



Environmental Cooperative Science Center
Florida A&M University - Lead Institution



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For the period from September 1, 2010 to February 28, 2011

Submitted By:

Florida Agricultural and Mechanical University (Lead Institution)

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

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Executive Summary

This report highlights the efforts of Environmental Cooperative Science Center (ECSC) faculty, staff and students during the period of September 1, 2010 through February 28, 2011. The focus of the center continues to be the involvement of students in education, research, and outreach, with the goal of creating a pipeline to train students, particularly from under-represented minorities, in the STEM disciplines relevant to NOAA's mission. The success and advancement of our students continues to be the Center's most notable accomplishment. There are over 40 funded students at various levels of postsecondary training (B.S., M.S., and Ph.D.) across ECSC institutions. ECSC faculty and students had 18 papers published or in press, and made about 40 presentations at professional meetings during the reporting period. In addition to EPP funding, ECSC researchers leveraged another \$3.2 million in new or ongoing grants during this period. At the K-12 level, there were over 200 presentations in the ECSC Environmental Awareness Poster Competition from area elementary school students. The ECSC Ocean Science Bowl Team participated in the National Oceans Science Bowl and will participate in NOBCCHE April, 2011. The ECSC is now planning the 2011 high school summer camp, with the theme of "Examining the Effects of Oil Spills in Coastal Ecosystems" to be held in June 2011. The research efforts of the Center for this period continue to be influenced by the BP Deepwater Horizon oil spill with some students modifying their research projects to address its impacts. The Center has also been able to leverage funds, in excess of \$1.2 million to date, to support research and student training projects related to the oil spill. Additionally, the ECSC has applied for five more years of funding (2011-2016) through the next NOAA EPP competitive award.

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. We use a regional approach to address coastal and marine environmental issues, 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 approximately \$40,000,000 (\$3,200,000 in new or ongoing funding in this reporting cycle) 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 180 (43 this reporting cycle) post-secondary students trained in NOAA-related sciences**
 - 116 students graduated in NOAA core science areas (*19 Ph.D., 37 M.S., 4 M.A., 55 B.S., and 1 B.A.*) with an additional 93 currently in the pipeline
 - 9 former ECSC students are now NOAA employees (*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 85 peer reviewed publications in NOAA-related sciences by faculty and students; 18 published or accepted this reporting period**
- **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 will be published in 2011 in the new Limnology and Oceanography Web Lecture 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 is at 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.

The ECSC has been structured into a set of integrated Thematic Areas of research and education, providing an organized approach to activities that cut across the institutional partners in the Center.

ECSC Thematic Areas:

I:1) Education & Outreach

I:2) Ecological Processes and Indicators of Ecosystem Health

I:3) Geospatial Analysis and Data Development

I:4) Integrated Assessment in Support of Environmental Decision Making

I:5) Integrated Social Sciences

I:1) Education and Outreach

Michael Abazinge and Bernadette Kelley, Thematic Area Leaders

Education continues to be the framework that underlies and unites all activities and initiatives of the ECSC. There are over 40 funded students at various levels of postsecondary training (B.S., M.S., and Ph.D.) across ECSC institutions. Students at the K-12 levels participating in ECSC activities continue to represent a potential pipeline for the recruitment of new students into the STEM disciplines, and particularly environmental sciences and NOAA related careers. The focus of the ECSC has been and continues to be to recruit, train, and support a pipeline of potential scientists ready to enter the workforce at NOAA and NOAA related facilities.

During the period **September 1, 2010 to February 28, 2011**, each Thematic Area (TA) incorporated education (training) and outreach (recruitment and retention) within their activities and initiatives. The purpose of the ECSC Ecological Processes and Indicators of Ecosystem Health Thematic Area (EPIEH-TA) was to train students in advanced environmental research. EPIEH-TA students at each of the ECSC institutional partners are expected to demonstrate successful mastery of a specified set of core competencies. The goal for Yr 5 was that all EPIEH-TA students would demonstrate successful mastery of these core competencies evidenced by their participation in courses, field research, public and professional presentations and outreach. In the **I:2) Ecological Processes and Indicators of Ecological Health** section of this report details are cited to demonstrate the attainment of this goal. In addition, during this period many of the EPIEH-TA faculty, students and staff have been actively engaged in research and public outreach efforts related to the Deepwater Horizon oil spill. This is further discussed in the EPIEH-TA text and documented in the tables and appendices. The focus of the **I:3) Geospatial Analysis and Data Development** continues to be student training, with the present activities of this TA involving planning and preparations for a follow-up satellite remote sensing and field survey campaign in collaboration with the Grand Bay NERR. Much of the work in this area also includes the development of new courses and redesign of existing course offerings across the center. In section I:3 of this report, details are provided that document the course offerings related to this thematic area. Most notable is the employment of a recent graduate, **Drew Seminara**, (Creighton University) as a geospatial analyst housed at the Florida A&M University. Other accomplishments in this thematic area, including student research and related activities, are detailed in the I:3 section of this report.

The ECSC **Integrated Assessment in Support of Environmental Decision Making (I:4)** thematic area's objective is to train students in integrated resource management, risk assessment, and decision-making methodologies. The IA objectives for Year 5 and the accompanying performance

indicators (or measures), the respective indicator targets for Year 5, and the accomplishments for each Year 5 indicator for this funding period are listed in the text for this thematic area,. Students have been involved in a variety of activities, including modeling workshops and model development, numerical simulations, and model testing and verification, as discussed in detail in section I.4 of this report.

The purpose of the ECSC Integrated Social Science (ISS) is to train students about increasing public sensitivity to the issues of equity and economic efficiency in the allocation of environmental services and natural resources. ECSC Students were trained in qualitative methodology to gather and analyze data which will be integrated into their thesis/dissertation research. In addition, students at the graduate levels were involved in research projects undertaken by this thematic area during this funding period. Specific data gathering, community outreach, and analysis of results are provided in section **I:5) Integrated Social Sciences** of this report

Within each thematic area, undergraduate, graduate students and post-doctoral personnel have been engaged in rigorous training, core competency development and training, research, and outreach to further the goals and objectives that support NOAA's mission and Strategic Plan for the Next Generation of scientist and workforce.

K-12 Outreach Activities

High School Ocean Science Bowl Team

Florida A&M University's (FAMU) Environmental Cooperative Science Center (ECSC) High School Ocean Science Bowl Team Orientation was held on September 16, 2010. The main purpose of the orientation was to give high school participants and their parents an overview of the program, inform them of ECSC's expectations, and to answer questions from participants and their parents. Linda Miller, ECSC Coordinator welcomed the group; Dr. Michael Abazinge, ECSC Director provided greetings; Ariana Marshall, ECSC Graduate Student and Ocean Science Bowl Coach presented the overview; and Zakiya Hoyett, ECSC Graduate Student and Ocean Science Bowl Coach discussed the expectations.



October 2010, the team began meeting for practice each Friday from 4:00-6:00 pm at Environmental Science Institute at FAMU. The practices will end after the team's final competition in late-April 2011.

The Ocean Science Bowl Team competed at the Regional National Ocean Science Bowl (NOSB) Roseate Spoonbill Bowl, University of South Florida's College of Marine Science in St. Petersburg, Florida on March 5, 2011.

The ECSC team is young (comprised of 2 sophomores, 1 junior, 1 senior), and eagerly competed against mostly seasoned teams (juniors, seniors). The team did not take home a trophy this year,

however the ECSC team exhibited sportsmanship with passion and determination, which are all qualities of a winning team. Their team spirit suggests they will be highly competitive at next year's Spoonbill Bowl. The ECSC Science Bowl team's next competition will be April 21, 2011 at The National Organization for the Professional Advancement of Black Chemists and Chemical Engineers (NOBCChE) Conference in Houston, Texas.

The ECSC Science Bowl was accompanied by coaches Ariana Marshall and Zakiya Hoyett, Linda Miller, and Willie Stubbs (ESI Health & Safety Coordinator).



ECSC 2010-2011 High School Ocean Bowl Team members:

Samuel Ichite (12th Grade), Patrick Holmes (11th Grade), Vivek Somasundaram (10th Grade), David Brown (10th Grade)

Alternate Members:

Anthony Medehue (12th Grade), Emmanuel Ichite (11th Grade), Allen Colston (9th Grade)

K-12 Environmental Awareness Poster Competition

The Gulf Coast of Florida, especially Escambia County has been historically devastated by hurricanes and tropical storms. Therefore, ECSC IA Post Doctoral Fellow Dr. Tanveer Islam applied and received a leveraged funded grant from the Gulf of Mexico Alliance (GOMA) for community outreach on hurricane preparedness in Escambia County (Pensacola, Florida).

Dr. Islam, Linda Miller (ECSC Program Coordinator), Jessica Wise (ECSC MS Student), and Tiffany Baskerville (ESI Ph.D. Student) planned for an elementary, middle and high school poster competition in Escambia County, Florida to assist in informing the most susceptible populations about the risks associated with coastal hazards, and to provide information on accessing tools necessary to increase community resilience.

The elementary school hurricane preparedness and adaptation poster competition was held at Spencer Bibbs Elementary School in Pensacola, FL, November-December 2010. About 70 students participated in the poster competition. The winners were announced in January, 2011. Avian Sanders (5th grade) won the first place for her poster, "If there's



a hurricane pack plenty of supplies”; Xabriana Perez (4th grade), “Find your route...the get out!”, and Cortez Blackmon (5th grade), “Before it’s too late...Evacuate!” tied for the second place; and Maurice Williams (5th grade) won the third place for “Get out of the Town”. The winners received prize packages and the school received gift certificate to be used to purchase supplies for the school. There were over 200 participants for the Middle and High School hurricane preparedness and adaptation poster competition. The winners will be announced in April, 2011.

High School Summer Camp

Each summer, FAMU hosts an ECSC summer camp for approximately 24 high school students to introduce them to the field of environmental science. The summer camp includes classroom, lab and field activities, centered around a topical theme. This theme is chosen to make the camp relevant to contemporary issues, and to develop interest and excitement about working on topics that are current and societally relevant. This year, our summer camp is planned for June 2011, with the theme of “Oil Spills in Coastal Waters”. The Deepwater Horizon spill had significant effects on the economy and environment of the Florida panhandle, and remains a topic of concern in the region; this makes it an ideal topic for “teachable moments” related to recent events. We are currently planning lab and classroom activities and ordering supplies. Local field trips are planned, including a day trip to the Apalachicola NERR. An overnight field trip to New Orleans is also planned. We have advertised the camp at regional high schools, and are currently accepting applications with a deadline of April 2011.

I:2) Ecological Processes and Indicators of Ecological Health

Jennifer Cherrier and Elijah Johnson, Thematic Area Leaders

Evaluation of ecosystem health requires a comprehensive understanding of ecosystem structure and function. Detailed knowledge of the biogeochemical, ecological, and physicochemical factors (climate, tidal energy, etc) defining estuarine ecosystems is key to supporting 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. Specifically, the research activities in the EPIEH-TA are designed to effectively engage EPIEH-TA students in research that is relevant to NOAA’s overarching mission with the ultimate goal of ensuring that these students complete their degrees and are well prepared to pursue 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*

where both activities-student training and research- are integral to ensuring success of the other. A listing of current year 5 participants engaged in this thematic area and their respective activities are summarized in Table I.2A.

Table I.2A. EPIEH-TA Participants (Faculty, Post-Docs, Students, and NOAA/NERR Collaborators) their affiliation and their respective research work/activity focus.

Name	Faculty/Student/Other	Institution	Work/Activity Res. Focus
Dr. Michael Abazinge	Professor and present ECSC Director	Florida A&M University	Ecosystem Status and Health/food webs
Dr. Jennifer Cherrier	Associate Professor, EPIEH-TA Thematic Lead, and present ECSC Deputy Director	Florida A&M University	Ecosystem Status and Health/biogeochemistry, food webs, integrated modeling
Dr. Hyun Jung Cho	Assistant Professor	Jackson State University	Ecosystem Status and Health//marshes, modeling
Dr. Chunlei Fan	Associate Professor	Morgan State University	Integrated Ecosystem Modeling/biogeochemistry, food webs
Dr. Ibrahim Farah	Professor	Jackson State University	Ecosystem Status and Health/biology, ecotoxicology
Dr. Mingxin Guo	Associate Professor	Delaware State University	Ecosystem Status and Health/biology
Dr. Yuch Ping Hsieh	Professor	Florida A&M University	Ecosystem Status and Health/marsh biogeochemistry

Table I.2A. EPIEH-TA Participants (Faculty, Post-Docs, Students, and NOAA/NERR Collaborators) their affiliation and their respective research work/activity focus. (Continues)

Name	Faculty/Student/Other	Institution	Work/Activity Res. Focus
Dr. Christopher Heckscher	Assistant Professor	Delaware State University	Ecosystem Status and Health/trophic[Type a quote from the document or the summary of an interesting point. You can position the text box anywhere in the document. Use the Text Box Tools tab to change the formatting of the pull quote text box.] interactions
Dr. Wenrui Huang	Professor	Florida A&M University	Integrated Ecosystem Modeling/hydrology
Dr. Charles Jagoe	Professor and ECSC Distinguished Scientist	Florida A&M University	Ecosystem Status and Health/ecotoxicology
Dr. Elijah Johnson	Associate Professor EPEIH-TA Thematic Co-Lead	Florida A&M University	Integrated Ecosystem Modeling/ transport chemistry, modeling
Dr. Dennis McIntosh	Associate Professor	Delaware State University	Ecosystem Status and Health/biology
Dr. Gulnihal Ozbay	Associate Professor	Delaware State University	Ecosystem Status and Health/biology
Dr. Larry Robinson	Professor and Former ECSC Director	Florida A&M University	Ecosystem Status and Health/chemistry, food webs and integrated assessment
Dr. Paul Tchounwou	Professor, JSU PI	Jackson State University	Ecosystem Status and Health/environmental toxicology
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
John Branch	Ph.D/Env Sci	Florida A&M University	Integrated Ecosystem Modeling/ chemistry
Steve Brown	Ph.D/Biology	Morgan State University	Ecosystem Status and Health/biology
Erik Davenport	Ph.D/Biology	Morgan State University	Integrated Ecosystem Modeling/ ecological modeling
Chuckwuemeka Ebube	Ph.D./Env Sci	Florida A&M University <i>*does not receive direct ECSC support</i>	Integrated Ecosystem Modeling/ transport chemistry

Table I.2A. EPIEH-TA Participants (Faculty, Post-Docs, Students, and NOAA/NERR Collaborators) their affiliation and their respective research work/activity focus. (Continues)

Name	Faculty/Student/Other	Institution	Work/Activity Res. Focus
Zakiya Hoyett	Ph.D./Env Sci	Florida A&M University	Ecosystem Status and Health/transport chemistry
Stephen Kishinhi	Ph.D/Env Sci	Jackson State University	Ecosystem Status and Health/microbiology
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
Melanie McHenry-Johnson	Ph.D/Env Sci	Jackson State University	Ecosystem Status and Health/toxicology
Mark Duggo	Ph.D Env Sci	Jackson State University	Ecosystem Status and Health/Fisheries
Christina Nica	Ph.D/Env Sci	Jackson State University	Ecosystem Status and Health/coastal zone management
Aaron White	Ph.D./Env Sci	Florida A&M University <i>*does not receive direct ECSC support</i>	Ecosystem Status and Health/toxicology
Michael Cinelli	M.S./Nat Res	Delaware State University	Ecosystem Status and Health/ food webs
Keyana Dickens	M.S./Nat Res	Delaware State University	Ecosystem Status and Health/toxicology
Akia Laurant	Ph.D./Env Sci	Florida A&M University <i>*does not receive direct ECSC support</i>	Ecosystem Status and Health/ food webs, biogeochemistry
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
Ramona Turner	M.S./Env Sci	Florida A&M University <i>*does not receive direct ECSC support</i>	Ecosystem Status and Health/ marine education
Kim Tucker	Ph.D./Civ & Env Eng	Florida A&M University	Integrated Ecosystem Modeling/ hydrologic, chemical transport
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
Lorielle Jackson	B.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/

Table I.2A. EPIEH-TA Participants (Faculty, Post-Docs, Students, and NOAA/NERR Collaborators) their affiliation and their respective research work/activity focus. (Continued)

Name	Faculty/Student/Other	Institution	Work/Activity Res. Focus
Tiffini Johnson	B.S./Nat Res	Delaware State University	Ecosystem Status and Health/food webs
Amari Jones	B.S./Env Sci	Florida A&M University	Integrated Ecosystem Modeling/hydrology
Dr. Dennis Apeti	Collaborator	NOAA	CCMA
Dr. Chris Chambers	Collaborator	NOAA	NMFS
Dr. John Christensen	Collaborator	NOAA	CCMA
Dr. April Croxton	Collaborator	NOAA	NMFS
Dr. Ashok Deshpande	Collaborator	NOAA	NMFS
Dr. D. Evans	Collaborator	NOAA	OAR
Dr. Trika Gerard	Collaborator	NOAA	NMFS
Dr. J. Govani	Collaborator	NOAA	NCCOS
Dr. Fred Holland	Collaborator	NOAA	CCHR
Dr. W. Luke	Collaborator	NOAA	ARL
Dr. Steve Morton	Collaborator	NOAA	CCEHRR
Dr. LaToya Myles	Collaborator	NOAA	ARL
Mr. Dave Ruple	Collaborator	NERR	Grand Bay
Dr. Larry Robinson	Collaborator	NOAA	Assistant Secretary for Conservation and Management
Dr. Bob Scarborough	Collaborator	NERR, DNREC	Delaware
Ms. Jennifer Wannat	Collaborator	NERR	Apalachicola Bay
Mr. Robert A. Warner	Collaborator	NOAA	NCCOS/CCMA
Dr. Gary Wikfors	Collaborator	NOAA	NMFS
Dr. Mark Woodrey	Collaborator	NERR	Grand Bay
Dr. Jiangtao Xu	Collaborator	NOAA	NOS/CSDL

The research in the EPIEH-TA is aligned with NOAA's ecosystem approach to management. Specifically, the research two focus areas are a) Ecosystem Status and Health and b) Integrated Ecosystem Modeling (Fig I.2A). Work carried out in the Ecosystem Status and Health research focus incorporates studies in the two broad topical areas of biogeochemistry and bioindicators and the work carried out in the second research focus, Integrated Ecosystem Modeling, incorporates studies in several topical areas including, for example, 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.

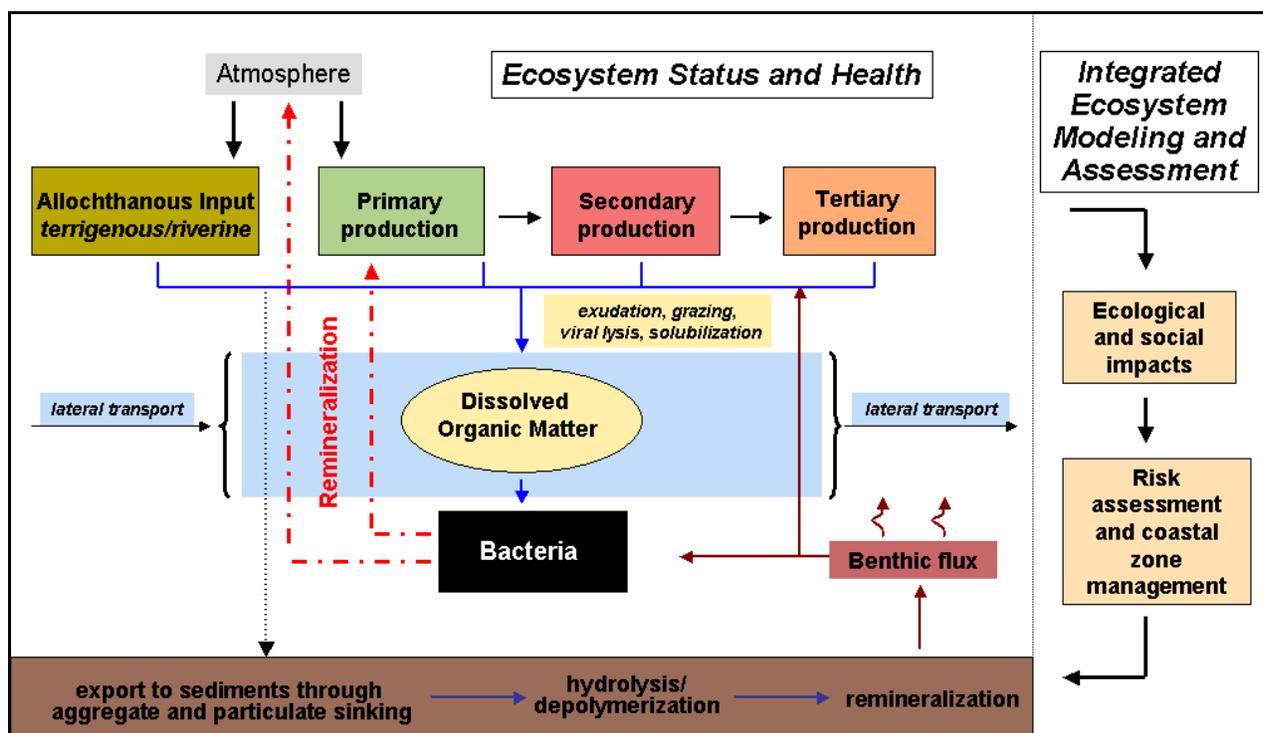


Fig. I.2A. Conceptual illustration showing the connectivity between the two EPIEH-TA research foci a) Ecosystem Status and Health in the EPIEH-TA and b) Integrated Ecosystem Modeling and Assessment and how this research then meant to inform other ECSC thematic area research.

In addition to the traditional and on-going research and training efforts within the EPIEH-TA many of the 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 shown in the Fig. I.2A conceptual illustration). Center wide EPIEH-TA monitoring efforts are outlined on the ECSC website and can be viewed at the following address <http://www.ecsc.famu.edu/ecsc2010/summaryep2.html>. 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. Finally, EPIEH-TA faculty have garnered approximately 1.4 million dollars in leveraged funds to work on oil spill related research activities since the spill began in April 2010 (see Appendix D).

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 in year 5, 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

The series of performance indicators (PI) and targeted goals summarized below for objective 1 were identified in the EPIEH-TA implementation plan to address and assess our success in carrying out this first objective, the rigorous and consistent center-wide training of the EPIEH-TA students. 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 partners engaged in EPIEH research activities (FAMU, JSU, MSU, DSU, & Creighton) 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 Yr 5 was that all ECSC partners (as listed in Table I.2A) engaged in EPIEH-TA research would have a curriculum in place to ensure that EPIEH-TA students would receive training in these core competencies. This goal has been achieved.

Two sets of core competencies and associated learning outcomes were identified that all EPIEH-TA students must possess to ensure that they are effectively prepared to embark on their research. 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). As each partner institution has it's own curriculum requirements for students, the ECSC core competency content and training is delivered by ECSC faculty/ staff and NERR scientists by various means either in traditional semester-long courses, special topics short courses, or arranged internships at NERR sites. Table I.2B lists these courses at each institution.

Table I.2B. Obj 1/PI 1 Partner Institutions Course Listings for EPIEH-TA Core Competencies (UG indicates undergraduate level class and G indicates graduate level class)
Florida A&M University
<i>Classroom:</i> EVR 3023, Intro to Mar Env (UG); PCB 5315, Mar & Est Ecosys (G)
<i>Field:</i> EVS 5930, Special Topics Aquatic Sciences Field Techniques @ FAMU & ANERR
Delaware State University
<i>Classroom:</i> Limnology 30-313, Ecosystems 30-451, Wetland Biology 30-456, Fisheries Sci. 30-404, Principles of Fisheries Management 30-405, & Hydrology 30-302 all UG
<i>Field:</i> summer or semester long field training internship at Delaware NERR
Morgan State University

Table I.2B. Obj 1/PI 1 Partner Institutions Course Listings for EPIEH-TA Core Competencies (UG indicates undergraduate level class and G indicates graduate level class) <i>(Continued)</i>
<i>Classroom:</i> MSU BIOL 603 online
<i>Field:</i> MSU summer internship training @ MSU Estuarine Research Center
<u>Jackson State University</u>
<i>Classroom:</i> BIO 423 / BIO-L 423, Ecol & Ecol Lab (UG); ENV 803 / ENV-L 803, WtInd Ecol & WtInd Ecol Lab (G); ENV 717/BIO 617/ENVL 717/BIOL 617, ENV 751, Water Quality Management
<i>Field:</i> JSU/Grand Bay NERR ECSC Core Competencies Field Course @ JSU & GBNERR
<u>Creighton University</u>
<i>Classroom:</i> BIO/EVS (co-listed) 485, 486, 487 - Mar & Freshwater Ecol & Labs (UG),
<i>Field:</i> BIO/EVS (co-listed) 385 - Ecol, Geography, & Health of Lakes (3 wk field trip, UG); BIO/EVS

PI 2) *EPIEH-TA students at each of the ECSC institutional partners will demonstrate successful mastery of core competencies.* The goal for Yr 5 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 (Table I.2B) 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 Yr 5 was that all EPIEH-TA BS students would develop a senior thesis or capstone project based on their ECSC research activities. This goal has been achieved as all EPIEH-TA students develop, present and defend their research to a faculty committee (see Appendix C for a listing of project titles, committee makeup, and projected graduation dates for each EPIEH-TA student).

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 Yr 5 was that all EPIEH-TA BS students graduating with BS degrees would present the findings of their ECSC research at the university departmental level. This goal has been achieved through the requirement that undergraduate students present their research findings in either an oral or poster presentation at the conclusion of their respective research projects (i.e. prior to graduation). This requirement has been in place since the first year of this grant cycle. One EPIEH-TA undergraduate student, Amari Jones, graduated during this reporting period. See Appendix C for a listing of the targeted graduation dates of EPIEH-TA undergraduates.

PI 5) *EPIEH-TA B.S. students will present their research findings at one or more national meetings.* The goal for Yr 5 was that at least half of the EPIEH-TA BS students would present their research findings at a national meeting. During this reporting cycle none of the EPIEH-TA undergraduate students presented their research at a professional meeting; however, two of these students, Loriele Jackson and Amari Jones, previously presented their research findings and the other three students are not yet far enough along in their research to do so. Every effort will continue to be made during the next reporting cycle to ensure that the 3 remaining EPIEH-TA undergraduate students have the opportunity to present their findings at a professional meeting.

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 Yr 5 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. See Table I.2C for a listing of EPIEH-TA students (listed in Tb I.2A) along with their research project titles. If a student's name does not appear in this table it is because they have not yet developed and defended their research proposals. No EPIEH-TA graduate students defended their research proposals during this reporting cycle but there are several proposals that are currently under development with a targeted summer defense of these proposals to their respective committees.

Table I.2C. Obj 1/PI 6, EPIEH-TA Graduate Committee Approved ECSC Relevant Research Proposals

- Tucker, Kim. Effects of Stormwater on Water Quality in Apalachicola Bay. FAMU
- Whitaker, Katherine. Effects of River Inflow on Chlorophyll-a in Apalachicola Bay. FAMU
- Kishinhi, Stephen. Source Tracking and Assessment of Bacteriological Water Quality at the Grand Bay National Estuarine Research Reserve. JSU.
- McHenry, Melanie. Ecotoxicology & Risk Assessment of Mercury in the GB-NERR. JSU.
- Nica, Christina. Ecological modeling of potential habitat for submerged aquatic vegetation at Grand Bay. JSU National Estuarine Research Reserve, Mississippi. JSU.
- Davenport, Erik. Assessing the Vulnerability of the Chesapeake Bay and Northern Gulf of Mexico to Impacts from Hurricanes. MSU
- Cinelli, Michael. Studies of Growth Rate of the Weakfish (*Cynoscion regalis*) at Different Temperatures and Salinities. DSU.
- Schutte, Melissa. Ecological Succession on Wetlands Restored from Agricultural Uses. DSU
- Dickens, Keyana. Investigating Uptake and Colonization of *Vibrio parahaemolyticus* in Eastern Oysters (*Crassostrea virginica*) in Relation to Phytoplankton Presence
- Laurant, Akia. Cumulative Impacts of DOM and Salinity on *Karenia brevis*: Implications for Apalachicola Bay FL. FAMU
- White, Aaron. The Use of Satellite Telemetry to Identify Sites for the Uptake of Mercury in the Loggerhead Sea Turtle. FAMU
- Turner, Ramona. A Model for Using Authentic Ocean Science Research to Teach Global Climate Change at the Secondary Level. FAMU

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 Yr 4 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. See Table I.2D for a listing of the NOAA or NERR scientists serving on the EPIEH-TA student committees (also listed in Appendix C). If one of the students listed in Table I.2A does not appear in Table I.2D, it is because their committee has not yet been finalized.

Table I.2D. Obj 1/PI 7, EPIEH-TA M.S. and Ph.D Committee Approved ECSC Relevant Research Proposals

- Kishinhi, Stephen. JSU. NOAA/NERR Committee Member M. Woodrey.
- McHenry, Melanie. JSU. NOAA/NERR Committee Member M. Woodrey. NOAA Committee Member L. Myles
- Laurant, Akia. FAMU. NOAA Committee Member S. Morton.
- White, Aaron. FAMU. NOAA Committee Member D. Evans
- Wise, Jessica, FAMU. NOAA Committee Members T. Gerard and A. Croxton
- Whitaker, Katherine. FAMU. NOAA Committee Member J. Christensen
- Tucker, Kim. FAMU. NOAA Committee Member J. Christensen
- Sarkodee-Adoo, Judith. NOAA/NERR Committee Member J. Wannat
- Branch, John. NOAA Committee Member D. Apeti.
- Davenport, Erik. MSU. NOAA Committee Members J. Govoni and J. Xu
- Dickens, Keyana. DSU. NOAA/NERR Committee Member B. Scarborough.
- Cinelli, Michael. DSU. NOAA/NERR Committee Member B. Scarborough.
- Schutte, Melissa. DSU. NOAA/NERR Committee Member B. Scarborough
- Turner, Ramona. FAMU. NOAA/NERR Committee Member R. Kilcollins

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. See Table I.2E for a listing of the graduate research projects aligned with ECSC Project PI research activities (also listed in Appendix C). If one of the students listed in Table I.2A does not appear in Table I.2E this means that their committee and their project topic has not yet been formally finalized.

Table I.2E. Obj 1/PI 8, EPIEH-TA Graduate Projects Aligned with ECSC Project PI Research Activities (All ECSC /EPIEH-TA faculty research must be represented by an in-house ECSC proposal; see below section describing PI's associated with Obj. 2)

<ul style="list-style-type: none"> • Stephen Kishinhi. JSU. Dissertation Title: Source Tracking and Assessment of Bacteriological Water Quality at the Grand Bay National Estuarine Research Reserve. Project PI: I. Farah. • Melanie McHenry. JSU. Dissertation Title: Ecotoxicology & Risk Assessment of Mercury in the GB-NERR. Project PI: P. Tchounwou • Christina Nica. JSU. Dissertation Title: Ecological modeling of potential habitat for submerged aquatic vegetation at Grand Bay National Estuarine Research Reserve, Mississippi. Project PI: H.J. Cho. • Akia Laurant. FAMU. Thesis Title: Cumulative impacts of DOM and salinity on <i>Karenia brevis</i>: Implications for Apalachicola Bay FL. Project PI(s): J. Cherrier & S. Morton (NOAA) • Aaron White. FAMU. Dissertation Title: The Use of Satellite Telemetry to Identify Sites for the Uptake of Mercury in the Loggerhead Sea Turtle. Project PI: L. Robinson • Ramona Turner. FAMU. Thesis Title: A model for using authentic ocean science research to teach global climate change at the secondary level. Project PI(s): J. Cherrier & B. Kelley. • Erik Davenport. MSU. Dissertation Title: Assessing the Vulnerability of the Chesapeake Bay and Northern Gulf of Mexico to Impacts from Hurricanes. Project PI: C. Fan. • Schutte, Melissa. DSU. Thesis Title: Primary ecosystem changes after restoring Delaware farmland to wetland. Project PI: M. Guo • Cinelli, Michael. DSU. Thesis Title: Studies of growth rate of the weakfish (<i>Cynoscion regalis</i>) at different temperatures and salinities. Project PI: McIntosh, D. • Dickens, Keyana. DSU. Thesis Title: Investigating uptake and colonization of <i>Vibrio parahaemolyticus</i> in eastern oysters (<i>Crassostrea virginica</i>) in relation to phytoplankton presence. Project PI(s): G. Ozbay & K. Coyne • James Garner. JSU. Dissertation Title: Habitat Suitability Index for Submerged Aquatic Vegetation. Project PI: H.J. Cho

PI 9) *EPIEH-TA graduate students will present their research findings at one or more national meetings.* During this reporting cycle approximately 40% (or 10 out of 25) EPIEH-TA graduate students either presented or were co-authors on presentations (see Appendix B) at regional or national meetings. This is a significant improvement, almost double, over that which was reported for the last reporting cycle (23%). Additionally some of these students presented at more than one meeting. We will continue to strongly encourage EPIEH-TA graduate students to present their research findings at professional meetings. Additionally we will also identify opportunities for these students to travel to, visit, and present their research findings at research relevant NOAA offices and centers (i.e. NCCOS labs in Charleston or SEFSC labs in FL, MS, TX, LA, and NC)

PI 10) *EPIEH-TA graduate students will publish their research findings in a peer-reviewed journal.* The goal for Yr 5 was that all EPIEH-TA graduate students would attempt to publish their findings in peer-reviewed journals and this goal was not met. There were 5 EPIEH-TA ECSC student co-authored papers published and/or accepted for publication during this funding cycle. This again is a significant improvement over that which was reported for the last funding cycle (1). In addition to ECSC student papers published there were 3 additional co-authored student papers published by non-ECSC students working on other NOAA relevant topical areas (i.e. ECSC leveraged funding) and co-authored by ECSC faculty advisors. EPIEH-TA graduate students continue to be strongly encouraged to submit their research for publication in peer-reviewed journals. To increase the chances of publication we are implementing a more rigorous EPIEH ‘in house’ pre-review process-

prior to submission to the journal- that engages EPIEH-TA faculty, postdoctoral research associates, NOAA/NERR collaborators, staff, and advanced Ph.D. candidate students.

Performance Summary: For this reporting period (Sept '10- March '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.* Areas we will be focusing on for improvement on for the next reporting period include a) ensuring that EPIEH-TA BS students continue to have the opportunity to present their research findings at a national meeting, and b) increasing the success rate of ECSC student publications in peer-reviewed journals through the implementation of a more rigorous EPIEH 'in house' pre-review process that engages EPIEH-TA faculty, postdocs, NOAA/NERR collaborators, staff, and advanced Ph.D. candidate students. During this reporting period many of the EPIEH-TA students, faculty, and staff 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. During this reporting cycle significant gains over that for the last reporting cycle were made in EPIEH-TA graduate student presentations (10 vs. 5, respectively) and publications (5 vs. 1, respectively). All EPIEH-TA student publications, publications, and project information are listed in **Appendices A, B, and C**, respectively. Student publications and presentations are denoted with an asterisk *.

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.

P1) *EPIEH-TA scientists will submit a research proposal to carry out EPIEH-TA related research.* The goal for Yr 5 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 Yr 5 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 EPIEH-TA proposals along with their respective NOAA/NERR collaborator are listed in Table I.2 F

Table I.2F. Obj 2/PI 2, EPIEH-TA Proposals and NOAA/NERR Collaborators

<ul style="list-style-type: none"> • Integrated Hydrological and Ecological Modeling for Apalachicola River and Bay System. FAMU. Project PI(s) W. Huang, E. Johnson, and Y. P. Hsieh. NOAA Collaborator: John Christensen, NOAA- CCMA • Drought, Reduced River Flow and Sea Level Rise: Exploring Climate Impacts on Carbon and Nitrogen Cycling in the Apalachicola Bay System. FAMU. J. Cherrier, S. Smith, P. Hsieh and J. Caffrey. NOAA/NERR Collaborator: Jennifer Wannat, A-NERR • Ecological succession on wetlands restored from agricultural uses. DSU. Project PI M. Guo. NOAA Collaborator: Ashok Deshpande, NOAA-Fisheries; Bob Scarborough, DE NERR • The use of aquaculture tools to study the effects of environmental change on weakfish (<i>Cynoscion regalis</i>). DSU. Project PI: D. McIntosh. NOAA Collaborator: Chris Chambers, NOAA-NMFS; Bob Scarborough, DE NERR • Benthic diatom assemblages as environmental indicators in Blackbird Watershed, DE. DSU. Project PI: G. Ozbay. NOAA Collaborator: Gary Wikfors, NOAA-NMFS; Bob Scarborough, DE NERR • Ecological modeling of potential habitat for submerged aquatic vegetation at Grand Bay National Estuarine Research Reserve, Mississippi. JSU. Project PI: H.J. Cho. NOAA/NERR Collaborators M. Woodrey and D. Ruple, GB-NERR • Ecotoxicology & Risk Assessment of Mercury in the GB-NERR. JSU. Project PI(s): P. Tchounwou & Y. Anjaneyulu. NOAA/NERR Collaborators M. Woodrey and D. Ruple, GB-NERR. NOAA Collaborator: L. Myles, NOAA-ARL. • Source Tracking and Assessment of Bacteriological Water Quality at the Grand Bay National Estuarine Research Reserve. JSU. Project PI(s): I. Farah and P. Tchounwou. NOAA/NERR Collaborators M. Woodrey and D. Ruple, GB-NERR • Deciphering Spatial and Temporal Water Quality Changes Through the Use of Continuous Monitoring, Dataflow Monitoring, and Box Models. MSU. Project PI: C.L. Fan. NOAA Collaborator: J. Govoni, NOAA-NCCOS • *Risk Assessment of <i>in vitro</i> Exposure to Perfluorinated Compounds in the Marine Environment” Project PI: E. Johnson. NOAA Collaborator P. Fair, NOAA-NCCOS • *Determination of the Micrometer Scale Distribution and Speciation of Metal Atoms in Biological Systems and Sediments, Project PI: E. Johnson. NOAA Collaborator D. Apeti, NOAA-NCCOS • *Investigations on the Microbial Community Structure and their Associated Functions in Apalachicola National Estuarine Research Reserve (ANERR). Project PI(s) C. Jagoe and A. Chauhan. NERR Collaborator J. Wannat, A-NERR • *Investigations on the Microbial Community Structure and their Associated Functions in Apalachicola National Estuarine Research Reserve (ANERR). Project PI(s) J. Cherrier and A. Chauhan. NERR Collaborator J. Wannat, A-NERR
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* still under ECSC internal review

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 Yr 5 was that all EPIEH-TA proposals would be vetted through this process. Four of the proposals listed in Table I.2F (denoted by asterisk) are currently in the review process so presently 70% of all of the proposals have been approved and four are still under review. 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 Yr 5 was that all EPIEH-TA proposals would include a student training component. To be considered for ECSC funding all EPIEH-TA proposals must demonstrate a student training component. Thus, this goal has been achieved and all of the EPIEH-TA proposals include student training.

PI 8) *EPIEH-TA funded research project results will be posted on the ECSC website.* The goal for Yr 5 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.* The goal for Yr 5 was that all institutional partners engaged in EPIEH-TA research would maintain the required data base and this goal has been achieved. 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 again, they in turn disseminated this to their respective Institutional Project PI's.

PI 10) *EPIEH-TA funded research project results will be disseminated to NCCOS and NOAA.* As a first step, the goal for Yr 5 for this PI was that results from all EPIEH-TA funded research projects would be posted on the ECSC website and that we would initiate and maintain communications with our NOS technical monitors. During this reporting cycle the ECSC Director, Deputy Director, and Distinguished Scientist had a teleconference call with the ECSC Program Manager and our NCCOS Technical Monitor to further discuss how we can more effectively disseminate ECSC research with NCCOS and NOS. As a start, we have 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 that EPIEH-TA faculty and students are engaged in (<http://www.ecsc.famu.edu/ecsc2010/summaryep1.html> & <http://www.ecsc.famu.edu/ecsc2010/summaryep2.html> , respectively). Again, as results become available and general conclusions about the findings are made, summaries of these findings will similarly be posted on the ECSC website. In addition, during the teleconference call we also discussed strategies for enhancing opportunities for ECSC faculty/post doc/students to present their research at research relevant NOAA facilities (i.e. via on site and webinar presentations). During the ECSC annual meeting in April we will further discuss this and formalize a plan for making gains on this performance indicator for the next reporting cycle.

PI 13) *EPIEH-TA funded research results will be presented at national meetings.* A total of 24 presentations of EPIEH-TA and ECSC leveraged research were given at professional meetings during this reporting period. The citations for these presentations are listed in Appendix B. This is a significant increase (i.e. 5 x's more) over that reported during the last reporting cycle. Of these 24 presentations almost half were co-authored by ECSC students (i.e. with the ECSC students serving as first authors on the majority of these).

PI 14) *EPIEH-TA funded research results will be published in peer-reviewed journals.* The goal for Yr 5 was that faculty and students from all partner institutions engaged in EPIEH-TA research would work toward the publication of their research results in peer-reviewed journals. During the present reporting period a total of 17 manuscripts were published or accepted for publication. Ten of these manuscripts were directly tied to EPIEH-TA research and the other seven were publications of NOAA-relevant scientific findings whose research was supported by leveraged funding. The full citations for these publications are listed in Appendix A. In addition to these 17 manuscripts, a short film entitled 'From Education to Exploration: Students at Sea' was shown in the NOAA Kiosk at The Smithsonian-Ocean Hall in Washington D.C. as well as 15 other aquarium/museums kiosks around the country in November, December, and January. It has gone into the archive and will rotate on and off with the rest of the videos. The link to the video on the NOAA Ocean Today website is as follows <http://oceantoday.noaa.gov/studentsatsea/>.

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.* All ECSC partner institutions engaged in EPIEH-TA research have now submitted proposals (a total of 13 so far) which have been reviewed or are in the process of being reviewed by the ECSC as well as NOAA and NERR scientists. All of the proposals demonstrate a student training component and all demonstrate a collaboration with either a NOAA or NERR scientist. The proposal titles, summaries and Project PI contact information for the ECSC/EPIEH-TA and EPIEH-TA ECSC leveraged proposals can be viewed on the EPIEH page of the ECSC website (<http://www.ecsc.famu.edu/ecsc2010/ep.html>). Areas we will be focusing on 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. EPIEH-TA faculty and students have been and will continue to be engaged in monitoring and research efforts associated with the Deepwater Horizon oil spill both through ECSC and ECSC-leveraged funding. Approximately 1.4 million dollars of highly competitive, leveraged research dollars for Deepwater Horizon oil spill research was garnered by EPIEH-TA faculty to support students and carry out research and we anticipate that the results of these activities will be of great utility to NOAA scientists and the science community at large. As we have done in the past, we will continue to seek out other ECSC leveraged NOAA-relevant funding to further build capacity at our respective institutions and most importantly increase the number of students we can train in NOAA and NOAA related sciences. All NOAA/ECSC/EPIEH-TA relevant publications, presentations, and leveraged funding information for the current review cycle are listed in *Appendices A, B, and D, respectively.*

I:3) Geospatial Analysis and Data Development

John F. Schalles, Thematic Area Lead

In the past six months, our thematic area section continued our emphasis on student training, engaged in planning and preparations for a follow-up satellite remote sensing and field survey campaign at the Grand Bay NERR in May, 2011, held discussions which led to a greatly revised plan of operation for the ECSC renewal proposal submitted last fall, and professional activities of faculty and students that include publications, presentations, proposal submissions, and awards and other recognitions. Individual accomplishments are listed in appendices. Within our Geospatial Analysis section, we had a total of seven new peer-reviewed publications and manuscript submissions, twelve presentations at regional or national meetings, twelve newly funded or continuing grants which represent leveraged funding which totaled \$931,810, and three proposals that are pending.

Table I.3A. GADD-TA Participants (Faculty, Post-Docs, Students, and NERR Staff)

Name	Faculty/Student/Other	Institution	Work/Activity Res. Focus
Dr. John Schalles	Prof. of Biology, GADD Lead Scientist	Creighton University	Remote sensing - coastal habitat mapping
Dr. Hyun J. Cho	Assistant Professor of Biology	Jackson State University	Sea grass habitat assessments
Dr. Chunlei Fan	Assistant Professor of Biology	Morgan State University	Optics of harmful algal blooms
Dr. Tanveer Islam	ECSC Research Associate	Florida A&M University	GIS - coastal systems
Dr. Donald Rundquist	Prof, School Natural Resources	University of Nebraska	Wetland and water analyses
Mr. Drew Seminara	Geospatial Analyst	Florida A&M University	Analysis of coastal habitats
Dr. Elizabeth Smith	Associate Research Scientist	Texas A&M - CC	Coastal vegetation analysis
Christina Mohrman	ECSC Site Coordinator	Grand Bay NERR	Vertebrate Habitat Analysis
Kemi Adeyinka	B.S. undergraduate student	Morgan State University	Harmful algal bloom detection
James Garner	Ph.D. Candidate	Jackson State University	SAB habitat suitability
Philemon Kirui	Ph.D. Candidate	Jackson State University	Remote detection of sea grasses
Paul Merani	Ph.D. Candidate	University of Nebraska	Salt marsh productivity
Nicole Davis	M.S. Student	Texas A&M - CC	Estuarine vegetation zonation
Gaye, Gibel	M.S. Student	Jackson State University	Corrections for bottom mapping
Christina Nica	Ph.D. Candidate	Jackson State University	Sea grass habitat modeling
John Olley	M.S. Student	Creighton University	Phytoplankton remote sensing
Marvin Washington	M.S. Student	Jackson State University	Sea grass maps, fluid mechanics
John Wood	Ph.D. Candidate	Texas A&M - CC	Sea grass mapping

The following section is organized to address progress towards the seven objectives of our thematic area, as established in the five year plan for the current 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)*

We've documented that our partner ECSC schools in most cases have adequate undergraduate and graduate coursework now in place to meet our Center's geospatial training objectives (Table I.3B).

Table I.3B. Partner Institution Course Listings for GADD-TA Core Competencies

Bethune Cookman University
<i>Classroom:</i> ES 335 - GIS and Remote Sensing
<i>Field:</i> ESL 335L - GIS and Remote Sensing Lab
Creighton University
<i>Classroom:</i> EVS 481 - Terrestrial Ecology; EVS 555 - Meteorological Remote Sensing;
EVS 570 - Geographic Information Systems, ATS 660 - Advanced Terrestrial Remote Sensing
<i>Field:</i> EVS 435 - Coastal & Estuarine Ecology; EVS 486 - Freshwater Ecology Laboratory
Delaware State University
<i>Classroom:</i> Natural Resources 30-484 - Advanced Wildlife Biology; NTRS-503: Conservation Biology
TRS-604: Geographic Information Systems (GIS) Applications in Natural Resources;
Florida A&M University
<i>Classroom:</i> AGR 4430C - GIS and Remote Sensing in Agriculture; SUR 3330C - Photogrammetry;
SUR 3415C - Geographic Information Systems
<i>Field:</i> EVS 5930, Special Topics Aquatic Sciences Field Techniques @ FAMU & ANERR
Jackson State University
<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
Morgan State University
<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
University of Nebraska - Lincoln
<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
Texas A&M University - Corpus Christi
<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 instructional modules. These modules were developed by our two former geospatial analysts, Christine Hladik and Sudhir Sheshthra.

The following describes recent activities for building geospatial capabilities at ECSC partner campuses:

(1) At Jackson State, two new courses were developed and offered for the first time in the Fall Semester, 2010 (SCI 220 - Earth System Science and the Changing Earth) and in the Spring Semester, 2011 (SCI 430 - Introduction to Remote Sensing for Earth System Science) and a proposal was submitted to the University to establish a Certificate Program in Remote Sensing and Geographic Information Systems.

(2) In the Department of Integrated Environmental Science at Bethune-Cookman University, a new position was recently filled with the appointment of Dr. Yong Q. Tian, a specialist in coastal geographic systems and remote sensing analysis. Dr. Tian will begin his duties at BCU in the Fall Semester of 2011.

(3) The Department of Atmospheric Science at Creighton University has just hired Dr. Timothy Wagner as a new Assistant Professor. Dr. Wagner, a specialist in aircraft and satellite remote sensing, including hyperspectral and radar instruments, will begin his duties in the Fall Semester of 2012. His research includes the influence of different vegetation covers on cloud formation and precipitation patterns. Also at Creighton, Dr. John Schalles significantly revised the ATS 660 course, Advanced Terrestrial Remote Sensing and is teaching it this spring to four students. New modules and class projects have been developed for coastal remote sensing and analysis of coastal AISA imagery and lidar systems and vector data retrieval for digital elevation model (DEM) development.

(4) At Florida A&M University, Dr. Tanveer Islam submitted a proposal for the development of a new Environmental Science Institute course to be offered in the Fall Semester, 2011 (EVS 5xxx – Geographic Information Systems in Environmental Sciences). While currently under review, the course intends to offer special focus with respect to mapping and analysis of environmentally related issues.

For 2011, we are again planning a joint field survey / training activity at Grand Bay NERR that we will coordinate with new WorldView2 satellite imagery acquisition of the entire reserve. A major objective of this campaign is to acquire imagery and field survey data to attempt change detection analyses with pre-Deepwater Horizon Oil Spill AISA imagery data from May 2010 and group field survey data (water quality and marsh vegetation) from May 2009. A series of conference calls have been held to establish objectives, discuss plans to acquire and use satellite data instead of AISA hyperspectral data, identify dates for the project, and begin planning logistics. Final planning will be conducted during break out sessions at the ECSC annual meeting scheduled for mid-April in Tampa, Florida. Currently, we have commitments for participation of students and faculty from Creighton, Florida A&M, Jackson State, and the University of Nebraska and other partner groups have been invited. In turn, the ECSC participants will work directly and in close coordination with staff at Grand Bay National Estuarine Research Reserve. Dr. John Schalles and a team of three students visited Grand Bay in early March and left boats and equipment in preparation for the work at Grand Bay.

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 of our students gave seven presentations in the past six months at regional or national meetings (Erik Davenport in February at the American Society of Limnology and Oceanography, Philemon Kirui at the AL-MS Bays and Bayous Symposium in December, James Garner at the Mississippi Water Conference in November and AL-MS Bays and Bayous Symposium in December, Christina Nica at the Mississippi Water Conference in November and AL-MS Bays and Bayous Symposium in December, and Marvin Washington at AL-MS Bays and Bayous Symposium in December) and one was co-author on a presented paper (Seminara, see appendix information). One geospatial graduate student, Drew Seminara, completed defended his M.S. thesis in the fall semester of 2010 and received his degree in December.

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

No additional AISA imagery data was collected during the reporting period. However, data collected during the May 2010 flyover at Grand Bay NERR has been processed and products developed, with special emphasis on the health of the wetland vegetation prior to oil reaching the Mississippi coast from the Deepwater Horizon incident. Drew Seminara began analyzing the data last summer, while still at Creighton as a graduate student. He completed an initial analysis last summer, which included masking all flightlines for non-salt marsh habitats, applying a Normalized Difference Vegetation Index to the salt marsh habitat in each flight line, and joining flightlines in a mosaic. The completed map products and ENVI data files were distributed to the Grand Bay NERR office and, in turn, to Dr. Mike Carron at NOAA's Northern Gulf Institute. Dr. Carron's Institute helped with the original funding for this project. Our group's efforts with geospatial analysis of coastal habitats potentially affected by the oil spill in Mississippi were coordinated with Dr. Carron. In the last three months of this reporting period, Drew Seminara completed additional analysis of the Grand Bay imagery, including maps of two additional vegetation indices important for documenting the biomass and health of the marsh vegetation, and these maps and the supporting data were also provided to the Grand Bay NERR staff and the Northern Gulf Institute (see Figure I.3A). We now plan to use these data as baseline maps to assess any changes to the salt marsh community from the oil spill or other potential stressors.

Additional work in these reporting period included provision of data and products (vegetation classification at species level and aboveground biomass) on Duplin River salt marsh habitat in Georgia to the Sapelo Island NERR and the Georgia Coastal Ecosystems LTER group at the University of Georgia, who were partners in the 2006 flyover project in coastal Georgia. Significant progress has been made on (1) mapping invasive Black Mangrove vegetation in Redfish Bay at the Mission-Aransas NERR and (2) developed improved procedures for removing water column effects in the mapping of seagrass beds at Grand Bay NERR.

Grand Bay NERR VI Comparisons

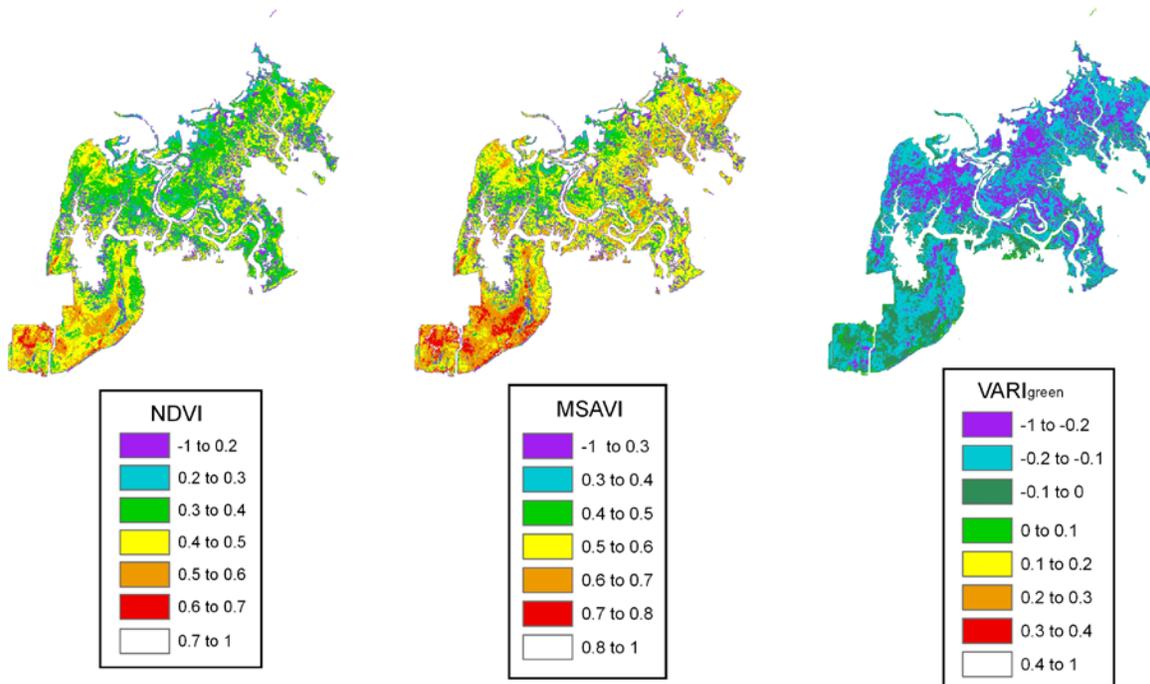


Figure I.3A. Pre-Oil Spill Map Products from May, 2010 AISA Imagery Acquisition at Grand Bay NERR in Southeastern Mississippi. This figure compares the results of applying three vegetation indices to the entire area of salt marsh habitats at the reserve, revealing patterns of plant abundance and condition.

GADD-TA 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. Current projects include those described in the Objective 3 section above, and ongoing work on (1) a species-level sea grass map for the Redfish Bay unit of Mission-Aransas NERR by John Wood, ECSC doctoral student at Texas A&M - Corpus Christi, (2) salt marsh biomass and plant health vegetation index maps for Mission-Aransas and Grand Bay NERR salt marshes by Paul Merani, ECSC Ph.D. student at the University of Nebraska, (3) seagrass mapping at Grand Bay NERR by Dr. J. Cho and several of her ECSC supported graduate students, (4) analysis of thermal data acquired at Mission Bay during the fall, 2008 flyover at Mission-Aransas NERR by John Olley, a new ECSC graduate student in John Schalles's laboratory at Creighton, and (5) analysis of phytoplankton chlorophyll distributions within all the AISA flightlines flown in 2008 at MANERR by John O'Donnell, a Creighton undergraduate student.

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

Papers, presentations, and proposal activity are summarized in Appendices A,B and D. Six papers were published and one manuscript was submitted. Impressively, students were senior authors of three of these papers. Twelve presentations were made at regional or national scientific conferences (as noted above, seven were by ECSC graduate students and one student was a co-author of another paper). A proposal by two ECSC scientists, John Schalles and Charles Jagoe, along with Evelyn Gaiser of Florida International University, to organize a special session (oral presentations and posters) on comparative studies of protected coastal habitats for the Coastal and Estuarine Research Federation Biennial Meeting in Daytona, Florida in November, 2011 was accepted. The Call for Papers is currently underway for the meetings, and several invited speakers are being recruited.

The Geospatial Thematic area continues to demonstrate a significant ability to leverage NOAA-ECSC funding with other extramural awards. There are 12 new and continuing awards, totaling \$981.3 K, and three submitted (pending) proposal. Also, John Schalles submitted a preproposal abstract to the Georgia Coastal Ecosystems NSF-LTER project in February for consideration in a six-year renewal proposal that is being prepared this year. The GADD-TM leveraged funds come from diverse sources: National Science Foundation, NOAA, NASA, National Geospatial Intelligence Agency, and the Mississippi-Alabama Sea Grant Consortium.

GADD-TA 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).*

The CALMIT group at the University of Nebraska continues to produce posters displaying imagery products from our different flyovers. Sample posters and posters as stored images on data CD's will again be made available at the upcoming meeting in April in Tampa. Don Rundquist of CALMIT can be contacted (see above) to request these materials. Our publications and presentations are an efficient way to inform other scientists, coastal managers, and others about our findings and the availability of products. Note that these products are routinely provided, by mail or in person, to our respective NERR partners, and NERR sites display these products for public viewing. Important to our efforts to analyze imagery and other remote sensing data and to distribute mapped products was the appointment of Drew Seminara as the new ECSC Geospatial Analyst in January 2011

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

Our thematic group has 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. These collaborations are very evident in the co-authorships in the following appendix section. Our current collaborations include

- J. Cho's (Jackson State) work on seagrass mapping and Deepwater Horizon oil impacts on coastal wetlands, with Patrick Biber at the Gulf Coast Research Laboratory and Deepak Mishra of Mississippi State University

- Christina Mohrman's and John Schalles's involvement in a new project to acquire high resolution lidar data, establish a tide gauging station, Surface Elevation Table stations for sedimentation studies, a CORS GPS reference station, and vegetation mapping products using Ground Lidar, AISA hyperspectral imagery and high resolution satellite imagery at the Grand Bay National Estuarine Research Reserve. The project involves joint work between Grand Bay NERR Staff (Mark Woodrey and Tom Strange), NOAA's National Geodetic Survey COASTAL program (Galen Scott, Nishanthi Wijekoon, and Philippe Hensele) and the ECSC. Work last year was delayed because of the Deepwater Horizon accident and disruptions of normal operations and new projects.

- Don Rundquist's work on harmful algae bloom detection with both the Water Center at the University of Nebraska and the Nebraska Department of Environmental Quality. This project utilizes the CALMIT aircraft and AISA instrument to provide early detection for toxic cyanobacteria blooms in Eastern Nebraska lakes and reservoirs, and collaborative projects at sites in the Upper Midwest. Results of this work were recently published in February in two book chapters (see appendices).

- John Schalles's extensive collaborations with Dr. Steve Pennings (University of Houston), Christine Hladik, Bill Miller, and Cristof Meile (University of Georgia), and Dorset Hurley and Aimee Gaddis (Georgia Department of Natural Resources / SINERR) in marsh mapping and integrated assessments of the Duplin River tidal watershed for the Georgia Coastal Ecosystem's NSF-LTER project at the Sapelo Island National Estuarine Research Reserve. In turn, John and Steve are members of an ad hoc group of LTER investigators pursuing comparative studies and data synthesis for the four East Coast LTER sites in Florida, Georgia, Virginia, and Massachusetts. A special session on comparative coastal studies has been accepted for the program at the 2011 Coastal and Estuarine Research Federation Meetings next November in Daytona, Florida.

- John Wood's work as a co-PI with the Texas Benthic Habitat Mapping Project a cooperative venture with Texas Parks and Wildlife, NOAA-NCCOS Coastal Services Center, TAMU-CC's Center for Coastal Studies, Alta Vista Consulting, and Fugro-Earth Data.

- John Schalles's joint work ongoing 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. Last fall, ECSC Distinguished Scientist Charles Jagoe met with this group, especially to discuss joint initiatives. In February, John Schalles met with Alex Gilerson and Sam Ahmed during the ASLO Ocean Sciences Meeting in Puerto Rico to continue discussions of joint projects. It was agreed that John Olley, the new M.S. student at Creighton would travel to the CUNY campus in March to work with the NOAA-CREST faculty and students, concentrating on (1) using the CUNY Hydrolight software to attempt inverse modeling with new field water reflectance data collected by Olley and Schalles and (2) train John in their approach to incorporate polarizing fore-optics in field spectroradiometer measures for isolation of the inelastic fluorescence component of the algal reflectance peak located near 700 nm. Possible joint field work, most likely at CUNY's remote platform and vicinity in Long Island Sound, are

under consideration, pending the availability of supplementary funding. A NASA Nebraska Space Travel Grant was applied for and awarded in February to cover the extra expenses of sending John Olley to New York City.

I:4) Integrated Assessment in Support of Environmental Decision Making

Michael Reiter, Thematic Area Lead

The ECSC Integrated Assessment in Support of Environmental Decision Making (IA) thematic area's objective is to train students in integrated resource management, risk assessment, and decision-making methodologies identified as being of key importance in the recent strategic plans for NOAA, NOS, and NCCOS while providing useful tools for NERR and NOAA decision makers. Our approach involves active participation in the creation and use of integrated conceptual models for partner NERR sites to be used as tools to communicate coastal system risks, to guide ECSC research, and to link scientific and social information to enhance decisions for achieving coastal management goals. The ECSC's distinctive capabilities allow us to develop and assist with integrated assessment methodologies as well as transfer integrated assessment methodologies to our students, NOAA, other stakeholder groups or locations, and other agencies. The IA team (Table I.4A) has the capability to integrate interdisciplinary information and expertise across institutions and geographic areas, and has built upon its existing record of providing resource information and management tools to ECSC stakeholders and the general public (including a large underserved population).

As listed in the IA implementation plan, below are the goals for the IA objective in Year 5 and the accompanying performance indicators (or measures), the respective indicator targets for Year 5, and the accomplishments for each Year 5 indicator for the first half of the funding year.

Table I.4A. IA-TA Participants

Name	Faculty/Student/Other	Institution	Activity Res. Focus
Dr. Michael Reiter	Faculty <i>IA Thematic Lead</i>	Bethune-Cookman University	Integrated Assessment, Conceptual Modeling
Dr. Sandra Arizmendez	Post-Doc	TAMU Corpus Christi	Upland-Estuarine Coupling
Ariana Marshall	PhD Environmental Science	Florida A&M University <i>**works in both EPIEH-TA and IA-TA</i>	Socio-Economic Impacts
Robyn Ball	MS Mathematics May 2008 & Researcher	TAMU Corpus Christi	Numerical Modeling
Rosaleen (Baluyot) March	MS Biology August 2010	TAMU Corpus Christi	GIS Land Use Applications
Cary Bleasdale	MS Integrated Environmental Science	Bethune-Cookman University	Integrated Assessment, Conceptual Modeling
Julien Clifford	BS Geographic Information Science May 2013	TAMU Corpus Christi	Model visualization using GIS
Felisha Cullins	BS Geology & Environmental Science August 2007	TAMU Corpus Christi	Data analysis support
Nicole Morgan Davis	MS Biology	TAMU Corpus Christi	GIS Land Use Applications
Dr. Jack Gentile	Researcher	Harwell Gentile & Associates, LC	Integrated Assessment, Conceptual Modeling
Dr. Mark Harwell	Researcher	Harwell Gentile & Associates, LC	Integrated Assessment, Conceptual Modeling

Name	Faculty/Student/Other	Institution	Activity Res. Focus
Domingo Hiracheta	BS Computer Science May 2013	TAMU Corpus Christi	Numerical Modeling
Dr. Wenrui Huang	Faculty	Florida A&M University	Numerical Modeling
Dr. Tanveer Islam	Post-Doc	Florida A&M University	Integrated Assessment, Socio-Economics
Andrew Kameronosky	MS Integrated Environmental Science	Bethune-Cookman University	Conceptual Modeling
Lauren Kiser	MS Integrated Environmental Science	Bethune-Cookman University	Integrated Assessment, Conceptual Modeling
Ms. Christina Mohrman	ECSC Liaison	Grand Bay NERR, MS	Integrated Assessment
Rashan Moss	MS Integrated Environmental Science	Bethune-Cookman University	Integrated Assessment, Conceptual Modeling
Yelena Nevel	MS Mathematics August 2010	TAMU Corpus Christi	Numerical Modeling & Data Assimilation
Samantha Quisenberry	BS Education December 2009	TAMU Corpus Christi	Numerical model optimization
Niraj Ray	MS Integrated Environmental Science	Bethune-Cookman University	Integrated Assessment, Conceptual Modeling
Sergey Reid	BS Geographic Information Science May 2012	TAMU Corpus Christi	GIS & Numerical Modeling
Jenny Rodriguez	MS Education	TAMU Corpus Christi	Texas navigational safety statistics
Whitney Rutledge	BS Mathematics & Environmental Science May 2013	TAMU Corpus Christi	Statistical analysis of coastal data
Dr. Geoff Scott	NOAA IA Contact	NCCOS Center for Coastal Environmental Health and Biomolecular Research at Charleston	NCCOS Liaison to IA
Dr. Elizabeth Smith	Faculty	TAMU Corpus Christi	Upland-Estuarine Coupling
Dr. Philippe Tissot	Faculty	TAMU Corpus Christi	Numerical Modeling
Dr. Wes Tunnell	Faculty	TAMU Corpus Christi	Large Marine Ecosystems
Cindy Valencia	BS Biomedical Science December 2009	TAMU Corpus Christi	Numerical model optimization
Angelica Villarreal	BS Computer Science & Mathematics August 2009	TAMU Corpus Christi	Numerical Modeling
Dr. Hongqing Wang	Researcher	USGS National Wetlands Research Center, LA	Numerical Modeling
Doug Weaver	PhD Fisheries	TAMU Corpus Christi	Fisheries Modeling
Dr. Mark Woodrey	Research Coordinator	Grand Bay NERR, MS	Integrated Assessment

IA-TA Goal 1: *Develop variations of the qualitative conceptual models for different habitats and levels of aggregation as appropriate for use in site-specific decision making*

Performance Indicators for Goal 1

- 1) Run 4C model workshop for GBNERR. Measure for Yr 5- Completion
-Progress: Requested. Workshop planned for late April or early May.
- 2) Run modeling workshop for Kachemak, if requested by KBNERR. Measure for Yr 5- Completion (if requested)
-Progress: Workshop not requested to date

Performance Summary: The GBNERR requested that the IA team run the second workshop to allow for the development of a complete Conceptual Ecological-Societal Systems Model (CESSM: “4C”). After some planning discussions, the GBNERR workshop is tentatively rescheduled for the week of April 25, pending approval by key workshop participants. A sample agenda has been developed and forwarded to GBNERR for planning purposes, and the GBNERR staff is generating a list of local socio-economic experts to invite for the workshop. The thesis of MS students Cary Bleasdale and Rashan Moss will be tied to the development and evaluation of the GBNERR model.

The Kachemak workshop was not requested by the KBNERR. Therefore, this workshop was not held, due to this and other factors including funding issues. We do not anticipate continuing efforts on this workshop in the remaining period of this grant.

IA-TA Goal 2: *Prioritize risks at partner NERR sites utilizing decision-analysis methodologies (ex. fuzzy set theory, sensitivity analysis) to address specific NERR management issues and begin the transition from the current qualitative conceptual models to a ranked list of priorities to be addressed*

Performance Indicators for Goal 2

- 1) Selected pathways for a full IAEMP demonstration and options analysis at GBNERR. Measure for Yr 5- Completion
-Progress: Pathway selection underway, but eventual implementation uncertain.

Performance Summary: During this reporting period, the IA team has discussed the potential options for pathways with the GBNERR managers. Up to this point, the two likely choices for focus were mercury (related to ongoing monitoring and research activities at GBNERR) and PAHs (as a result of the Gulf Oil Spill). While completing the selection of pathways for a full demonstration and options analysis can be completed relatively easily by simply evaluating the needs of GBNERR for information on these two topics, funding for this type of activity has not been included in the pending ECSC Cooperative Agreement for 2011-2016 (submitted in November 2010). Either of these options are still viable, and the IA team has worked to identify potential supplemental funding sources to develop either or both of these lines of inquiry.

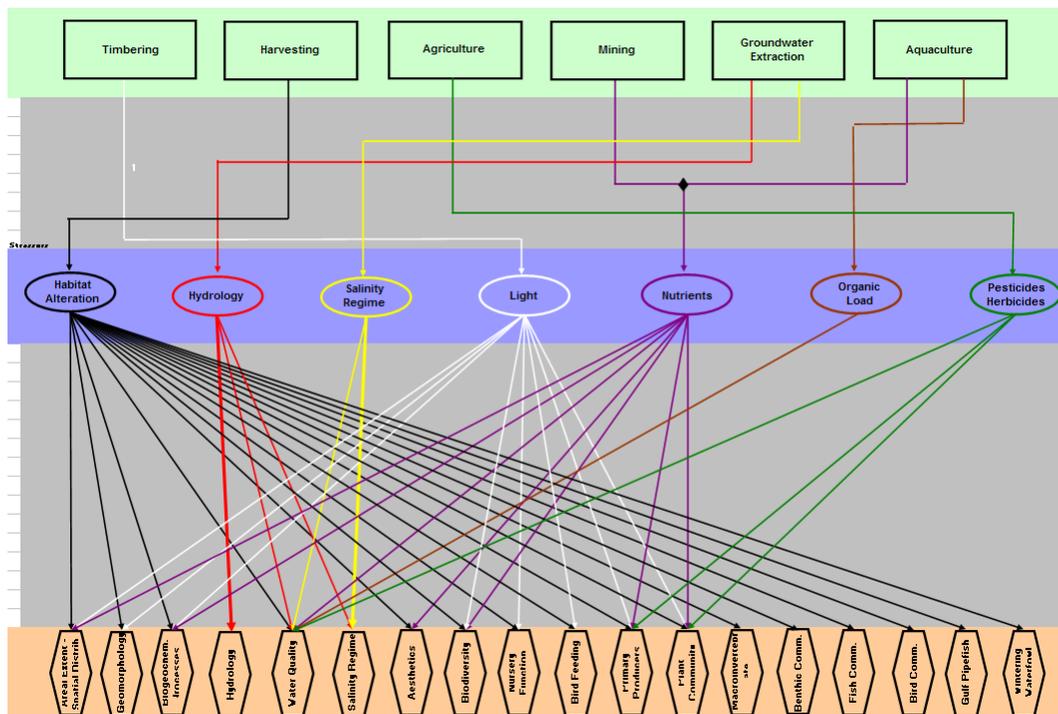
IA-TA Goal 3: *Use the risk priorities to assess current conditions at each site and objectively identify research and management needs at that site*

Performance Indicators for Goal 3

- 1) Completed initial assessments of priority issues, using existing data, for GBNERR. Measure for Yr 5- Completion

-Progress: New data for matrices scheduled to be received from GBNERR personnel in March, with new models developed at that time.

Performance Summary: The desire by the site managers for revisions to the GBNERR matrices, documented in past semiannual reports, resulted in the need to update the conceptual models for GBNERR. Revisions were begun by GBNERR personnel during the last reporting period, with three habitat matrices (Tidal Creeks, Seagrass/SAV, and Oyster Reefs) completed. The Conceptual Ecosystem (“2C”) Models (CEMs) for these habitats have since been completed.



Example CEM from the revised GBNERR matrices: Seagrass/SAV Habitat, Production Drivers (non-narrowed).

The remaining matrices are currently being checked by GBNERR staff, and are scheduled to be turned over to Dr. Reiter in March. At that time, the new CEMs can be developed and readied for the second modeling workshop. Despite the need for the revisions, we are on schedule to complete this task.

IA-TA Goal 5: *Conduct targeted risk assessments at the ANERR, focusing on water management of the ACF system and/or navigation issues of maintaining the commercial barge traffic up the Apalachicola River into Alabama*

Performance Indicators for Goal 5

- 1) Complete options stages of the IAEMP for the selected issue. Measure for Yr 5- Options Stages Completed

-Progress: After a subcontract delay, re-evaluation of the numerical model outputs is being completed and new projections are being developed.

Performance Summary:

Once the subcontract to Harwell, Gentile and Associates LC. was completed, the review of the outputs from the model projections developed during the last funding year identified a few unexpected and paradoxical results (for example, a sea level rise of 1m at one site resulted in a lowering of salinity). Given these results, the models were rechecked and an inconsistency detected in the hydrodynamic modeling algorithms. Thus, the ecological modeling based on these hydrodynamic model outputs was questionable. The problem in the hydrodynamic model was identified and solved, and we are re-running all hydrodynamic models. As the new hydrodynamic outputs are obtained, new ecological model runs are being performed for the four sites where we are most confident in the data. There may also be data available for other sites identified by recent publications that provide better resolution than we originally had available. While the unexpected model irregularities have set us back roughly six months, we are now moving forward with this task again. Since we were ahead of schedule as of the end of the last funding year, we expect that we will still be able to complete the deliverable as scheduled.

IA-TA Goal 6: *Initiate assessments at MANERR focused on characterizing habitat changes, navigation and port issues, and Large Marine Ecosystem (LME) studies on the Gulf of Mexico*

Performance Indicators for Goal 6

- 1) Run CESSM (4C) modeling workshop for MANERR, if requested. Measure for Yr 5- Completion
-Progress: Requested. Workshop scheduled for May 2011.
- 2) Personnel involved in the Harte/LME development program per year. Measure for Yr 5- 2 people involved
-Progress: Met: 3 IA people working on the project.
- 3) Data files from GIS analysis available to MANERR. Measure for Yr. 5- 1 data file
-Progress: On schedule to transfer all data files to MANERR.

Performance Summary:

Modeling:

The MANERR requested that the IA team run the second workshop to allow for the development of a complete CESSM. After some planning discussions, the CESSM workshop was scheduled for the week of May 16, 2011. The tentative agenda has been submitted to MANERR managers for planning purposes. The thesis work of MS students Niraj Ray and Lauren Kiser will be derived from the assembly and evaluation of the MANERR conceptual model.

Harte/LME:

The Gulf of Mexico, economically and ecologically one of the most productive bodies of water in the world, has significant threats and stressors. After many years of proposal development and planning, the Gulf of Mexico was funded for an initial GEF grant as an Large Marine Ecosystem

(LME). Mexico is the lead partner in this multiyear program that began in 2009, under the guidance and oversight of UNIDO. Dr. Wes Tunnell, appointed by NOAA to be on the Steering Committee for the LME in June 2009, has been engaged in the LME process since that time in Gulf-wide meetings in Merida, Miami, and Veracruz. The required Transboundary Analysis and Strategic Action Plan have now been completed, and three pilot projects are underway. Dr. Jorge Brenner and TAMUCC-ECSC PhD student Sandra Arismendez worked on a review of all LME programs worldwide with Dr. Tunnell. That large paper, submitted for publication and review in 2008, has been extensively reworked and shortened to meet the requested requirements from the editors and should be re-submitted later in the spring or summer of 2011.

Navigation and Port Issues:

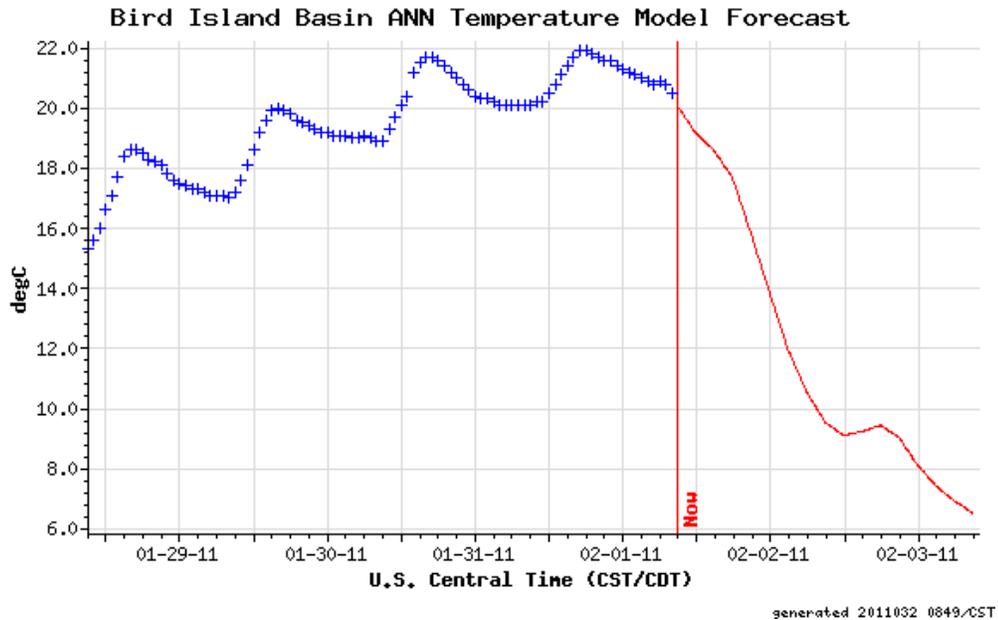
Hydrodynamic modeling of Corpus Christi Bay and MANERR has continued. During the last two years, the hydrodynamic model FVCOM was calibrated for Corpus Christi Bay by ECSC students, including most recently by MS student Yelena Nevel. Ms. Nevel tested a data assimilation scheme based on measured currents in the Corpus Christi channel. While the data assimilation method nudged the currents locally, there was no significant impact on the overall performance of the model. It was concluded that measurements at a broader set of locations would be necessary for the strategy to be successful (Yelena Nevel MS Thesis). Based on computational efficiency and ease of implementation, the US Army Corps of Engineer CMS model was adopted to replace the FVCOM model. Student Sergey Reid calibrated the model for Corpus Christi Bay with water levels within 3cm inside the bay and within 6cm overall for a 20 day test case (presented at 2011 American Meteorological Society Student Conference in Seattle). Sergey Reid is presently extending the model to include MANERR and experimenting with resolution and boundary conditions to improve model performance. Student Julien Clifford is developing a Google Map visualization system for the hydrodynamic model results coupled with water level charts.

Progress continues in the application of the water level predictive model based on artificial neural networks. Student Domingo Hiracheta presented results (at a TAMUCC Undergraduate Seminar) of a related statistical analysis for Tampa Bay and Mobil Bay explaining significant differences between these locations and Texas embayments by contrasting hydrodynamic setting and bathymetry. Student Whitney Rutledge is using lagged correlation analysis between various locations in Chesapeake Bay to study the potential of the method to predict water levels for the Port of Baltimore. While the elongated shape of the bay and the resulting lags in the overall water level dynamic seem well suited for the technique, riverine inputs play a more important role than for previous locations and will need to be taken into account.

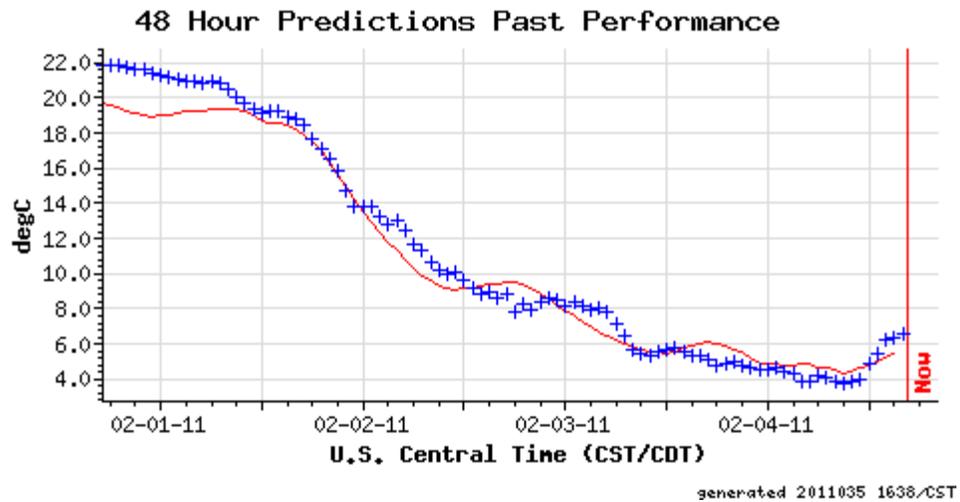
A real-time water temperature prediction model previously developed by student Robyn Ball and IA team member P. Tissot is being used in the Laguna Madre. It takes only a day or two for the temperature of the mostly shallow waters of the Laguna Madre to equilibrate with air temperatures., which can result in very cold water temperatures that impact fisheries and turtles, for example. Barge traffic re-suspends sediment that affects lethargic fish during cold events. When the model predicts low temperature, announcements go out for voluntary barge traffic suspensions. The model is based on artificial neural networks and uses real-time measurements from the Texas Coastal Ocean Observation Network (TCOON) and atmospheric predictions provided 4 times per day by the local office of the National Weather Service.

The model was used in January 2010 and recently in February 2011. Advised by IA team member P. Tissot, the Gulf Intracoastal Canal Association (GICA) sent the following statement to its members

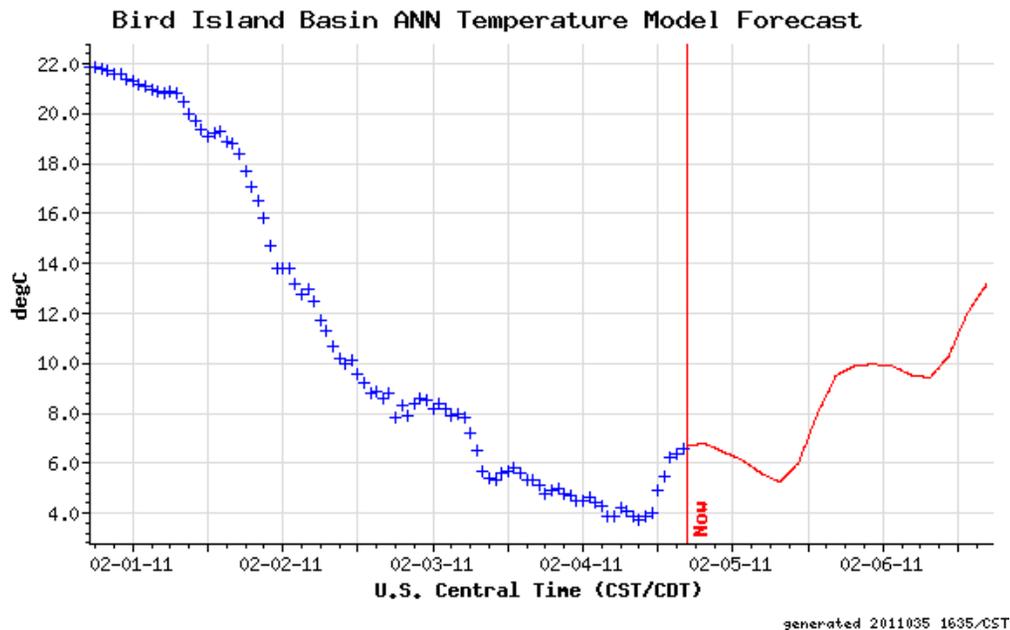
“GICA, TAMUCC, TXPWD and CCA Texas are now requesting members to voluntarily suspend transit through the Laguna Madre reach from south of JFK Bridge at Corpus Christi to Port Isabel from 0600 Thursday, 3 February through 0600 Saturday, 5 February 2011.” The advice was issued at 9AM on Tuesday February 1st (see graph below), almost 48 hrs prior to the start of the closure, allowing barge companies to prepare for the event.



The following figure shows the 48 hour prediction model performance between Tuesday February 1st and Friday February 4th (i.e. most of the traffic interruption time)...:



...and the prediction used for final advice on termination of traffic interruption (Friday Afternoon 4:36PM):



Preliminary data indicated about 1,200 cold stunned turtles, mostly green sea turtles, stranded in the Laguna Madre. The voluntary traffic suspension enabled by the collaboration between industry, a conservation association, a state agency (TPWD) and a university combined with the development of an accurate model likely contributed to mitigate the impact of this cold water event.

Fennessey GIS:

GIS work continues at the Fennessey Ranch, encompassing over 3500 acres of upland, freshwater wetland, and riparian habitat permanently managed under a conservation easement (CE) through the Mission-Aransas NERR program. ECSC graduate fellow Nicole Morgan Davis completed analyzing community- and population-level data designed to address unique components of this riparian system compared to other adjacent watersheds, and is developing a succession model for the riparian vegetation community encompassing the non-tidal/tidal segments of this coastal river. Four hydrologic models were constructed using increasing complexity of data layers to develop a methodology to map riparian corridors. This information will be used in the riparian section of the environmental flows regime recommendations underway at the state level for this basin. All information, analyses and results will have been submitted to Mission-Aransas NERR to assist in the management of the CE on Fennessey Ranch as of the completion of the project in March 2011.

IA-TA Goal 7: *Transfer ECSC IA methodology to NOAA sites and other stakeholders dealing with coastal resource management issues*

Performance Indicators for Goal 7

- 1) Number of trained students employed by NOAA and/or NERRs. Measure for Yr 5- 4
-Progress: Sandra Arizmendez with NOAA Response and Restoration Group in LA; others with IA training are captured in other thematic areas

- 2) Number of newly trained students employed by state or private resource management agencies.
Measure for Yr 5- 4
-Progress: None as of February
- 3) Number of graduates moving to graduate school or postdocs in coastal resource management.
Measure for Yr 5- 4
-Progress: None as of February
- 4) Number of NERR and other NOAA site personnel involved in ECSC activities. Measure for Yr 5- 6
-Progress: There are five NERR and NOAA personnel working with ECSC projects and activities as of February
- 5) Number of ECSC-related workshops and activities at partner, NERR, and other NOAA sites.
Measure for Yr 5- 3
-Progress: There are two in the planning stages as of February
- 6) Number of non-ECSC sites utilizing ECSC resources, personnel, or methodologies. Measure for Yr 5- 2
-Progress: Completed. Fennessey Ranch is utilizing ECSC resources and personnel, as is the Texas Gulf Intracoastal Canal Association (GICA) (both discussed in other sections of this report)
- 7) Number of published IA manuscripts derived from ECSC activities. Measure for Yr 5- 1
-Progress: Completed: one manuscript from past IA work at DNERR and one accepted with revisions, one from Gulf modeling, two from Fennessey Ranch work, with others in review
- 8) Number of briefings, presentations, or requests focused on ECSC data and activities. Measure for Yr 5- 2
-Progress: Completed: 12 presentations, five with student presenters

Performance Summary:

Student Bullet Points and Details:

- Sandra Arismendez (PhD TAMUCC May 2010) has just accepted a job with NOAA's Response and Restoration group in Baton Rouge, LA where she will start in mid March 2011 working on the BP Deepwater Horizon Oil Spill.
- ECSC Student Sergey Reid is a NOAA Hollings Scholar and will work during the summer 2011 at NOAA offices in Honolulu, HI.
- ECSC IA student Sergey Reid won 1st place in the oral presentations competition at the 10th TAMUCC Undergraduate Research Symposium, Corpus Christi, TX last September for the presentation "Hydrodynamic Model Comparison for Corpus Christi Bay".

Non-Student Information:

- GBNERR staff are finalizing the last CEM matrices and developing an outline for an associated manuscript. They are working with other NERR site staff and IA to explore publication options (e.g. Gulf and Caribbean Research, PLOS, etc.).
- The session proposal on IA work prepared and submitted by Michael Reiter and Geoff Scott to the CERF 2011 conference planning committee was accepted and is in the conference

schedule (see following, italics). The plan is to highlight the IA's integrated assessment approach, but we will involve other researchers with related approaches as well. One group in particular we plan to have represented is the GOMA integrated ecosystem assessment group. IA team member Mark Woodrey has presented our work at GBNERR to GOMA in the past and they are very interested in our approach, so their participation in the session could be valuable to forge a stronger link for future work.

- *SCI-039 Integrated Assessments of Valued Components and Services in Estuarine Ecosystems*

Conveners: Michael A. Reiter (reiterm@cookman.edu) and Geoff Scott (Geoff.Scott@noaa.gov)

This session will focus on integrated resource management in estuarine systems, the impact of critical system stressors on the health of estuaries and the provision of ecosystem services, and integrated methods that can be used to address these issues. Presentations in the session will introduce the topic of integrated assessments for estuarine ecosystems and associated coastal regions, discuss key stressors, and present case studies of the use of integrated assessment approaches based on conceptual ecosystem models to forecast and manage stressor impacts. (SCI-039; Integrated Ecosystem Assessment; Ecosystem Stressors, Responses and Trends)

- Mark Woodrey and Christine Mohrman of GBNERR are working closely with IA team members on the site's modeling project and upcoming workshop, and Sally Morehead is playing a similar role at MANERR.
- Drs. Geoff Scott and Gary Matlock are both involved in the IA work at BCU, with Geoff acting as an advisor on MS student committees and Gary (and possibly Geoff) exploring becoming associated with the teaching faculty for the new MS program in IES at BCU.
- Research results were translated into ecosystem services provided for the riparian corridor within the Mission-Aransas NERR Fennessey Ranch Conservation Easement and presented at A Community on Ecosystem Services in Phoenix, Arizona, in December 2010. An oral presentation focused on the challenges involved in crosswalking from ecological functions to services as defined by ecosystem service standards. An emphasis was given to issues at various spatial and temporal scales. Mapping ecosystem services using GIS tools within the Mission River Watershed was assessed and recommendations given on the benefits at a spatial level in a poster presentation at the same meeting. Research results from the Mission-Aransas NERR conservation easement were incorporated in the Riparian Vegetation Overlay section of the environmental flow regime recommendation report from the Guadalupe, San Antonio, Mission and Aransas Rivers and San Antonio, Copano, and Aransas Bays (GSA Bay and Basin) Expert Science Team. An invited presentation was also given to the GSA Bay and Basin Stakeholder Advisory Committee on riparian ecology as related to hydrologic flow regimes on the Mission River in September 2010. This information was posted on their website and will be used to assist in developing recommendations of flow regimes to Texas Commission on Environmental Quality.
- Philippe Tissot is on the organizing committee planning for a workshop co-organized with Texas A&M University to gather input on priorities to improve the availability and communication of data for navigation, emergency situations and other coastal situations.

Participants will include staff from federal (NOAA-NWS and CO-OPS, USACE), state agencies (TGLO, TWDB, TXDOT), US Coast Guard, pilot associations, emergency management and other coastal users.

Other Notable Activities by IA Participants during this Period:

- The new Master of Science in Integrated Environmental Science at Bethune Cookman University was approved by SACS during this reporting period. This new degree program is part of the Department of Integrated Environmental Science initiated at Bethune-Cookman University. Drs. Gary Matlock and Geoff Scott of NOAA are involved in the program, new faculty will arrive shortly, and a new Center for Integrated Environmental Science is being developed part of this effort (the building is scheduled to be ready for occupation in late March). As part of this development, Dr. Reiter was appointed Director of the IES Graduate Program at BCU. An undergraduate minor in Environmental Justice is now making its way through campus curriculum channels, with a proposed start date of Fall 2011. Once approved, the department will offer a BS degree, an MS degree, and two undergraduate minors.
- Dr. Reiter was nominated for the Excellence in Research and Community Service award at BCU during this reporting period.
- Dr. Smith was nominated to membership on the Guadalupe-San Antonio, Mission-Aransas Bays & Basins Expert Science Team, Texas Senate Bill 3 Watershed Planning Group (April 2010 – February 2011) and their Stakeholders Committee (April 2010 – present). She was also invited to become a member of the San Antonio Bay Partnership (January 2010 – present) and their Scientific-Technical Subcommittee (June 2010 – present).

I:5) Integrated Social Sciences

Anthony Wilbon, 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. More importantly, this thematic area exposes students to the methodologies needed to understand the human/ecosystem linkages that lead to the expected outcome in the NOAA’s strategic Ecosystem Mission Goal of “A well-informed public that acts as stewards of coastal and marine ecosystems.” Its participants comprise faculty from Morgan State University, Florida A&M University, and University of Miami as well as NOAA representative (Table I.5A).

Through the ISS thematic area, the ECSC provides NOAA and its partnering agencies a unique source of expertise. While the science data needed to develop the conceptual models are critical, we consider providing students an understanding of the social and economic factors that affect management strategies as equally important.

In this thematic area, the ECSC’s distinctive capability includes a multidisciplinary faculty representing natural resource/agricultural economics, community planning, sociology (demography, environmental sociology), history and management. Together our research expertise encompasses the use of 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.

As given in the ISS implementation plan, which was generated in year one, the objectives are listed below. Following each objective are the accompanying performance indicators (or measures), the respective indicator target goals for year 5, and the accomplishments for each indicator to date.

Table I.5A. ISS-TA Participants (students, project PI’s etc...)

Name	Faculty/Student/Other	Institution
Dr. Anthony Wilbon	Associate Professor	Morgan State University
Dr. Kelton Clark	Director	Morgan State University Estuarine Research Center
Dr. Mark Bundy	Research Faculty	Morgan State University Estuarine Research Center
Dr. Marcia Owens	Associate Professor	Florida A&M University
Dr. Dreamel Worthen	Associate Professor	Florida A&M University
Dr. David Letson	Associate Professor	University of Miami
Jolvan Morris	Student	Florida A&M University
Ariana Marshall	Student	Florida A&M University
Leticia Allen	Student	Florida A&M University
Rhianna Neely	Student	Florida A&M University

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. Goal for Year 5 = 3 projects.

There are two projects approved in the ISS thematic area: the MSU Oyster harvesting project and the FAMU Environmental justice analysis in Port St. Joe, Florida

MSU Oyster Micro-hatchery Project

Morgan State University's project to develop a prototype of an alternative business model for the Maryland oyster industry has been ongoing and will continue through this period. The overall goal of the project is develop an integrated model for a stable, sustainable oyster industry through development of a micro-hatchery.

The findings to date primarily concern start up costs, labor costs and fuel cost. Data on growth rates, mortality rates and Dermo intensity are currently being collected and will be applied to future analysis. As new data comes in the exact figures of the model will change, reflecting the increased amount of data. The start up and running costs for the first year have been estimated to be \$19,835, of which \$16,862 has been spent to date.

These cost figures were put into the Aquaism model and projected 10 years into the future starting from the summer of 2009. The model runs 300 iterations and gives probabilities and averages for key results. Given the assumptions of the model¹, it shows that there is a 91% chance of economic success for an aquaculture business of this kind. Economic success is defined in this case as profit exceeding the cost of all the inputs. In the other 9% of cases the oyster farm still remained solvent. The average yearly net revenue of the farm, starting in 2010 (the assumed end of the first grow out period) was \$18,914.

These findings indicate that aquaculture on this scale is profitable enough to attract watermen to enter the business while allowing them to continue to do more traditional income generating activities. Aquaculture on this scale results in a cumulative average of \$102,562 of wages to the watermen and \$67,664 in profit. The average ending net worth is \$83,600 with a variance of 8%.

FAMU St. Joe Project

Preliminary visits have been made to Port St. Joe to tour the site and meet with a resident who was a named plaintiff on a lawsuit against St. Joe Paper Company. The pleadings from the lawsuit, which has been completed, were shared with Dr. Worthen and Dr. Owens. The pleadings contain environmental reports, including environmental impact statements. These documents are being evaluated for environmental justice implications. Focus group and case

¹ Aquaism Application Version 1.0, developed by C.M. Gempe saw of the University of Delaware, Douglas Lipton and Sherrell Goggin of the University of Maryland.

study methodology are in continued development. Qualitative software selection is ongoing. A research plan and calendar are being finalized for summer activity from April-August 2011. A site for focus groups and community meetings has been identified.

2) Additional student training

*Environmental Ethics is being offered on the graduate level for the first time at FAMU. Two (2) ECSC students (Jolvan Morris and Lorielle Jackson (undergraduate)) are enrolled. Two (2) other graduate students are enrolled.

*ECSC Students Jolvan Morris and Ariana Marshall were trained in qualitative methodology, including mixed methods research methodology during a special topics course. Both are employing mixed methods in their thesis/dissertation research, and will assist in data gathering for the project. Two (2) other doctoral students, Rhianna Neely and Viniece Jennings also participated in the special topics course. Neely is employing mixed methods research in her dissertation project and will assist in the Millwood Study

*Ariana Marshall and LaTrisha Allen were part of a research trip to Apalachicola and Port St. Joe where they along with NOAA Intern Kasim Reed and Savannah State University students, toured the communities, spoke to residents, and reviewed documents in local government offices.

3) Number of conference presentations by faculty and /or students resulting from ECSC-approved ISS projects. Goal for Year 5 = 3

We exceeded this goal with the following conferences. We expect to attend other conferences to meet this objective before the end of the reporting year.

FAMU faculty and students have presented at the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers Regional Meeting (October 2010), and the Environmental Justice and Law Symposiums (November 2010).

*Dr. Worthen and Ariana Marshall participated in the SoGreen Network Conference held on FAMU's campus (February 2011).

Dr. Kelton Clark presented at the World Aquaculture America 2011 conference in New Orleans, LA on the MSU oyster project (March 2011)

*Students Erik Davenport (MSU) and Jolvan Morris (FAMU) will present at the ECSC Center Directors Meeting (March 2011).

4) Number of publications by faculty and/or students in refereed journals based on ECSC-approved ISS research. Goal for Year 5 = 2 journal articles

We have met goal with the following papers.

a) Marshall, A., Robinson, L. and Owens, M.A. Coastal construction trends in response to coastal erosion: an opportunity for adaptation *Journal of Coastal Conservation* (14 September 2010), pp. 1-12-12. doi:10.1007/s11852-010-0120-5

b) Wilbon, A.D., Bundy M., and Clark, K. (IN PRESS). Case Study: Entrepreneurship in the Chesapeake Bay Oyster Industry. *International Journal of Case Studies in Management*.

c) Wilbon, A.D., Bundy M., and Clark, K. (IN PRESS). Teaching Notes: Entrepreneurship in the Chesapeake Bay Oyster Industry. *International Journal of Case Studies in Management*.

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 Year 5 - 100% of the students working on ISS related projects present at conferences and/or publish journals.

1) We have students working on all 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 Year 5 - 50% of the students working on ISS related projects receiving internships at NOAA.

The following students have received internships:

- * 1) Jolvan Morris – FAMU Master’s student received an internship and an offer of SCEP employment with the Northeast Regional Office of NOAA Fisheries
- * 2) Nancy Metayer - FAMU undergraduate student received an internship with the Northeast Regional Office of NOAA Fisheries

3) Percentage of students working on ECSC-approved ISS projects employed by NOAA or related agencies/firms. Goal for Year 5 - 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 Year 5 - 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 Aquaculture Division. It also includes partnership with 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.

2) Percentage of ECSC-approved project results/findings presented at NOAA sites by ISS faculty and /or students. Goal for Year 5 - 50% of the projects will be presented at NOAA sites by ISS faculty and students.

*Students Erik Davenport (MSU) and Jolvan Morris (FAMU) will present at the ECSC Center Directors Meeting (March 2011).

Section II: Success Stories

- 14 peer reviewed publications that were directly tied to ECSC research 6 of which were student authored and/or co-authored
- 36 presentations at professional meetings 15 of which were given by students
- Sandra Arismendez (PhD TAMUCC May 2010) accepted a job with NOAA's Response and Restoration group in Baton Rouge, LA where she will start in mid March 2011. She will be working on the BP Deepwater Horizon Oil Spill.
- ECSC Student Sergey Reid is a NOAA Hollings Scholar and will work during the summer 2011 at NOAA offices in Honolulu, HI.
- ECSC Student Frank Johnson is a NOAA Hollings Scholar and will work during the summer 2011 at the NMFS Southeast Fisheries Science Center in Miami FL.
- A proposal for a session at the Coastal and Estuarine Research Federation Biennial Meeting (CERF) 2011 entitled '*Integrated Assessments of Valued Components and Services in Estuarine Ecosystems (SCI-039)*' was accepted. Michael Reiter (ECSC PI and Prof at BCU) and Geoff Scott (NOAA) are the co-conveners of this session.
- A proposal for a session at the Coastal and Estuarine Research Federation Biennial Meeting (CERF) 2011 entitled '*Comparative Studies of Protected Coastal Habitats*' was accepted. John Schalles (ECSC PI and Professor at Creighton) and Charles Jago (ECSC Distinguished Scientist and Professor at FAMU) are conveners, along with Evelyn Gaiser of Florida International University
- ECSC IA student Sergey Reid won 1st place in the oral presentations competition at the 10th TAMUCC Undergraduate Research Symposium, Corpus Christi, TX last September for the presentation "Hydrodynamic Model Comparison for Corpus Christi Bay".
- Jolvan Morris (MS FAMU) received an internship and an offer of SCEP employment with the Northeast Regional Office of NOAA Fisheries. . She is expected to graduate April 2011.
- Nancy Metayer – (BS FAMU) received an internship with the Northeast Regional Office of NOAA Fisheries
- A short film entitled 'From Education to Exploration: Students at Sea' was shown in the NOAA Kiosk at The Smithsonian-Ocean Hall in Washington D.C. as well as 15 other aquarium/museums kiosks around the country in November, December, and January It has gone into the archive and will rotate on and off with the rest of the videos. The link to the video on the NOAA Ocean Today website is as follows
<http://oceantoday.noaa.gov/studentsatsea/> .

Section III: CSC Wide Collaborative Research

The NOAA-EPP supports 5 Cooperative Science Centers (CSCs) including the ECSC. To date, inter-center collaborations involving two or more CSCs have been limited. To increase collaboration and interactions among centers, ECSC has established ongoing collaborations with 2 other CSCs (CREST at CUNY and LMRSC at UMES), and continues to explore opportunities with the remaining two CSCs.

The Deepwater Horizon oil spill, and its potential ongoing impacts, represents a unique opportunity for collaboration among the CSCs. In addition to NOAA's interests in this area, there are a variety of important scientific questions to address, as well as considerable potential for student training. As the CSC located closest to the Gulf of Mexico, the ECSC has a variety of historical data and ongoing research efforts that are relevant to oil spill questions. ECSC partners have been performing research for several years at two National Estuarine Research Reserve (NERR) sites, the Grand Bay NERR (GBNERR) in Mississippi and the Apalachicola NERR (ANERR) on the Florida panhandle. Research by ECSC scientists and students at these sites has included 1) high resolution imaging and hyperspectral data from marsh, seagrass and open water habitats accompanied by ground-truthing surveys and sampling of water and biota, 2) investigations of ecosystem status and ecological processes and 3) integrated ecological, economic, social science and natural resource risk assessments, including development of both conceptual and quantitative models. For example, aerial imagery and hyperspectral data were gathered by aircraft, with concurrent ground truthing, at GBNERR in May 2003 (pre Hurricane Katrina), May 2009 and May 2010 (before oil arrived in the area). Similar survey campaigns were also conducted at ANERR in the spring of 2002 and 2006. In addition to aircraft data, water was collected at several dozen stations with the NERR sites during each campaign for a suite of chemical and biological analyses (including salinity, DO, C and N, nutrients, trace elements chlorophyll, phytoplankton, and bacteria). Ground surveys were also done of seagrasses, marsh vegetation, and plant biomass. ECSC scientists are lead or coPIs on several projects funded by BP through the Florida Institute of Oceanography that focus on immediate data needs, particularly collection and analysis of water, sediment and fish samples. ECSC activities related to the oil spill are summarized at <http://sites.google.com/site/noaaecscspillresponse/>.

ECSC Distinguished Scientist Charles Jagoe began discussions with Reza Khanbilvardi and Shakila Merchant of the Cooperative Remote Sensing Science and Technology Center (CREST) at CUNY about possible collaborations on oil-spill related research in July 2010. He then visited CREST in New York, NY in August 2010 to further discuss opportunities and potential projects. Collaborators at CREST include Samir Ahmed, Alex Gilerson and Irina Gladkova. Several potential projects were identified, focusing on using remote sensing products to detect oil sheens, and to assess chlorophyll concentrations in nearshore and offshore areas.

The proposed work builds on ongoing interactions and collaborations between the ECSC and CREST in the areas of remote sensing and coastal ecology. The history of these interactions goes back over 5 years. In the winter and spring of 2005, Alex Gilerson (CREST) and John Schalles and Christine Hladik (ECSC) planned a large, joint project for measuring water optics, including remote sensing reflectance. This project involved three teams operating on different boats in a 10 day, 50 station survey of the Maryland section of Chesapeake Bay coincident with hyperspectral and imagery collection by aircraft in July 2005. The data collected was used in two theses by ECSC

students (Whitehurst and Hladik), a book chapter in a coastal remote sensing volume (Schalles), two joint CREST/ECSC peer reviewed publications and several additional journal articles. Other collaborators included Morgan State's Estuarine Research Center, the Maryland Chesapeake Bay NERR (Otter Creek Point and Monie Bay sites), NOAA National Marine Fisheries Laboratory at Beaufort, NC, and students and faculty from six ECSC partner schools (Creighton, Delaware State, Florida A&M, Jackson State, Morgan State, and Nebraska) and students and faculty from City University of New York and Kent State University. The other main project was salt marsh mapping, resulting in a species-level mapping of the wetland habitats of the Monie Bay unit of the MCBNERR (master's thesis by Paul Merani at the University of Nebraska).

The next joint ECSC-CREST effort was initiated in the winter and spring of 2006, by Alex Gilerson (CREST) and John Schalles and Christine Hladik (ECSC). This project included field surveys to support an AISA hyperspectral aircraft flyover mission at the Sapelo Island (GA) NERR and additional water and wetland sites located between St. Andrews and Sapelo Sounds. A planning meeting that included ECSC and CREST scientists was held at the University of Georgia Marine Institute in the spring of 2006. The field campaign involved five days of water optics measurements using four boat teams and 74 sets of station measurements, and twelve days of intensive salt marsh transect sampling involving 500 comprehensive vegetation plots (species covers, above ground biomass, canopy heights, soil properties, submeter GPS locations, photography, and invertebrate counts). Chlorophyll and CDOM maps were produced from AISA flightlines of the Duplin River and its tributaries and species-level and aboveground biomass maps for the entire 1200 ha Duplin Watershed salt marsh. Participants included the same ECSC and CREST schools from the 2005 program, the Sapelo Island NERR, the University of Georgia Marine Institute, the Georgia Coastal Ecosystems LTER-NSF project, the Skidaway Oceanographic Institute, and the University of Houston.

In May 2007 John Schalles (ECSC) spent a week in residence with the CUNY-CREST group in New York City. He presented a seminar representing a synthesis of five years of ECSC coastal remote sensing studies, performed joint data analysis and water optics modeling with CUNY students and faculty, and discussed prospective joint manuscripts and new field campaigns. Alex Gilerson of CREST participated in the ECSC annual meeting and further discussions of joint work. In 2008, Alex Gilerson participated in a planning workshop convened by John Schalles and Sally Morehead (Mission-Aransas NERR) at the University of Texas Marine Institute at Port Aransas, TX (<http://www.utmsi.utexas.edu/mission-aransas-nerr/research-and-monitoring/hyperspectral-imaging-project.html>). The workshop was used to plan another large scale AISA flyover project and related wetland and water quality surveys at Mission-Aransas NERR and nearby Corpus Christi and Nueces Bays and the inland Fenessey Ranch Property on the Mission River. However, logistic challenges including issues about shallow depths and water clarity for many surface water habitats, other project commitments, and budgetary issues resulted in a decision by the CREST group not to participate in the 2008 summer field campaign. Nonetheless, Dr. Gilerson again attended the ECSC annual meeting, held in the winter in Jacksonville, Florida.

The CREST group was invited to participate in joint AISA flyover projects at Grand Bay in May of 2009 and the repeat of the project in May 2010, during the Deepwater Horizon incident but before detectable oil reached the MS coast. Their participation was precluded by other CREST field projects - especially the installation and start-up work of their monitoring platform in Long Island

Sound, and the travel distance and expense of traveling to the Mississippi coast. However, significant discussions about water optics issues continued during this period and plans were made to send an ECSC graduate student (John Olley - M.S. thesis student at Creighton) to the CUNY campus in March, 2011 for training purposes and to foster joint initiatives in water optics measurements.

At the present time, ECSC and CREST are pursuing several collaborative projects. John Schalles, Alex Gilerson, and Sam Ahmed (CUNY-CREST) participated in water optics sessions and made presentations that included joint data and analyses at the ASLO Ocean Sciences Meeting in March in San Juan, Puerto Rico. They also held serious discussions about possible joint field work on at field sites in the Mid-Atlantic and at Long Island Sound. Prospects are good for work this summer, but details and funding sources are still under consideration. ECSC graduate student John Olley spent the a week in March 2011 working at CUNY-CREST with graduate students and faculty. He shared pilot water optics and related field data collected in Nebraska and Texas over the past 6 months, and learned to use the Hydrolight software package for forward and inverse modeling of radiative transfer processes using his own data. He also learned about the CUNY group's use of polarization with spectroradiometer foreoptics to isolate scatter versus fluorescence components of the diagnostic algal chlorophyll reflectance; this is a novel technique to reduce noise when using an optical signal to remotely measure chlorophyll concentrations in surface water. The student will be using these tools in fieldwork beginning in the spring and summer of 2011.

In another initiative, we are exploring the availability and utility of satellite imagery to detect changes in surface waters associated with the Deepwater Horizon oil spill. Such changes can be used to assess variation in chlorophyll and CDOM content of waters, and may indicate effects of the spill on plankton or system biogeochemistry. Several viable image and hyperspectral data sets are readily available, at no cost for research and educational use through several public inventory databases (i.e. NASA's Warehouse Inventory Search Tool). Such imagery includes Moderate Resolution Imaging Spectroradiometer (MODIS) Aqua, Medium Resolution Imaging Spectrometer Instrument (MERIS), and to some extent, Sea-viewing Wide Field-of-view Sensor (SeaWiFs; while this was discontinued in December 2010, before the spill, data from this source may still be useful in assessing pre-spill conditions) and Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER). While most products are effective in the analysis of offshore waters, signals from coastal waters are often difficult to interpret, as optical properties in these waters are complicated by shore runoff and drainage and other factors. Ultimately, while several studies have shown the effectiveness of each individual product, MERIS appears to provide the best possible discrimination in coastal areas. Furthermore, DigitalGlobe's new WorldView-2 satellite may also be a source of relevant data. As the only commercially available high-resolution 8-band multispectral satellite imagery, WorldView-2 provides enhanced spectral diversity that would be useful for the discrimination of chlorophyll *a* and the estimation of phytoplankton abundance. We are also investigating the availability and suitability of geospatial data about the extent and magnitude of oil contamination in the Gulf during and after the accident, in order to correlate this information with remote sensing products that measure chlorophyll and other surface parameters. In addition to satellite imagery, geospatial data is available from several states and federal agencies that were actively monitoring the spread of the oil during and after the accident.

The following timeline indicates tasks and expected results for these projects for the remainder of 2011:

March 2011: ECSC student receives training on Hydrolight software and the use of polarization to improve fluorescence detection of chlorophyll by optical sensing at CREST (completed)

May-June 2011: Optical remote sensing and field collection of samples at selected NERR sites (planned and pending)

May-August 2011: Identification and acquisition of relevant satellite data to assess oil spill impacts; evaluation of data quality and potential utility. Investigate the availability of geospatial data (from academic, commercial, state and federal sources) about the extent of oil slicks, sheens and tarballs during and after the Deepwater Horizon event to define the spatial areas likely to be affected by the spill (planned and pending)

July-September 2011: Explore additional field data acquisition (optical measurements and water sampling) at additional NERR sites and Long Island Sound (pending arrangements with NERR, CREST and ECSC personnel)

At the March 2011 ASLO Ocean Sciences Meeting in San Juan, Puerto Rico, John Schalles (ECSC) and Paulinus Chigbu (Living Marine Resources CSC) met to review future initiatives of the two centers and prospects for joint work should both groups receive renewal funding. Faculty and students from the Living Marine Resources campuses are being notified about, and invited to participate in the upcoming field campaign and WorldView2 satellite data acquisition in late spring of this year at the Grand Bay NERR.

The Distinguished Scientists from the ECSC and LMRCSC met in December 2010 and again in March 2011 and planned a joint project to evaluate mercury contamination in gastropod mollusks. These animals are important members of many benthic marine communities, and are utilized as food in many cultures; for example, conchs are commonly consumed in south Asian coastal areas and the Caribbean. Whelks (including *Busycon* and *Busycotypus* sp.) are also used as food. They are commercially harvested in the United States, to be sold and consumed as scungilli, an Italian-American specialty. While contaminant data is available for a variety of other edible mollusks (for example, through NOAA's Mussel Watch program), there is little data about contaminants in edible marine gastropods.

To address this data gap, we will collect and analyze whelks from coastal New England, and possibly from waters in the mid-Atlantic region. The LMRCSC has an ongoing research project involving age and growth, genetics, and reproductive biology of channeled whelks *Busycotypus canaliculatum* in Massachusetts. Whelks are already being collected for this project, and tissue samples from the summer of 2011 will be available for contaminant analysis. We will also collect samples of knobbed whelks, *Busycon carica* from the Delaware-Maryland-Virginia area. Selected tissues, including organs (hepatopancreas) and edible muscle will be collected, frozen, and transported to the ECSC for analysis. As an initial investigation, tissues will be analyzed for total Hg using an EPA-recognized method (USEPA method 7473) using a Milestone DMA80 analyzer. Other shellfish are known to accumulate both inorganic and methyl mercury, which differ in both toxicity and potential for trophic transfer. Therefore, it would be desirable to measure methyl mercury in at least a subset of samples, in addition to total mercury. We are currently investigating

possibilities for methyl mercury analyses with additional collaborators, including NOAA laboratories. Measurements of stable isotopes of C and N ($\delta^{15}\text{N}$ and $\delta^{13}\text{C}$) in contaminant studies can provide information about trophic transfer and biomagnification, and may suggest sources and routes of contaminant accumulation. We have identified a potential collaborator who may be able to perform C and N isotope analyses at very low cost, and anticipate adding these parameters to our data sets. Samples will be archived and may be analyzed for additional contaminants or other parameters in the future, pending initial findings, availability of funding, and interest by NOAA and external collaborators.

This study will include participation by students from both the ECSC and LMRCSC. Students will be involved in sample collection, contaminant measurement, statistical analysis, and the preparation of manuscripts and the presentation of data at scientific meetings. Initially, this will be a “side project” for our graduate students, performed in addition to their related thesis research projects, and undergraduates may also participate. However, this may grow into a larger project for additional student efforts in the future. We also anticipate that this study may be the first of a series of intercenter collaborations on contaminants in marine benthic invertebrates. For example, the Distinguished Scientists from the ECSC and LMRCSC have recently discussed potential studies of Hg in red crabs (*Chaceon sp.*, a deepwater crab that is commercially harvested) from areas along the northeastern US coast polluted by deepwater waste disposal. Nonetheless, the present project represents a true collaborative effort that can be accomplished in a relatively short time for a small investment, which will provide novel data of interest to NOAA, and is aligned with NOAA strategic goals.

The following timeline indicates tasks and expected results for this project for the remainder of 2011:

Jan-March 2011. Define problem, identify collection areas, identify methods and resources, approach potential collaborators (completed).

May-July 2011. Collect and process samples (planned and pending)

July-September 2011. Analyze samples for total Hg; perform QA/QC and initial statistical analysis (planned and pending).

September 2011-December 2011. Analyze samples for methyl mercury and stable isotopes (pending commitments from NOAA and external collaborators). Prepare and submit manuscript (planned and pending).

Additional collaborative opportunities between CSCs are the subject of ongoing discussions among the Center Directors and Distinguished Scientists. A proposed consortium, to be formed among the CSCs, represents a conduit for future collaborations and funding opportunities. As an example of the latter, CREST and ECSC developed a joint preproposal for the NOAA Environmental Literacy Grants for Formal K-12 Education Program titled “Increasing Ocean and Climate Literacy Among Elementary School Students and Teachers by Applying a Holistic Framework to Existing NOAA Resources”, and submitted this in late summer 2010. Although not selected for development as a

full proposal, we are currently seeking additional opportunities to develop and submit this proposal for funding.

Citations of publications involving joint work between ECSC and other CSCs published to date:

Zhou, J., A. Gilerson, I. Ioannou, S. Hlaing, J. Schalles, B. Gross, F. Moshary, and S. Ahmed. 2008. Retrieving quantum yield of sun-induced chlorophyll fluorescence near surface from hyperspectral in-situ measurement in productive water. *Optics Express* 16(22), 17468-17483.

Gilerson, A., J. Zhou, S. Hlaing, I. Ioannou, J. Schalles, B. Gross, F. Moshary, and S. Ahmed. 2007. Fluorescence component in the reflectance spectra from coastal waters. Dependence on water composition. *Optics Express* 15(24), 15702-15721

Gitelson, A.A., J.F. Schalles, and C.M. Hladik. 2007. Remote chlorophyll-a retrieval in turbid, productive estuarine waters: Chesapeake Bay Case Study. *Remote Sensing of the Environment*, 109(4): 464-472

Schalles, J.F., C.M. Hladik, L. Whitehurst, and P. Merani. 2006. Hyperspectral imaging of wetlands and estuarine waters of National Estuarine Research Reserves in the Southeastern and Mid-Atlantic Regions of the United States. Extended Abstract. *Ocean Optics 18 Conference*, Montreal, Canada. (14 p)

Schalles, J. F. 2006. Optical remote sensing techniques to estimate phytoplankton chlorophyll *a* concentrations in coastal waters with varying suspended matter and CDOM concentrations. In: (L. Richardson and E. Ledrew, editors) *Remote Sensing of Aquatic Coastal Ecosystem Processes: Science and Management Applications*. Springer. pp. 27-79.



Appendix A Publications

NOAA ECSC Publications

*(Student Publications are denoted with an asterisk *)*

Boleques, A., J. Cherrier, M. Abazinge, and G. Matungwa. 2011. Installation of a Bioretention/Rain Garden to Mitigate Agricultural Irrigation Runoff from a Container Plant Nursery. *Proc. Fla. State Hort. Soc.* 123: 1-4.

Chen, S.S, Huang, W., Chen, W., and H. Wang. 2011. Remote sensing analysis of rainstorm effects on sediment concentrations in Apalachicola Bay, USA. *Journal of Hydroinformatics. In press.*

Cho, H.J., P. Biber, and C. Nica*. 2010. The Rise of *Ruppia* in Seagrass Beds: Changes in coastal environment and research needs. Chapter (In) *Handbook of Environmental Quality*. Nova Science Publishers, Inc. Hauppauge, NY.

Cho, H.J., P. Biber, M. Poirrier, and J. Garner*. 2011. Aquatic plants of Mississippi coastal river systems. *Journal of Mississippi Academy of Sciences. Accepted.*

*Garner, J., H.J. Cho, and P. Biber. 2011. Relationships of Submerged Aquatic Vegetation of Mississippi Coastal River Systems. *Proceedings of the 2010 MS Water Resource Conference. Submitted.*

Gitelson, A., D. Rundquist, G. Dall'Olmo, W. Moses, and B. Leavitt. Real-time proximal sensing of water quality. Chapter 2 in Chipman, J., L. Olmanson, and A. Gitelson, 2009. *Remote Sensing Methods for Lake Management: A Guide for Resource Managers and Decision-Makers*. Madison, Wisconsin: North American Lake Management Society, 126 pp.

Huang, W., Liu X., Chen, X. and M.S. Flannery. 2011. Critical Flow for Water Management in a Shallow Tidal River Based on Estuarine Residence Time. *Journal of Water Resources Management. Accepted.*

Huang W., Mukherjee D. and S. Chen. 2011. Assessment of Hurricane Ivan impact on chlorophyll-a in Pensacola Bay by MODIS 250 m remote sensing. *Marine Pollution Bulletin. In press.*

Islam T., A. Marshall*, and E. Johnson. Socio-economic vulnerability of African Americans to hurricanes in the Gulf Coast of the United States. *Regional Environmental Change. Accepted with revisions.*

*March, R.G. and E.H. Smith. Combining available spatial data to define restoration goals. *Ecological Restoration. In review.*

*March, R.G. and E.H. Smith. Using digital elevation models to model potential habitat responses to storm surge and sea-level rise on two Gulf Coast peninsulas. *J. Coastal Res. In final revision.*

*Marshall, A., L. Robinson. and M.A. Owens. 2011. Coastal construction trends in response to coastal erosion: an opportunity for adaptation. *Journal of Coastal Conservation* 15(1): 61-72(12).

*Masse, R. J., and K. Vulinec. 2010. Possible impact of mulitflora rose on breeding bird diversity in riparian forest fragments of central Delaware. *Northeastern Naturalist* 17:647-658.

Pataki, D.E., M.M Carreiro, J. Cherrier, N.E. Grulke, V. Jennings*, S. Pincetl, R.V. Pouyat, T.H. Whitlow, and W.C. Zipperer. 2011. Coupling Biogeochemical Cycles in Urban Environments: Ecosystem Services, Green Solutions, and Misconceptions. *Front Ecol Environ* 2011; 9(1): 27–36, doi:10.1890/090220.

Perk, R., D. Rundquist, G. Dall'Olmo, and A. Gitelson. Airborne hyperspectral remote sensing. Chapter 3 in Chipman, J., L. Olmanson, and A. Gitelson, 2009. *Remote Sensing Methods for Lake Management: A Guide for Resource Managers and Decision-Makers*. Madison, Wisconsin: North American Lake Management Society, 126 pp.

Reljin, N., D. Pokrajac and M. Reiter. Adaptive filters for processing water level data. In P. Zobic, ed. *Adaptive Filtering, Book 2 (working title)*, ISBN 978-953-307-442-9. Intech Publishing, Rijeka, Croatia. *In press.*

Schalles, J.F. Reflections on the B.P. Oil Spill. The Last Word. *Creighton Magazine*. Fall Issue - November, 2010.

Simoniello, C., P. Tissot, D. McKee, A. Adams, R. Ball*, and R. Butler. 2010. A cooperative approach to resource management: Texas gamefish win. *J. Marine Tech. Soc.* 44(5):5-9.

Tuluri F, R.S. Reddy, Y. Anjaneyul, J. Colonias and P.B. Tchounwou. 2010. Environmental modeling, technology, and communication for land falling tropical cyclone/hurricane prediction. *Int. J. Environ. Res. Public Health*, 7(5), 1937-1952.

*Velma, V. and P.B. Tchounwou. 2010. Hexavalent chromium-induced multiple biomarker responses in liver and kidney of goldfish, *Carassius auratus*. *Environmental Toxicology. In press.*

*Warner, N. and P.E. Tissot. Storm flooding sensitivity to sea level rise for Galveston Bay, Texas. *Ocean Engineering. In review.*

Washington, M., C. Wafo-Soh, P. Kirui, and H.J. Cho. Data-driven Correction for Light Attenuation in Shallow Waters. *Remote Sensing Letters. In review.*

Wilbon, A.D., M. Bundy., and K. Clark. 2010. Case Study: Entrepreneurship in the Chesapeake Bay Oyster Industry. *International Journal of Case Studies in Management*. *In press*.

Xiao, H. and W. Huang. 2010. Effects of turbulence models on numerical simulations of wave breaking and run-up on a mild slope beach. *Journal of Hydrodynamics, Ser. B* Volume 22, Issue 5, Pages 166-171.



Appendix B Presentations

NOAA ECSC Presentations

(Student Presentations are denoted with an asterisk *.)

Beasley, J., S.R. Remata, and P.B. Tchounwou. Environmental and Health Effects on Mississippi Gulf Coast Resulting from Gulf of Mexico Deep Water Horizon Oil Spill. Paper presented at the Seventh International Symposium on Recent Advances in Environmental Health Research. Marriott Hotel, Jackson, Mississippi. September 12-15, 2010.

Chen, R. F., G.B. Gardner, J. Cherrier, J.E Cable, C. Meile, , X.C. Wang, and F. Peri. Outwelling of Chromophoric Dissolved Organic Matter (CDOM) from Tropical Salt Marshes. American Society of Limnology and Oceanography Meeting. San Juan, Puerto Rico. February 2011

Cherrier, J., H. Brown*, and S. Morton. The Effects of Dissolved Organic matter on *Karenia Brevis* Growth and Toxin Production. American Society of Limnology and Oceanography Meeting. San Juan, Puerto Rico. February 2011.

Cherrier, J., J. Chanton., L. Chasar., and K. Craig. Tracing the Intrusion of the GOM-2010 Oil spill on Marine Food Webs with Natural Abundance Radiocarbon (^{14}C) and Stable Isotopes (^{13}C , ^{15}N & ^{34}S). Florida Institute of Oceanography Principal Investigator Meeting. Orlando, FL. September 2010

Cho, H.J. Invited. Seagrass and submerged aquatics of the Mississippi Coast: Changes in the coastal environment and research needs. Mississippi Museum of Natural Science, Jackson, MS. October 2010.

Cho, H.J., A. Lu*, and P. Biber. Aquatic plants of the Mississippi coast. AL-MS Bays and Bayous Symposium. Mobile, AL. December 2010.

*Cinelli, M. and D. McIntosh. Warm water tolerance of the weakfish, *Cynoscion regalis*. American Fisheries Society: Mid-Atlantic Chapter. November 2010.

*Cinelli, M. Invited. Innovative Technologies Breakfast Lecture Series: Is the weakfish getting into hot water? October 2010.

Clark, K. Aquaculture America 2011 Conference. MSU Oyster Project, New Orleans, LA. 2011.

Cordero, S.C. and P.E. Tissot. Accepted. Coastal Zone 2011: Coastal Bend Collaborative Consortium of Streaming Atmospheric and Oceanographic Environmental Data, Chicago, IL, July 17-21, 2011.

Davenport, E. (MSU) and J. Morris (FAMU) will present at the ECSC Center Directors Meeting (March 2011).

*Davenport, E., C. Fan, and J. Anderson. Description of a dynamic NPZD model that simulates hurricane effects on secondary production. American Society of Limnology and Oceanography Meeting. San Juan, Puerto Rico. February 2011.

El-Sadek L, Aggarwal A, Aggarwa V, Reddy S, and PB Tchounwou. Environmental Pollution, Oil Spill and Health Effects. Paper presented at the Seventh International Symposium on Recent Advances in Environmental Health Research. Marriott Hotel, Jackson, Mississippi. September 12-15, 2010.

FAMU faculty and students have presented at the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers Regional Meeting (October 2010), and the Environmental Justice and Law Symposiums (November 2010).

*Garner, J., H.J. Cho, and P. Biber. Landscape features of submerged aquatic vegetation communities of Mississippi coastal river systems. AL-MS Bays and Bayous Symposium. December, Mobile, AL

*Garner, J. and H.J. Cho. Submersed aquatic vegetation communities of Mississippi Coastal River Systems. Mississippi Water Conference. Bay St. Louis, MS. November 2010.

Howard B., J. Branch*, C. Mohrman, E. Johnson, R. Gragg and C.H. Jagoe. Mercury distribution and spatial variability in sediments from Grand Bay National Estuarine Research Reserve, MS. 31st Annual Meeting of the Society of Environmental Toxicology and Chemistry, New Orleans LA November 2010.

Hiracheta, D., S. Reid, and P. Tissot. 10th TAMUCC Undergraduate Research Symposium: Potential for Application of ANN Water Level Prediction Models Around the Gulf of Mexico. Corpus Christi, TX.

Jackson, N., P. Kirui, S. Ghosh*, H.J. Cho, and D. Mishra. Quantifying the impact of Gulf of Mexico oil spill on salt marshes. AL-MS Bays and Bayous Symposium. Mobile, AL. December, 2010.

Jagoe, C., R. Snyder, and J. Cherrier. Assessing the impact of the Deepwater Horizon Oil Spill on coastal regions of the Florida Panhandle. Florida Institute of Oceanography Principal Investigator Meeting. Orlando, FL. September 2010.

Jeffrey, W., J. Cherrier, and A. Chauhan. Uncoupling of autotrophy and heterotrophy: effects of the Deepwater Horizon Oil Spill on microbial food webs. Florida Institute of Oceanography Principal Investigator Meeting. Orlando, FL. September 2010

*Kishinhi, S., P.B. Tchounwou, and I.O. Farah. Molecular Approach for Targeting Specific Fecal Contamination in the Grand Bay Mississippi 7th International Symposium on Recent Advances in Environmental Health Research. September, 12-15th, 2010.

Kirui, P., M. Washington, G. Gaye*, and H.J. Cho. Depth-induced variations in hyperspectral reflectance for optical water quality studies. AL-MS Bays and Bayous Symposium. Mobile, AL. December 2010.

*McHenry MN., Z.Arslan, and P.B. Tchounwou. Determination of Mercury in Water, Sediment and Soil Samples From National Estuarine Research Reserve (NERR). Paper presented at the Seventh International Symposium on Recent Advances in Environmental Health Research. Marriott Hotel, Jackson, Mississippi. September 12-15, 2010.

Mohrman, C., C. Jagoe, J. Branch*, and R. Wood. Mercury in Mangrove Terrapins from the Florida Keys. 2010. Mercury in Mangrove Terrapins from the Florida Keys. 31st Annual Meeting of the Society of Environmental Toxicology and Chemistry, New Orleans LA. November 2010.

Mohrman, C., C. Jagoe, J. Branch*, and R. Wood. Mercury in Mangrove Terrapins from the Florida Keys. 2010. Mercury in Mangrove Terrapins from the Florida Keys. Mississippi-Alabama Sea Grant Bays and Bayous Symposium. December 2010.

*Nica, C., and H.J. Cho. A Study of Seagrass Beds at Grand Bay National Estuarine Research Reserve, Mississippi. AL-MS Bays and Bayous Symposium. December 1-2, 2010. Mobile, AL.

*Nica, C. and H.J. Cho. Study of seagrass beds at Grand Bay National Estuarine Research Reserve. Mississippi Water Conference. Bay St. Louis, MS. November 2010.

Reid, S., Y. Nevel, J. Davis and P.E. Tissot. 2011. American Meteorological Society Tenth Annual Student Conference: Hydrodynamic Model Comparison for Corpus Christi Bay. Seattle, WA, January 22-23, 2011.

Reiter, M.A., J. H. Gentile, M.H. Harwell, and M.S. Woodrey. Invited. NOAA Gulf of Mexico Alliance Integrated Ecosystem Assessment Team Meeting: Conceptual ecosystem models: A collaborative effort between the Environmental Cooperative Science Center and National Estuarine Research Reserves, New Orleans, LA. 2010.

*Sarkodee-Adoo, J., J. Cherrier., and L. Chasar. Monitoring Shifts in Drivers of Primary Productin in Two Gulf of Mexico Estuaries Following the Deepwater Horizon. Oil Spill. American Society of Limnology and Oceanography Meeting. San Juan, Puerto Rico. February 2011.

*Sarkodee-Adoo, J., J. Cherrier, and L. Chasar. Monitoring Shifts in Drivers of Primary Productin in Two Gulf of Mexico Estuaries Following the Deepwater Horizon Oil Spill. Educational Partnership Program Cooperative Science Center Spring Meeting. Washington DC. March 2011.

Schalles, J.F., C.M. Hladik, D.N Seminara*, and J.P. O'Donnell. Mapping coastal and estuarine chlorophyll concentrations. Special Session S05. Ocean Color Radiometry of Coastal and Inland Waters. American Society of Limnology and Oceanography Annual Meeting. San Juan, Puerto Rico. February, 2011.

*Schutte, M. Monitoring and evaluation of water quality in Silver Lake, Delaware. Delaware State University Presidential Inauguration Weekend. October 2010.

Simoniello, C., P. Tissot, D. McKee, A. Adams, R. Ball*, R. Butler. 2011 ASLO Aquatic Sciences Meeting: A Cooperative Approach to Resource Management: Texas Gamefish Win. San Juan, Puerto Rico, February 13-18, 2011.

Smith, E and N. Davis*. A Community on Ecosystem Services annual meeting: Finding common Ground between ecosystem services and environmental ecosystems. Phoenix, AZ, December 6-9, 2010.

Smith, E. Invited. Guadalupe, San Antonio, Mission and Aransas Rivers and San Antonio, Copano, and Aransas Bays Stakeholder Advisory Committee: Riparian ecology of the Mission River Watershed, San Antonio, TX, October 14, 2010.

Tissot, P.E. 2011 American Meteorological Society Educational Forum on Computational Intelligence Techniques: Sample Application of Computational Intelligence: Coastal Water Level Predictions. Seattle, WA. 2011.

Tissot, P.E. NOAA Center for Operational Oceanographic Products and Services (CO-OPS): Operational Models for the Support of Navigation and Coastal Decisions at CBI-TCOON. Silver Spring, MD. 2011.

Tissot, P.E. NOAA Center for Operational Oceanographic Products and Services (CO-OPS): Relative Sea Level Rise and the Texas Coastal Ocean Observation Network (TCOON). Silver Spring, MD. 2011.

Washington, M*, D. Lu, and H.J. Cho. A Water-Depth Correction Algorithm for Seagrass Mapping Using Hyperspectral Data. AL-MS Bays and Bayous Symposium. Mobile, AL. December, 2010.

Worthen, D. and A. Marshall* participated in the SoGreen Network Conference held on FAMU's campus (February 2011).



Appendix C Student Projects

NOAA ECSC Student Projects

Adeyinka, Kemi. (B.S., MSU). *A Study of Spectral Reflectance of Phytoplankton Groups For Remote Sensing Applications*. [Dr. C. Fan, advisor and R.A. Warner, NOAA/CCMA collaborator]

Allen, LaTrisha. (Ph.D. FAMU) *Effects of crude oil on coastal fish and invertebrates*. Expected Graduation date May 2014. [Dr. C. Jagoe, advisor; rest of committee to be formed].

Bleasdale, Cary. (M.S., BCU). Title Yet To Be Determined (Working on the conceptual model output of GBNERR as it relates to PAHs and mercury). [Dr. M. Reiter, advisor].

Branch Jr., John. (Ph. D., FAMU). *Determination of the Speciation and Distribution of Metal Atoms in Biological Systems and Sediments*. Expected graduation date Aug 2013 [Advisor Dr. E. Johnson and committee members Dr. C. Jagoe-FAMU, Dr. L. Robinson- FAMU, Dr. L Johnson-FAMU, and Dr. D. Apeti- NOAA]

Brown, Steven. (Ph.D., MSU). *Chemical Signaling Discrimination in Larval Setting of Chesapeake Bay Oyster, Crassostrea virginica*. [Dr. A. Wilbon, advisor].

Cinelli, Mike (M.S., DSU). *The use of aquaculture tools to study the effects of environmental change on weakfish (Cynoscion regalis)*, expected graduation date Aug 2011 [Advisor Dr. D. McIntosh-DSU Dr. R. Scarborough-DENERR, Drs. D. Fox and C. Chambers-NOAA, and J. Clark-DNREC]

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

Dickens, Keyana. (M.S., DSU). *Investigating uptake and colonization of Vibrio parahaemolyticus in Eastern oysters, Crassostrea virginica*. Graduated Aug 2010. [Advisor Dr. G. Ozbay-DSU, Dr. A. Anoruo-DSU, and Dr. R. Scarborough-DENERR].

Dugo, Mark. (Ph.D., JSU). *Variable signal of endocrine disruption by 17 β -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].

Ebube, Chukwuemeka (Ph.D., FAMU). Title Yet To Be Determined. Expected graduation date Aug 2013 [Advisors Dr. Johnson-FAMU and Dr. W. Huang-FAMU, rest of committee to be formed]

Edwards, Amy E. (Ph. D.). Dissertation title to be determined, expected graduation date May 2014 [Advisor Dr. E. Johnson-FAMU and committee member Katherine Milla-FAMU, rest of committee to be formed]

Garnder, James. (Ph.D., JSU). *Habitat Suitability Modeling for Submerged Aquatic Vegetation*. Expected graduation date May 2012 [Dr. H.J. Cho, advisor].

George, Adrienne (B.S., DSU). *Evaluating the effects of Silver Lake on water quality in the St. Jones Watershed*. Expected graduation date Aug 2011 [Advisors Dr. A. Anoruo-DSU and Dr. R. Scarborough-DNERR, 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].

Jackson, Lorielle (B.S., FAMU): *Toxicological Effects of Perfluoroalkyls in Bottle Nose Dolphins*. [Advisor Dr. M. Abazinge-FAMU, and committee members Drs. E. Johnson-FAMU, N. Henry-NOAA and P. Fair-NOAA].

Johnson, Frank. (B.S, FAMU). Title yet to be determined. Expected graduation date April 2012. [Advisor Dr. M. Abazinge -FAMU, rest of committee to be formed].

Johnson, Tiffini (BS, DSU): *Evaluating the Effects of Silver Lake on Water Quality in the St. Jones Watershed*. Graduated August 2010. (Advisors Dr. A. Anoruo -DSU, Robert Scarborough-DNERR)

Jones, Amari. (BS, FAMU). *The Investigation of Flood Simulation from Dam Failure using the Hydrologic Engineering Centers River Analysis System*, Graduated December 2010 [Advisors Dr. M. Abazinge-FAMU, Dr. L. Robinson-NOAA, and committee member Dr. E. Johnson-FAMU].

Kamerosky, A. (M.S., BCU). Title Yet To Be Determined (Working on applying IA methods to community sustainability efforts). [Dr. M. Reiter, advisor].

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. Hyun J. Cho, Dr. Paul Tchounwou, Dr. Mishra Deepak (External Advisor, Mississippi State Univ.)]

Kiser, Lauren. (M.S., BCU). Title Yet To Be Determined (Working on comparing the CESSM models for DNERR, MANERR, and GBNERR). [Dr. M. Reiter, advisor].

Kishinhi, Stephen. (Ph.D., JSU). *Source Tracking and Assessment of Bacteriological Water Quality at the Grand Bay National Estuarine Research Reserve*. Expected graduation date May 2011 [Advisor Dr. I.

Farah-JSU and committee members Dr. P. Tchounwou- JSU, Dr. Woodrey-NOAA/NERR and Dr. George Lukasik-UF).

Laurant, Akia. (M.S., FAMU). *Cumulative impacts of DOM and salinity on *Karenia brevis*: Implications for Apalachicola Bay FL*. ABD, student obtained outside work at FL-DEP. [Advisors Dr. J. Cherrier-FAMU, Dr. S. Morton-NOAA, and committee members Dr. L. Robinson and Mr. L. Edmiston-NOAA/NERR].

Marshall, Ariana (Ph.D., FAMU). *An Evaluation of Public Participation in Florida's Coastal Development Policies in Response to Sea-Level Rise*. Expected graduation data 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].

McHenry, Melanie. (Ph.D, JSU). *Ecotoxicology and risk assessment of mercury in the Grand Bay National Estuarine Research Reserve*. Expected graduation date May 2011. [Advisor Dr. Tchounwou-JSU, Dr. Arslan-JSU, Dr. Anjaneyulu-JSU, and Dr. L. Myles-NOAA].

Merani, Paul. (Ph.D., UN). *Remote estimation of biophysical parameters in selected coastal salt marshes*. [Drs. D. Rundquist and S. Narulamani, co-advisors].

Morgan Davis, Nicole. (M.S., TAMU-CC). *Riparian species composition and distribution along the upper tidal segment of the Mission River, Texas using hyperspectral imagery*. [Dr. E. Smith, advisor]

Morris, Jolvan (M.S., FAMU): *Evaluating Biological and Sociological Concerns in the Section 7 Process: Using Conservation Units to Protect Sturgeon Populations*. Expected graduation data April 2011. [Advisor Dr. M. Owens-FAMU, and committee members Dr. C. Jagoe-FAMU, K. Damon-Randall -NOAA].

Moss, Rahan. (M.S., BCU). Title Yet To Be Determined (Working on the conceptual model output of GBNERR as it relates to PAHs and mercury) [Dr. M. Reiter, advisor].

Muehlehner, Nancy. (Ph.D., UM-RSMAS). Title yet to be determined. Expected graduation date April 2012 [Advisor, Dr. AC. Langdon-UM/RSMAS, committee member Dr. D. Letson, 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., CU). *Mapping Chlorophyll *a* concentrations at NOAA NERR sites and the effect of accessory pigments on the specific absorption of phytoplankton*. [Dr. J. Schalles, advisor].

Parker, Diane. (B.S., MSU). *Methods of collecting field data using Bluetooth technology*. [Dr. A, Wilbon, advisor].

Ray, Niraj. (M.S., BCU). Title Yet To Be Determined (Working on the model predictions for Whooping Crane habitat in MANERR). [Dr. M. Reiter, advisor].

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. L. Chasar USGS, Dr. C Jagoe-FAMU, and J. Wannat-ANERR].

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].

Turner, Ramona. (M.S., FAMU). *A model for using authentic ocean science research to teach global climate change at the secondary level*. ABT, student obtained outside work at the FL-DEP. [Advisors Dr. J. Cherrier-FAMU and Dr. B. Kelley-FAMU and committee member Dr. M. Abazinge-FAMU].

Washington, Marvin. (M.S., JSU). *Hyperspectral algorithm development for water effects*. [Dr. H.J. Cho, 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].

White, Aaron. (Ph.D., FAMU). *The Use of Satellite Telemetry to Identify Sites for the Uptake of Mercury in the Loggerhead Sea Turtle*. ABD, student obtained outside work with the DOE. (Advisor Dr. L. Robinson-NOAA, committee members Dr. M. Abazinge-FAMU, Dr. D. Evans-NOAA, and Dr. R. Carthy-MOTE)

Wise, Jessica. (M.S., FAMU). *Trace metal elemental composition of otoliths of Mullet and Spotted sea trout from the Apalachicola and Grand Bay National Estuarine Research Reserves*. Expected graduation date May 2011. [Advisor Dr. M. Abazinge, committee members Dr. C. Jagoe-FAMU, Dr. T. Gerard-NOAA].

Wood, John. (Ph.D., Texas TAMU-CC). *Seagrass mapping with hyperspectral AISA Imagery in the Mission Aransas NERR*. [Dr. W. Tunnell, advisor].

Young, Yasaun. (B.S., MSU). *Distribution of abundance of Mesozooplankton in Mackall Cove and adjacent waters of the Patuxent River*. [Dr. A. Wilbon, advisor].



Appendix D Funding

NOAA ECSC Funded Proposals

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 total for 1 year

Advanced water correction for shallow coastal benthic habitat mapping. Co-PI: H.J. Cho, D. Mishra, and D. Lu. National Aeronautics and Space Administration. October 1, 2011–September 30, 2013, \$459,870.

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 total for 1 year.

Center for the Integrated Study of Coastal Ecosystem Processes and Dynamics in the Mid-Atlantic Region. National Science Foundation. Co-PI: P. Chibu and C. Fan - Morgan State University subcontract through University of Maryland Eastern Shore, September, 2010 to August, 2015. \$102,000.

Coastal Geospatial Research for Undergraduates, with an Emphasis on Oil Spill Effects on Gulf of Mexico Coastal Habitats. PI: J.F. Schalles. Nebraska Space Grant Office of the NASA National Space Grant College and Fellowship Program, 2010-2011, \$6,900.

Commitment as a Partnering Institution in the Climate Literacy Partnership in the Southeast United States (CLiPSE). PI: H.J. Cho. National Science Foundation (subcontract through Mississippi State University). January 1, 2011 - December 31, 2012, \$29,700.

Coupling Phytoremediation of Military Wastewater Pollutants and Nutrients to Generation of Environmentally Sustainable Biobased Products. PIs: A. Chauhan with J. Kostka, A. T. Cooper, M. Wetz, C. Sund, and E. Johnson. U. S. Department of Defense. \$568,472 for 3 years.

Ecological Modeling of Potential Seagrass Habitat at Grand Bay National Estuarine Research Reserve. Co-PI: C. Nica* and H.J. Cho (faculty advisor). National Oceanic and Atmospheric Administration (NOAA-National Estuarine Research Reserve (NERR) Fellowship). June, 2009 - May 2011, \$40,000.

Field Surveys for Mapping Invasive Mangroves and Surface Water Quality in Coastal Texas. PI: J.F. Schalles. Nebraska Space Grant Office of the NASA National Space Grant College and Fellowship Program, 2011, \$40,000.

Habitat Suitability Index for Submerged Aquatic Vegetation of the Mississippi Coast. Co-PIs: H.J. Cho and P. Biber. Mississippi - Alabama Sea Grant Consortium February, 2010 – January, 2011, \$51,860.

Hyperspectral Algorithm Development and Dimension Reduction for Improved Detection of Shallow Coastal Submerged Vegetation. National Geospatial Intelligence Agency. Co-PIs: H.J. Cho, H.J. Kim, and C. Wafo-soh. NGA University Research Initiatives. June, 2008 - June 2,011, \$299,900.

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 total for 2 years.

Minority Students and Community Outreach on Hurricane Preparedness and Adaptation. Co-PI T. Islam and E. Johnson. Gulf of Mexico Alliance Environmental Education Network. 2010-2011, \$9,350.

Quantifying the Impact of the Gulf of Mexico Oil Spill on the Health and Productivity of Louisiana Salt Marshes. National Science Foundation Rapid. Co-PIs: H.J. Cho - Jackson State University subcontract through Mississippi State University; 2010 - 2011. \$70,000; total award \$200,000.

Pesticide Sensitive Crop Locator. PI: D.C. Rundquist. Nebraska Department of Agriculture. November 1, 2010 - September 30, 2012, \$ 25,500.

Sending graduate student John Olley to collaborate with Dr. Alex Gilerson at the City College of New York. Co-PI: J.T. Olley*, and J.F. Schalles. Nebraska Space Grant Office of the NASA National Space Grant College and Fellowship Program, 2011, \$1,300.

Strengthening Global Climate Change Education through Remote Sensing Application in Coastal Environment using NASA satellite Data and Models. Co-PIs: H.J. Cho and D. Mishra. National Aeronautics and Space Administration. May, 2010 - May, 2013, \$321,000.

Tracing the intrusion of the GOM-2010 oil spill on coastal and marine food webs using radiocarbon and stable isotopes. Co-PIs: J. Cherrier with J.P. Chanton (FSU), L. Chasar (USGS), and K. Craig (FSU). Florida Institute of Oceanography/BP. \$297,258 for 2 years.

Uncoupling of autotrophy and heterotrophy: effects of the Deepwater Horizon Oil Spill on microbial food webs. Co-PIs: J. Cherrier with W. H. Jeffrey (UWF) and A. Chauhan (FAMU). Florida Institute of Oceanography/BP. \$239,027 for 1 year.

NOAA ECSC Pending Proposals

A Pilot Study on the Community Engagement Resilience Framework (CERF)- Web-based Community Resiliency Tool. Co-PIs: T. Islam and R. Gragg. Gulf of Mexico Alliance 2011. Environmental Education Program, \$19,800. *In review.*

Building Capacity to Respond to Disaster Emergencies. Co-PIs: B. H. Wright with R. Bullard, J. A. Carr, R. Collins, B. Dennis, W. Gao, R. Gragg, E. Johnson, T. Islam, T. Lee, E. Nance, K. Singh, E. Smith, S. Suter, E. Turner, and W. Williams. National Institute of Health. \$1,200,000 for 3 years. *Pending.*

Environmental Cooperative Science Center: A Regional Ecosystem Approach for the Conservation and Sustainable Management of Coastal and Marine Resources: Co-PIs: Abazinge, M.A., Cherrier, J., and J.W. Tunnel, et. al. National Oceanographic and Atmospheric Administration. \$14,999,999 for 5 years. *In review.*

Identifying Health Impacts and Building Community Resiliency in Deepwater Horizon Disaster and Waste Disposal Impacted Communities. Co-PIs: T. Islam, E. Johnson, and R. Gragg. National Institute of Health \$1,000,000 for 5 years. *In review.*

Inventory and habitat modeling of coastal SAV and seagrass beds. PI: H.J. Cho. Mississippi Department of Marine Resources. February 1, 2012 – January 31, 2013, \$51,900. *In review.*

SAV Mississippi Wetlands: A Social Networking Tool Connecting Resource Users, Managers, and Scientists. Co-PIs: H.J. Cho, H. Park, H. Kim, and P.Biber. Mississippi Department of Marine Resources. February 1, 2012 – January 31, 2013, \$115,350. *In review.*

Scientific Environmental Technology Cooperative Science Center. Texas A&M University-Kingsville Lead institution, PI: K. Jones, \$1,100,000 for TAMUCC subcontract – P. Tissot, Senior Investigator, Thrust area leader for sensor development. NOAA -SEC-OED-2011-2002684, \$15,000,000 for 5 years. *In review.*

Social Impact Studies of Florida Gulf Coast Communities (Panhandle) in response to the Deepwater Horizon (MS-252) Petroleum Spill. Co-PIs: T. Islam, M. Abazinge, and E. Johnson. NOAA 2011-2013. Unsolicited pre-proposal, \$1,500,000. *In review.*

Spatial Technology for the Integrated Assessment of Coastal Ecosystems. Co-PIs: M. Reiter and Y. Tian. Gulf of Mexico Alliance 2011. Environmental Education Program, \$19,470. *In review.*