf of Mexico Shrimp Fishery*. Expected Graduation Date 2015. Advisor. Dr. M. Owens-FAMU, rest of committee to be formed.

Nica, Christina. (Ph.D., JSU). *Ecological modeling of potential habitat for submerged aquatic vegetation at Grand Bay National Estuarine Research Reserve, Mississippi*. Expected graduation date April 2012 [Advisor Dr. H.J. Cho-JSU, Dr. Paul B. Tchounwou, Dr. Hafiz Anwar Ahmad, Dr. Patrick Biber (USM)].

Olley, John. M.S. Thesis Student, Creighton University. *Mapping Chlorophyll a concentrations at NOAA NERR sites and the effect of accessory pigments on the specific absorption of phytoplankton*. [Dr. J.Schalles, thesis advisor, committee member Dr. P. Tester-NOAA]

Sarkodee-Adoo, Judith. (M.S., FAMU). *Deepwater Horizon oil spill contaminants in biota of two estuarine Gulf of Mexico sites assessed using natural radiocarbon and stable C, N, P isotopes tracers*. Expected date graduation December 2011. [Advisor Dr. J. Cherrier-FAMU, Dr. C Jagoe-FAMU, and Dr. D. Evans-NOAA NCCOS, Beaufort NC].

Shutte, Melissa. (M.S., DSU). *Ecological succession of wetlands restored from agricultural uses*. Expected graduation date Aug 2011 [Advisor Dr. M. Guo-DSU and committee members Dr. B. Scarborough-DENERR, Dr. Christopher Heckscher, DSU].

Young, Yasaun (BS, Morgan State University). Development of a sustained Marine-Science based student organization at Morgan State University. Expected Graduation date 2012. Dr. K. Clark, Advisor.

Whitaker, Katherine. (M.S., FAMU). *Effects of river inflow on chlorophyll-a in Apalachicola Bay*. expected graduation April 2012 [Advisor Drs. W. Huang and E. Johnson-FAMU, committee members Dr. J. Christensen-NOAA].

Wise, Jessica. (M.S., FAMU). Trace metal otolith analysis of Gulf of Mexico fishes. MS in Environmental Sciences, Florida A&M University, completed May 2012 [Advisor Dr. M. Abazinge, committee members Dr. C. Jagoe-FAMU, Dr. T. Gerard-NMFS/SEFSC Miami].