



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



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For the period from March 1, 2010 to August 31, 2010

Submitted By:

Florida Agricultural and Mechanical University (Lead Institution)

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

National Oceanic and Atmospheric Administration
Environmental Cooperative Science Center

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Executive Summary

This report highlights the efforts of Environmental Cooperative Science Center (ECSC) faculty, staff and students during the period of March 1, 2010 through August 31, 2010.

There has been a change in leadership for the Environmental Cooperative Science Center with the appointment of Dr. Larry Robinson as Assistant Secretary of Commerce responsible for Oceans and the Atmosphere. The new leadership team is Dr. Michael Abazinge as Director and Dr. Jennifer Cherrier as Deputy Director. This change was proposed and accepted by NOAA.

The involvement of students in education, research, and outreach continue to be the Center's most notable accomplishments. There are approximately 40 funded students at various levels across ECSC institutions. There were over 300 presentations in the ECSC K-12 environmental awareness poster competition with participation from area elementary school students. The ECSC Ocean Science Bowl Team participated in both the National Oceans Science bowl and NOBCCChE. The ECSC also hosted 25 high school students during the Environmental Sciences Institute Summer Camp at FAMU and graduate environmental science training for middle and high school teachers during the TAMU-CC Teaching Environmental Science Camp.

The research efforts of the Center for this period have been 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 \$6 million to support research and student training, including projects related to the oil spill. Faculty and students continue to be very active during this period, with about thirty seven (37) presentations and over nineteen (19) publications. In addition, a power point presentation was developed and shared with other centers to provide information and awareness regarding the oil spill

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 (\$6,000,000 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 (40 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
 - 8 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 75 (19 this reporting cycle) peer reviewed publications in NOAA-related sciences by faculty and students**
- **Examples of ECSC Management Products**
 - Comprehensive ecological risk assessment is underway at ANERR addressing sea-level rise and water management scenarios
 - Grand Bay NERR conceptual model is being used to assist manager and research coordinator to develop a site plan and research plan
 - Delaware NERR conceptual model is being used to introduce members of the St. Jones Watershed Tributary Action Team (forming in response to a Clean Water Act judgment involving the State of Delaware) to major environmental issues found within the watershed
 - Established hyper-spectral geospatial data base from aerial flyovers at 5 NERRs
- **Examples of ECSC Education and Outreach Products**
 - Developed a peer-reviewed post-secondary Ocean Science Concept-driven Interactive (OSCI) teaching model available on-line. This teaching model 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) Ecological Processes and Indicators of Ecosystem Health

I:2) Geospatial Analyses and Data Development

I:3) Integrated Assessment in Support of Environmental Decision Making

I:4) Integrated Social Sciences

I:5) Education and Outreach

I:1) 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 participants engaged in this thematic area and their respective activities are summarized in Table 1A.

Table 1A. 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. Ambrose Anoruo	Professor and former DSU PI	Delaware State 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

Table 1A continues. 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. Yuch Ping Hsieh	Professor	Florida A&M University	Ecosystem Status and Health/marsh biogeochemistry
Dr. Christopher Heckscher	Assistant Professor	Delaware State University	Ecosystem Status and Health/trophic 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 EPIEH-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. Stacy Smith	EPIEH-TA Post-Doctoral Res. Associate	Florida A&M University	Ecosystem Status and Health/biogeochemistry
John Branch	Ph.D./Env Sci	Florida A&M University	Integrated Ecosystem Modeling/chemistry
Antanasio Brito	Ph.D./Env. Sci	Florida A&M University <i>*does not receive direct ECSC support</i>	Ecosystem Status and Health/food webs
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
Adesuwa Erhunse	Ph.D./Env Sci	Florida A&M University <i>*does not receive direct ECSC support</i>	Ecosystem Status and Health/transport chemistry
Zakiya Hoyett	Ph.D./Env Sci	Florida A&M University	Ecosystem Status and Health/transport chemistry
Philemon Kirui	Ph.D./Biology	Jackson State University	Ecosystem Status and Health/foodwebs

Table 1A continues. 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
Stephen Kishinhi	Ph.D/Biology	Jackson State University	Ecosystem Status and Health/toxicology
Arianna 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/Biology	Jackson State University	Ecosystem Status and Health/toxicology
Christina Nica	Ph.D/Biology	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
Amanda Pappas	M.S./Nat Res	Delaware State University	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/
Tiffini Johnson	B.S./Nat Res	Delaware State University	Ecosystem Status and Health/food webs

Table 1A continued. 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
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. 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

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 1A). 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.

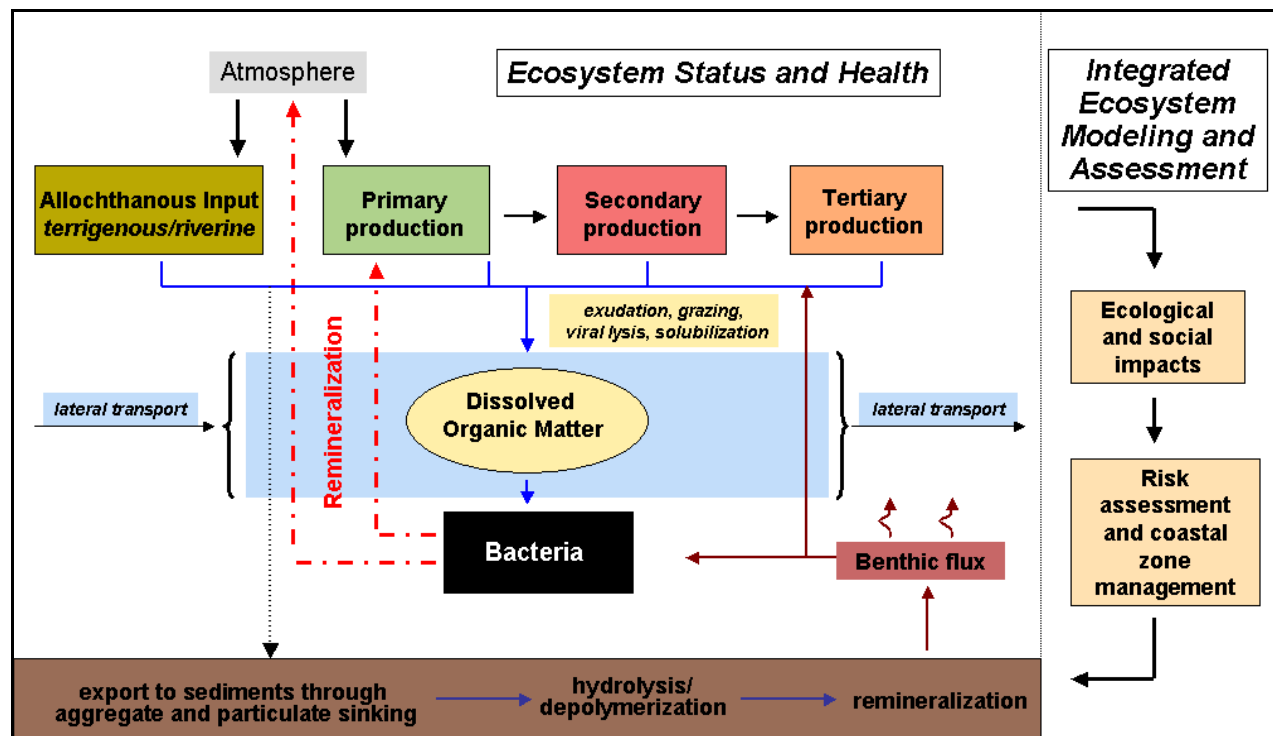


Fig. 1A. Conceptual illustration showing the connectivity between the two EPIEH-TA research foci a) Ecosystem Status and Health in the EPIEH-TA and b) Integrated Ecosystem Modeling and Assessment and how this research then meant to inform other ECSC thematic area research.

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. 1A conceptual illustration). Center wide EPIEH-TA monitoring efforts are outlined on the ECSC website and can be viewed at the following address <http://sites.google.com/site/noaaecscspillresponse/>. An outreach presentation about the spill can also be viewed at this site. 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 1: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 4, 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 a 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 4 was that all ECSC partners (as listed in Table 1A) 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 its 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 1B lists these courses at each institution.

Table 1B. Obj 1/PI 1 ECSC partner institution course listings for that address/teach EPIEH-TA core competencies. UG indicates undergraduate level class and G indicates graduate level class.

<u>Florida A&M University</u>
<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
<u>Delaware State University</u>
<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
<u>Morgan State University</u>
<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, WtlnD Ecol & WtlnD 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 4 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 1A) have taken the necessary courses at their respective institutions (table 1B) 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 4 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 1:F for a listing of project titles and committee makeup 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 4 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. when they graduate). This requirement has been in place since the first year of this grant cycle. See Appendix 1:F for a listing of EPIEH-TA undergraduates who have graduated during this reporting period.

PI 5) *EPIEH-TA B.S. students will present their research findings at one or more national meetings.* The goal for Yr 4 was that at least half of the EPIEH-TA BS students would present their research findings at a national meeting. During this reporting cycle this goal was not achieved due primarily to timing (i.e. EPIEH-TA faculty and students primarily attend fall and winter meetings; relatively few are held in the summer months) and funding. However, every effort will be made during the next funding cycle to ensure that the 5 EPIEH-TA students have the opportunity to present their findings at a national meeting. Additionally we will work closely with these students to assist them in trying to leverage additional travel funding to help defer costs.

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 4 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 1C for a listing of EPIEH-TA students (listed in Tb 1A) 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.

Table 1C. Obj 1/PI 6, Listing EPIEH-TA graduate committee approved ECSC relevant research proposals

<ul style="list-style-type: none">• 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 (<i>Cynoscion regalis</i>) at Different Temperatures and Salinities. DSU.• Schutte, Melissa. Ecological Succession on Wetlands Restored from Agricultural Uses. DSU• Dickens, Keyana. Investigating Uptake and Colonization of <i>Vibrio parahaemolyticus</i> in Eastern Oysters (<i>Crassostrea virginica</i>) in Relation to Phytoplankton Presence• Pappas, Amanda. Evaluation of Benthic Diatoms as Water Quality Indicators in the Blackbird Creek Watershed, Delaware• Laurant, Akia. Cumulative Impacts of DOM and Salinity on <i>Karenia brevis</i>: 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
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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 1D for a listing of the NOAA or NERR scientists serving on the EPIEH-TA student committees (also listed in Appendix 1:F). If one of the students listed in Table 1A does not appear in Table 1D, it is because their committee has not yet been finalized.

Table 1D. Obj 1/PI 7, Listing of EPIEH-TA M.S. and Ph.D committee approved ECSC relevant research proposals

<ul style="list-style-type: none">• 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 Member J. Govoni.• 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• Pappas, Amanda. DSU. NOAA/NERR Committee Member B. Scarborough• Turner, Ramona. FAMU. NOAA/NERR Committee Member R. Kilcollins
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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 4 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 research to their committee. See Table 1E for a listing of the graduate research projects aligned with ECSC Project PI research activities (also listed in Appendix 1:F). If one of the students listed in Table 1A does not appear in Table 1E this means that their committee has not yet been finalized.

Table 1E. Obj 1/PI 8, Listing of EPIEH-TA graduate projects aligned with ECSC Project PI research activities. Where 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 • Pappas, Amanda. DSU. Thesis Title: Evaluation of benthic diatoms as water quality indicators in the Blackbird Creek Watershed, Delaware. Project PI(s): G. Ozbay & K. Coyne • James Garner. JSU. Dissertation Title: Habitat Suitability Index for Submerged Aquatic Vegetation. Project PI: H.J. Cho
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PI 9) *EPIEH-TA graduate students will present their research findings at one or more national meetings.* This goal was not achieved during this reporting cycle where approximately 23% (or 5 out of 22) EPIEH-TA graduate students either presented or were co-authors on presentations (see Appendix 1:C) the reason for this was primarily due to timing as most EPIEH-TA faculty and students tend to present at fall and winter meetings.

PI 10) *EPIEH-TA graduate students will publish their research findings in a peer-reviewed journal.* The goal for Yr 4 was that all EPIEH-TA graduate students would attempt to publish their findings in peer-reviewed journals and this goal was not met. One student co-authored paper was accepted for publication. In retrospect we see that this goal was unrealistic as the publication process is highly competitive and the rejection rate is fairly high. However, all EPIEH-TA graduate students are strongly encouraged to submit their research for publication in peer-reviewed journals. To increase the chances of publication we propose to implement 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 (March '10- Sept. '10) 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 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 by implementing 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 were actively engaged in research and monitoring activities at the Grand Bay and Apalachicola NERRs in response to the Deepwater Horizon Oil Spill. Additionally EPIEH-TA students developed a presentation that is to be used Center-wide for outreach efforts to the community. All EPIEH-TA student publications, publications, and project information are listed in **Appendices 1:B, 1:C, and 1:F**, respectively. ECSC/EPIEH-TA 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 that EPIEH-TA students are engaged in is 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 made it through and 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 4 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 Appendix 1:A for titles of ECSC proposals and affiliated EPIEH-TA project PI’s)

PI 2) *EPIEH-TA research proposals will demonstrate a formal collaboration with a NOAA or NERR scientist.* The goal for Yr 4 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 1 F

Table 1F. Obj 2/PI 2, Listing of EPIEH-TA proposals along with names of NOAA/NERR collaborators.

- 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 (*Cynoscion regalis*). 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 *in vitro* 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

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 4 was that all EPIEH-TA proposals would be vetted through this process. Four of the proposals listed in Table 1 F (last four) are currently in the review process so presently 70% of of all of the proposals have been approved and four are still under review.

PI 6) *EPIEH-TA funded research projects will include a student training component.* The goal for Yr 4 was that all EPIEH-TA proposals would include a student training component. To be considered for in house review all 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 4 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 come up with a process whereby all EPIEH-TA project summaries and all pertinent PI contact information will be posted on the ECSC website. It was planned to have this information posted by June 2010. However our collective efforts with the Deepwater Horizon oil spill have interfered with this target date. We are working to get all posted by the next reporting period.

PI 9) *EPIEH-TA institutional partners will establish and maintain a required database according to ECSC standards.* The goal for Yr 4 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. 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.

PI 10) *EPIEH-TA funded research project results will be disseminated to NCCOS and NOAA.* As a first step, the goal for Yr 4 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. At the end of April we met with both technical monitors and initiated these discussions. Our efforts advance out this particular performance indicator have been also been delayed due to our efforts with the Deepwater Horizon oil spill. We will work diligently to get a better process in place for the dissemination of the EPIEH-TA data by the next reporting cycle. It is a priority and the need for a better vehicle became apparent as oil spill efforts within NOAA and within the ECSC unfolded.

PI 13) *EPIEH-TA funded research results will be presented at national meetings.* Most EPIEH-TA faculty and students tend to attend fall and winter meetings. Nonetheless, a total of 5 presentations were given during this reporting period. The citations for these presentations are listed in Appendix 1C.

PI 14) *EPIEH-TA funded research results will be published in peer-reviewed journals.* The goal for Yr 4 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 10 manuscripts were published or accepted for publication. Five of these manuscripts were directly tied to EPIEH-TA research and the other five were publications of NOAA-relevant scientific findings whose research was supported by leveraged funding. The full citations for these publications are listed in Appendix 1:B. In addition to these 10 manuscripts, a short film entitled 'From Education to Exploration: Students at Sea' was selected to be shown in the NOAA Kiosk at The Smithsonian-Ocean Hall in Washington D.C. as well as 15 other museums around the country.

Performance Summary: For this reporting period (March '10 to Sept. '10) 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 and EPIEH-TA project scientists for proposals submitted are listed in **Appendix 1:A**. Areas we will be focusing on for improvement on for the next reporting period include a) implementation of annual in-house EPIEH-TA project reporting, b) identification and implementation of most effective means for posting EPIEH-TA research results, and c) disseminating EPIEH-TA research results to NOAA and NOS scientists. EPIEH-TA faculty and students have been engaged in monitoring and research efforts associated with the Deepwater Horizon oil spill. Approximately 1.4 million dollars of highly competitive, leveraged research dollars was garnered by EPIEH-TA faculty and we anticipate that the results of these activities will be of great utility to NOAA scientists and the science community at large. We are working to ensure that this data is readily accessible and available to our NOAA partners. All NOAA/ECSC/EPIEH-TA relevant publications, presentations, and leveraged funding information for the current review cycle are listed in **Appendices 1:B-D**

I:2) ECSC Geospatial Analysis and Development

John F. Schalles, Thematic Area Leader

In the past 6 months, this thematic area emphasized student training, planning and preparations for a follow-up hyperspectral remote sensing campaign at the Grand Bay NERR in May, discussions on future programs and scientific themes for the ECSC renewal proposal in 2010 for the ECSC, and professional activities of faculty and students that include publications, presentations, proposal submissions, and awards and other recognitions. Individual accomplishments are listed in the appendix at the end of this section. Within our Geospatial Analysis section, we had a total of seven new peer-reviewed publications, with an additional manuscript submitted, five presentations at regional or national meetings, nine newly funded or continuing grants which represent leveraged funding, and four proposals that are pending.

Table 1-2A GADD-TA Participants (Faculty, Post-Docs, Students, and NOAA/NERR Collaborators) , affiliation and respective work/activity research focus. (continued on next page)

Name	Faculty/Student/Other	Institution	Work/Activity Res. Focus
Dr. John Schalles ^{1*}	Prof. of Biology, GADD Lead Scientist	Creighton University	Remote sensing - coastal habitat mapping
Dr. Hyun J. Cho ²	Assistant Professor of Biology	Jackson State University	Sea grass habitat assessments
Dr. Chunlei Fan ³	Assistant Professor of Biology	Morgan State University	Optics of harmful algal blooms
Dr. Tanveer Islam ⁴	ECSC Research Associate	Florida A&M University	GIS - coastal systems
Dr. Donald Rundquist ⁵	Prof, School Natural Resources	University of Nebraska	Wetland and water analyses
Dr. Elizabeth Smith ⁶	Associate Research Scientist	Texas A&M - CC	Coastal vegetation analysis
Dr. Zhiming Yang ^{7*}	Postdoc Agric. & Nat. Resources	Delaware State Univ.	Coastal mapping & GIS
Christina Mohrman ⁸	ECSC Site Coordinator	Grand Bay NERR	Vertebrate Habitat Analysis
Kemi Adeyinka ⁹	B.S. Biology	Morgan State University	Harmful algal bloom detection
Philemon Kirui ¹⁰	Ph.D. Biology	Jackson State University	Remote detection of sea grasses
Paul Merani ¹¹	Ph.D. Geography	University of Nebraska	Salt marsh productivity
Nicole Davis ¹²	M.S. Biology	Texas A&M - CC	Estuarine vegetation zonation
Christina Nica ¹³	Ph.D. Biology	Jackson State University	Sea grass habitat modeling
Drew Seminara ¹⁴	M.S. Biology	Creighton University	Comparisons of marsh habitats
Urban, Lauren ¹⁵	M.S. Biology	Creighton University	CDOM behavior in shelf waters
Marvin Washington ¹⁶	M.S. Biology	Jackson State University	Water quality and optics
John Wood ¹⁷	Ph.D. Biology	Texas A&M - CC	Sea grass mapping

**Footnotes 1-16, please see Appendix 2A for address and email information. Also, Dr. Yang left Delaware State in late summer to begin a tenure track appointment at North Carolina Central University*

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

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)*

Performance Indicators for Objective 1

We were unable to undertake the planned ground survey work at the Grand Bay NERR in May because the site was closed to outside investigators due to the Deepwater Horizon incident. Students and faculty from Florida A&M, Jackson State, Creighton, and University of Nebraska had expected to participate. In most instances, other work was substituted, but not in cross-school collaborations. The Creighton team moved their work east to Apalachicola Bay NERR, St. Josephs Bay, and the Florida Keys NMS. The Jackson State group was able to resume their own coastal survey work in Mississippi later in the summer. Other students in our geospatial group, at Texas A&M - Corpus Christi, Morgan State, and University of Nebraska have already received training at their respective institutions and, or had participated in the ECSC ground truth surveys at Grand Bay in May, 2009.

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 imagery analysis software. Software training occurs in courses at our respective schools, through individual instruction and mentoring, and through self-teaching modules that come with each software program and, or the ECSC's own modules. These modules were developed by our two former geospatial analysts, Christine Hladik and Sudhir Shethra. All the principal training approaches for ECSC core competencies in geospatial training are utilized in group and individual student projects within our thematic area. This fall, we will discuss arrangements to set up a group summer training opportunity at one of our partner NERR sites for the summer of 2011.

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.*

Performance Indicators for Objective 2

Two of our students gave presentations in the past six months at regional or national meetings (Paul Merani in April at the Association of American Geographers and Drew Seminara in August at the Ecological Society of America Annual Meeting) and two were co-authors on presented papers (Marshall and Seminara, see appendix information). One student, Lauren Urban, completed her thesis (M.S. in Atmospheric Science, Creighton University, August, 2010; thesis advisor John Schalles), and the remaining eight students are on schedule for their plans of study.

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

Performance Indicators for Objective 3

The Geospatial Analysis team spent the spring planning and preparing for an integrated AISA Eagle hyperspectral flyover and concurrent, intensive field survey work at the Grand Bay National Estuarine Research Reserve. Less than one month before the planned work, the Deepwater Horizon accident and wellhead failure led to a fast reconsideration of our plans. A request was made from NOAA HQ to move up the flight target date in an attempt to acquire coverage of Grand Bay NERR before oil reached the reserve. The University of Nebraska flight crew worked hard to prepare the plane and instruments, and were able to acquire full coverage of the reserve on May 5 and 6. Data processing at CALMIT was completed on June 28, and compressed data were made available on an FTP server. A second copy of data was shipped on July 3 to John Schalles and then distributed to scientists at Grand Bay, Jackson State, and to co-sponsor Michael Carron at the Northern Gulf Institute (Stennis Space Center). A mosaic of the entire salt marsh habitat at the reserve was prepared as a vegetation index product (Normalized Difference Vegetation Index) by graduate student Drew Seminara at the Schalles lab at Creighton. This product was displayed in early August at the Ecological Society of America Meetings in Pittsburgh, Pennsylvania and images were sent to the Grand Bay staff and other collaborators.

Several products were finalized in the past six months from previous AISA flyovers. A mosaic of wetland habitats at the Fennessey Ranch unit of the Mission-Aransas NERR in Texas was produced by graduate student Tarlan Razzagi in Don Rundquist's lab at the University of Nebraska-Lincoln. From this mosaic, a wetland vegetation map, with 8 habitat classes, was produced, with a classification accuracy of 91.5%, (estimated using field survey data from Elizabeth Smith's research group at the Texas A&M - Corpus Christi). Using 2006 imagery, above ground salt marsh vegetation biomass maps were produced by the Schalles lab for the entire Duplin River tidal watershed and its 15 sub-basins. This watershed is the major wetland habitat for the Sapelo Island NERR in Georgia and a subject of intensive investigations of salt marsh ecology for over 50 years. This data, in turn, is being incorporated into a 1 m resolution GIS reference map layer, along with georeference, 1 m species-level vegetation map and 1 m lidar maps (from NCALM flyover in 2009) of top of canopy and substrate elevations. These later two products use data from Christine Hladik's doctoral dissertation at the University of Georgia. Christine, who earned her M.S. at Creighton and then became the first geospatial analyst for ECSC, is currently supported by a NERR graduate student fellowship at SINERR. The Duplin Watershed project represents a collaboration with Dorset Hurley's research group at SINERR and the Georgia Coastal Ecosystems LTER project.

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

Performance Indicators for Objective 4

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) a map of invasive Black Mangrove cover and canopy height within the Redfish Bay unit of Mission-Aransas NERR by John Schalles and Creighton undergraduate research students, (3) 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 Creighton University, and (4) a series of comparative maps of salt marsh habitats using

three vegetation indices applied to salt mosaic images of salt marsh vegetation (with water and uplands masked) for eight ECSC AISA flyover projects at seven partner NERR sites by Drew Seminara, ECSC M.S. thesis student at Creighton University.

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

Performance Indicators for Objective 5

Papers, presentations, and proposal activity are summarized in Appendix 2-B. Seven papers were published or in press, and one manuscript submitted. Impressively, students were senior authors of four of these published papers in refereed research journals.

Five presentations were made at regional or national scientific conferences (as noted above, two were by ECSC graduate students and students were co-authors of two other papers). Five abstracts were submitted for upcoming conferences, including 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.

The Geospatial Thematic area continues to demonstrate a significant ability to leverage NOAA-ECSC funding with other extramural awards. There were six new awards, totaling \$267 K, two continuing awards (which provided \$140 K in funding for the past year), and four submitted (pending) proposals, for \$1,857.1 K in requested funds. Our leveraged funds come from diverse sources: National Science Foundation, NOAA, NASA, National Geospatial Intelligence Agency, and the Mississippi-Alabama Sea Grant Consortium.

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

Performance Indicators for Objective 6

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 were distributed to attendees of the ECSC annual meeting in Jacksonville. Don Rundquist at UNL 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. Also, these products are routinely provided, by mail or in person, to our respective NERR partners, and NERR sites display these products for public viewing.

Last winter, John Schalles's geospatial lab at Creighton acquired a net-based server system as a satellite archive system for ECSC geospatial imagery and products. The server is a Netgear ReadyNAS Pro Pioneer, with four 2 terrabyte Western Digital OEM Hard Drives (and expandability to six drives). The system was tested and then became operational this spring. All AISA flyover

hyperspectral imagery from NOAA-ECSC projects since 2002 have been added to the archive, and attention has shifted to acquiring and uploading imagery products from collaborating groups.

The ECSC Geospatial Analyst position was offered to a qualified applicant in late spring, by Dr. Elijah Johnson, chair of the center's hiring committee, but the offer was declined when the applicant accepted another position. The position was re-listed in mid-summer, and two qualified applicants were selected by the committee to be interviewed in late September, with an intent to make an offer and have the position filled by mid to late October. This position has been very difficult to fill, as persons with the desired qualifications are in high demand and the center may need to reassess the compensation package if we are unable to fill this position again.

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

Performance Indicators for Objective 7

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 coauthorships 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 this spring was delayed because of the Deepwater Horizon accident, which severely disrupted normal operations at the reserve.
- 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.
- 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.

- 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. This fall, ECSC Distinguished Scientist Charles Jagoe met with this group, especially to discuss joint initiatives related to the Deepwater Horizon accident. John Schalles joined the discussion by speaker phone. Several project concepts emerged and are currently being examined with the intent to pursue at least one joint study this fall.

I:3) 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 3A) has the capability to integrate interdisciplinary information and expertise across agencies 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 4 and the accompanying performance indicators (or measures), the respective indicator targets for year 4, and the accomplishments for each Year 4 indicator not discussed in the last semi-annual report.

Table 3A IA-TA Participants

Name	Faculty/Student/Other	Institution	Work/Activity Focus	Res.
Dr. Michael Reiter	Associate Professor <i>GADD-TA Thematic Lead</i>	Bethune-Cookman University	Integrated Assessment, Conceptual Modeling	
Sandra Arizmendez	PhD Coastal and Marine System Sciences May 2010	TAMU Corpus Christi	Upland-Estuarine Coupling	
Arianna Marshall	PhD Environmental Science	Florida A&M University <i>**works in both EPIEH-TA and IA-TA</i>	Socio-Economic Impacts	
Robyn Ball	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	
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	
Domingo Hiracheta	BS Computer Science	TAMU Corpus Christi	Numerical Modeling	
Dr. Wenrui Huang	Professor	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 Research Coordinator	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
Niraj Ray	MS Integrated Environmental Science	Bethune-Cookman University	Integrated Assessment, Conceptual Modeling
Sergey Reid	BS Geographic Information Science	TAMU Corpus Christi	GIS Land Use Applications
Dr. Geoff Scott	NOAA IA Contact	NCCOS Center for Coastal Environmental Health and Biomolecular Research at Charleston	NCCOS Liaison to IA
Dr. Elizabeth Smith	Assistant Professor	TAMU Corpus Christi	Upland-Estuarine Coupling
Dr. Philippe Tissot	Associate Professor	TAMU Corpus Christi	Numerical Modeling
Dr. Wes Tunnell	Professor	TAMU Corpus Christi	Numerical Modeling
Cindy Valencia	BS Biomedical Science	TAMU Corpus Christi	Numerical Modeling
Dr. Hongqing Wang	Researcher	USGS National Wetlands Research Center, LA	Numerical 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

PI 1) Run Blackbird mini-workshop for model revision at DNERR. Measure for Yr 4- Completion
-Progress: Completed: covered in March Semi-Annual Report

PI 2) Completed modified Blackbird CESSM model available to DNERR. Measure for Yr 4- Completion

-Progress: Completed: covered in March Semi-Annual Report

PI 3) Run modeling workshop for Hilo (by request). Measure for Yr 4- Completion if requested
-Progress: Meeting placed on hold due to issues in Hilo

Performance Summary:

A mini-workshop was held at DNERR to further develop a conceptual model to support management of the Blackbird creek watershed. A modified conceptual model for this region was submitted to the DNERR management. Additionally, we will try to further develop existing models to address issues at GBNERR related to impacts from the Deep Water Horizon oil spill.

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) Develop GBNERR long-term research strategy using conceptual model results. Measure for Yr 4- Completion
-Progress: Completed: covered in March Semi-Annual Report, but may be modified

Performance Summary:

In the previous reporting period, the focus areas for research at the Grand Bay NERR, developed from incorporation of the ECSC conceptual model results into GBNERR planning, were:

1. Ecological Effects of Sea-Level Rise
2. Ecology of Tidal Marsh Vertebrates
3. Ecology of Unique Habitats (e.g., salt pannes, shell middens, submerged aquatic vegetation beds, etc.)
4. Monitoring Ecosystem Effects of Atmospheric Mercury
5. Coastal Plant Ecology and Mapping
6. Long-term Monitoring of Environmental Conditions

Since that time, the occurrence of the Deep Water Horizon oil spill and signs of potential impacts at Grand Bay have led the GBNERR managers to alter this list to include monitoring the effects of PAHs, and to move that issue to a high priority. GBNERR has asked the IA team to help with planning a strategy to address this issue, and so as of the end of this reporting period the IA team is working with GBNERR managers to determine how we might proceed on oil spill-specific models and risk analysis using available ECSC IA and external resources. IA team members are considering leveraged funding sources to assist GBNERR, and it appears likely that Cary Bleasdale (MS IES, Bethune-Cookman University) will have his thesis topic shifted from using the GBNERR models to develop a strategy to address Atmospheric Mercury at Grand Bay to using a similar approach to develop a strategy for addressing PAHs.

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) Completed model stages of the IAEMP for the selected issue. Measure for Yr 4- Model Stages Completed
-Progress: Completed: March Semi-Annual Report information summarized here with further developments included

Performance Summary:

To demonstrate the utility of ecological risk assessments in coastal and marine spatial planning, ECSC IA initiated an ecological risk assessment (ERA) of the Apalachicola National Estuarine

Research Reserve (ANERR) ecosystem. The ANERR ERA focuses on the ecological consequences of altered salinity in the Apalachicola Bay ecosystem due to : a) altered water management in the Apalachicola-Chattahoochee-Flint (ACF) watershed; and/or b) global climate change based on plausible scenarios of temperature, precipitation, and sea-level rise for the Gulf Coast of Florida. The focal point of the ERA is the health and sustainability of the oyster fishery of ANERR, which has particularly high societal value and importance to the local community and is an indicator of broader ecological effects.

For this risk assessment, IA developed scenarios that encompassed the plausible range of future conditions in the Bay and analyzed each scenario for its consequences to the Apalachicola Bay ecosystem. We had previously developed a set of coupled quantitative simulation models that can forecast the salinity regime of the Bay and associated effects on oyster productivity: 1) a 3-D hydrodynamic model of Apalachicola Bay which can simulate water circulation, tidal, and salinity regimes for the Bay; this high-resolution simulation model has been calibrated and validated for the Apalachicola Bay system, and 2) an Apalachicola Bay oyster population model which forecasts oyster bar productivity based on the ambient salinity regime. The Apalachicola Bay hydrodynamic model has now been used to generate the Bay salinity regime for the various scenarios: 1) the Low-Flow Scenario, which simulates prolonged drought conditions through a continuous release of 4500 cfs from the Woodruff Dam; and 2) the High-Flow Scenario, in which the USACE schedule of releases for maximal river flows is followed. Moreover, we have now completed the hydrodynamic model simulations for each of these flow scenarios under three Sea-Level Scenarios: a) Current Sea Level; b) Sea-Level Rise of +0.5 m above current; and c) Sea-Level Rise of +1.0 m above current .

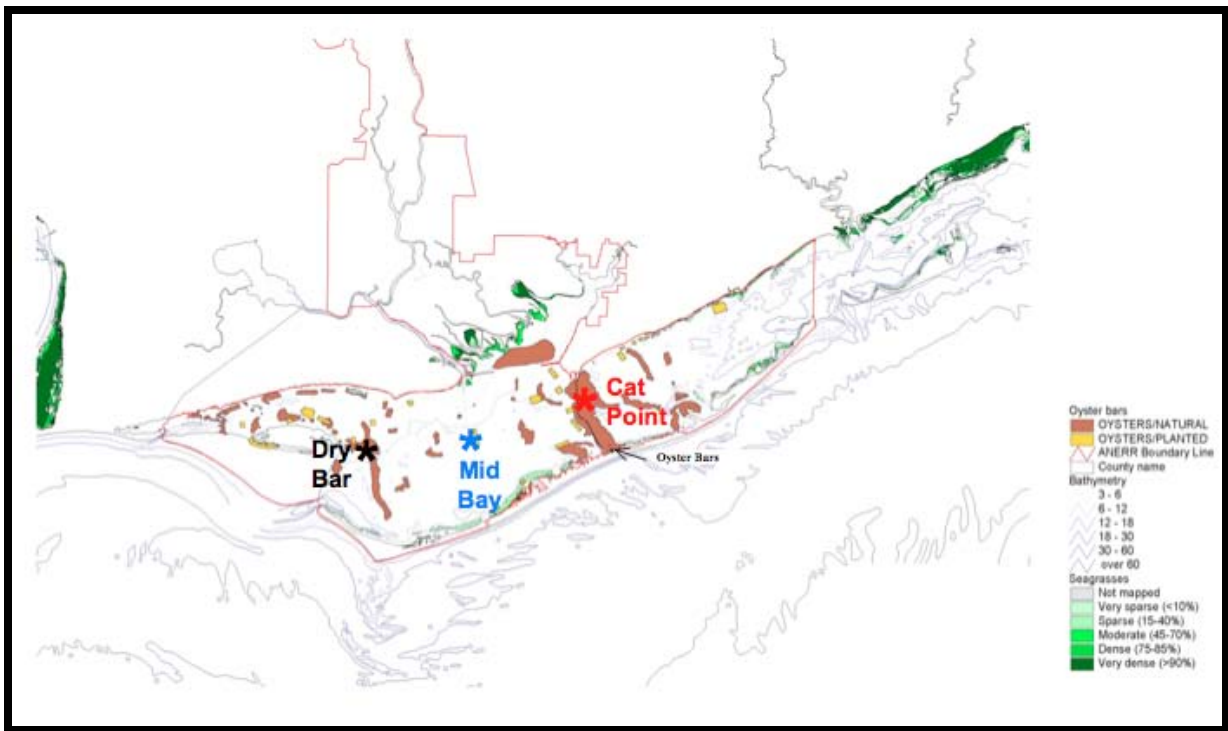


Fig. IA1. Map showing several of the oyster bars utilized in the IAEMP demonstration project's modeling effort.

The hydrodynamic model output, along with other physical and chemical conditions, is used as the input parameters for the oyster productivity model. The full suite of hydrodynamic and oyster model simulation results are presently being analyzed, and a paper for the peer-reviewed literature is well underway. As expected, the hydrodynamic model outputs show reduced freshwater flow would cause salinity increases, whereas high flow results in decreased salinity for all oyster sites across the Bay; at all sites, the very low-flow conditions would lead to major reduction in oyster productivity (Figure IA2).

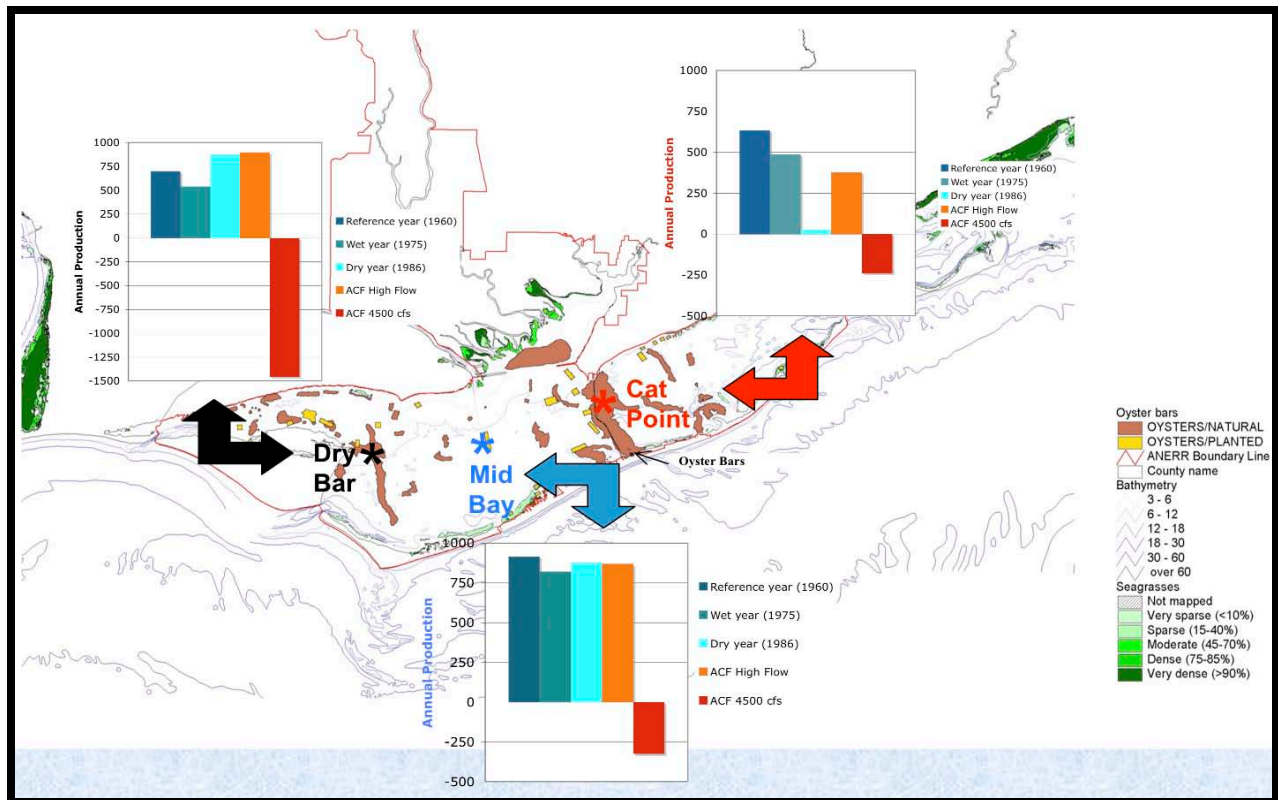


Fig. IA2. Predicted production levels for oysters at three oyster bars in Apalachicola Bay under the normal (dark blue), wet (mid-blue), and dry (light blue) reference years, followed by the ACF high flow (orange) and low flow (red) simulations.

In the sea-level rise scenarios, Bay salinity changes more under the ACF high-flow conditions than under low-flow conditions, because at elevated sea levels the base salinities increase compared to present conditions and are more resistant to the influence of freshwater inputs. In general in Apalachicola Bay, oyster reefs would suffer great loss under an increased sea-level future, particularly under low freshwater-inflow condition that could result from either climate change and/or water removals from the ACF system for other uses. Oyster reefs might have to migrate or retreat up-estuary to outside the existing Apalachicola Bay boundaries because of the saltwater intrusion under SLR, assuming such migration could occur in sufficient time and assuming there is adequate habitat for new oyster beds to become established.

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) Complete CEM model for MANERR. Measure for Yr 4- Model Stages Completed
-Progress: Completed: covered in March Semi-Annual Report
- 2) Personnel involved in the Harte/LME development program per year. Measure for Yr 4- 2 people involved
-Progress: Completed: four people involved directly, as covered in March Semi-Annual Report with further developments reported here
- 3) Data files from GIS analysis available to MANERR. Measure for Yr. 4- 2 data files
-Progress: Completed: covered in March Semi-Annual Report with further developments reported here

Performance Summary:

Bay Modeling:

A short-term, week-long field study that encompassed landfall of a category 2 hurricane was conducted to assess the role of Oso Bay on the occurrence of hypoxia in Corpus Christi Bay and the storm effects on nutrient loadings. The study demonstrated how short-term storms provide pulses of nutrient rich runoff that change the dynamics of nutrient cycling and contribute to long-term lingering effects. The research contradicts previous work that ruled out human activities as a cause of hypoxia in Corpus Christi Bay by showing that human activities facilitate the transfer of hypersaline water from the Laguna Madre to Oso Bay and the delivery of nutrients in runoff from the urban and agriculture dominated watershed.

A long-term study was conducted in three Texas estuaries and contributing river basins which focused on mining, synthesizing, analyzing, and interpreting temporal and spatial land use/land cover (LULC) and water quality data. Results revealed temporal change and spatial composition of LULC affects nutrient water quality in river basins. This research demonstrates that human activities and climate play a major role in the short- and long-term nutrient dynamics in Texas coastal river basins and estuaries. Alterations in spatial and temporal LULC resulting from human activities lead to nutrient enrichment, and variations in climate regimes affect nutrient loadings and cause shifts in estuarine ecosystem response.

Navigation and Port Issues:

Work during the second part of program Year 4 focused on two main objectives: 1) continuing the implementation of a hydrodynamic model for Corpus Christi Bay to support navigation, and 2) investigating the implementation of the artificial neural network based water level predictive model to areas other than the Texas coast.

The port of Corpus Christi is now the fifth largest port by tonnage in the country and the only one among the ten largest US ports without a NOAA PORTS system. Better modeling of the bay and particularly currents in the ship channel is highly desirable. The model FVCOM was previously selected and matches the model selection of the National Ocean Service Coast Survey Development Lab (CSDL) for PORTS systems in the Gulf of Mexico (per fall 2009 visit of the lab). After implementing FVCOM for Corpus Christi Bay, ECSC MS student Yelena Nevel focused her

research on using a data assimilation technique to update current measurements in the Corpus Christi ship channel and evaluate the impact of the correction on overall model accuracy.

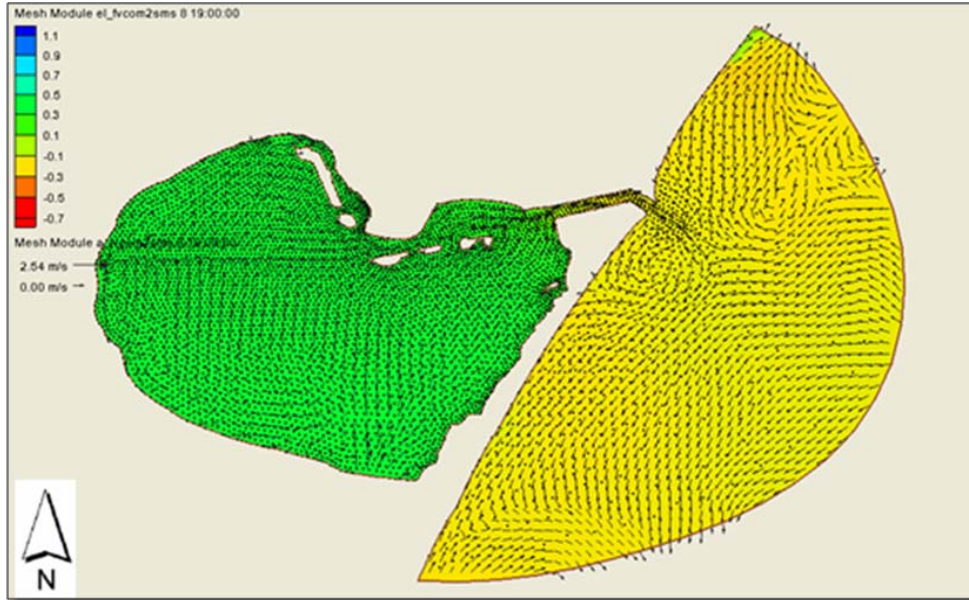


Figure IA3. Surface current map (arrows) of Corpus Christi Bay as modeled by FVCOM for November 4, 2002, 19:00 UTC. Colors represent water level above msl. The influence of a northerly winds is visible as well as the strong ebb flow in the ship channel.

FVCOM proved to be a difficult model to set up given the necessity to correct the open source Fortran code. The existing manual and the code do not always match, and help is through a forum. While the number of features available in FVCOM allow for a broad range of applications, this is not an easy model to set up and run for students.

Another hydrodynamic model, the Coastal Modeling System or CMS was investigated during summer 2010. The model was designed and is provided by the US Army Corps of Engineer Coastal & Hydraulics Laboratory. The model does not require compilation and is run from the same interface as the one typically used to build hydrodynamic grids. Two undergraduate students were able, with some help and benefiting from the experience gained with FVCOM, to implement the CMS model for Corpus Christi Bay. The CMS model is presently only a 2-D model. Accuracy was found to be comparable with FVCOM but run times were considerably less based on a 21 day test case. Absolute average errors on water levels at an embayment station were 4.8cm for the 2-D CMS model and 6.5cm for the 3-D FVCOM model. Both models water levels were forced by a coastal station and a station at the south of the bay. Further reviews of the model bathymetry and parameters will be conducted for a more accurate comparison.

Now that both hydrodynamic models are set, further improvements to models and extension to MANERR will be implemented in both systems. A MS student who is funded by sources outside the ECSC has started implementing FVCOM for salinity predictions in nearby embayment, Nueces Bay.

Upland GIS Projects:

All GIS data used to characterize the barrier strandplain peninsulas were submitted to Mission-Aransas NERR in August 2010. This data includes developed historic baseline habitat maps for all peninsulas and predicted sea-level rise impacts on Lamar and Live peninsulas.

MS student Rosaleen Baluyot completed merging GIS data among counties that include the barrier strandplain and also include areas within and of interest to the Mission-Aransas NERR program. Two peninsulas (Live Oak and Lamar) were selected to assess potential land change impacts on the upland potential natural vegetation as a result of sea-level rise and storm surge. Significant changes were not evident at the 1m levels, however, loss of evergreen woodland increased substantially on the smaller peninsula at 2m and 3m. Areas of unique conservation priority for neotropical migratory landbirds were identified to assist in developing management and conservation strategies for the two peninsulas.

One peninsula (Lamar) was selected by Dr. Smith to develop methodology for modeling habitat change as a result of a 1m increase in sea-level. Since the estuarine wetlands along the northwestern Gulf coast are very sensitive to minor changes in sea-level rise, the concern was if and where coastal marsh migration would occur. The GIS model was sensitive to habitat changes around the perimeter of Lamar Peninsula, and potential whooping crane habitat expanded substantially at 1m sea level rise with a net increase in habitat over time. These findings will be valuable to prioritize habitat for conservation to potentially accommodate whooping crane expansion in efforts to de-list the endangered species.

The Fennessey Ranch encompasses over 3500 acres of upland, freshwater wetland, and riparian habitat and is permanently managed under a conservation easement (CE) through the Mission-Aransas NERR program. The riparian corridor is generally located along the tidal segment of the Mission River connected to Mission and Copano bays. Seventeen vegetation transects along the corridor within the CE were completed the previous summer, and an additional seventeen transects were completed during March-August 2010 on an adjoining property upstream by incoming ECSC graduate fellow Nicole Morgan Davis. These data will be used to groundtruth land use/land cover datasets including NOAA C-CAP and NWI prior to analyses to determine the potential effects of tidal waters on riparian composition as well as future sea-level rise. All information, analyses and results will be submitted to Mission-Aransas NERR to assist in the management of the CE on Fennessey Ranch.

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 4- 4
-Progress: One graduated IA student is seeking a NOAA position; 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 4- 4
-Progress: One graduated IA student seeking a position; others with IA training are captured in other thematic areas

- 3) Number of graduates moving to graduate school or postdocs in coastal resource management. Measure for Yr 4- 4
-Progress: Completed: three graduated IA students moving to graduate school or searching (Krystal Alvarado B.S → M.S., Robyn Ball M.S. → PhD, Rosaleen (Baluyot) March M.S.: searching for PhD program), one into a postdoc (Sandra Arismendez PhD → postdoc in Dr. Paul Montagna's lab at HRI). Others with IA training captured in other thematic areas
- 4) Number of NERR and other NOAA site personnel involved in ECSC activities. Measure for Yr 4- 4
-Progress: Completed: covered in March Semi-Annual Report
- 5) Number of ECSC-related workshops and activities at partner, NERR, and other NOAA sites. Measure for Yr 4- 2
-Progress: Completed: one covered in March Semi-Annual Report with one other reported here
- 6) Number of non-ECSC sites utilizing ECSC resources, personnel, or methodologies. Measure for Yr 4- 2
-Progress: Completed: one covered in March Semi-Annual Report with three others reported here
- 7) Number of published IA manuscripts derived from ECSC activities. Measure for Yr 4- 1
-Progress: Completed: 17 (4 student publications) covered in March Semi-Annual Report with six other submissions (five with student authors, three primary) reported here
- 8) Number of briefings, presentations, or requests focused on ECSC data and activities. Measure for Yr 4- 2
-Progress: Completed: 3 covered in March Semi-Annual Report with twenty-two others (12 with student presenters) reported here

Performance Summary:

Student Bullet Points and Details:

- Rosaleen (Baluyot) March, ECSC M.S. Graduate Fellow at TAMUCC, Thesis Completed. Title: “Potential Sea-Level Rise and Storm Surge Impacts on Ingleside Strandplain Peninsula Habitats and Conservation Recommendations.” Currently considering PhD programs.
- Robyn Ball, ECSC Researcher (M.S. Summer 2008, Thesis Title: “A Comparison of Artificial Neural Network, Random Forest, and Multi-linear Regression Models: Predicting Water Temperature in the Upper Laguna Madre”) now enrolled in the PhD program in Statistics at TAMU College Station.
- Krystal Alvarado, ECSC Undergraduate Fellow Summer 2008 at TAMUCC, graduated B.S. Admitted to MS program at TAMUCC.
- Sandra Arismendez, Coastal and Marine Science PhD Student, Dissertation Completed. Title: “Land-Water Nutrient Coupling Process in Central Texas Estuaries.” Currently a postdoc in Dr. Paul Montagna's lab at HRI.
- ECSC MS student Yelena Nevel just graduated in August with a MS in Applied Mathematics (Philippe Tissot). Title: “Data Assimilation for a Hydrodynamic Model”. Looking for a job: wants to work at NOAA Silver Spring, but is finding it hard to locate an Applied Math position to apply for at NOAA.

Sandra Arismendez is arguably the current IA poster child for the ECSC. As one of nine children from a small south Texas town, she became the first in her family to receive a BS degree and later her MS degree, and now a PhD. She was such a good student and role model that she was asked to give the commencement speech for Texas A&M University-Corpus Christi at her graduation in May 2010. She was also included in a feature article about her education and family in the Spring HRI News, the quarterly newsletter of the Harte Research Institute for Gulf of Mexico Studies at TAMU-CC. Sandra's PhD dissertation committee included Dr. Paul Montagna of HRI as Chair, Dr. Wes Tunnell of HRI as Co-Chair, Dr. Suzanne Bricker of NOAA-NOS in Silver Spring, and Dr. Elizabeth Smith of the Center for Coastal Studies at TAMU-CC.

Although Sandra's dissertation included the MANERR, it also extended to the watersheds and estuaries both to the north and south of the Reserve. The title of her dissertation was "Land-Water Nutrient Coupling Processes in Central Texas Estuaries". The purpose of this research was to assess the temporal, spatial, and climatic effects of land-water nutrient coupling processes in Texas estuaries and to investigate the effect of nutrient loads during wet and dry conditions on estuarine ecosystem response.

Sandra made several presentations regarding nutrient loading from central Texas watersheds into central Texas bays and estuaries, including the MANERR. She presented at the 4th Annual Graduate Student Scholarly Works Symposium on April 23, 2010 (with the title "Land-water nutrient coupling process in central Texas estuaries") and won the 1st place award of \$250. She also presented this work for her Dissertation Defense in the HRI Conference Center on April 16, 2010 with numerous natural resource agency personnel present. She also presented at Gulf of Mexico Alliance Nutrient Criteria Team Conference in St. Pete, FL on June 9, 2010 (with the title "Establishing standard water quality criteria using satellite products for Texas").

Rosaleen Baluyot, M.S. Biology (TAMUCC) was also active, presenting her research results of coastal marsh changes at a Sea Level Rise Conference in Corpus Christi, Texas, in March 2010. Rosaleen Baluyot and Elizabeth Smith presented research findings from their ECSC IA project to the Texas Bays & Estuaries annual meeting at the University of Texas Marine Science Institute in Port Aransas, Texas, and the Society for Conservation GIS annual meeting at Monterey, California on July 8-10, 2010. Robyn Ball, and ECSC IA student who graduated in 2008 with an MS in Applied Mathematics from TAMUCC and has been working as a researcher there, has decided to move on for her PhD. She is now enrolled in the PhD program in Statistics at TAMU College Station.

Yelena Nevel, M.S. Mathematics (TAMUCC) finished her work for her MS thesis entitled "Data Assimilation for a Hydrodynamic Model". Yelena defended her thesis and graduated in August 2010. She is presently seeking employment, and would love to take advantage of an opportunity at NOAA Silver Spring if it presents itself.

Sergey Reid, B.S. GIS (TAMUCC), continued to build grids for the hydrodynamic model FVCOM with the software SMS in support of ECSC graduate student Yelena Nevel's MS project. He is presently working with graduate student James Davis to compare computational efficiency and accuracy of the two models for Corpus Christi to better assess the potential of each model for real-time operation to support navigation. Sergey will be giving the oral presentation "Hydrodynamic Models Comparison for Corpus Christi Bay" at the upcoming Tenth Annual Texas A&M University - Corpus Christi Undergraduate Research Symposium on September 25th, 2010. Sergey was selected as a Hollings Scholar and participated to the related orientation week in Silver Spring, MD in June.

Sergey enjoyed very much the experience and is looking for a mentor in Silver Spring for next summer's internship.

Domingo Hiracheta, B.E. Mechanical Engineering (TAMUCC), looked for spatially dense multi year data sets along the Florida coast to test the Artificial Neural Network water level modeling technique that had so far only been implemented along the Texas coast. Domingo will be presenting a poster "Potential for Application of ANN Water Level Prediction Models in the Gulf of Mexico" at the upcoming Tenth Annual Texas A&M University - Corpus Christi Undergraduate Research Symposium on September 25th, 2010. Domingo is transferring to Texas A&M University-College Station for Fall 2010 to pursue a B.E. in Electrical Engineering and a B.S. in Computer Sciences.

The IA students have done very well in presentations and publications during this reporting period. During this period, Dr. Islam has submitted a manuscript with student author Arianna Marshall and the two have presented two posters. Two manuscripts have been submitted with student Rosaleen (Bayout) March (a student of Dr. Smith) as primary author, and five research presentations were offered this reporting period (with one having Rosaleen as primary author). Two manuscripts and one presentation have been submitted with Sandra Arismendez (a student of Drs. Montagna and Tunnel) as a student author (one as primary author), and one presentation was offered by both Rashan Moss and Cary Bleasdale (students of Dr. Reiter). Citations for these presentations can be found in Appendix 3:B.

Non-Student Information:

In early March, Dr. Reiter travelled to the Universidad Autónoma de Baja California in Ensenada, Mexico (under the invitation of Dr. Ileana Espejel) as a Visiting Professor to introduce the ECSC modeling Methodology to graduate Resource Management students and other faculty and students at UABC. Dr. Reiter presented the current state of the demonstration project for the IAEMP, including implications of the work for the ACF basin, the regional "Water Wars", and the implications for the Apalachicola Bay oyster fishery. Dr. Reiter also offered a seminar to UABC GIS and remote sensing students on the utilization of GIS data in the creation of watershed-scale CESSMs from habitat-scale models (work published in the Journal of Environmental Management as reported in the last semi-annual report). The major activity of the visit, however, was a four day, twelve hour short course offered by Dr. Reiter for graduate student at UABC majoring in all fields related to resource management (approximately 35 MS and PhD students plus several graduate faculty members). Dr. Reiter's short course consisted of a hands-on workshop that introduced the ECSC CEM and CESSM modeling methodology to workshop participants. (Fig. IA4). Response to the workshop was extremely positive, and UABC is looking to join with Bethune-Cookman University in a resource management consortium that would include joint research and student/faculty exchanges.

From June 6-10, 2010, Dr. Reiter was invited by Dr. Mamdouh Nasr of Ain Shams University to Cairo to present ECSC research and methods to the university's graduate faculty and students in the Department of Agricultural Economics. The program focuses heavily on water resource issues, and thus they were interested in the ECSC IAEMP demonstration project and its implications for water management in the area. Dr. Reiter presented the IAEMP work in an open seminar and met individually with graduate students and faculty in their program who were interested in the method. This interaction led Dr. Nasr to visit Bethune-Cookman University as a Fulbright Visiting Professor (awarded beginning August 2010) and the interest of Ain Shams University to join the consortium being developed with UABC and BCU.

Regarding other presentations, Dr. Tissot was invited by MIC Scott Cordero of the Corpus Christi Weather Forecast Office to discuss the performance of the water level prediction model implemented as part of the ECSC program for coastal stations in the Corpus Christi Weather Forecast Office warning area. He was also invited by Nicholas Kraus of the USACE ERDC Coastal and Hydraulics Laboratory in Vicksburg, MS to discuss ANN water level predictive model performance, hydrodynamic modeling work with FVCOM, and testing of CMS as an alternative to FVCOM.

Also during this period, Dr. Islam received a grant from the Gulf of Mexico Alliance (GOMA) Environmental Education Network and submitted a second grant proposal to the NERRS Science Collaborative as a Co-PI along with ECSC Ecological processes Thematic lead Dr. Cherrier, ECSC Distinguished Professor Dr. Jagoe, and ANERR Research Coordinator Dr. Wanat. Dr. Islam, along with co-author and ECSC graduate student Ariana Marshall, submitted an article entitled "Socio-economic Vulnerability of African Americans to Hurricanes in the Gulf Coast of the United States" to the journal *Regional Environmental Change*. Dr. Islam and Ms. Marshall also presented two posters on this work, to the American Planning Association National Planning Conference and the Coastal Society Biannual Conference.

Dr. Tissot chaired the organization of the workshop "Coastal Bend Workshop on Streaming Environmental Data", Friday August 27, 2010, at Texas A&M University-Corpus Christi. The workshop was co-organized with the local office of the National Weather Service. The availability and communication of data for navigation and emergency situations were a focus of the workshop. Participants included staff from the National Weather Service, the US Coast Guard, the local ship pilot association and the City of Corpus Christi emergency management.

One important development during this reporting period was the the Deep Water Horizon oil spill. Given that ECSC has several partner sites along the GOM, IA was contacted concerning the use of the ECSC modeling methodology to help develop a strategy for monitoring potential impacts of the spill. For GBNERR, IA faculty have modified the original CEM models to include PAH-related Drivers and Stressors that were originally left out of the Level One models due to the low probability of a spill of the magnitude of Deepwater Horizon as determined by the stakeholder group. The revised model was given to GBNERR in June, and GBNERR managers and IA investigators are looking for ways (and funding sources) to address the need to develop a monitoring plan at GBNERR and other NERR sites along the Gulf coast.

Other Notable Activities during this Period:

- In order to help address comments concerning the relatively low number of ECSC students graduating specifically in Integrated Assessment, Dr. Reiter developed and initiated the Department of Integrated Environmental Science at Bethune-Cookman University. The B.S. and M.S. programs are beginning their first full year, and the M.S. program in particular is tied to ECSC IA. Dr. Reiter has recruited five students in this first class, two who began last year and are being transferred over from other programs and three new students recruited for Fall 2010 (one of whom will be supported primarily by the university using leveraged funds). The five MS students in Integrated Environmental Science at BCU are from diverse backgrounds all applicable to integrated assessment, and includes one African American male, one Hispanic female, and one Asian American male. The thesis projects of the ECSC-supported students will

focus on IA topics at partner sites, and their thesis committees will include a manager from the appropriate site plus Geoff Scott (NOAA Charleston), the IA NOAA liaison.

- During the reporting period, Dr. Smith was nominated for membership in the Guadalupe-San Antonio, Mission-Aransas Bays and Basins Expert Science Team of the Texas Senate Bill 3 Watershed Planning Group (April 2010 – present). She was also invited into membership in the Guadalupe-San Antonio, Mission-Aransas Bays and Basins Areas Stakeholders Committee for the same watershed planning group, as well as the San Antonio Bay Partnership Scientific-Technical Subcommittee (June 2010 – present).
- Philippe Tissot was the recipient of a Spring 2010 Texas A&M University System Chancellor Teaching Excellence Award, one of three TAMUCC faculty to score in the top 5 percent of their respective class.

Progress on Year 5 Measures:

Notable progress has also been made during this reporting period on the following Year 5 Goals and Measures:

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

Measure: Run CESSM model workshop for GBNERR (by request)

Preparations to run this workshop continue, but may be delayed by (or combined with) work concerning the Deep Water Horizon oil spill.

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

Measure: Selected pathways for a full IAEMP demonstration options analysis

As reported in the previous semi-annual report, GBNERR was interested in developing a long-term mercury monitoring program at Grand Bay, and based on conversations with GBNERR managers at the annual meeting it appears that it would be helpful to GBNERR personnel to select the mercury issue for their IAEMP demonstration project. However, since then, concerns over monitoring potential impacts of the Deep Water Horizon oil spill have replaced mercury as the current critical issue. IA is therefore moving forward for the next grant period with PAHs as a logical Stressor for the IAEMP demonstration project.

IA 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

Measure: Completed options stages of the IAEMP for the selected issue

Progress continues on the model stages for the IAEMP demonstration at ANERR. At this point, there are already several potential scenarios that appear to be problematic for oyster productivity in

Apalachicola Bay, particularly involving the ACF Low Flow scenario for the Lake Woodruff dam as proposed by the USACE. We will be able to more fully examine alternatives once all model runs are completed.

I:4) Integrated Social Sciences

Anthony Wilbon, Thematic Area Leader

The purpose of the ECSC Integrated Social Science (ISS) is to train students on the increasing public sensitivity to the 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 (Table 4A).

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

Table 4A list all ISS participants (students, project PI’s etc...)

Name	Faculty/Student/Other	Institution	
Dr. Anthony Wilbon	Associate Professor	Morgan State University	Environmental Policy, Environmental Entrepreneurship
Dr. Kelton Clark	Director	Morgan State University Estuarine Research Center	Ecology, Environmental Policy
Dr. Mark Bundy	Research Faculty	Morgan State University Estuarine Research Center	Environmental Entrepreneurship
Dr. Marcia Owens	Associate Professor	Florida A&M University	Environmental Policy and Law
Dr. Dreamel Worthen	Associate Professor	Florida A&M University	Environmental Justice and Policy
Dr. David Letson	Associate Professor	University of Miami	Environmental Economics
Karlisa Callwood	Ph.D. Marine Science	University of Miami	Environmental Economics
Sue Ebanks	Ph.D. Marine Science	University of Miami	Environmental Economics

Table 4A continued list all ISS participants (students, project PI's etc...)

Name	Faculty/Student/Other	Institution	
Steven Brown	Ph.D. Environmental Science	Morgan State University	Environmental Policy, Environmental Entrepreneurship
Edgar Chambers	B.S. Biology	Morgan State University	Environmental Policy, Environmental Entrepreneurship
Jolvan Morris	MS Environmental Science	Florida A&M University	Fisheries Policy
Nancy Metayer	BS Environmental Science	Florida A&M University	Fisheries Policy
Diane Parker	B.S. Biology	Morgan State University	Environmental Policy, Environmental Entrepreneurship
Yasaun Young	B.S. Biology	Morgan State University	Environmental Policy, Environmental Entrepreneurship

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.

Specific goals were listed in the ISS implementation plan, generated in year one of the present grant cycle. These are listed below, along with the accompanying performance indicators (or measures), and the accomplishments for each indicator to date.

ISS 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 4 was 3 projects.

To date, two projects have been 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

A working research hatchery has been developed at the Morgan State University Estuarine Research Center (ERC) facility. The hatchery utilizes native oysters and has the capability of producing both larvae and spat. The facility is being used to find ways to optimize the hatchery process to make it appropriate for private sector development. Products from the hatchery are being used to assist members of the Calvert County Watermen's Association to develop growout operations. These operations allow the watermen to utilize products from the hatchery to help them produce a supply stream of marketable oysters. The hatchery provides capital intensive infrastructure to the nascent aquaculture industry and will provide technology transfer as the industry grows to the level that it can support a commercial hatchery

Spat On Shell Culture:

The watermen have been least resistant to spat on shell aquaculture. It has the additional advantage that it results in the development of a natural oyster reef and employs the current method of harvest.

- MSU personnel are working with the Calvert County Waterman's Association to develop a cooperative aquaculture venture. The watermen have formed a cooperative group; they have leased over 30 acres of oyster bottom from the state, they have planted over 4 million oyster to date. Through the Hatchery program ERC has provided them spat on shell, and technical and logistical support.
- Based on the success of the CCWA, we are proposing this model to MD DNR as a mechanism to transition watermen to aquaculture statewide. Regional groups of watermen would be offered designated areas of the Bay. Within these zones, the watermen have control and responsibility of the planting and harvesting of all oysters. The watermen would be required to provide and implement a management plan for the zone. Assistance with initial capitalization may be needed for spat on shell.

Bottom Cage Culture:

- Spat on shell culture is resource intensive and provides a low market value product. Bottom cage culture may provide an alternative method that is ecologically friendly and adaptable to existing gear.
- MSU evaluated the feasibility of local watermen establishing private oyster aquaculture businesses using off-bottom cages
- Working with two local watermen, we assessed the profitability and the cultural acceptance of bottom cages. We gave them start up supplies and equipment and monitored their labor and other costs. Based on data collected, Aquasim (an economic model developed by MD Sea Grant) predicts a 95% chance of economic success.
- At the request of Maryland Department of Natural Resource MSU is submitting a proposal to expand the program to 10 watermen in different parts of the state.

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 the 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 study methodology are being planned.

2) Number of conference presentations by faculty and /or students resulting from ECSC-approved ISS projects. Goal for Year 4 was 3 presentations

ISS personnel made one conference presentation during the reporting period. We presented our work to the Southern Maryland Oyster Cultivation Society (SMOCS) by hosting a SMOCS event at the hatchery that included a lecture from an ERC researcher on oysters and a tour of the hatchery. (June 2010). We expect to attend other conferences to meet this objective before the end of the reporting year.

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

Currently there is one journal articles scheduled for publication.

1) Morgan State's research in environmental and sustainably entrepreneurship related to the oyster harvesting project in Chesapeake Bay was submitted to the International Journal of Case Studies in Management and accepted for publication:

- 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*.

ISS 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 4 was to have 100% of the students working on ISS related projects present at conferences and/or publish journals.

- 1) We have students working on ISS projects and plan to have them prepare presentations for conferences in the upcoming year. A new doctoral student at MSU worked over the summer doing research in bioenvironmental science with an emphasis on social sciences and has experience in the social science area.

2) Percentage of students working on ECSC-approved ISS projects receiving internships at NOAA or related agencies/firms. Goal for Year 4 was to have 25% 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

Both Morris and Metayer participated in summer research in 2010

3) Percentage of students working on ECSC-approved ISS projects employed by NOAA or related agencies/firms. Goal for Year 4 was to have 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 Goal 3: *Collaborate with researchers within cooperating 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 4 was to have 75% of the projects will have NOAA collaborations during Year 4.

Currently all ISS projects have a NOAA collaboration. The MSU Oyster Harvesting project collaborates with the NOAA Aquaculture Division. It also includes partnership with a Sea Grant economist. We also began a partnership with MD Sea Grant on extension and outreach. Following are some highlighted activities:

- Featured in a NOAA fisheries Weekly Update for Week Ending (May 7, 2010)
- Featured in Washington Post, Jeff Newman May 20, 2010. Oyster hatchery opens at research center in Calvert.
- Assistant Administer for Fisheries, Eric Schwab was a featured speaker at the MSU hatchery dedication ceremony
- NOAA Chesapeake Bay Program Office funded the Pilot Hatchery Program \$432,000

- Hold regular meetings with Maryland Sea Grant extension agent in the development of an outreach program.
- NOAA Chesapeake program office is represented on the hatchery advisory committee.
- Partnering with Maryland Sea grant extension Director on use of an economic model

2) Percentage of ECSC-approved project results/findings presented at NOAA sites by ISS faculty and /or students. Goal for Year 4 was to have 50% of the projects will be presented at NOAA sites by ISS faculty and students.

We are planning to have MSU students visit NOAA to discuss oyster harvesting project

NOAA/ECSC/ISS relevant publications, presentations, and leveraged funding information for the current review cycle are listed in *Appendix 4:B-D*.

I:5) Education and Outreach

Michael Abazinge and Bernadette Kelley, Thematic Area Leaders

Education Overview

The goal of the Educational Partnership Program is to increase the number of students from underrepresented communities who are educated, trained and graduated in fields that directly support NOAA's mission. The National Oceanic and Atmospheric Administration (NOAA) Educational Partnership Program with Minority Serving Institutions (EPP/MSI) is aimed at increasing programs and opportunities for individuals to pursue applied research and education in atmospheric, oceanic, and environmental sciences and remote sensing technology, in support of NOAA's mission. The goals of the Cooperative Science Centers are:

- Educate, train and graduate students, particularly from underrepresented communities, in NOAA sciences;
- Increase graduation rates of students from underrepresented minority communities in NOAA sciences;
- Impact NOAA and national Science, Technology, Engineering and Mathematics (STEM) workforce statistics by increasing the number of graduates from underrepresented communities in NOAA sciences;
- Contribute to NOAA's mission by strengthening and building capacity in NOAA scientific and management areas at MSIs as well as building research experience in NOAA scientific areas; and,
- Leverage NOAA funds to build the education, training and research capacity at the MSI.

The mission and goals set by NOAA has been the blueprint that the Environmental Cooperative Science Center (ECSC) has used to train and prepare scientist and other professionals poised to further the mission and goals of NOAA. According to the **Jacqueline Rousseau**, Director, EPP and Associate Director for Student Opportunities:

“From the first planning meeting in December 1997, to the first grant awards made in 2001, the educational programs and training activities of the Educational Partnership Program (EPP) at the National Oceanic and Atmospheric Administration (NOAA) have inspired and challenged the program to employ new and better ways to train and develop next generation scientists for our nation. The cumulative accomplishments of program participants since the inception of EPP have been a source of inspiration. The achievements of this program to date have impacted national statistics and have had direct and immediate benefits to the NOAA workforce.”

The Environmental Center Science Collaborative (ECSC) has employed research-based strategies and methods to recruit, train, and advance students in NOAA sciences and related fields that support the development of a next generation workforce. Since the awarding of the initial grant, ECSC has recruited and trained hundreds of students and graduated over 150 students at the undergraduate and graduate levels. In addition, the success of the ECSC is further illustrated by the numerous presentations and publications by the students, faculty mentors and scientists. The work of the

ECSC will be also be measured also in years to come because of the various activities that have ignited a spark in the K-12 community of students. Students in the K-12 grades have participated in summer camps, weekend academies, and several bowl competitions.

The ECSC is organized in the four thematic areas; [Education and Outreach](#), [Integrated Assessment in Support of Environmental Decision Making](#), [Integrated Social Sciences](#), [Ecological Processes and Indicators of Ecosystem Health](#), and [Geospatial Analyses and Data Development](#). Each of these thematic areas incorporates an educational focus in all area activities, to accomplish the goal of recruiting and training a workforce ready to engage in fields directly supporting the NOAA mission. This semi-annual report documents the milestones and accomplishments of the center aligned with the educational goals of NOAA.

The objectives of the Education and Outreach Thematic area are to:

- 1) Enhance curriculum and educational capacities at partner institutions in NOAA-relevant disciplines by providing high quality education and research experiences to students through various measurement strategies;
- 2) Provide a pipeline for the production of minority scientists and teachers of the future by direct interactions with K-12 students and by enhancing the quality of teacher education programs; and
- 3) Establish a post-doctoral program to solidify ECSC interactions with NOAA scientists.

Quick Facts

The period of review include the dates of **March 1, 2010** to **August 31, 2010**. During this period the ECSC has continued to meet the goals and objectives mandated by NOAA and proposed by the Center.

Objective 1) Enhance curriculum and educational capacities at partner institutions in NOAA-relevant disciplines by providing high quality education and research experiences to students through various measurement strategies

During this period the ECSC center-wide supported 10 undergraduate students, and 36 graduate students through scholarships and assistantships. Also during this period ECSC employed two (2) post docs.

Table E-1 Number of Students Supported

Number of Students Supported	Scholarship/ Assistantships	Graduated
Graduate	36	7
Under graduate	10	3
Post-Docs	2	

The students in the ECSC have been consistently productive and have been recognized for their efforts to work in the field alongside scientist and other NOAA related areas.

Table E-2 Student Awards/Internships/Recognitions

Name	Institution	Award/Internships/Recognitions	Date
Jolvan Morris	FAMU Master's student	Received an internship and an offer of SCEP employment with the Northeast Regional Office of NOAA Fisheries	Summer 2010
Nancy Metayer	FAMU undergraduate student	Received an internship Regional Office of with the Northeast NOAA Fisheries	Summer 2010

The ECSC continues to reach out to the K-12 students and teachers in efforts to increase awareness of NOAA and its mission and goals. These efforts will increase the pipeline of potential scientist and teachers.

Objective 2) Provide a pipeline for the production of minority scientists and teachers of the future by direct interactions with K-12 students and by enhancing the quality of teacher education programs; and

Table E-3 K-12 Student Outreach and Activity

Activity	Institution	Grade level	Number of Participants
Ocean Bowl	FAMU	10-12	6
Summer Camp	FAMU-MSU-JSU	9-12	24
Poster Competition	FAMU	4-6	About 200

ECSC Research

Objective 3) Establish a post-doctoral program to solidify ECSC interactions with NOAA scientists.

Research and collaborations with NOAA scientists are essential for providing mentors and role models for minority students. In turn, this leads to an increase in students selecting NOAA related careers. During this reporting period, the ECSC has incorporated educational and outreach activities throughout each thematic area. The level of research activity is also documented by the number of presentations and publications, as documented in tables E4 and E5. Student authors are indicated by asterisks.

Table E-4 Student and Faculty Presentations

	Presentation	Who	Date(s)/Where
1	Land-water nutrient coupling process in central Texas estuaries. 4th Annual Graduate Student Scholarly Works Symposium	*Arismendez, S.	April 23, 2010, Texas A&M University.
2	Land-water nutrient coupling process in central Texas estuaries. Dissertation Defense	Arismendez, S.	April 16, 2010. Harte Research Institute
3	“The Journey”. Commencement speaker for Texas A&M University-Corpus Christi,	Arismendez, S.	May 15, 2010
4	“Establishing standard water quality criteria using satellite products for Texas”	Arismendez, S., P. Montagna, and J. W. Tunnell, Jr.	Gulf of Mexico Alliance Nutrient Criteria Team Conference, June 9, 2010, St. Petersburg, FL
5	“Potential sea-level rise impacts on coastal woodlands on Lamar and Live Oak Peninsulas and conservation recommendations for otropical avifauna”	*(Baluyot) March, R. and E. Smith	Oral presentation at Texas Bays and Estuaries Meeting, University of Texas Marine Science Institute, April 16, 2010, Port Aransas, TX.
6	“Natural Upland Habitat Shifts from Sea Level Rise on Coastal Peninsulas and Implications on Habitat Diversity.”	*(Baluyot) March, R. and E.H. Smith.	Society for Conservation GIS 13 th Annual International Conference, July 2010, Monterey, CA.
7	“Volusia Blue Spring's Ecological Status: The Value of a Stakeholder-Based Alternative.”	*Bleasdale, C. and M. Reiter.	2010 Annual Meeting of the Florida Academy of Sciences, March 18-20, 2010, Fort Pierce, FL.
8	“On the accuracy of numerical weather prediction models for wind speed predictions along the Texas Gulf coast.”	Chavez, R., P. Tissot, W. Collins and O. Probst.	2010 American Wind Energy Association Windpower, Dallas, TX.
9	“Coastal modeling system grid optimization for Corpus Christi Bay”	Ekeh, I., *S. Reid and P.E. Tissot. 2010.	Eight Annual SURF Symposiums: Corpus Christi, TX, 2010.
10	“Addressing Socio-Economic Vulnerability to Hurricanes”	Islam T. and *A. Marshall.	American Planning Association National Planning Conference, April 10-14, 2010, New Orleans, Louisiana.

11	“Socio-economic Vulnerability of African Americans in the Gulf Coast Counties”.	Islam T., *A. Marshall, L. Robinson, and E. Johnson.	22 nd American Coastal Society Biannual Conference, June 13-16, 2010, Wilmington, North Carolina.
12	“Environmental and ecological determinants influencing riparian corridor dynamics along a Texas coastal river”	Morgan, N. and E. Smith.	Texas Bays and Estuaries Meeting, University of Texas Marine Science Institute, April 16, 2010, Port Aransas, TX.
13	“Changes in the Hydrobiid [Family Hydrobiidae, Mud snails] Community of Blue Spring State Park, Volusia County, Florida.”	Moss, R., M. Reiter, and A. Brooks-Walter.	2010 Annual Meeting of the Florida Academy of Sciences, March 18-20, 2010, Fort Pierce, FL.
14	“Vertical accretion rates in estuarine wetlands using Cs-137”.	Radosavljević, B., J. Gibeaut and P. Tissot.,	Texas Bays and Estuaries Conference, Mustang Island, TX.
15	“The Integrated Assessment and Ecosystem Management Protocol (IAEMP): Use of Conceptual Ecosystem Models in an integrated assessment context”	Reiter, M.	Ain Shams University Invited Seminar Series: Cairo, Egypt, June 7, 2010.
16	“The Integrated Assessment and Ecosystem Management Protocol (IAEMP): Use of Conceptual Ecosystem Models in an integrated assessment context”.	Reiter, M.	Universidad Autónoma de Baja California Invited Seminar Series, March 4, 2010.
17	“ECSC Workshop (15h Short Course): An Integrated Assessment and Ecosystem Management Protocol for decision making in coastal habitats”	Reiter, M.	Universidad Autónoma de Baja California, Ensenada, Baja, Mexico, Feb. 28 - March 6, 2010.
18	“Creating the Department of Integrated Environmental Science at Bethune-Cookman University: Interdisciplinary Curriculum Design, Program Outcomes, and the Role of Service Learning Research”.	Reiter, M.	Council on Undergraduate Research 13th National Conference, June 20-26, 2010, Ogden, UT.
19	“Derivation of a GIS-Based Watershed-Scale Conceptual Model for the St. Jones River, Delaware from Habitat-Scale Conceptual Models”.	Reiter, M., M. Saintil, Z. Yang, and D. Pokrajac	2010 Annual Meeting of the Florida Academy of Sciences, March 18-20, 2010, Fort Pierce, FL.

20	“Mean sea level: What are the recent changes along the Texas Gulf Coast?”	Sadovski, A., G. Jeffress, P. Tissot, S. Duff, and S. Ussery.	2010 Sea Level Rise Conference, Corpus Christi, TX.
21	“Modeling wetland complexity for coastal landscapes within sea level rise scenarios.”	Smith, E. and *R. (Baluyot) March.	Society for Conservation GIS 13 th Annual International Conference, 8-11 July 2010, Monterey, CA
22	“Predicting habitat change on Ingleside Barrier Strandplain using available data: Lamar Peninsula”.	Smith, E. and *R. (Baluyot) March.	Sea Level Rise 2010 Conference, 1-3 March 2010, Corpus Christi, TX.
23	“Coastal modeling at the Texas Coastal Ocean Observation Network (TCOON)	Tissot, P.	Technical Session of the 2010 TCOON Annual Meeting, Austin, TX.
24	“CBI real-time coastal predictions”	Tissot, P.	(invited by MIC Scott Cordero). Corpus Christi Weather Forecast Office Marine Workshop, Corpus Christi, TX.
25	“Coastal modeling and the Texas Coastal Ocean Observation Network (TCOON).”	Tissot, P.	Invited presentation (Nicholas C. Kraus): US Army Corps of Engineers, ERDC Coastal and Hydraulics Laboratory, Vicksburg, MS.
26	“Comparison of extreme value statistical distributions and implications for Galveston Pier 21”.	Warner, N., P. Tissot, B. Sterba-Boatwright, and G. Jeffress.	2010 Sea Level Rise Conference, Corpus Christi, TX.
27	Enhancing the Ocean Literacy of Underrepresented Students and Their Teachers.	Dr. Marcia Allen Owens, “Florida A&M University & the Orlando Science Center	Ocean Sciences Conference (Ocean Science and Mutualism), February 2010.
28	Above-ground biomass of emergent salt marsh vegetation using close range hyperspectral remote sensing.	Merani*, P. B., D.C. Rundquist, and J. F. Schalles.	Annual Meeting of Association of American Geographers, Washington, D.C. April,

			2010.
29	Characterization of water reflectance spectra variability: Implications for hyperspectral remote sensing in estuary waters.	Fan, C., and J. F. Schalles.	OneNOAA Science Seminar. NOAA HQ, Silver Spring, Maryland. April, 2010
30	Extracting habitat features from hyperspectral coastal wetland imagery in Georgia and Texas.	Schalles, J.F., C. M. Hladik, D. N. Seminara*, A. E. Altrichter, M.M. Steele, and A. C. Hart.	Ecological Society of America Annual Meeting, Pittsburgh, Pennsylvania. August, 2010.
31	Vegetation indices to compare salt marsh spatial structure at seven NOAA estuarine reserves.	Seminara, D.N.*, and J.F. Schalles.	Ecological Society of America Annual Meeting, Pittsburgh, Pennsylvania. August, 2010.
32	Application of Single and Dual-Pulse LIBS for Trace Metal Oyster Studies	Branch, J, Martinez, J., Akpovo, C., Jagoe, C., Johnson, E. , Johnson, L.	Florida A&M University Focus on the Environment Student Research Poster Session, Tallahassee FL. March 2010
33	Numerical investigations of sea-level-rising effects on Apalachicola estuary.	Huang, W., Cherrier J., Harwell M., Hsieh P., Johnson E., Wang H.	Presented in the ASCE Engineering Mechanics Conference, Los Angeles, CA, August 8-11, 2010.
34	The weakfish (<i>Cynoscion regalis</i>) as a candidate species for aquaculture production.	Cinelli*, and D. McIntosh.	World Aquaculture Society 2010 meeting, April 2010.
35	Investigating Uptake and Colonization of <i>Vibrio parahaemolyticus</i> in Eastern oysters, <i>Crassostrea virginica</i> .	Dickens, K*, Ozbay, G., Watson, M. and Richards, G.	Delaware State University Honors Program, Dover, DE. March 31, 2010
36	Benthic Diatoms as Water Quality Indicators in the Blackbird Creek Watershed, Delaware.	Pappas, A*, Ozbay, G. and Coyne, K.	Atlantic Estuarine Research Society, Atlantic City, MD. March 2-4, 2010
37	Evaluation of Benthic Diatoms as Water Quality Indicators in the Blackbird Creek Watershed, Delaware.	Pappas, A*, Ozbay, G. and Coyne K.	Delaware State University Honors Program, Dover, DE.

			March 31, 2010.
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Note: *students are denoted with an asterisk.*

Listed in the table below are publications and documents in review for publication produced during this six month period.

Table E-5 Student and Faculty Publications

	Publications	Who	Date(s)/Where
1	A Cooperative Approach to Resource Management: Texas Gamefish Win.	Simoniello, C., P. Tissot, D. McKee, A. Adams, R. *Ball, and R. Butler. 2010	Journal of the Marine Technology Society, Science Note. <i>In press</i>
2	An improved water-depth correction algorithm for seagrass mapping using hyperspectral data.	Lu, D* and Cho, H.J.	Remote Sensing Letters 2(2): 91-97. 2011
3	A study on spectral bands for detecting submerged aquatic vegetation from hyperspectral data.	Gaye, G.*, H. Kim, and H. J. Cho. 2010	Proceedings of ADMI 2010 (in CD-Rom); 4 p
4	A water-depth correction algorithm for submerged vegetation spectra	Cho, H.J. and D. Lu.	Remote Sensing Letters 1(1): 29-35. 2010
5	Website for Aquatic Plants and their Habitats of the Mississippi Coast.	Cho, H.J.	Final Report to NOAA Coastal Services Center Gulf of Mexico Alliance. July 2010. 8 pp.
6	How large is the seamount biome?	Etnoyer, P.J., J. Wood*, and T.C. Shirley.	Oceanography Vol. 23(1): 206-209. 2010
7	Aquatic plants of Mississippi coastal river systems.	Cho, H.J., P. Biber, M. Poirrier, and J. Garner*	Journal of Mississippi Academy of Sciences <i>in press</i>
8	Seasonal and spatial variations of macrobenthic invertebrates in three Mississippi Gulf Coast bayous.	J. Watkins* and Cho, H.J. 2010.	Journal of Mississippi Academy of Sciences Vol. 55(2) 154-169. 2010
9	Seed Propagation Protocol for Wigeongrass (<i>Ruppia maritima</i> L.) (Mississippi	Cho, H.J. and P. Biber.	Ecological Restoration Vol. 28(2): 135-137. 2010
10	Hexavalent chromium-induced multiple biomarker responses in liver and kidney of goldfish, <i>Carassius auratus</i> .	Velma, V., and P.B. Tchounwou.	Environmental Toxicology. <i>In press.</i>
11	Chromium-induced biochemical, genotoxic and histopathologic effects in liver and kidney of Goldfish, <i>Carassius auratus</i> . Mutation Research	Velma, V., and P.B. Tchounwou. 2010	Genetic Toxicology and Environmental Mutagenesis, Vol. 698, (1-2): 43-51. 2010

12	Enhancement of the Turbulence Sub-model for More Accurate Predictions of Vertical Stratifications in 3D Coastal and Estuarine Modeling.	Huang. W.	International Journal of Ocean and Climate Systems., Volume 1 • Number 1 , pages 37-50. 2010
13	Coupled biogeochemical cycles in urban environments: Ecosystem services, green solutions, and misconceptions	Pataki D, Carreiro MM, Jennings J *, Pincetl S, Pouyat RV, Whitlow TH, Zipperer WC	Special Issue of Frontiers in Ecology and the Environment on coupled biogeochemical cycles. <i>In press</i>
14	Influence of sealevel rise on iron diagenesis in an east Florida subterranean estuary.	*Roy, M., Martin, J.B., Cherrier, J., Cable, J.E., and C.G. Smith.	Geochimica et Cosmochimica Acta. <i>In press</i>
15	Assessing hydrologic and biogeochemical controls on pore water dissolve inorganic carbon flux in a subterranean estuary: a 14C and 13C mass balance approach.	*Dorsett, A.M., Cherrier, J., Martin, J.B. and J.E. Cable.	Marine Chemistry. <i>In press</i>
16	Case Study: Entrepreneurship in the Chesapeake Bay Oyster Industry.	Wilbon, A.D., Bundy M., and Clark, K.	International Journal of Case Studies in Management <i>in press</i>
17	Atlas of Shallow-Water Benthic Habitats of Coastal Texas: Espiritu Santo Bay to Lower Laguna Madre. NOAA Coastal Services Center, Charleston, SC.	Finkbeiner, M., J. D. Simons, C. Robinson, J. Wood*, A. Summers, and C. Lopez.	NOAA Coastal Services Center, Charleston, SC.
18	Review of “Communicating Environmental Geoscience.” By D.G.E. Liverman, C.P.G. Pereira, and B. Marker, eds.	Wood, J*	Science Editor 32(5).
19	<i>‘From Education to Exploration: Students at Sea’.</i>	<i>Video Cherrier, J. Producer</i>	To be shown in the NOAA Kiosk at The Smithsonian-Ocean Hall in Washington D.C.and 15 other museums around the country

ECSC Leveraging

Leveraging existing funds and resources is also essential for extending the influence of the ECSC. The total amount of leveraged dollars obtained over reporting cycle is: \$6,421,192.00. In the table below the leveraging activities are documented.

Table E-6 Leveraged Activities

Partnership	Grant/Activity	Date/Participants
Florida Institute of Oceanography	Tracing the intrusion of the GOM-2010 oil spill on coastal and marine food webs using radiocarbon and stable isotopes. \$297,258 for 2 years.	Co PI J. Cherrier with J.P. Chanton (FSU), L. Chasar (USGS), and K. Craig (FSU).
Florida Institute of Oceanography	Uncoupling of autotrophy and heterotrophy: effects of the Deepwater Horizon Oil Spill on microbial food webs. \$239,027 for 1 year.	Co-PI J. Cherrier with W. H. Jeffrey (UWF) and A. Chauhan (FAMU).
Florida Institute of Oceanography	Assessing the impact of the Deepwater Horizon oil spill on coastal waters of the Florida panhandle: water, sediments and fish \$193,518 for 1 year	C. Jagoe (FAMU) and R. Snyder (UWF)
Florida Institute of Oceanography	Acute effect of oil on northern Gulf of Mexico reef communities. \$167,376 total for 1 year	Patterson, W. (UWF) and Jagoe C. (FAMU)
Florida Institute of Oceanography	Impacts from MC252 oil on ecologically and commercially important plankton of the Gulf of Mexico. \$ 350,779 total for 2 years.	Rumbold, D. (FGCU) and Jagoe, C. (FAMU)
NSF	Center for the Integrated Study of Coastal Ecosystem Processes and Dynamics in the Mid-Atlantic Region. \$5,000,000 for 5 years	Chigbu, P., (Leading PI at UMES), C. Fan (co-PI).
NSF	Quantifying the Impact of the Gulf of Mexico Oil Spill on the Health and Productivity of	Cho, H.J.

	Louisiana Salt Marshes. 1 year. JSU subcontract thru MSU: \$70,000 for one year. NSF Rapid (MSU PI: D. Mishra)	
NSF	Commitment as a Partnering Institution in the Climate Literacy Partnership in the Southeast United States (CLiPSE). JSU subcontract \$29,772 for one year through Mississippi State University.	Cho, H.J.
MS-AL Sea Grant Consortium. PI & PD	Habitat Suitability Index for Submerged Aquatic Vegetation of the Mississippi Coast \$51,862 for one year.	Cho, H.J. and P. Biber
Gulf of Mexico Alliance Environmental Education Network	Minority Students and Community Outreach on Hurricane Preparedness and Adaptation. \$9350/1 year	Islam, T., and E. Johnson.
NOAA-National Estuarine Research Reserve (NERR) Fellowship	Ecological Modeling of Potential Seagrass Habitat at Grand Bay National Estuarine Research Reserve. \$40,000 for 1 year	Nica, C. and H.J. Cho
National Geospatial Intelligence Agency.	Hyperspectral Algorithm Development and Dimension Reduction for Improved Detection of Shallow Coastal Submerged Vegetation. \$299,000 for 3 years	Cho, H.J., H.J. Kim, and C.Wafo-soh.
NASA	Strengthening Global Climate Change Education through Remote Sensing Application in Coastal Environment using NASA satellite Data and Models. \$321,000 for 3 years	Cho, H.J. and M. Deepak.
NASA	Coastal Geospatial Research for Undergraduates, with an Emphasis on Oil Spill Effects on Gulf of Mexico Coastal Habitats. \$4600 for 1 year	Schalles, JF

Conner and Associates, Ft. Meyers FL	Non-Tidal Nature of a Set of Shallow Water Stations in the Vicinity of the Florida Indian River: Phase II \$19985 for 1 year	P. Tissot, with D. Martin
NASA	Improved Connective Initiation Forecasting in the Gulf of Mexico Region \$37,818 for 1 year	P Tissot
Jesse Ball DuPont Foundation	Expansion of Library Support Services for the Masters in Integrated Environmental Science at Bethune-Cookman University \$250,000	Co-PI, Michael Reiter, with H. Thompson and H. Powell.

Table E-7: New ECSC Students

Student Name	Degree Program & Major	Institution
LaTrisha Allen	Ph.D. Environmental Science	FAMU
Amy Edwards	MS Environmental Science	FAMU
Lauren Kiser	MS Integrated Environmental Science	Bethune-Cookman
Andrew Kameronosky	MS Integrated Environmental Science	Bethune-Cookman
Rashan Moss	MS Integrated Environmental Science	Bethune-Cookman
Niraj Ray	MS Integrated Environmental Science	Bethune-Cookman
Stephen Brown	Ph.D. Environmental Science	Morgan State University
Edgar Chambers	BS Biology	Morgan State University
Diane Parker	BS Biology	Morgan State University
Yasaun Young	BS Biology	Morgan State University

K-12 Outreach Activities

FAMU High School Ocean Science Bowl Team



The ECSC 2009-2010 Ocean Science Bowl team saw the return of three students with previous experience, while three of its members competed for the first time. Regardless of previous experiences, the team was enthusiastic about competing. Adding to their eagerness and determination were the accounts of near-victory by former team members. This team knew that it had both a reputation to defend and victory to claim. They competed in the Regional National Ocean Science Bowl (NOSB) Spoonbill Bowl, St. Petersburg, FL and the NOBCCChE National Science Bowl, Atlanta, GA in March. However, the

team found difficulty in adjusting to the increased number of social science questions as they had prepared according to the marine technology theme of the National Ocean Science Bowl. It did teach the team how broad based their knowledge base must be not only to be successful in this competition but also in their future studies.

Following, this realization the team decided to prepare for “as much as we possibly can” for their NOBCCHE competition. The questions from this competition had a specific focus on African American inventors, scientists and inventions however the proportion of general science questions has fluctuated from year to year. NOBCCHE’s general science questions this year were mostly in the environmental science category as it related to the overall conference theme of sustainability. This favored the ECSC team as all of them have participated in the ESI summer camp, and have been introduced to environmental and ocean science. Unfortunately, luck was not on their side as the team accumulated a score in the round-robin which was the third highest in their group, and was actually higher than the second position in all of the other groups. As only the top two teams, regardless of comparative point accumulation across groups, advanced to the semi-finals, the young NOAA ECSC team will have to wait until next year to reach their goals. They were defeated by the eventual second place winners La Jolla High School. Although not disheartened, the team acknowledged where its weaknesses are and their coaches Zakiya Hoyett and Ariana Marshall will work with them to improve them for next year. The team proudly congratulated its two graduating seniors Erinma Kalu and Obi Onyeozili who are continuing with their education at Harvard and Tallahassee Community College respectively.

ECSC 2009-2010 Ocean Bowl Team members:

Erinma Kalu (12th Grade), Obi Onyeozili (12th Grade), Samuel Ichite (11th Grade), Patrick Holmes (10th Grade), Vivek Somasundaram (9th Grade), David Brown (9th Grade)

FAMU K-8 Environmental Awareness Poster Competition was held March-May, 2010.



The 2010 ECSC Environmental Awareness Poster Competition focused on urban runoff- "Reduce Runoff: Slow It Down, Spread It Out, and Soak It In." The turnout for the educational presentations was over 200 students. ECSC graduate students, Jessica Wise, Judith Sarkodee-Adoo, and John Branch presented the information to the students using a PowerPoint presentation on urban runoff and runoff prevention and also using an Urban Runoff "Know-No" game. The students then designed posters

which reflected strategies to prevent urban runoff. The schools which participated in the competition were: Sealey, Pineview, and John G. Riley elementary schools. The schools of the winning posters received gift certificates to be used to purchase supplies for the school. All of the winning posters were from Sealey Elementary.

Sealey Garners Top Three Environmental Poster Awards

By Lenita J. Joe



Linda Miller, Program Coordinator for Florida A&M University's (FAMU) Environmental Sciences Institute announced the winners in the 2010 Annual National Oceanic and Atmospheric Administration (NOAA) Environmental Awareness Poster Competition. Three Sealey Elementary Math and Science Magnet School students took the top three prizes. Aditya Hota, 5th grade was the first place winner. Second place winner was Amauria Willis, 4th grade and Madison Sutherland, another fifth grader took third place. The competition was open to all area elementary and middle

schools.

The event was sponsored by NOAA's Environmental Cooperative Science Center (ECSC) housed at FAMU. The major goals of ECSC are to "educate present and future generations about the changing earth and its processes; inspire our nation's youth to pursue scientific careers; and to improve the public's understanding and appreciation of NOAA's mission."

This year's Environmental Awareness topic was "Reduce Runoff: Slow It Down, Spread It Out, and Soak It In." Media specialist at Sealey, Lenita Joe and art teacher Jean McGoogan worked with all 4th and 5th grade students to educate them about the runoff problems which assisted them to come up with possible solutions. They used many media resources as well as information provided by FAMU, including a half-hour session provided by graduate student Jessica Wise and undergraduate student, Brandon Howard. Eleven students at Sealey participated in the poster contest. Besides the winners, the other students were: Tabias Thomas, Kayla Turner, Adrianna Griffin, Javelle Strickland, Dharma Hadders, Autumn Maxwell, Ellis Chaires, Melanie Clark. Each student received

a certificate of participation. First place was a prize package and a \$50 gift certificate to Staples for school supplies. Second place winner received a \$40 gift certificate and a prize package and the third place winner received a \$30 gift certificate as well as a prize package.



Ms. Miller, along with Ph.D. student John Branch, Jr., were on hand, along with principal Demetria Clemons to present the awards. Media Specialist Lenita Joe, art teacher Jean McGoogan, and principal Demetria Clemons congratulate NOAA Environmental poster winners Aditya Hota (1st place), Amauria Willis (2nd place), and Madison Sutherland (3rd place winner). *(Article courtesy of the Tallahassee Democrat)*

FAMU Environmental Science High School Summer Camp

The NOAA Environmental Cooperative Science Center (ECSC) at FAMU hosted the 2010 Environmental Sciences Institute (ESI) High School Summer Camp from June 6-26, 2010. Twenty-five participants, mostly from Leon and surrounding Counties, were given the opportunity to be introduced to marine and environmental science through a variety of settings including classroom training, seminars, laboratory experiments, and field trips. The theme for the Camp was “If it’s in your Gutter, it’s in your Bay: Examining the Impacts of Urban Runoff in Coastal Ecosystems.”



The kick-off for the ESI Summer Camp was an orientation and reception on 6/6/2010. All camp participants, parents, faculty, staff and ECSC/ESI students were encouraged to attend. The daily instructional portion of the camp was June 7-21, 2010. Classes were taught by ECSC/ESI graduate students/post-

doctoral fellow and included Discovering Environmental Science, Ocean Science, Geographic Information Systems (GIS), and Creative Projects (see camp handbook http://www.ecsc.famu.edu/camp2010/2010_ESI_Summer_Camp_Final_Handbook.pdf). Seminars were given by professionals in the field and they were designed to enhance the students understanding of science, and to demonstrate various career choices in the field of science. A campus field trip was scheduled to collect water samples for experiments, and an off campus field trip was scheduled to Gulf Specimen Marine Laboratory to observe and study marine life. Classroom experiences, field trips, and Seminars were augmented by a series of hands-on laboratory experiments led by graduate students (lab manual http://www.ecsc.famu.edu/camp2010/2010_ESI_Summer_Camp_Manual.pdf). At the end of the summer camp, the high school participants presented their research findings before a panel of judges using presentation techniques learned during the summer camp and awards were presented during the end of camp banquet later that day.



The end of Camp trip took place June 23-26, 2010 and included a trip to the Metro Washington, D.C. Area. Linda Miller (ECSC Program Coordinator) collaborated with Meka Laster of NOAA-EPP to arrange a summer camp group visit to NOAA Headquarters in Silver Spring, MD and the NOAA Center for Atmospheric Sciences (NCAS) Beltsville, MD facility for June 24. Upon arrival at NOAA's Headquarters, the group was greeted by Sabrina Tucker; Chantell Haskins gave an overview of NOAA's Office of Education, Educational Partnership Program; Zayani Sims gave a perspective from a college student and NOAA Undergraduate Scholarship; and Kamani Kimbro (NOAA employee and former MSU ECSC Post-doctoral fellow) gave a perspective on environmental science employment at NOAA. Audrey Trotman, Meka Laster, and Sandra Sarvis were also in attendance.

Upon arrival at the NCAS Beltsville facility, Demetrius Venable gave an overview of the research at the facility, and tours were provided by NCAS staff and students. The summer camp left the facility with a better understanding of atmospheric processes that are fundamental to weather, air quality and climate prediction.



Later in the afternoon, the group visited the National Aquarium Baltimore which featured the "Our Ocean Planet, Dolphin Show", and exhibits of more than 16,500 animals. The purpose of this visit was to inspire the camp participants to, respect, enjoy, and protect the aquatic world.

On June 25, the group visited the Environmental Protection Agency (EPA). Sarita Hoyt and Peter Cassell, co-leads of the Urban Waters Communications Team, arranged the presentation and curriculum for the visit. Yu-Ting Guilaran, Deputy Director, Assessment & Watershed Protection Division, Office of Wetlands, Oceans & Watershed, gave the introduction to the presentation; the camp participants had a meet and greet with the Deputy Assistant Administrator for Water, Michael Shapiro; Shanika Whitehurst discussed career opportunities at the EPA; and Christopher Burgess gave a tour of the Emergency Operations Center at the EPA.

The group later visited the Smithsonian National Museum. One of the main attractions of the visit was the Ocean Exhibit Hall, co-sponsored by the National Oceanic and Atmospheric Administration (NOAA).

The Environmental Sciences Institute High School Summer Camp plays a vital role in preparing participants for their pursuit of careers not only in the sciences, but in all facets of professional life requiring leadership, critical thinking, exceptional communication skills, and understanding of our multi-disciplinary world. Upon returning to their homes and schools, ECSC/ESI Summer Camp students are more mature, focused and motivated. They are well on their way to becoming aware, involved citizens, real assets to their schools and communities, and potential leaders in the environmental field. The majority of ESI Summer Camp Participants attend college after graduating high school. Appendix 5: is a sample of the outcome of the ESI Summer Camp participants. The success of the ESI Summer Camp is attributed to NOAA, ESI faculty, staff, students, and other inter-disciplinary participants. *For more information, visit www.ecsc.famu.edu/camp2010.*

Table E-8: FAMU High School Summer Camp Graduates for Current Award

Student	H.S. Graduation	University/College Attending	Major
Diliesha Bryant	06/2009	Florida A&M University	Pharmacy
Lorenca Claxton	06/2008	Tallahassee Community College	Biology
Lance Farmer	06/2010	Florida A&M University	Computer Science
Booker Gainor	06/2007	Florida A&M University	Business Administration
Carrol Hylton	06/2008	Florida A&M University	Nursing
Elizabeth Ichite	06/2010	Florida State University	Pre-Med
Bradley Johnson	06/2009	Florida A&M University	Engineering
Erinma Kalu	06/2010	Harvard	Engineering
Emilio Kenny	06/2010	Miami Dade College	Pre-Engineering
John Kershaw	06/2009	Ball State University	Environmental Science
Xavier McGill	06/2009	Florida State University	Business Administration
Jason Moore	06/2009	Florida A&M University	Pharmacy
Eric Nottage	06/2009	Florida A&M University	Biology
Obi Onyeozili	06/2010	Tallahassee Community College	Political Science
Jasmyn Sanders	06/2010	Florida A&M University	Pre-Pharmacy considering changing to Environmental Science
Allen Starke	06/2009	Florida A&M University	Engineering
Jade E. Walker	06/2010	Florida A&M University	Biology

TAMUCC Teaching Environmental Sciences Summer Course for Teachers

The Teaching Environmental Sciences (TES) graduate course was again offered during June 2010 at Texas A&M University-Corpus Christi. The course was taught by Dr. Denise Hill, Associate Professor in Teacher Education. She is a science educator at TAMUCC after teaching in the Texas public schools for 20 years. The graduate students are preservice or inservice teachers currently teaching in Texas. The grant-funded course provides payment of tuition and fees for the teachers. The TES course is designed to increase teachers' understanding of environmental concepts and principles regarding air, water and waste management, and a clean and healthy environment. Students were involved in the following activities: Birding, Kayaking, Seining, Core Sampling, boat trips in the Corpus Christi Bay and Gulf of Mexico and riding on airboats through mangrove beds provided by the Texas General Land Office. Visits were made to AEP Electric to learn more of its Education Outreach Program and to the Texas Sea Grant Floating Classroom. The students also received six hours of continuing professional education for the Texas Parks & Wildlife, "Energy and Society" program training provided by the Texas State Aquarium. The following supplies, totaling \$ 4,921.98, were also provided to the graduate students for use in the classrooms: Gulf Coast Marine Life (3rd Ed.), Seining nets, Binoculars, Bubble Box portable air pump/with bucket, Bubble Box portable air pump/without bucket, Indoor/Outdoor Thermometers (acceptable for GLOBE).

Section II: Success Stories

Larry Robinson (former ECSC Director and FAMU Vice President for Research) was confirmed by the US Senate to serve as Assistant Secretary of Commerce for conservation and management at the National Oceanic and Atmospheric Administration (NOAA).

Philippe Tissot (IA-TA Researcher at TAMUCC) was the recipient of a Spring 2010 Texas A&M University System Chancellor Teaching Excellence Award, one of three TAMUCC faculty to score in the top 5 percent of their respective class.

Robyn Ball, ECSC Researcher at TAMUCC (M.S. Summer 2008, Thesis Title: “A Comparison of Artificial Neural Network, Random Forest, and Multi-linear Regression Models: Predicting Water Temperature in the Upper Laguna Madre”) is now enrolled in the PhD program in Statistics at Texas A&M, College Station.

Sandra Arismendez, completed her PhD at TAMUCC Title: “Land-Water Nutrient Coupling Process in Central Texas Estuaries.” She is currently a postdoc in Dr. Paul Montagna’s lab at the Harte Institute for Gulf of Mexico Studies. She was also selected to give an address at the TAMUCC Commencement in May 2010.

Krystal Alvarado, ECSC Undergraduate Fellow Summer 2008 at TAMUCC, graduated with a B.S. degree and was admitted to the MS program at TAMUCC.

Lauren Urban, completed her M.S. in Atmospheric Science at Creighton University in August, 2010. Her thesis title was: “Effects of Meteorological Forcing on CDOM in the South Atlantic Bight”

Rosaleen Baluyot, completed her MS at TAMUCC in May 2010. Her thesis is titled “Natural and Anthropogenic Changes on the Ingleside Barrier Strandplain Peninsulas and Implications on Neotropical Avifauna Diversity”.

Frank Johnson, a FAMU undergraduate student, was awarded Ernest F. Hollings Undergraduate Scholarship

Sergie Reid, a TAMU-CC undergraduate student, was awarded Ernest F. Hollings Undergraduate Scholarship

Jolvan Morris, a FAMU MS student, received an internship and an offer of SCEP employment with the Northeast Regional Office of NOAA Fisheries

Lorielle Jackson, a FAMU BS student, received an internship at the Hollings Marine Laboratory

Nancy Metayer, a FAMU undergraduate student, received an internship with the Northeast Regional Office of NOAA Fisheries

Charles Jagoe and Jennifer Cherrier, ECSC faculty at FAMU received five FIO/BP grants to carry out research associated with the Deepwater Horizon oil spill

Section III: CSC Wide Collaborative Research

The NOAA-EPP has established 5 Cooperative Science Centers (CSCs) including the ECSC. To date, inter-center collaborations involving two or more CSCs have been limited. The Deepwater Horizon oil spill, and its potential ongoing impacts, represents a unique opportunity for collaboration among the CSCs. In addition to NOAA's obvious interests in this area, there are a variety of important scientific questions to address, as well as great potential for student training. While previous efforts to identify large-scale collaborative projects among the CSCs have failed to gel to date, the spill presents an important research opportunity and focus area, and holds the potential for significant additional funding.

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 on the Gulf of Mexico that may be impacted by the Deepwater Horizon oil spill. These are 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) various basic investigations of ecosystem status, processes and health, 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 any oil arrived in the area). Similar survey campaigns were also conducted at ANEER 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.

Additionally, a number of studies in ecosystem processes and ecosystem health are underway, led by FAMU and partner institutions. These were planned and initiated well before the oil spill began, but can provide supporting samples, data and baseline information for work related to the current problem. These include work in ANEER on C and N biogeochemistry, microbial ecology and

nutrient dynamics, oyster contaminants and microbiology, and impacts of changes in water flow and wastewater inputs on the system. At GBNERR, ongoing projects include studies of terrapin turtle populations, fish communities and resident marsh birds, as well as microbial source tracking to identify sources of bacterial contamination, and studies of Hg concentrations and cycling in sediments, biota and the atmosphere. The latter work is in cooperation with the NOAA air resources laboratory.

In June 2010, the Florida Institute of Oceanography (FIO) received \$10M in funding from BP for initial assessment and data collection, and issued a call for proposals. Over 200 proposals were received, and 27 were funded. Of these, ECSC scientists are lead or coPIs on 4 projects. All of these focus on immediate data needs, particularly collection and analysis of water, sediment and fish samples. Work will include measurement of chemical and biological parameters to address changes in carbon cycling, microbial and planktonic communities, assessment of enzymatic biomarkers to assess fish exposure to hydrocarbons and fish health, and measurement of oil and oil components in water and sediments from the northern Gulf of Mexico. Some 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. Brad Stevens, Distinguished Scientist at the Living Marine Resources Cooperative Science Center (LMRCSC) at UMES also expressed interest in potential projects, pending the availability of additional funding and resources. Collaborators at CREST include Samir Ahmed, Alex Gilerson and Irina Gladkova. We identified several potential projects, focusing on using remote sensing products to detect oil sheens, and to assess chlorophyll concentrations in nearshore and offshore areas. John Schalles of the GADD-TA of the ECSC participated in these discussions by conference call. The next step will be to identify and acquire relevant data sets for the team at CREST to begin processing; these activities will continue this fall.

An additional collaborative opportunity between ECSC and CREST is represented by the NOAA Environmental Literacy Grants for Formal K-12 Education program. Two ECSC faculty members (Charles Jagoe and Bernadette Kelley) collaborated with Shakila Merchant and Reza Khanbilvardi at CREST, as well as scientists from the New York Academy of Sciences and the American Museum of Natural History to develop a pre-proposal titled "Increasing Ocean and Climate Literacy Among Elementary School Students and Teachers by Applying a Holistic Framework to Existing NOAA Resources". This initiative would create a climate and ocean science education "consortium" to develop a holistic approach to the K-12 formal and informal educational framework. These efforts would involve students (including field experiences at NOAA and NERR facilities) and teachers (through training and workshops) in both New York and Florida. This has been submitted to NOAA and we are awaiting a decision on whether a full proposal will be solicited.



Appendix 1

Ecological Processes and Indicators of Ecological Health Supporting Information

Appendix 1:A

Proposal Titles and EPIEH-TA Project Scientists for proposals submitted to date are as follows:

- “Integrated Hydrological and Ecological Modeling for Apalachicola River and Bay System” W. Huang, E. Johnson, and Y. P. Hsieh
- “Drought, Reduced River Flow and Sea Level Rise: Exploring Climate Impacts on Carbon and Nitrogen Cycling in the Apalachicola Bay System” J. Cherrier, S. Smith, P. Hsieh and J. Caffrey
- “Ecological Succession of Wetlands Restored from Agricultural Uses” M. Gao & A. Deshpande
- “The Use of Agricultural Tools to Study the Effects of Environmental Change on Weakfish (*Cynoscion regalis*)” D. McIntosh
- “Benthic Diatom Assemblages as Environmental Indicators in Blackbird Watershed, Delaware” G. Ozbay & K. Coyne
- “Ecological modeling of potential habitat for submerged aquatic vegetation at Grand Bay National Estuarine Research Reserve, Mississippi” H.J. Cho
- “Ecotoxicology & Risk Assessment of Mercury in the GB-NERR” P. Tchounwou & Y. Anjaneyulu
- “Source Tracking and Assessment of Bacteriological Water Quality at the Grand Bay National Estuarine Research Reserve” I. Farah & P. Tchounwou
- “Assessing the vulnerability of the Chesapeake Bay and Northern Gulf of Mexico to Impacts from Hurricanes” C.L. Fan
- “Temperature and salinity dependent growth of weakfish.” D. McIntosh & C. Chambers
- “Risk Assessment of *in vitro* Exposure to Perfluorinated Compounds in the Marine Environment” E. Johnson.
- “Determination of the Micrometer Scale Distribution and Speciation of Metal Atoms in Biological Systems and Sediments”, E. Johnson
- “Investigations on the Microbial Community Structure and their Associated Functions in Apalachicola National Estuarine Research Reserve (ANERR)” C. Jagoe and A. Chauhan

- “Investigations on the Microbial Community Structure and their Associated Functions in Apalachicola National Estuarine Research Reserve (ANERR)” J. Cherrier and A. Chauhan

Appendix 1:B

*ECSC/EPIEH-TA student publications are denoted with an asterisk *.*

NOAA/ECSC/EPIEH-TA Publications

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

Cho, H.J. and P. Biber. 2010. Seed Propagation Protocol for Wigeongrass (*Ruppia maritima* L.) (Mississippi). *Ecological Restoration* Vol. 28(2): 135-137.

*Dorsett, A.M., Cherrier, J., Martin, J.B. and J.E. Cable. Assessing hydrologic and biogeochemical controls on porewater dissolved inorganic carbon flux in a subterranean estuary: a 14C and 13C mass balance approach. *Marine Chemistry*. *accepted pending minor revisions*

Huang, W., 2010, Enhancement of the Turbulence Sub-model for More Accurate Predictions of Vertical Stratifications in 3D Coastal and Estuarine Modeling. *International Journal of Ocean and Climate Systems*, Volume 1 • Number 1 , pages 37-50.

Huang, W., Cherrier J., Harwell M., Hsieh P., Johnson E., Wang H., 2010. Numerical investigations of sea-level-rising effects on Apalachicola estuary. invited and submitted for review for a book chapter of ASCE Special Publication on Coastal Hazards.

Pataki, D.E., Carreiro, M.M., Cherrier, J., Grulke, N.E., *Jennings, V. , Pincetl, S., Pouyat, R.V., Whitlow, T.H., and W. C. Zipperer. Coupled biogeochemical cycles in urban environments: Ecosystem services, green solutions, and misconceptions. Special Issue of *Frontiers in Ecology and the Environment* on coupled biogeochemical cycles. *accepted*

*Roy, M., Martin, J.B., Cherrier, J., Cable, J.E., and C.G. Smith. Influence of sea level rise on iron diagenesis in an east Florida subterranean estuary. *Geochimica et Cosmochimica Acta*. *accepted*

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*.

Velma, V., and P.B. Tchounwou. 2010. Chromium-induced biochemical, genotoxic and histopathologic effects in liver and kidney of Goldfish, *Carassius auratus*. *Mutation Research - Genetic Toxicology and Environmental Mutagenesis*, Vol. 698, (1-2): 43-51.

J. Watkins* and Cho, H.J. 2010. Seasonal and spatial variations of macrobenthic invertebrates in three Mississippi Gulf Coast bayous. *Journal of Mississippi Academy of Sciences* Vol. 55(2) 154-169.

****Video** Cherrier, J. Producer. 'From Education to Exploration: Students at Sea'. To be shown in the NOAA Kiosk at The Smithsonian-Ocean Hall in Washington D.C. and 15 other museums around the country

Appendix 1:C

*ECSC/EPIEH-TA student presentations are denoted with an asterisk *.*

NOAA/ECSC/EPIEH-TA Presentations

Branch, J, Martinez, J., Akpovo, C., Jagoe, C., Johnson, E. , and L. Johnson. Application of single and dual-pulse LIBS for trace metal oyster studies. Florida A&M University Focus on the Environment Student Research Poster Session, Tallahassee FL. March 2010.

Cinelli*, and D. McIntosh. The weakfish (*Cynoscion regalis*) as a candidate species for aquaculture production. World Aquaculture Society 2010 meeting, April 2010.

Dickens, K*, Ozbay, G., Watson, M. and G. Richards. March 31, 2010. Investigating uptake and colonization of *Vibrio parahaemolyticus* in Eastern oysters, *Crassostrea virginica*. Delaware State University Honors Program, Dover, DE.

Huang, W., Cherrier J., Harwell M., Hsieh P., Johnson E., and H. Wang . 2010. Numerical investigations of sea-level-rising effects on Apalachicola estuary. Presented in the ASCE Engineering Mechanics Conference, Los Angeles, CA, August 8-11.

Pappas, A*, Ozbay, G. and K. Coyne. March 31, 2010. Evaluation of benthic diatoms as water quality indicators in the Blackbird Creek Watershed, Delaware. Delaware State University Honors Program, Dover, DE.

Appendix 1:D

NOAA/ECSC/EPIEH-TA Leveraged Funded Proposals

Tracing the intrusion of the GOM-2010 oil spill on coastal and marine food webs using radiocarbon and stable isotopes. Co PI 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-PI J. Cherrier with W. H. Jeffrey (UWF) and A. Chauhan (FAMU). Florida Institute of Oceanography/BP. \$239,027 for 1 year.

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. Jagoe C (FAMU), R. Snyder (UWF) and J. Cherrier (FAMU) \$193,518 total for 1 year.

Acute effect of oil on northern Gulf of Mexico reef communities. Florida Institute of Oceanography/BP. Patterson, W. (UWF) and Jagoe C. (FAMU) \$167,376 total for 1 year

Impacts from MC252 oil on ecologically and commercially important plankton of the Gulf of Mexico. Florida Institute of Oceanography/BP. Rumbold, D. (FGCU) and Jagoe, C. (FAMU). \$ 350,779 total for 2 years.

Instructional cruise to support marine ecosystem studies at Florida A&M University. PI J. Cherrier (FAMU). State of Florida-Florida Institute of Oceanography. 2 3-day cruises funded \$21,600 for 1 year.

Center for the Integrated Study of Coastal Ecosystem Processes and Dynamics in the Mid-Atlantic Region. Chigbu, P., (Leading PI at UMES), C. Fan (co-PI). National Science Foundation \$5,000,000 for 5 years.

Quantifying the Impact of the Gulf of Mexico Oil Spill on the Health and Productivity of Louisiana Salt Marshes. Cho, H.J. (JSU) with PI: D. Mishra (MSU). National Science Foundation Rapid Response Grant \$70,000 for one year.

Commitment as a partnering institution in the climate literacy partnership in the southeast United States (CLiPSE). Cho, H.J. (JSU) with PI: D. Mishra (MSU). National Science Foundation \$29,772 for one year.

Habitat suitability index for submerged aquatic vegetation of the Mississippi coast. Cho, H.J. (JSU) and P. Biber (JSU) MS-AL Sea Grant Consortium \$51,862 for one year.

Appendix 1:E

NOAA/ECSC/EPIEH-TA Leveraged Pending Proposals

Collaborative Research: The role of light in phytoplankton extracellular production and bacterial consumption of dissolved organic matter: implications for coastal carbon cycling. PI J. Cherrier with J.F. Marra (CUNY BC) and W.H. Jeffrey (UWF). Submitted to the National Science Foundation. \$1,047,882 for 3 years.

Appendix 1:F

ECSC/EPIEH-TA Student Projects

John Branch, Jr. (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)

Mike Cinelli (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)

Eric Davenport (Ph.D., MSU): *Assessing the vulnerability of the Chesapeake Bay and Northern Gulf of Mexico to impacts from hurricanes*. Expected graduation date Sept. 2012 (Advisor Dr. C. Fan-MSU, and committee members J. Anderson- MSU, Dr. J. Govoni-NOAA and Dr. J. Xu-NOAA)

Keyana Dickens (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).

Chukwuemeka Ebube (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)

Amy E. Edwards (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)

James Garner (Ph.D., JSU) *Habitat suitability index for submerged aquatic vegetation*. expected graduation date May 2012 (Advisor Dr. H.J. Cho-JSU, rest of committee to be formed)

Adrienne George (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)

Zakiya Hoyett (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. D. Apeti-NOAA/NCCOS, rest of committee to be formed).

Lorielle Jackson (BS, 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)

Amari Jones (BS, FAMU): *The Investigation of Flood Simulation from Dam Failure using the Hydrologic Engineering Centers River Analysis System*, Graduated April 2010 (Advisor Dr. L. Robinson-FAMU).

Frank Johnson (BS, FAMU). *Title yet to be determined*. expected graduation date April 2012. (Advisor Dr. M. Abazinge -FAMU, rest of committee to be formed)

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

Philemon Kirui (Ph.D., JSU): *Genetic and Ecological Variation in Ruppia maritima*. Expected

graduation date April 2112 (advisor Dr. H.J. Cho-JSU, rest of committee to be formed)

Stephen Kishinhi (Ph.D., JSU): *Assessment of microbiological quality of water in selected Grand Bay NERR Ecosystems*. Expected graduation date August 2010 (Advisor Dr. I. Farah-JSU and committee members Dr. P. Tchounwou- JSU, Dr. Woodrey-NOAA/NERR and Mr. D. Ruple-NOAA/NERR)

Akia Laurant (MS, FAMU): *Cumulative impacts of DOM and salinity on *Karenia brevis*: Implications for Apalachicola Bay FL*. expected graduation date December 2009 (Advisors Dr. J. Cherrier-FAMU, Dr. S. Morton-NOAA, and committee members Dr. L. Robinson and Mr. L. Edmiston-NOAA/NERR)

Arianna Marshall (Ph.D., FAMU). *Title yet to be determined*. expected graduation data April 2013. (Advisor Dr. M. Owens, rest of committee to be formed)

Natasha Magee (Ph.D., JSU): *Patterns of abundance and distribution of groundfish in relation to environmental factors in the northern Gulf of Mexico*. Expected graduation date April 2012 (Advisor Dr. P. Tchounwou-JSU, Dr. Driggers-JSU, Dr. Walter-JSU and Dr. Woodrey- NOAA/NERR)

Melanie McHenry (Ph.D, JSU): *Ecotoxicology and risk assessment of mercury in the Grand Bay National Estuarine Research Reserve*. expected graduation date April 2013. (Advisor Dr. P. Tchounwou-JSU, Dr. Arslan-JSU, Dr. M. Woodrey-NOAA/NERR, and Dr. W. Luke-NOAA)

Nancy Muehllehner (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)

Cristina Nica (Ph.D., JSU): *Scientific habitat assessment for seagrass restoration*. Expected graduation date April 2012 (Advisor Dr. H.J. Cho-JSU, rest of committee to be formed)

Amanda Pappas (M.S., DSU). *Evaluation of benthic diatoms as water quality indicators in the Blackbird Creek Watershed, Delaware*. expected graduation date Aug 2012 (Advisor Dr. G. Ozbay-DSU and committee member Dr. B. Scarborough-DENERR, rest of committee to be formed)

T.R. Santos (B.S., MSU). *Evaluating the mesozooplankton population and grazing rates in Mackall Cove*. Expected graduation date August 2009 (Advisors Dr. J. Anderson-MSU and Dr. M. Olson-MSU, rest of committee to be formed)

Judith Sarkodee-Adoo (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 April 2012. (Advisor Dr. J. Cherrier-FAMU, Dr. L. Chasar USGS, Dr. C Jagoe-FAMU, and J. Wannat-ANERR)

Melissa Shutte (B.S., DSU): *Ecological succession of wetlands restored from agricultural uses*. Expected graduation date Aug 2011 (Advisor Dr. M. Guo-DSU and committee member Dr. B. Scarborough-DENERR, rest of committee to be formed)

Kim Tucker (Ph.D., FAMU). *Effects of stormwater on water quality in Apalachicola Bay*. expected graduation April 2012 (Advisor Drs. W. Huang and E. Johnson-FAMU, committee members Dr. J. Christensen-NOAA)

Ramona Turner (M.S., FAMU): *A model for using authentic ocean science research to teach global climate change at the secondary level*. Expected graduation date December 2009 (Advisors Dr. J. Cherrier-FAMU and Dr. B. Kelley-FAMU and committee member Dr. M. Abazinge-FAMU)

Jonathan Watkins (M.S., JSU): *Assessment of the macrobenthic invertebrate abundance and distribution in three Mississippi gulf coast bayous* (Advisor Dr. H.J. Cho-JSU, rest of committee to be formed)

Aaron White (Ph.D., FAMU): *The Use of Satellite Telemetry to Identify Sites for the Uptake of Mercury in the Loggerhead Sea Turtle*. expected graduation August 2010. (Advisor Dr. L. Robinson-FAMU, committee members Dr. M. Abazinge-FAMU, Dr. D. Evans-NOAA, and Dr. R. Carthy-MOTE)

Katherine Whitaker (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)

Jessica Wise (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)

Appendix 1:G

ECSC/EPIEH-TA Workshops Led or Hosted

nothing to report/not applicable to the EPIEH-TA for this reporting cycle



Appendix 2 Geospatial Analysis and Data Development Supporting Information

Appendix 2-A. Geospatial Analysis Group Personnel

NOAA/ECSC/GADD-TA Research Scientists

1. Dr. John F. Schalles (Lead Scientist), Biology Department, Creighton University, Omaha, NE, 68178; email: JohnSchalles@creighton.edu
2. Dr. Hyun J. Cho, Department of Biology, Jackson State University, Jackson, MS, 39217; email: hyun_jung.cho@jsums.edu
3. Dr. Chunlei Fan, Biology Department and MSU Estuarine Research Center, Morgan State University, Baltimore, MD, 21251; email: cfan@jewel.morgan.edu
4. Dr. Tanveer Islam, Environmental Science Institute, Florida A&M University, Tallahassee, FL 32307; email: tanveerul.islam@famuc.edu
5. Dr. Donald C. Rundquist, Center for Advanced Land Management Information Technologies (CALMIT), School of Natural Resources, University of Nebraska-Lincoln. Lincoln, NE, 68583; email: drundqui@unlnotes.unl.edu
6. Dr. Elizabeth H. Smith. Center for Coastal Studies, Texas A & M University – Corpus Christi, Corpus Christi, TX, 78412; email: elizabeth.smith@tamucc.edu
7. Dr. Zhiming Yang. Department of Agriculture and Natural Resources. Delaware State University, Dover, DE, 19901; email: zyang@dsu.edu. **Note:** As of August, 2010, Dr. Yang is Assistant Professor, Department of Environmental, Earth, and Geospatial Sciences, North Carolina Central University, new email: zyang@ncsu.edu.
8. Christine Mohrman. ECSC Site Coordinator. Grand Bay National Estuarine Reserve, Moss Point, MS, 39562; email: Christina.Watters@dmr.ms.gov

NOAA/ECSC/GADD-TA Graduate Students and Their Projects

9. Adeyinka, Kemi. B.S. undergraduate student, Morgan State University. *A Study of Spectral Reflectance of Phytoplankton Groups For Remote Sensing Applications* [C. Fan, advisor and R.A. Warner, NOAA/CCMA collaborator]
10. Kirui, Philemon. Ph.D. candidate, Jackson State University. *Feature selection and dimension reduction for improved detection of shallow coastal SAV* [H.J. Cho: dissertation advisor].

11. Merani, Paul. Ph.D. candidate. University of Nebraska. *Remote estimation of biophysical parameters in selected coastal salt marshes*. [Don Rundquist and Sunil Narulamani, co-dissertation advisors].
12. Morgan Davis, Nicole. M.S. Thesis Student, Texas A & M University – Corpus Christi. *Riparian species composition and distribution along the upper tidal segment of the Mission River, Texas using hyperspectral imagery*. [Elizabeth Smith, thesis advisor]
13. Nica, Christina. Ph.D. candidate, Jackson State University.). *Ecological modeling of potential seagrass habitat at Grand Bay National Estuarine Research Reserve* [Hyun J. Cho, dissertation advisor]
14. Seminara, Drew. M.S. Thesis Student, Creighton University. *Comparative analysis of salt marsh community structures at seven NOAA National Estuarine Research Reserves using Vegetation Indices Derived from AISA Hyperspectral Imagery* [John Schalles, thesis advisor]
15. Urban, Lauren. M.S. Thesis Student, Creighton University. Effects of Meteorological Forcing on CDOM in the South Atlantic Bight. [John Schalles, thesis advisor]. Note: thesis accepted by committee and M.S. degree awarded in August, 2010.
16. Washington, Marvin. M.S. Thesis Student, Jackson State University. *Hyperspectral algorithm development for water effects*. [H.J. Cho, thesis advisor].
17. Wood, John. Ph.D. Candidate, Texas A&M University - Corpus Christi. *Seagrass mapping with hyperspectral AISA Imagery in the Mission Aransas NERR*. [Wes Tunnell, dissertation advisor].

Appendix 2-B Geospatial Analysis Group Publications & Presentations

ECSC /GADD-TA student researchers are denoted by an asterisk.*

NOAA/ECSC/GADD-TA Publications

1. Lu, D* and Cho, H.J. 2011. An improved water-depth correction algorithm for seagrass mapping using hyperspectral data. *Remote Sensing Letters* 2(2): 91-97.
2. Cho, H.J. and D. Lu. 2010. A water-depth correction algorithm for submerged vegetation spectra. *Remote Sensing Letters* 1(1): 29-35.
3. Cho, H.J. 2010. Website for Aquatic Plants and their Habitats of the Mississippi Coast. Final Report to NOAA Coastal Services Center Gulf of Mexico Alliance. July 2010. 8 pp.
4. Etnoyer, P.J., J. Wood*, and T.C. Shirley. 2010. How large is the seamount biome? *Oceanography* Vol. 23(1): 206-209.
5. Finkbeiner, M., J. D. Simons, C. Robinson, J. Wood*, A. Summers, and C. Lopez. 2009. Atlas of Shallow-Water Benthic Habitats of Coastal Texas: Espiritu Santo Bay to Lower Laguna Madre. NOAA Coastal Services Center, Charleston, SC. [Note: This paper not reported in previous semi-annual report]

6. Gaye, G.*, H. Kim, and H. J. Cho. 2010. A study on spectral bands for detecting submerged aquatic vegetation from hyperspectral data. Proceedings of ADMI 2010 (in CD-Rom); 4 p.

7. Wood, J*. 2009. Review of Communicating Environmental Geoscience. D.G.E. Liverman, C.P.G. Pereira, and B. Marker, eds. Science Editor 32(5). [Note: This paper not reported in previous semi-annual report]

NOAA/ECSC/GADD-TA Manuscripts Submitted or In Press

1. Warner, R.A., C. Fan. Optical spectra of phytoplankton cultures for remote sensing applications: focus on harmful algae blooms. Limnology and Oceanography. (submitted)

NOAA/ECSC/GADD-TA Presentations

1. Merani*, P. B., D.C. Rundquist, and J. F. Schalles. Above-ground biomass of emergent salt marsh vegetation using close range hyperspectral remote sensing. Annual Meeting of Association of American Geographers, Washington, D.C. April, 2010.

2. Fan, C., and J. F. Schalles. Characterization of water reflectance spectra variability: Implications for hyperspectral remote sensing in estuary waters. OneNOAA Science Seminar. NOAA HQ, Silver Spring, Maryland. April, 2010.

3. Islam, T. and A. Marshall*. Addressing socio-economic vulnerability to hurricanes. American Planning Association - National Planning Conference. New Orleans, Louisiana. April, 2010.

4. Schalles, J.F., C. M. Hladik, D. N. Seminara*, A. E. Altrichter, M.M. Steele, and A. C. Hart. Extracting habitat features from hyperspectral coastal wetland imagery in Georgia and Texas. Ecological Society of America Annual Meeting, Pittsburgh, Pennsylvania. August, 2010.

5. Seminara, D.N.*, and J.F. Schalles. Vegetation indices to compare salt marsh spatial structure at seven NOAA estuarine reserves. Ecological Society of America Annual Meeting, Pittsburgh, Pennsylvania. August, 2010.

NOAA/ECSC/GADD-TA Abstracts Accepted or Submitted

1. Schalles, J.F. Airborne High Resolution AISA Imagery for Delineation and Classification of Coastal Habitats. 2010 NASA Western Region Space Grant Director's Meeting. Omaha, NE. September, 2010.

2. Nica, C.* and H.J. Cho. 2010. Study of Seagrass Beds at Grand Bay National Estuarine Research Reserve, Mississippi. Seventh International Symposium on Recent Advances in Environmental Health Research.

3. Garner, J.* and H.J. Cho. 2010. Submersed aquatic vegetation communities of Mississippi Coastal River Systems. Seventh International Symposium on Recent Advances in Environmental Health Research. Jackson, Mississippi. September, 2010.

4. Lu, A.* and H.J. Cho. 2010. Aquatic Plants of Mississippi Gulf Coast. Seventh International Symposium on Recent Advances in Environmental Health Research. Jackson, Mississippi. September, 2010.

5. Schalles, J.F., E. Gaiser, and C. Jagoe. Comparative Studies of Estuarine and Coastal System Properties. Scientific Session Proposal Submitted to Coastal and Estuarine Research Federation, Biennial Meeting,

Daytona, Florida in November, 2011.

Appendix 2-C Geospatial Analysis Group Leveraged Funding Activity

NOAA/ECSC/GADD-TA Funded Grants

1. Chigbu, P., and C. Fan. Center for the Integrated Study of Coastal Ecosystem Processes and Dynamics in the Mid-Atlantic Region. National Science Foundation. September, 2010 to August, 2015 (Morgan State University subcontract through University of Maryland Eastern Shore: \$102 K).
2. Cho, H.J. Quantifying the Impact of the Gulf of Mexico Oil Spill on the Health and Productivity of Louisiana Salt Marshes. National Science Foundation Rapid. 2010 - 2011. (Jackson State University subcontract through Mississippi State University: \$70 K; total award \$200K to D. Mishra, Mississippi State University)
3. Cho, H.J. Commitment as a Partnering Institution in the Climate Literacy Partnership in the Southeast United States (CLiPSE). National Science Foundation. January 1, 2011 - December 31, 2012. (JSU subcontract through Mississippi State University for \$29.77 K).
4. Cho, H.J. and P. Biber. Habitat Suitability Index for Submerged Aquatic Vegetation of the Mississippi Coast. Mississippi - Alabama Sea Grant Consortium February, 2010 – January, 2011. (\$51.86 K).
5. Islam, T., and E. Johnson. Minority Students and Community Outreach on Hurricane Preparedness and Adaptation. Gulf of Mexico Alliance Environmental Education Network. 2010-2011. (\$ 9.35 K)
6. Nica, C. and H.J. Cho (faculty advisor). Ecological Modeling of Potential Seagrass Habitat at Grand Bay National Estuarine Research Reserve. National Oceanic and Atmospheric Administration (NOAA-National Estuarine Research Reserve (NERR) Fellowship). June, 2009 - May 2011. (\$40 K).
7. Cho, H.J., H.J. Kim, and C. Wafo-soh. Hyperspectral Algorithm Development and Dimension Reduction for Improved Detection of Shallow Coastal Submerged Vegetation. National Geospatial Intelligence Agency. NGA University Research Initiatives. June, 2008 - June 2,011. (\$299.9 K).
8. Cho, H.J. and M. Deepak. Strengthening Global Climate Change Education through Remote Sensing Application in Coastal Environment using NASA satellite Data and Models. National Aeronautics and Space Administration. May, 2010 - May, 2013. (\$321 K).
9. Schalles, J.F. Coastal Geospatial Research for Undergraduates, with an Emphasis on Oil Spill Effects on Gulf of Mexico Coastal Habitats. National Aeronautics and Space Administration. May, 2010 - December, 2010. (\$4.6 K).

NOAA/ECSC/GADD-TA Proposals Submitted, Pending

1. Cho, H.J. and P. Biber. Habitat Suitability Index Modeling for Coastal Submerged Aquatic Vegetation. National Science Foundation. January, 2011 – December, 2012. (\$280.4 K, Pending)
2. Cho, H.J., D. Mishra, and D. Lu. Advanced Water Correction for Shallow Coastal Benthic Habitat Mapping. National Aeronautics and Space Administration. October, 2010 – September, 2013. (\$459.9 K, Pending).

3. Gitelson, A., D. Rundquist, and J. Schalles. Monitoring Program for Damage Assessment related to Deepwater Horizon. Broad Agency Announcement (BAA) HSCG32-10-R-R00019. Project dates not determined. (\$ 1,007.8 K, Pending).

4. Loubert, L., C. Fan. Grasping GIS: A Certificate Program in Geographic Information Systems. Maryland Higher Education Commission BRAC Higher Education Investment Fund. 2010 - 2012. (\$109 K, Pending)

Appendix 2-D Geospatial Analysis Group – Other Achievements

1. Dr. J. Cho conducted a geospatial training workshop at the Jackson State University e-Center on June 14 - 17. The workshop was entitled "Basics of Earth System Science using GIS and GPS". She also has established the Mississippi Aquatic Plants website (<http://jcho.masgc.org/>).

2. Dr. John Schalles assembled a panel on the Creighton campus for a press conference on the Deepwater Horizon accident on April 29, and was subsequently featured in a series of interviews in the Omaha World Herald¹, on Omaha Station KETV², and on Fox National News³. His summer training course in coastal ecology and geospatial analysis, which helped obtain baseline survey data for the Gulf of Mexico oil spill at Apalachicola Bay NERR and the Lower Florida Keys, within the Florida Keys NMS, was the subject of an 11 minute video program⁴ and several shorter news release clips⁵ released by the Creighton University Public Relations Department.

Media links:

¹<http://www.omaha.com/article/20100430/AP/100439982>

¹<http://www.omaha.com/article/20100607/NEWS01/706079941>

²http://www.youtube.com/watch?v=7aTojt_oifs&feature=related

³<http://s3.amazonaws.com/NDSMediaArchiveBucket/AA3A538F-6DD3-4D8C-923F-EACD7887BE35.wmv>

⁴<http://www.youtube.com/watch?v=Aa2K7bkuI9g>

⁵<http://www.youtube.com/watch?v=Qv8awUxgYz0&feature=related>



Appendix 3 Integrated Assessment in Support of Environmental Decision Making Supporting Information

Appendix 3:A

ECSC/ IA Publications this Reporting Period (*student publications are denoted with an asterisk **).

Accepted:

Simoniello, C., P. Tissot, D. McKee, A. Adams, R. *Ball, and R. Butler. 2010. A Cooperative Approach to Resource Management: Texas Gamefish Win. Journal of the Marine Technology Society, Science Note.

In review:

*Arismendez, S., P. Montagna, and J. W. Tunnell, Jr. Short-term effect of a storm on nutrient delivery and biogeochemical cycling in coastal waters. Journal of Environmental Management.

*(Baluyot) March, R. and E. Smith. Combining available spatial data to define restoration goals. Ecological Restoration.

*(Baluyot) March, R. and E. Smith. Using digital elevation models to model potential habitat responses to storm surge and sea-level rise on two Gulf Coast peninsulas. Global Ecology and Biogeography.

Brenner, J., *S. Arismendez, and J. W. Tunnell, Jr. Environmental assessment needs for ecosystem-based management in the Gulf of Mexico Large Marine Ecosystem. Ocean and Coastal Management.

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.

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

Appendix 3:B

ECSC/ IA Presentations Contributed, Accepted, and Presented (*students are denoted with an asterisk*).

*Arismendez, S. 2010. Land-water nutrient coupling process in central Texas estuaries. 4th Annual Graduate Student Scholarly Works Symposium, April 23, 2010, Texas A&M University.

- *Arismendez, S. 2010. Land-water nutrient coupling process in central Texas estuaries. Dissertation Defense, April 16, 2010. Harte Research Institute.
- *Arismendez, S. 2010. "The Journey". Commencement speaker for Texas A&M University-Corpus Christi, May 15, 2010.
- *Arismendez, S., P. Montagna, and J. W. Tunnell, Jr. 2010. "Establishing standard water quality criteria using satellite products for Texas". Gulf of Mexico Alliance Nutrient Criteria Team Conference, June 9, 2010, St. Petersburg, FL.
- *(Baluyot) March, R. and E. Smith. 2010. "Potential sea-level rise impacts on coastal woodlands on Lamar and Live Oak Peninsulas and conservation recommendations for neotropical avifauna. Oral presentation at Texas Bays and Estuaries Meeting, University of Texas Marine Science Institute, 16 April 2010, Port Aransas, TX.
- *(Baluyot) March, R. and E.H. Smith. "Natural Upland Habitat Shifts from Sea Level Rise on Coastal Peninsulas and Implications on Habitat Diversity." Society for Conservation GIS 13th Annual International Conference, 8-11 July 2010, Monterey, CA.
- *Bleasdale, C. and M. Reiter. 2010. "Volusia Blue Spring's Ecological Status: The Value of a Stakeholder-Based Alternative." 2010 Annual Meeting of the Florida Academy of Sciences, March 18-20, 2010, Fort Pierce, FL.
- Chavez, R., P. Tissot, W. Collins and O. Probst. 2010 "On the accuracy of numerical weather prediction models for wind speed predictions along the Texas Gulf coast." American Wind Energy Association Windpower, Dallas, TX.
- Ekeh, I., *S. Reid and P.E. Tissot. 2010. "Coastal modeling system grid optimization for Corpus Christi Bay". Eight Annual SURF Symposium: Corpus Christi, TX, 2010.
- Islam T. and *A. Marshall. 2010. "Addressing Socio-Economic Vulnerability to Hurricanes". American Planning Association National Planning Conference, April 10-14, 2010, New Orleans, Louisiana.
- Islam T., *A. Marshall, L. Robinson, and E. Johnson. 2010. "Socio-economic Vulnerability of African Americans in the Gulf Coast Counties". 22nd American Coastal Society Biannual Conference, June 13-16, 2010, Wilmington, North Carolina.
- Morgan, N. and E. Smith. 2010. "Environmental and ecological determinants influencing riparian corridor dynamics along a Texas coastal river". Texas Bays and Estuaries Meeting, University of Texas Marine Science Institute, 16 April 2010, Port Aransas, TX.
- Moss, R., M. Reiter, and A. Brooks-Walter. 2010. "Changes in the Hydrobiid [Family Hydrobiidae, Mud snails] Community of Blue Spring State Park, Volusia County, Florida." 2010 Annual Meeting of the Florida Academy of Sciences, March 18-20, 2010, Fort Pierce, FL.
- Radosavljević, B., J. Gibeaut and P. Tissot., 2010.: "Vertical accretion rates in estuarine wetlands using Cs-137". Texas Bays and Estuaries Conference, Mustang Island, TX.
- Reiter, M. 2010. "The Integrated Assessment and Ecosystem Management Protocol (IAEMP): Use of Conceptual Ecosystem Models in an integrated assessment context". Ain Shams University Invited Seminar Series: Cairo, Egypt, June 7, 2010.
- Reiter, M. 2010. "The Integrated Assessment and Ecosystem Management Protocol (IAEMP): Use

of Conceptual Ecosystem Models in an integrated assessment context”. Universidad Autónoma de Baja California Invited Seminar Series, March 4, 2010.

Reiter, M. 2010. “ECSC Workshop (15h Short Course): An Integrated Assessment and Ecosystem Management Protocol for decision making in coastal habitats”. Universidad Autónoma de Baja California, Ensenada, Baja, Mexico, Feb. 28 - March 6, 2010.

Reiter, M. *. “Creating the Department of Integrated Environmental Science at Bethune-Cookman University: Interdisciplinary Curriculum Design, Program Outcomes, and the Role of Service Learning Research”. Council on Undergraduate Research 13th National Conference, June 20-26, 2010, Ogden, UT.

Reiter, M., M. Saintil, Z. Yang, and D. Pokrajac. 2010. “Derivation of a GIS-Based Watershed-Scale Conceptual Model for the St. Jones River, Delaware from Habitat-Scale Conceptual Models”. 2010 Annual Meeting of the Florida Academy of Sciences, March 18-20, 2010, Fort Pierce, FL.

Sadovski, A., G. Jeffress, P. Tissot, S. Duff, and S. Ussery. 2010. “Mean sea level: What are the recent changes along the Texas Gulf Coast?” 2010 Sea Level Rise Conference, Corpus Christi, TX.

Smith, E. and *R. (Baluyot) March. 2010. “Modeling wetland complexity for coastal landscapes within sea level rise scenarios.” Society for Conservation GIS 13th Annual International Conference, 8-11 July 2010, Monterey, CA.

Smith, E. and *R. (Baluyot) March. 2010. “Predicting habitat change on Ingleside Barrier Strandplain using available data: Lamar Peninsula”. Sea Level Rise 2010 Conference, 1-3 March 2010, Corpus Christi, TX.

Tissot, P. 2010. “Coastal modeling at the Texas Coastal Ocean Observation Network (TCOON)”. Technical Session of the 2010 TCOON Annual Meeting, Austin, TX.

Tissot, P. 2010. “CBI real-time coastal predictions”. Invited presentation (invited by MIC Scott Cordero). Corpus Christi Weather Forecast Office Marine Workshop, Corpus Christi, TX.

Tissot, P. 2010. Invited presentation (Nicholas C. Kraus): “Coastal modeling and the Texas Coastal Ocean Observation Network (TCOON).” US Army Corps of Engineers, ERDC Coastal and Hydraulics Laboratory, Vicksburg, MS.

Warner, N., P. Tissot, B. Sterba-Boatwright, and G. Jeffress. 2010. “Comparison of extreme value statistical distributions and implications for Galveston Pier 21”. 2010 Sea Level Rise Conference, Corpus Christi, TX.

Appendix 3:C

ECSC/ IA Leveraged Funded Proposals

Cooner and Associates, Fort Myers FL, 2009-2010, \$19,985 (extension of existing project with additional funding). Project: “Non-Tidal Nature of a Set of Shallow Water Stations in the Vicinity of the Florida Indian River: Phase II” PI: P. Tissot, with D. Martin.

Gulf of Mexico Alliance Environmental Education Network, 2010-2011. \$ 9,350. Project: “Minority Students and Community Outreach on Hurricane Preparedness and Adaptation” PI: Tanveer Islam, with E. Johnson.

NASA, 2010. \$37,818. Project: “Improved Connective Initiation Forecasting in the Gulf of Mexico Region”. PI for TAMU-CC: P.E. Tissot (University of Alabama, Huntsville; NASA Prime).

Jesse Ball DuPont Foundation, 2010-2010. \$250,000 + \$30,000 match. Project: “Expansion of Library Support Services for the Masters in Integrated Environmental Science at Bethune-Cookman University. Co-PI, Michael Reiter, with H. Thompson and H. Powell.

Appendix 3:D

ECSC/ IA Leveraged Pending Proposals

NERRS Science Collaborative, 2010-2014, \$900,000. Project: “An integrated assessment of the source(s), transport and fate of contaminants to the Apalachicola Bay National Estuarine Research Reserve”, Co-PIs: Tanveer Islam, A. Chauhan, J. Cherrier, C. Jagoe, and J. Wanat. Under review.

NSF, \$786,815. Project: “MRI: Acquisition of a High Performance Computational Cluster for Computational, Mathematical, and Natural Science Applications”. PI: M. Scherger, P.E. Tissot Co-PI. Under review.

Appendix 3:E

ECSC/ IA Student Awards

*Arismendez, S. 2010. \$250 1st Place award for the presentation “Land-water nutrient coupling process in central Texas estuaries. 4th Annual Graduate Student Scholarly Works Symposium, April 23, 2010, Texas A&M University.

Appendix 3:F

ECSC/ IA Workshops Led or Hosted

Ensenada, Baja, Mexico. March 1-6, 2010. Universidad Autónoma de Baja California. ECSC Workshop (12 hour short course): “The Integrated Assessment and Ecosystem Management Protocol for Decision Making in Coastal Habitats”. Workshop Leader: Dr. Reiter.

Corpus Christi, TX. August 27, 2010. Workshop: “Coastal Bend Workshop on Streaming Environmental Data”. Workshop Leader: Dr. Tissot (co-organized with the Corpus Christi Weather Forecast Office (also discussed the performance of the water level prediction model implemented as part of the ECSC program for coastal stations).



Appendix 4 Integrated Social Sciences

Appendix 4A NOAA/ECSC/ISS Publications

ISS has the following paper under review, but no publications in press during this period :

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

Appendix 4B NOAA/ECSC/ISS Presentations

Dr. Kelton Clark, MSU provided briefings to Southern Maryland Oyster Cultivation Society personnel and hosted SMOCS event at the hatchery that included a lecture from an ERC researcher on oysters and a tour of the hatchery. (June 2010)

Appendix 4C NOAA/ECSC/ISS Leveraged Funded Proposals

- NOAA Chesapeake Bay Program Office funds the Pilot Hatchery Program \$432,000
- National Transportation Center \$100,000 Impacts of PAH on oyster larvae.
- Maryland Department of Natural Resources \$3,000 oyster larvae production

Appendix 4D NOAA/ECSC/ISS Leveraged Pending Proposals

ISS has no proposals for leveraged funding pending for this period

Appendix 4E ECSC/ISS Workshops Led or Hosted

- Hosted a Calvert County Waterman's Association meeting at ERC (May 2010)
- Site visit and discovery meeting with the Assistant Secretary for Aquatic Resources and the Director of Fisheries Service (July 2010)
- Hold regular meetings with Maryland Sea Grant extension agent in the development of an outreach program.



Appendix 5

NOAA ECSC FY2011 Calendar of Events

September 2010

Ocean Science Bowl Orientation– September 16, 2010, Tallahassee, FL

October 2010

FAMU ECSC/Gulf of Mexico Alliance Poster Competition– October-December, 2010, Pensacola, FL
National Organization for the Professional Advancement of Black Chemists and Chemical Engineers (NOBCChE) Regional Meeting– October 22-23, 2010, Atlanta, Georgia

November 2010

FAMU ECSC/Gulf of Mexico Alliance Education Hurricane Preparedness Workshop– November 6, 2010, Pensacola, FL

Florida A&M University Educational & Recruitment Fair – November 19-20, 2009, Orlando, FL

January 2011

FAMU Elementary/Middle School Environmental Awareness Poster Competition Solicitation to Schools– January 11, 2011

FAMU ESI High School Summer Camp Applications Available – January 25-March 15, 2011

National Conference on Science, Policy and the Environment (NCSE) – January 19-21, 2011, Washington, DC
NOAA ECSC Annual Meeting – *Tentatively January or February, 2011, Place, TBA*

February 2011

National Ocean Science Spoonbill Bowl – February 5, 2011, St. Petersburg, FL

March 2011

FAMU Elementary/Middle School Environmental Awareness Poster Competition –March-May 2011,

April 2011

National Organization for the Professional Advancement of Black Chemists and Chemical Engineers (NOBCChE) – April 19-22, 2011, Houston, Texas

June 2011

FAMU ESI High School Summer Camp – June 5-June 25, 2011, Tallahassee, FL