



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



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For the period from September 1, 2009 to February 28, 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 September 1, 2009 through February 28, 2010. Major activities that involved all of the thematic areas and partner institutions during this reporting period included the EPP Fifth Education and Science Forum at Howard University in November 2009 and the ECSC Annual Meeting convened in Jacksonville at the end of January 2010. Posters and platform sessions presented by ECSC students won several awards at the EPP meeting. ECSC personnel also presented about three dozen posters and talks at other regional, national and international meetings. The ECSC Annual Meeting included reports from all of the thematic areas, as well as discussions of new research opportunities, and planning for a remote sensing (flyover) project with ground-truthing to be held at the Grand Bay NERR site in the spring of 2010.

Other ECSC activities also included implementation of an internal annual project reporting system to track research efforts, student training, and progress towards goals. A draft manual of standard procedures and protocols for field and laboratory methods was developed and circulated to ensure data quality and compatibility among the institutions participating in ECSC projects. ECSC scientists agreed to develop interdisciplinary collaborations among Centers, and began planning potential joint research projects. These projects will initially involve examination of existing data sets to identify spatial and temporal patterns, and will focus on priority areas for NOAA such as climate change and ocean acidification.

ECSC student involvement in education, research, and outreach continues to be the Center's most notable accomplishment. There are over 35 funded students at various levels across the ECSC institutions. ECSC graduates are now employed by NOAA and other government agencies, and are contributing to many research and student training initiatives. In addition to student training, the ECSC continues to be scientifically productive, with over 20 papers published or in press by students and faculty during the reporting period. Also, there were over ten grant proposals for leveraged funding awarded or continuing during the reporting period.

Section I: Status of Award Tasks

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 (participants engaged in this thematic area are listed in Table 1A). 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.

The research in the EPIEH-TA is aligned with NOAA's ecosystem approach to management. Specifically, the research foci are a) Ecosystem Status and Health and b) Integrated Ecosystem Modeling. 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.

Table 1A EPIEH-TA Participants

Name	Faculty/Student/Other	Institution
Dr. Michael Abazinge	Professor	Florida A&M University
Dr. Ambrose Anoruo	Professor	Delaware State University
Dr. Jennifer Cherrier	Associate Professor <i>EPIEH-TA Thematic Lead</i>	Florida A&M University
Dr. Hyun Jung Cho	Assistant Professor	Jackson State University
Dr. Chunlei Fan	Associate Professor	Morgan State University
Dr. Ibrahim Farah	Professor	Jackson State University
Dr. Mingxin Guo	Associate Professor	Delaware State University
Dr. Yuch Ping Hsieh	Professor	Florida A&M University
Dr. Wenrui Huang	Professor	Florida A&M University
Dr. Charles Jagoe	Professor	Florida A&M University
Dr. Elijah Johnson	Associate Professor <i>EPIEH-TA Thematic Co-Lead</i>	Florida A&M University
Dr. Dennis McIntosh	Associate Professor	Delaware State University
Dr. Gulnihal Ozbay	Associate Professor	Delaware State University
Dr. Larry Robinson	Professor	Florida A&M University
Dr. Paul Tchounwou	Professor	Jackson State University
Dr. Stacy Smith	Post-Doctoral Research. Associate	Florida A&M University
John Branch	Ph.D/ Environmental Science	Florida A&M University
Antanasio Brito	Ph.D./ Environmental Science	Florida A&M University <i>*does not receive direct ECSC support</i>
Erik Davenport	Ph.D/Biology	Morgan State University
Chuckwuemeka Ebube	Ph.D./ Environmental Science	Florida A&M University <i>*does not receive direct ECSC support</i>
Adesuwa Erhunse	Ph.D./ Environmental Science	Florida A&M University <i>*does not receive direct ECSC support</i>
Zakiya Hoyett	Ph.D./ Environmental Science	Florida A&M University
Philemon Kirui	Ph.D/Biology	Jackson State University

Stephen Kishinhi	Ph.D/Biology	Jackson State University
Arianna Marshall	Ph.D./ Environmental Science	Florida A&M University <i>**works in both EPIEH-TA and IA-TA</i>
Melanie McHenry-Johnson	Ph.D/Biology	Jackson State University
Christina Nica	Ph.D/Biology	Jackson State University
Aaron White	Ph.D./ Environmental Science	Florida A&M University <i>*does not receive direct ECSC support</i>
Michael Cinelli	M.S./Nat Res	Delaware State University
Keyana Dickens	M.S./Nat Res	Delaware State University
Akia Laurant	Ph.D./ Environmental Science	Florida A&M University <i>*does not receive direct ECSC support</i>
Amanda Pappas	M.S./Nat Res	Delaware State University
Judith Sarkodee-Adoo	Ph.D./ Environmental Science	Florida A&M University
Melissa Schutte	M.S. Student	Delaware State University
Ramona Turner	M.S./ Environmental Science	Florida A&M University <i>*does not receive direct ECSC support</i>
Kim Tucker	Ph.D./Civil & Environmental Engineering	Florida A&M University
Katherine Whitaker	M.S./ Civil & Environmental Engineering	Florida A&M University
Jessica Wise	M.S./ Environmental Science	Florida A&M University
Lorielle Jackson	B.S./ Environmental Science	Florida A&M University
Frank Johnson	B.S./ Environmental Science	Florida A&M University
Tiffini Johnson	B.S./Nat Res	Delaware State University
Amari Jones	B.S./ Environmental Science	Florida A&M University
Dr. Dennis Apeti	NOAA Collaborator	NOAA-CCMA
Dr. Chris Chambers	NOAA Collaborator	NOAA-NMFS
Dr. John Christensen	NOAA Collaborator	NOAA-CCMA
Dr. April Croxton	NOAA Collaborator	NOAA-NMFS
Dr. Ashok Deshpande	NOAA Collaborator	NOAA-NMFS
Dr. D. Evans	NOAA Collaborator	NOAA-OAR
Dr. Trika Gerard	NOAA Collaborator	NOAA-NMFS
Dr. J. Govani	NOAA Collaborator	NOAA-NCCOS

Dr. Fred Holland	NOAA Collaborator	NOAA-CCHR
Dr. W. Luke	NOAA Collaborator	NOAA-ARL
Dr. Steve Morton	NOAA Collaborator	NOAA-CCEHRR
Mr. Dave Ruple	NERR Collaborator	Grand Bay-NERR
Dr. Bob Scarborough	NERR Collaborator	Delaware-NERR, DNREC
Ms. Jennifer Wannat	NERR Collaborator	Apalachicola-NERR
Mr. Robert A. Warner	NOAA Collaborators	NCCOS/CCMA
Dr. Gary Wikfors	NOAA Collaborator	NOAA-NMFS
Dr. Mark Woodrey	NERR Collaborator	Grand Bay-NERR

As listed in the EPIEH-TA implementation plan, generated in year one of this funding cycle, below are the 2 EPIEH-TA objectives. Following each objective are the accompanying performance indicators (or measures), the respective indicator target goals for 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

- 1) Number of ECSC partners engaged in EPIEH research activities that have developed and implemented a core competency training program to ensure that students are effectively prepared to embark on their research activities. Core competencies in: a) coastal and marine ecosystem dynamics (classroom based), and b) field research methodologies (field based). Goal for Yr 4- All
 - Number of ECSC partner institutions engaged in EPIEH-TA research activities: 5 (FAMU, JSU, MSU, DSU, & Creighton).
 - Number of ECSC partner institutions engaged in EPIEH-TA research activities who have developed and are implementing core competency training program for their students engaged in EPIEH-TA research: 5 (FAMU, JSU, MSU, DSU & Creighton).

TB 1B. Obj 1/PI 1 ECSC partner institution course listings for that address/teach EPIEH-TA core competencies

Florida A&M University
<i>Classroom:</i> EVR 3023, Intro to Mar Env (UG); PCB 5315, Mar & Est Ecosys (G)
<i>Field:</i> EVS 5930, Special Topics Aquatic Sciences Field Techniques @ FAMU & ANERR
Delaware State University
<i>Classroom:</i> Limnology, Ecosystems, Wetland Biology, Fisheries Sci., Principles of Fisheries Management, & Hydrology
<i>Field:</i> summer or semester long field training internship at Delaware NERR
Morgan State University
<i>Classroom:</i> MSU BIOL 603 online
<i>Field:</i> MSU summer internship training @ MSU Estuarine Research Center
Jackson State University
<i>Classroom:</i> BIO 423 / BIO-L 423, Ecol & Ecol Lab (UG); ENV 803 / ENV-L 803, Wtld Ecol & Wtld Ecol Lab (G); ENV 717/BIO 617/ENVL 717/BIOL 617, Intro to Remote Sensing for Envl Sci & Lab (G); ENV 718/BIO

718/ENVL 718/BIOL 618, Applic of Remote Sensing in Env Sci & Lab (G)
Field: JSU/Grand Bay NERR ECSC Core Competencies Field Course @ JSU & GBNERR
Creighton University
Classroom: BIO/EVS (co-listed) 485, 486, 487 - Mar & Freshwater Ecol & Labs (UG),
Field: BIO/EVS (co-listed) 385 - Ecol, Geography, & Health of Lakes (3 wk field trip, UG); BIO/EVS

- 2) Percentage of EPIEH-TA institutional partners whose students are able to demonstrate the set of core competencies. Goal for Yr 4- 100%
-Percentage of EPIEH-TA institutional partners whose students can demonstrate the set of core competencies: 100%
- 3) Percentage of EPIEH-TA B.S. students who develop a senior thesis or capstone report based on their ECSC research activities. Goal for Yr 4- 100%
-Percentage of EPIEH-TA B.S. students who develop a senior thesis or capstone report on their research activities: 100% for all EPIEH-TA students at all participating partner institutions
- 4) Percentage of EPIEH-TA B.S. students who present their research findings at the University seminar level. Goal for Yr 4- 100%
-Percentage of EPIEH-TA B.S. students who present the findings of their research at the University/Departmental seminar level: all EPIEH-TA undergraduate students at each participating partner institutions are required to present their research findings in either an oral or poster presentation at the conclusion of their respective research project (i.e. when they graduate). Most of these students graduate in the spring semester therefore for this reporting period this goal has not yet been met. Expect 100% at end of 2009/2010 academic year.
- 5) Percentage of EPIEH-TA B.S. students who present their research findings at one or more national meetings. Goal for Yr 4- 50%
*-Percentage of EPIEH-TA B.S. students who present the findings of their research at one or more national meetings: at least 50% of all EPIEH-TA B.S. students at all participating partner institutions- all presented at the National Oceanic and Atmospheric Administration Educational Partnership Program (EPP) Fifth Education and Science Forum in Washington DC (see **Appendix 1:C** for further details)*
- 6) Percentage of EPIEH-TA M.S. and PhD. students who participate in the development of an EPIEH- TA research proposal (this measure is dependent on when the student is recruited into the ECSC- i.e. before or after the EPIEH-TA proposal is written, but regardless this measure is captured by the fact that all graduate students are required to write and defend a research thesis/dissertation prospectus so all students have the opportunity to develop a proposal). Goal for Yr 4- 100%
*-Percentage of EPIEH-TA graduate students who participate in the development of a research proposal: 100% of all incoming graduate EPIEH-TA students at each participating partner institutions are required to develop a research proposal/prospectus (see TB1C, i.e. we list those projects/proposals that have been developed and approved by their respective thesis/dissertation committees to date- if not listed it means they are still being developed. see **Appendix 1:F** for additional information)*

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

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

7) Percentage of EPIEH-TA graduate student committees with NOAA/NERR members. Goal for Yr 4- 100%

-Percentage of EPIEH-TA graduate students committees with NOAA/NERR members: 100% of all EPIEH-TA students at each participating partner institutions are required to have NOAA/NERR scientists on their thesis/dissertation committees. (TB 1D, lists those EPIEH-TA students who now have a NOAA/NERR scientist serving on their thesis/dissertation committee- if not listed it means the NOAA/NERR scientists have yet to be identified. see Appendix 1:F for additional information)

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

- Kishinhi, Stephen. JSU. NOAA/NERR Committee Member M. Woodrey,
- McHenry, Melanie. JSU. NOAA/NERR Committee Member M. Woodrey, NOAA Committee Member W. Luke..
- 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.

8) Percentage of EPIEH-TA M.S. and Ph.D. students who has developed a thesis and dissertation, respectively based on their ECSC research activities. Goal for Yr 4- 100%

*-Percentage of EPIEH-TA graduate students whose research is based on their EPIEH-TA research activities: 100% of all EPIEH-TA students at each participating partner institution are required to develop a thesis/dissertation aligned with their respective ECSC research activities (in TB 1E, we list only those students whose thesis/dissertation project that have been formally approved by their thesis/dissertation committee- if not listed it means that thesis/dissertation project plan still under development. see **Appendices 1:A and 1:F** for additional information)*

TB 1E. Obj 1/PI 8, Listing EPIEH-TA graduate projects aligned with ECSC Project PI research activities.

- Philemon Kirui. JSU. Dissertation Title: Genetic and Ecological Variation in *Ruppia maritima*. Project PI: Dr. H.J. Cho.
- 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 *Karenia brevis*: 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 Hurrance. 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 (*Cynoscion regalis*) at different temperatures and salinities. Project PI: McIntosh, D.
- Dickens, Keyana. DSU. Thesis Title: Investigating uptake and colonization of *Vibrio parahaemolyticus* in eastern oysters (*Crassostrea virginica*) 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

9) Percentage of EPIEH-TA graduate students who present their research findings at one or more national meeting. Goal for Yr 4- 100%

*-Percentage of EPIEH-TA graduate students who present the findings of their research at one or more national meeting: 100% for all EPIEH-TA graduate students at each participating partner institution (see **Appendix 1:C** for details)*

10) Percentage of EPIEH-TA graduate students who publish their research findings in a peer-reviewed journal. Goal for Yr 4- 100%

-Percentage of EPIEH-TA graduate students who submitted their research to a peer-reviewed journal: 100% BUT

*-Percentage of EPIEH-TA graduate students who were actually able to publish their findings in a peer reviewed journal: 50% (see **Appendix 1:B** for details)*

Performance Summary: For this reporting period (Sept '09- March '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) developing a process for more effectively identifying and formalizing partnerships with NOAA scientists and b) increasing the success rate of ECSC student publications in peer-reviewed journals. During this reporting period an internal EPIEH-TA Student Training/Progression Tracking sheet was developed and successfully implemented. This internal tracking sheet which is specific to the EPIEH-TA should allow us to more effectively track the various steps in student's progression both through and post the EPIEH-TA training program (i.e. for each student tracks core competency training-classroom and field, prospectus submission and defense outcome, thesis/dissertation submission and defense outcome, research presentations, research publications, and career placement). The EPIEH-TA tracker is continually maintained at each individual partner institution and all institutional trackers are merged bi-annually into the master EPIEH-TA tracker sheet. 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

1) Percentage of EPIEH-TA scientists who submit a research proposal to carry out EPIEH-TA related research. Goal for Yr 4- 100%

-Percentage of EPIEH-TA scientists who submit a research proposal: 80% (see Appendix I:A)

2) Percentage of EPIEH-TA research proposals that demonstrate formal collaboration with a NOAA or NERR scientist. Goal for Yr 4- 100%

-Percentage of EPIEH-TA scientists whose research proposals demonstrate formal collaborations with NOAA or NERR scientists: 100%

TB 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: W. Luke, 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

3) Percentage of EPIEH-TA research proposals peer reviewed by EPIEH-TA committee. Review process- 1. NERR Ranking (where applicable), 2. ECSC Internal Review, 3. NOAA Relevance Ranking. Goal for Yr 4- 100%

*-Percentage of EPIEH-TA research proposals vetted through review process: 100%
(see Appendix 1:A)*

4) Number of ECSC partners engaged in EPIEH research activities whose projects are informed by the Integrated Assessment Conceptual Model for their respective ECSC collaborating NERR site. Goal for Yr 4- 100%

-Percentage of EPIEH-TA research proposals informed by ECSC Integrated Assessment Conceptual Models for their respective study sites: 100%

6) Percentage of EPIEH-TA funded research projects that include a student training component. Goal for Yr 4- 100%

-Percentage of EPIEH-TA research proposals that demonstrate a student training component: 100%

7) Percentage of EPIEH-TA funded research project PI's who submit an (in-house) annual progress report for continued funding. Goal for Yr 4- 100%

-Percentage of EPIEH-TA project PI's who submit in-house annual progress report to date: 0%. The template for this annual in-house project report has recently been developed and will be implemented by June 2010. We expect 100% of all funded EPIEH-TA project PI's will submit their respective in-house annual reports.

8) Percentage of EPIEH-TA funded research project results posted on the ECSC website. Goal for Yr 4- 100%

- Percentage of EPIEH-TA project results posted on ECSC website to date: 0%. EPIEH-TA project summaries and all pertinent PI contact information are posted on the ECSC website. Beginning June 2010 all in-house EPIEH-TA annual reports will also be posted on the ECSC website. EPIEH-TA participants are in the process of collectively determining what the best venue would be for posting project data. We are considering the practicality of either creating our own metadata base or linking with existing NOAA/NERR data bases. We expect to finalize these plans by the next reporting period.

9) Percentage of EPIEH-TA institutional partners who establish and maintain a required database according to ECSC standard. Goal for Yr 4- 100%

*-Percentage of EPIEH-TA institutional partners who maintain required database: 100%
A spreadsheet format has been developed and disseminated to all EPIEH-TA Institutional Leads. Additionally, to ensure consistency and data quality among all of the partner institutions, we have also developed an ECSC Standard Sampling and Analytical Protocols manual that has also been disseminated to all EPIEH-TA Institutional Leads.*

10) Percentage of EPIEH-TA funded research project results disseminated to NCCOS and NOAA. Goal for Yr 4- 100%

-Percentage of EPIEH-TA funded research project results disseminated to NERR, NCCOS, and NOAA: 50%. We're still working toward developing a process that will help to improve this.

11) Percentage of EPIEH-TA products (tools/models) that improve the forecasting capability for predicting potential impacts of stressors on estuarine ecosystem. Goal for Yr 4- 100%

- Percentage of EPIEH-TA products that improve forecasting capabilities for predicting coastal and estuarine stressors: 50%. We are still working toward developing a process by which this can be assessed.

12) Capability of integrated hydrological-biological-ecological modeling for forecasting estuarine responses to stressors. Goal for Yr 4- 100%

-Percentage of EPIEH-TA integrated hydrological-biological-ecological modeling products that can be used for forecasting coastal and estuarine responses to stressors: 50%.

Hydrodynamic modeling simulations have been conducted to examine the effects of sea level rising on salinity variations in Apalachicola Bay NERR system. Based on the ICCP report, two sea level rise scenarios have been investigated, +0.5 m and +1.0 m sea level rise. Model simulations show increased salinity in the Bay in responses to the sea level rising. Under each sea level rise condition, two extreme flow scenarios were investigated: (a) a Low-Flow Scenario, and (b) a High-Flow Scenario. Hydrodynamic model simulations of surface elevations, velocity, and salinity at oyster bars were performed for oyster model simulations. Integrated hydrodynamic and oyster-population modeling was conducted for above two flow scenarios. We are in the process of adapting these models to evaluate ecosystem response to nutrient loading in Apalachicola Bay as well as investigating the feasibility of modifying all of these models for use in other ECSC-associated NERR systems (i.e. GB-NERR, MA-NERR, DE-NERR) where extensive data-logger and SWMP data has been collected and maintained.

13) Percentage of EPIEH-TA funded research projects whose results will be disseminated at national meetings. Goal for Yr 4- 100%

*-Percentage of EPIEH-TA funded research projects whose results are disseminated at national meetings: 100% (see **Appendix I:C**)*

14) Percentage of EPIEH-TA funded research projects whose results will be published in peer-reviewed journals. Goal for Yr 4- 100%

*-Percentage of EPIEH-TA funded research projects whose results are published in peer-reviewed journals: 70% (see **Appendix 1:B**).*

Performance Summary: For this reporting period (Sept '09- March '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 who are engaged in EPIEH-TA research have now submitted proposals (a total of 9 so far) which have been vetted or are in the process of being vetted through the ECSC proposal review process. 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**. There are presently a few EPIEH-TA participants (faculty and students) whose efforts are not yet represented by an EPIEH-TA proposal. We anticipate, however, that this will be rectified no later than May 2010. A template for annual in-house reporting for all EPIEH-TA funded projects has recently been developed and will be implemented by June 2010. A standardized data spreadsheet for maintaining center wide EPIEH-TA ground-truthing data has been developed and disseminated to all EPIEH-TA institutions. An ECSC Standard Sampling and Analytical Protocol Manual has similarly been developed and distributed. 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, c) disseminating EPIEH-TA research results to NOAA and NCCOS, and d) development of more tools to for improving forecasting capabilities of stressors to coastal and estuarine systems. 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

The Geospatial Analysis and Development Thematic Area (GADD-TA) had an emphasis in the past 6 months on student training, planning and preparations for a follow-up hyperspectral remote sensing campaign at the Grand Bay NERR this coming May, discussions on future programs and scientific themes for an anticipated 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 four new peer-reviewed publications, two manuscripts submitted, eighteen presentations at regional or national meetings, four newly funded or continuing grants which represent leveraging, and two proposals that are pending.

Table 2A GADD-TA Participants

Name	Faculty/Student/Other	Institution
Dr. John F. Schalles ^{1*}	Professor of Biology <i>GADD-TA Thematic Lead</i>	Creighton University
Dr. Hyun J. Cho ²	Assistant Professor of Biology	Jackson State University
Dr. Chunlei Fan ³	Assistant Professor of Biology	Morgan State University
Dr. Donald C. Rundquist ⁴	Professor, Sch. of Natural Resources	University of Nebraska-Lincoln
Dr. Elizabeth H. Smith ⁵	Associate Research Scientist	Texas A&M University-Corpus Christi
Dr. Zhiming Yang ⁶	Postdoctoral Fellow, College of Agriculture & Natural Resources	Delaware State University
Christina Mohrman ⁷	ECSC Site Coordinator	Grand Bay NERR
Philemon Kirui ⁸	Ph.D. Candidate	Jackson State University
Paul Merani ⁹	Ph.D. Candidate	University of Nebraska-Lincoln
Nikki Morgan ¹⁰	M.S. Student	Texas A&M University-Corpus Christi
Christina Nica ¹¹	Ph.D. Candidate	Jackson State University
Drew Seminara ¹²	M.S. Student	Creighton University
Marvin Washington ¹³	M.S. Student	Jackson State University
John Wood ¹⁴	Ph.D. Candidate	Texas A&M University-Corpus Christi <i>*does not receive direct ECSC support</i>

**Footnotes 1-14, please see Appendix 2A for address and email information*

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-TA 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)*

Ground survey work at the Grand Bay NERR is our next field project, with students from Florida A&M, Jackson State, Creighton, and University of Nebraska expected to participate. The work will largely repeat work done last year. Students will learn the use of field spectroradiometers (Ocean Optics and ASD Field Spec equipment from Creighton, Florida A&M, Jackson State, and University of Nebraska) to collect spectral library data from both water and vegetation survey sites. All sampling will include differential-correction GPS data collected by our students using Trimble and Thales-Magellan instruments and post-processing procedures. Students will also use ARC-GIS and ENVI imagery analysis software for their own projects linked to the survey work. Thus, all the principal training approaches for ECSC core competencies in geospatial training are utilized in this project. We expect to have approximately 16 students involved in the Grand Bay exercise in May. This year, we have dormitory and laboratory space reserved at the new headquarters facility at Grand Bay. These arrangements will greatly facilitate our work and reduce logistics challenges for housing and transporting participants.

On-line core competency training modules were developed by our former Geospatial Analyst, Sudhir Shrestha. Since vacated by Mr. Shrestha in December, 2008, the geospatial analyst position at Florida A&M has remained unfilled. Without a person in this position, we have not had the ability to fully implement and assess the training modules. However, students continue to receive training in geospatial procedures and practices in appropriate courses at our partner institutions, and individual faculty are having their students use these modules (for example, John Schalles at Creighton and Liz Smith at Texas A&M – Corpus Christi).

GADD-TA 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.*

Six of our students presented eight talks in the past six months at regional or national meetings (see appendix information). None of their students completed their thesis or dissertation products in the current review period, but all appear to be on track in their plans of study to complete their projects according to schedules agreed upon with their graduate committees and advisors. Doctoral student John Wood, at Texas A&M Corpus-Christi was invited to give a talk on his dissertation work on sea grass mapping at the Mission-Aransas NERR at the 2010 Ocean Sciences meetings in Portland, Oregon in February. Paul Merani and Drew Seminara will present their thesis work at upcoming national annual meetings (Association of American Geographers and the Ecological Society of America) in April and August.

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

Our group began preparations for a follow-up AISA hyperspectral flyover at Grand Bay NERR this May with discussions last summer and fall, and conference calls and a meeting convened at the front end of the ECSC Annual Meeting in Jacksonville, Florida in February. As reported in our last semi-

annual report, the imagery from May, 2009, was largely compromised by equipment malfunctions with the CALMIT-University of Nebraska AISA Eagle system. CALMIT is reflaying the entire Grand Bay site at no additional cost. John Schalles (Creighton) and Christina Mohrman (Grand Bay) are co-leaders of this project.

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

The Geospatial group's products, including vegetation and other habitat maps and change detection analysis continue to be delivered to and used by NOAA NERR researchers and site managers. Recent products include hyperspectral AISA imagery, biomass, and vegetation maps of the Duplin River tidal watershed within the Sapelo Island NERR provided by John Schalles and Christine Hladik, and the M.S. thesis products of Dan Becker, of the University of Nebraska-Lincoln, to the Apalachicola Bay NERR.

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

Papers, presentations, and proposal activity are summarized in Appendix 2-B. Seven papers were published or are in press, and 18 presentations were made at local, national, and international conferences.

The Geospatial Thematic area continues to demonstrate an ability to leverage their ECSC funding with other extramural awards. There were 4 new or continuing awards listed in Appendix 2-D for the current reporting period, which total \$390.1K. An additional 3 proposals were submitted and are pending.

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

The CALMIT group at the University of Nebraska continues to produce posters displaying imagery products from our different flyovers. Don Rundquist brought sample posters in both printed format and as stored images on data CD's to the annual meeting in Jacksonville. He 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.

In January, John Schalles's lab at Creighton acquired a net-based server system as a satellite archive capability for ECSC geospatial imagery and products. The server is a Netgear ReadyNAS Pro Pioneer, with four 2 terabyte Western Digital OEM Hard Drives (and expandability to six drives). The server ensures data redundancy and ease of storage expandability using Netgear's XRAID2 application. The server has been installed, and is interfaced to the internet with dual Ethernet Cat6 cables. The system is currently being tested before data archiving begins this spring.

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

Our thematic group has active collaborations with other thematic groups and NERR partners within our center, as well as a number of collaborations with other EPP Centers and academic and government research laboratories and centers. These collaborations are very evident in the coauthorships in the following appendix section. Our current collaborations include

- J. Cho's (Jackson State) work on seagrass mapping with Patrick Biber at the Gulf Coast Research Laboratory and Deepak Mishra of Mississippi State University
- Christina Mohrman's and John Schalles's involvement with a new collaboration 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 is beginning this year at the Grand Bay National Estuarine Research Reserve involving 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.
- Don Rundquist's work on harmful algae bloom detection with the Water Center at the University of Nebraska and the Nebraska Department of Environmental Quality.
- John Schalles's extensive collaborations with Dr. Steve Pennings (University of Houston), Christine Hladik and John Carpenter (University of Georgia), and Dorset Hurley and Aimee Gaddis (Georgia Department of Natural Resources / SINERR) in marsh mapping for the Georgia Coastal Ecosystem's NSF-LTER project at the Sapelo Island National Estuarine Research Reserve.
- John Schalles's joint work in water optics and algal bloom detection with the NOAA CREST group at the City University of New York, with Drs. Alex Gilerson and Sam Ahmed's water remote sensing group at City University of New York.
- John Wood's work as a co-PI with the Texas Benthic Habitat Mapping Project.

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 to date.

Table 3A IA-TA Participants

Name	Faculty/Student/Other	Institution
Dr Michael Reiter	Faculty <i>GADD-TA Thematic Lead</i>	Bethune-Cookman University
Sandra Arizmendez	PhD Coastal and Marine System Sciences	TAMU Corpus Christi
Arianna Marshall	PhD Environmental Science	Florida A&M University <i>**works in both EPIEH-TA and IA-TA</i>
Robyn Ball	MS	TAMU Corpus Christi
Rosaleen Baluyot	MS Biology	TAMU Corpus Christi
Cary Bleasdale	MS Integrated Environmental Science	Bethune-Cookman University
Dr. Jack Gentile	Researcher	Harwell Gentile & Associates, LC
Dr. Mark Harwell	Researcher	Harwell Gentile & Associates, LC
Domingo Hiracheta	BS Computer Science	TAMU Corpus Christi
Dr. Wenrui Huang	Faculty	Florida A&M University
Dr. Tanveer Islam	Post-Doc	Florida A&M University
Ms. Christina Mohrman	ECSC Liaison	Grand Bay NERR, MS
Rashan Moss	MS Integrated Environmental Science	Bethune-Cookman University
Yelena Nevel	MS Mathematics	TAMU Corpus Christi

Sergey Reid	BS Geographic Information Science	TAMU Corpus Christi
Dr. Geoff Scott	NOAA IA Contact	NCCOS Center for Coastal Environmental Health and Biomolecular Research at Charleston
Dr. Elizabeth Smith	Faculty	TAMU Corpus Christi
Dr. Philippe Tissot	Faculty	TAMU Corpus Christi
Dr. Wes Tunnell	Faculty	TAMU Corpus Christi
Cindy Valencia	BS Biomedical Science	TAMU Corpus Christi
Dr. Hongqing Wang	Researcher	USGS National Wetlands Research Center, LA
Dr. Mark Woodrey	Research Coordinator	Grand Bay NERR, MS

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

Performance Indicators for Goal 1

- 1) Run Blackbird mini-workshop for model revision at DNERR. Measure for Yr 4- Completion
-Progress: mini-workshop completed
- 2) Completed modified Blackbird CESSM model available to DNERR. Measure for Yr 4- Completion
-Progress: modified model in the hands of DNERR personnel
- 3) Run modeling workshop for Hilo (by request). Measure for Yr 4- Completion if requested
-Progress: interest expressed, planning meeting being arranged

Performance Summary: Dr. Reiter of BCU met with DNERR personnel in Spring 2009 to complete the data work for the Blackbird model revision. The completed model was made available to Blackbird in August 2009, completing both of these Year 4 measures ahead of schedule.

During this reporting period, Dr. Reiter contacted Dr. Kevin Hopkins, Director of the Pacific Aquaculture and Coastal Resources Center at the University of Hawaii at Hilo (UHH), to follow up on the interest in the modeling workshop noted in the last annual report. Dr. Hopkins put Dr. Reiter in touch with Dr. Jene Michaud (Department of Geology, UHH) who will act as the local modeling team organizer. Karen Frutchey, JIMAR-International Turtle Conservation and Management Liaison for NOAA’s Fisheries Service, also expressed interested in the modeling workshop.

In a conference call between Jene Michaud and the IA team at the end of January 2010, Ms. Michaud related that she had half a dozen people thus far interested in being part of the local modeling team for the project, though none yet from the planning community. Her expectation is that local planning people might be the best chance for application, and that the planning meeting could help with identifying participants. She noted that state budget cuts were interfering with the ability of government officials or agencies to implement new initiatives, but again the planning meeting could help reach conclusions on this issue.

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: strategy developed

Performance Summary: Under the supervision of Dr. Mark Woodrey and Ms. Christina Mohrman, the conceptual model results are currently being incorporated into the Grand Bay NERR long-term research strategy. The Grand Bay NERR strategy now identifies six focus areas based on several elements: increased understanding of the Grand Bay ecosystem through site-focused investigations, monitoring/research needs and data gaps identified in the site profile, research issues identified through the conceptual risk assessment models developed in collaboration with the ECSC, areas of expertise of reserve staff, and opportunities for collaboration with universities, research laboratories, and government scientists. The new focus areas for research at the Grand Bay NERR are:

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

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: boundary simulations and ACF scenario model stages completed

Performance Summary: As of the end of this reporting period, Dr. Huang has completed the Apalachicola Bay hydrodynamic model simulations for current sea level, three historical years (representing normal, dry, and wet years), and two ANERR Apalachicola-Chattahoochee-Flint (ACF) water management scenarios: a Low-Flow Scenario with release from Woodruff Dam set at 4500 cfs continuously for the year-long simulation period, and a High-Flow Scenario with release from Woodruff Dam based on the historical wet year using the new US Army Corps of Engineers' Interim Operational Plan management rules (with flows varying by month; Fig. 3.1). Results to date suggest that the ACF low-flow scenario would result in extremely high salinities at oyster bars, while the ACF high-flow scenario could not reduce salinity to the point of the reference wet year 1975. Dr. Huang has also re-parameterized (by resetting the model boundary conditions) the Apalachicola Bay hydrodynamic model to represent two sea-level rise scenarios based on EPA research projections for the Gulf of Mexico, current sea level + 0.5 m and current sea level + 1.0 m. Model outputs have been assessed, modifications were completed to yield reliable results of predicted salinity regimes, and the Apalachicola Bay hydrodynamic simulations were completed for

the two elevated sea-level rise scenarios (+0.5 m and +1.0 m above current), using the three historical years and the two ACF water management scenarios detailed above.

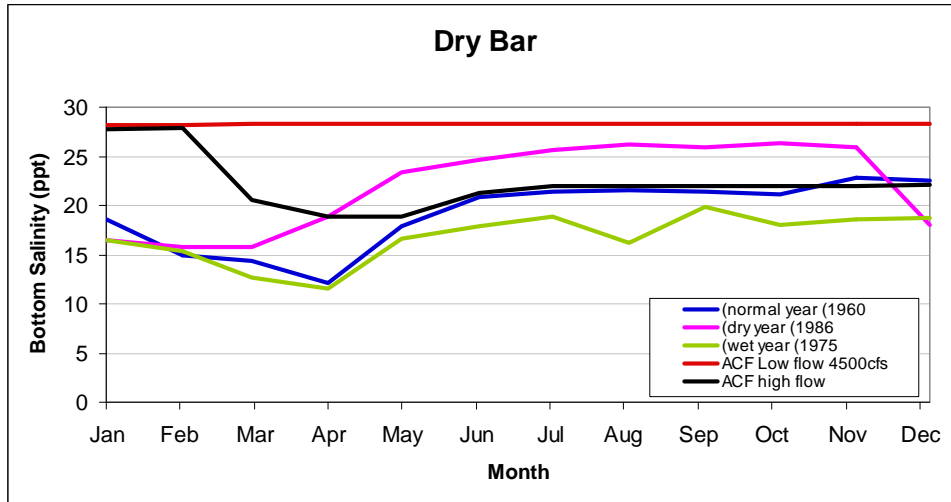


Figure 3.1. Example salinity model output for Dry Bar under the reference years and the low- and high-flow scenarios. **Preliminary Data: Do Not Cite.**

Also during this reporting period, Dr. Wang converted the outputs from the above Apalachicola Bay hydrodynamic model simulations into the input format needed for the demonstration project’s oyster productivity model that he has developed, specifically representing the salinity and velocity fields for each year’s simulations at each of five locations: Dry Bar, Cat Point, Mid-Bay, East Bay, and Sike’s Cut (Figure 3.2). As of the end of this reporting period, Dr. Wang has completed the Apalachicola oyster productivity model simulations for the current sea-level scenario for normal, wet, and dry years at Dry Bar, Cat Point, Mid-Bay, and East Bay. Predictions were made for both growth rates over the year and for productivity (Figure 3.3).

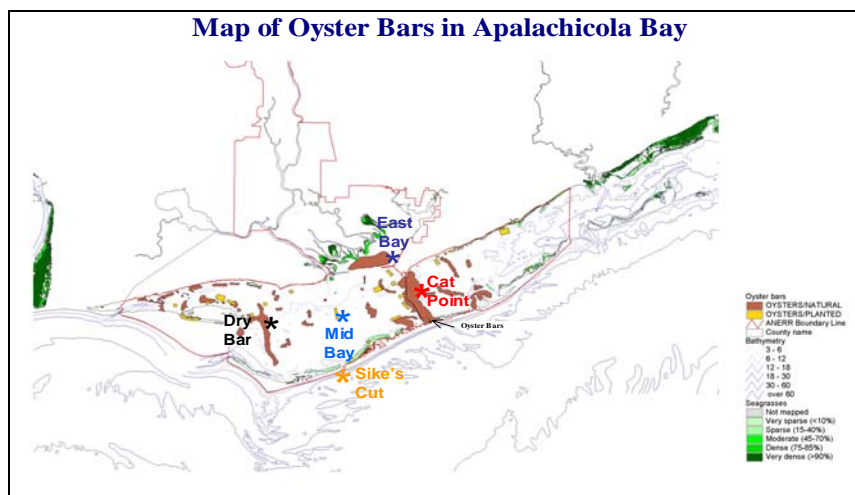


Figure 3.2. Map of Apalachicola Bay showing the location of the sites referenced in the report.

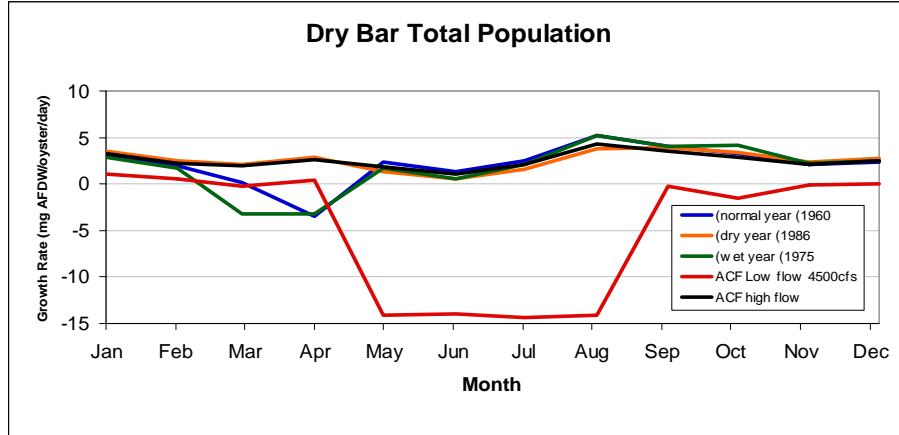


Figure 3.3. Sample oyster productivity model output for Dry Bar for reference years and the low- and high-flow scenarios. **Preliminary Data: Do Not Cite.**

Our results thus far seem to indicate that oyster growth rates would decrease under the ACF low-flow scenario (high salinity), especially for the summer and dramatically so for Dry Bar where more freshwater is needed. Under the high-flow ACF scenario (low salinity), oyster growth rates remain the same at Dry Bar and decrease at Cat Point, indicating that freshwater flow, if it surpasses a certain threshold amount, may negatively affect oyster growth rates in areas that normally receive less freshwater. Therefore, the oyster production in different areas of Apalachicola Bay would likely be affected differently by high freshwater flows.

Dr. Wang is currently setting up the oyster productivity model for the salinity data from the sea-level rise and ACF flow scenarios (Figure 3.4). It is expected that our risk assessment, including quantitative oyster modeling, can provide critical information to help decision-makers understand the consequences of sea-level rise, climate change, and possible freshwater shortage in the next century. The IA team is presently on schedule to complete this measure in Year 4.

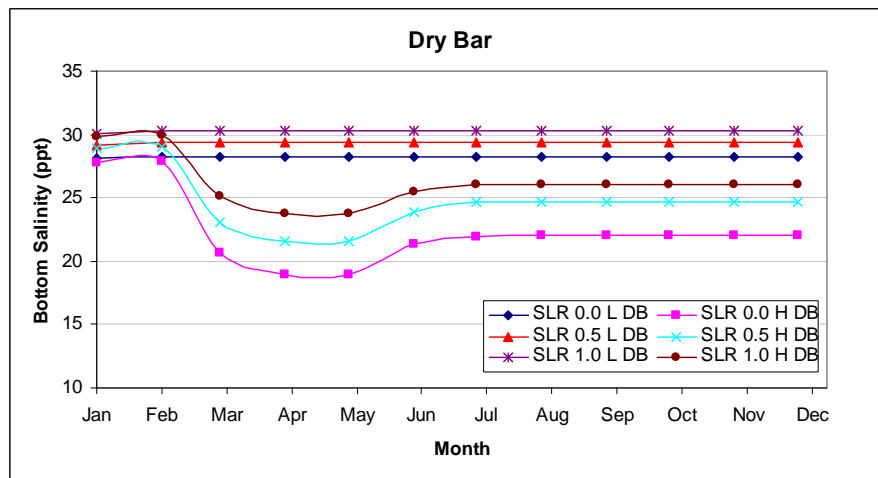


Figure 3.4. Example salinity model output for Dry Bar (DB) for current sea level (SLR 0.0) and sea level rise scenarios (SLR 0.5 and 1.0) under the ACF low- (L) and high-flow (H) proposals. **Preliminary Data: Do Not Cite.**

Related to this measure, Dr. Wang and others have a new paper recently published in International Journal of Remote sensing (Wang et al. 2010). This paper, a joint effort among past and present IA, Geospatial Thematic Area, and ANERR personnel, describes the use of MODIS imagery to detect spatial variability in chlorophyll *a* concentration and total suspended solids in Apalachicola Bay. The spatial information on bay-wide chlorophyll *a* concentration and total suspended solids can be used in spatially-explicit modeling of oyster population in Apalachicola Bay, since they are crucial environmental factors in oyster dynamic modeling.

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: matrices and first draft of CEM models completed
- 2) Personnel involved in the Harte/LME development program per year. Measure for Yr 4- 2 people involved
-Progress: 3 people involved directly
- 3) Data files from GIS analysis available to MANERR. Measure for Yr. 4- 2 data files
-Progress: data for these and extra files obtained and being processed

Performance Summary: Work is continuing on the MANERR model based upon the MANERR CEM Workshop (April 2009) matrices assembled during the last reporting period. The matrices were revised, reviewed by workshop coordinators, and finalized in October. The matrices are substantial and include a large number of Drivers and Stressors, so completion of the diagrams will take some time. Drs. Reiter, Harwell, and Gentile have been working on the draft Mission Aransas NERR Graphical Conceptual Models, with about half of the 20 habitat types completed as of the end of this reporting period. We expect that the full set of models will be completed in time to accomplish this measure in Year 4.

Also during this reporting period, Dr. Tissot and his MS student, Robyn Ball, (partially funded through ECSC) have applied a water-temperature prediction model for the Laguna Madre Intracoastal waterway developed as part of Robyn's thesis. The water in the Laguna is home to some of the clearest water and most productive game fish ecosystems anywhere. During the winter of 1989, an extremely hard freeze hit the area with several days of sub-freezing temperatures that virtually wiped out the game fish population in the Laguna Madre. It took several years before stocks returned to pre-freeze levels. Biologists have since learned that when water temperatures in the normally shallow expanse of the Laguna fall to these low levels, fish head for the safety of the warmer waters deep in the Intracoastal Waterway and become very lethargic, reducing their ability to escape predators or contact with vessels.

The model and studies suggested that during times of extreme cold, the barge industry could assist in reducing game fish mortality by voluntarily stopping transits of the Laguna Madre. The concept was applied for the first time during the weekend of January 9-10, during an extremely cold period in south Texas. Navigation was voluntarily stopped for 60 hours. Combined, three GICA members,

American Commercial Line, Blessey Marine Service and Florida Marine Transporters stopped planned barge traffic, a value of \$21,000.

As a Gulf of Mexico LME Steering Committee Member, Wes Tunnell attended the second Steering Committee meeting in Miami in February 2010 with other members from the NOAA Southeast Fisheries Sciences Center, various Mexican government organizations, and UNIDO. Philippe Tissot continues to optimize and implement additional real-time water level models for coastal locations on the Gulf of Mexico. He currently has working models to optimize for Packery Channel (Corpus Christi), Pleasure Pier (Galveston ; he added wind as a factor in this model), Rockport, and Port Isabel as of this reporting period, and is presently working on Port Arthur. PhD student Sandra Arismendez is completing her work on watershed nutrient loading along the Texas coast, including the MANERR (Suzanne Bricker, NOAA Silver Springs, is the NOAA Committee Member for the project).

Liz Smith has been working on acquiring all GIS data available for conservation planning for MANERR and Stewardship Aransas. Data available include DEM (elevation), soils, wetlands, highways/roads, land use/land cover (vegetation types/development), impervious cover, canopy cover, state, county, city land parcels, and exempt parcels. Based on her progress to date, all GIS data used to characterize the barrier strandplain peninsulas, develop historic baseline habitat maps, and predict sea-level rise impacts should be submitted to Mission-Aransas NERR by August 2010.

Dr. Smith and ECSC graduate fellow Rosaleen Baluyot organized several field days of groundtruthing in the Mission-Aransas Watershed to assist Texas Parks & Wildlife Department (TPWD) in their Texas Ecosystems Mapping Project. They contacted and obtained permission from seven private landowners and foundations encompassing 43,000 acres to access and survey their habitats using the TPWD standardized protocol and data entry. Landowners actively participated and were interested in the TPWD and ECSC mapping projects and the potential to use the final products in wildlife management and conservation practices. Each landowner was given information about the ECSC project and the Mission-Aransas NERR program in anticipation of their future involvement in watershed planning and assessments. In addition, a proposal to determine the distribution and environmental requirements of a federally endangered cactus was submitted to Texas Parks & Wildlife's Section 6 Program with private landowner permission to access their properties for the research covering upland habitat of 11,700 acres.

Rosaleen Baluyot continued merging soils classification data among counties that encompass the Ingleside barrier strandplain that include areas within and of interest to Mission-Aransas NERR program in preparation for assisting FWS with work on the SLAMM model at Aransas National Wildlife Refuge, which is within Mission-Aransas NERR boundaries. Historical ecological site maps were created using soils data to develop baseline information for the land change analyses. In addition, 30-m DEM data were clipped to the peninsula boundaries, and individual shapefiles were created by 1 m elevation contours and ecological sites by peninsula for relative sea-level rise analyses. Preliminary results were presented at two regional meetings by Ms. Baluyot and Dr. Smith during this period. One peninsula was selected to develop the methodology for modeling habitat change as a result of 1 m increase of sea-level rise. Results of the approach will be presented at a Sea Level Rise Conference in Corpus Christi, Texas, in March 2010. Abstracts are also being prepared for the Texas Bays and Estuaries annual meeting and Society for Conservation GIS annual meeting this summer.

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: too early to tell; likely 2 specific to IA with others with IA training from among other institutions
- 2) Number of newly trained students employed by state or private resource management agencies. Measure for Yr 4- 4
-Progress: too early to tell; likely 2 specific to IA with others with IA training from among other institutions
- 3) Number of graduates moving to graduate school or postdocs in coastal resource management. Measure for Yr 4- 4
-Progress: too early to tell; likely 1 specific to IA with others with IA training from among other institutions
- 4) Number of NERR and other NOAA site personnel involved in ECSC activities. Measure for Yr 4- 4
-Progress: 4 underway thus far
- 5) Number of ECSC-related workshops and activities at partner, NERR, and other NOAA sites. Measure for Yr 4- 2
-Progress: one such interaction has been completed thus far
- 6) Number of non-ECSC sites utilizing ECSC resources, personnel, or methodologies. Measure for Yr 4- 2
-Progress: two such interactions have been completed thus far
- 7) Number of published IA manuscripts derived from ECSC activities. Measure for Yr 4- 1
-Progress: 13 publications, 4 with student authors have been completed to date
- 8) Number of briefings, presentations, or requests focused on ECSC data and activities. Measure for Yr 4- 2
-Progress: 3 completed thus far

Performance Summary: For several of the Goal 7 measures, other than the students documented in previous annual and semi-annual reports, it is too soon to tell which students will have their degrees completed in May/June and be newly available for employment this year. Sandra Arismendez and Rosaleen Baluyot are among the IA-focused students who are most likely to be finished this year, with others with IA training from among the other thematic area students.

Geoff Scott, Director of the NCCOS Center for Coastal Environmental Health and Biomolecular Research at Charleston, continues to work with the IA team as its NOAA contact. Christina Mohrman of the GBNERR is involved with the thesis work of Cary Bleasdale, an ECSC MS student at BCU. Cary's thesis research will focus on the development of the CESSM model for Grand Bay. Ed Buskey and Sally Morehead of MANERR are working with Drs. Harwell, Gentile, and Reiter to finish the MANERR CEM, which should be completed by this summer.

Dr. Smith participated in the Wintering Habitat advisory group workshop in Corpus Christi, Texas for the Whooping Crane Conservation Action Planning Program on February 2 – 4, 2010 led by The Nature Conservancy. The group provided insight into available data, information gaps, threats and stressors, and prioritized actions to support increasing populations of this endangered species that utilize the northern half of the Mission-Aransas NERR area. The integrated approach necessary to

maintain the recovery of this species is expected to be both a challenge and the primary factor for success. The group was interested in using the research results from the MANERR ECSC project, and to assist in extending the scope of the integrated assessment into the estuaries to the north of the Mission-Aransas NERR.

Also during this period, Dr. Reiter has been invited to travel to Ensenada Mexico and Cairo Egypt this coming Spring to give seminars and workshops on the ECSC conceptual modeling methodology to students and researchers at the two universities. This travel represents a first step toward developing the international consortium of universities with interest in coastal resource management reported in past annual reports. Dr. Reiter has also secured a Fulbright grant during this period to bring Dr. Mamdouh Nasr, Vice-Dean for Graduate Studies and Research of the Faculty of Agriculture, Ain Shams University, Cairo to BCU for the 2010-2011 academic year. Dr. Nasr, an environmental economist, will teach within the Department of Integrated Environmental Science, assist Dr. Reiter with the integration of economics into existing courses, and help with a search for a similarly trained faculty member to join the BCU staff permanently.

A Land Use/Land Cover Map Reading Skills learning station was developed by Liz Smith and used at two outreach programs in October 2009 at Refugio, Texas. Over 200 5th-6th graders (October 27th) and over 100 8th graders (October 30th) from the Mission-Aransas Watershed and surrounding areas were trained to read a map and use the land use/land cover legend to identify habitats close to their schools and homes, as well as where coastal species live and migrate. The program will be expanded to provide a poster for each classroom of the participating schools that identifies watershed boundaries, rivers and streams, and bays.

Also during this period, the data analyses and modeling papers are making their way into print. The list of publications related to IA activities (refer to Appendix 3:A) includes 13 publications, 4 with student authors, and is spread across journals, books, and web publications.

Dr. Smith provided ECSC briefings and recent results to the San Patricio Soil and Water Conservation Board members on 19 January 19, 2010, and to the Aransas County Stormwater Management Plan advisory group on October 13, 2009. Combined with her presentation on ECSC activities to the Whooping Crane Conservation Action Planning Program on February 2 – 4, 2010, IA has already surpassed the Year 4 briefings measure.

ECSC/ IA Publications (*Appendix 3:A*)

ECSC/ IA Presentations (*Appendix 3:B*)

ECSC/ IA Leveraged Funded Proposals (*Appendix 3:C*)

ECSC/ IA Leveraged Pending Proposals (*Appendix 3:D*)

ECSC/ IA Student Awards (*Appendix 3:E*)

ECSC/ IA Workshops Led or Hosted (*Appendix 3:F*)

The IA Thematic Area has used the conceptual modeling workshops as training events in IA methodology for ECSC students. However, due to the complexity of the work, the time scales involved, and the spacing of workshops, to date there are relatively few students with thesis work focusing specifically on the development of IA methodology. At present, only Texas A&M University at Corpus Christi (numerical modeling) and the newly organizing program and department at Bethune-Cookman University (conceptual modeling) have students whose graduate theses focus on IA methodology. The development and expansion of the BCU program will help

grow the number of students that are specifically focused on IA in the coming years. However, the IA conceptual and numerical models are central to the ECSC's work and approach, and drive much student research across the ECSC sites regardless of the student's listed thematic area. It is therefore important to note that while the students counted as exclusively IA students appears small, students in other thematic areas have received IA training, their project topics address concerns identified by IA models, and the results that they generate feed back into the broader integrated assessment process.

Other Notable Activities during this Period: During this reporting period, Drs. Reiter, Harwell, and Gentile came up with a way to clarify the terminology associated with the ECSC conceptual modeling method. The terminology was developed based on ecosystem ecology, which places an emphasis on the flows between levels rather than the levels themselves (ex. there are two layers of flows in a "2C", or "two-component", model). However, the terminology being used can be confusing to those outside of the ECSC because practitioners can look at our "2C" models, count the "layers of boxes", and think three components instead. Since we are beginning to distribute publications and run seminars on the method, and since practitioners are likely to be a major group interested in using the method, a set of terms has been chosen which is likely to be more descriptive and clear to both theoreticians and practitioners. For the "2C" models, we will from this point use the same terminology used by Drs. Harwell and Gentile in other publications, specifically "Conceptual Ecosystem Model (CEM)", as it is more descriptive of the structure and is more consistent with other similar conceptual ecological models. For the "4C" models, we will expand on that terminology in a descriptive way, specifically "Conceptual Ecological-Societal Systems Model (CESSM)". This terminology is also more descriptive, plus will distinguish our approach from other conceptual ecological models that don't explicitly incorporate societal feedbacks, services, and similar. These choices remove the terminology from the realm of ecosystem ecology, and therefore reduce the chance of misunderstanding by theoreticians and practitioners based on their approach to the discipline. This report and future IA items will reflect this change in terminology.

During this period, Dr. Tanveer Islam completed a project entitled "Assessing Socio-Economic Vulnerability of African Americans to Hurricanes in the Gulf States using GIS", which was funded by the Ford Foundation through the Southern Regional Asset Building Coalition. ECSC graduate student Ms. Ariana Marshall assisted Dr. Islam on this project. They submitted a project report and presented the study at Florida A&M University and at the 5th NOAA EPP Science and Education Forum. Two abstracts were also accepted for presentations at the American Planning Association National Planning Conference and the Coastal Society Biannual Conference.

Dr. Reiter was invited to offer an Elderhostel course on Global Climate Change for the Stetson University Elderhostel program in Daytona Beach FL during this reporting period. He accepted the invitation and will present the course March 15th – 18th, 2010.

In an effort to remain current on NOAA issues and priority sites, Dr. Reiter met briefly with Dr. Gary Matlock (past Director, National Centers for Coastal Ocean Science, National Ocean Service) and Dr. Marie Bundy (National Research Coordinator, OCRM/NOS/NOAA) at Silver Spring MD in January. Dr. Bundy suggested that IA consider expanding/shifting ECSC efforts to Tijuana and/or Sapelo Island if Kachemak does not pan out as a viable site or if other IA deliverable goals must be shifted due to local budget issues (as happened last year with DNERR).

Dr. Brian Keller, a new NOAA Science Advisor for ECSC and lead scientist for NOAA Sanctuaries in the southeastern US, has referred IA thematic lead Dr. Reiter to Dr. Becky Allee, who is with the NOAA CSC distributed network in the Gulf (housed at Stennis) and is heading the Gulf of Mexico Integrated Ecosystem Assessment. A habitat characterization specialist, she is part of the GOMA Ecosystems Integration and Assessment (EIA) team. Brian thinks that our Gulf coastal models and method could be of use to the Gulf IEA. Dr. Allee has extended an invitation to the IA team to have a representative attend the GOMA meeting in New Orleans in April.

Dr. Reiter's design method for the undergraduate degree in the new Department of Integrated Environmental Science was recently published in Volume 31 of the international book series on sustainability education titled Environmental Education, Communication and Sustainability.

Dr. Reiter has been selected to continue as Co-Chair of the Interdisciplinary Environmental Association's Roundtables on Environmental Systems and Sustainability, a national effort to develop certification standards for interdisciplinary environmental programs in higher education.

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)

Grand Bay NERR staff discussed the development of a CESSM modeling workshop and agreed this would be a useful tool, particularly as they try to develop their research program to include the social sciences. At the 2010 ECSC Annual Meeting, GBNERR managers formally requested that this workshop be developed and held in Year 5 of this grant, and the IA team will begin preparations to run this workshop.

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

While the location was not specified in the IA list of Goals and Measures, original planning had this Year 5 measure taking place at DNERR. However, with last year's request from DNERR managers to suspend activities there for the time being due to budgeting issues, the IA team decided at the 2010 January ECSC Annual Meeting to move up the GBNERR activities to fill this slot. GBNERR is 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. IA is moving forward for the remainder of this grant period with this new plan in mind.

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, necessary to move toward the options stages. At this point, however, there are already some likely scenarios that appear to be problematic for the oyster population in Apalachicola Bay, particularly involving the ACF Low Flow scenario as proposed by the USACE. We will be able to more fully examine the alternatives once the remainder of the model runs is 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 as well as NOAA representatives (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 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.

Table 4A ISS-TA Participants

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

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

Performance Indicators for Goal 1:

1) Number of ISS research projects approved by ECSC. Goal for Year 4 = 3 projects.

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

MSU Oyster Micro-hatchery Project

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

During this period, the Morgan State University Estuarine Research Center (MSUERC) oyster farm project focused on gaining information on the economic viability of oyster aquaculture in the Patuxent River Region of the Chesapeake Bay. To do this we employed a summer intern and found two local watermen who agreed to participate in the project. ECSC provided the necessary equipment and the watermen ran the oyster farm, allowing the MSUERC access to the farm, the oysters, and any information pertaining to the running of the business. Information on the capital cost and budget for the farm was collected and an economic analysis was performed. The analysis used a program called Aquasim. Given the information gained from the summer the model predicted a 95% chance of economic success, meaning that the profits from the operation would exceed the cost of the operation. Assuming the size of the farm does not expand, the model predicted that the net revenue of the farm would be around \$18,000 a year. These results are encouraging to the prospects of aquaculture in the Patuxent River Region. The results also indicate that aquaculture on this scale must be a part time endeavor. Currently, labor input data are being kept for future analysis and expansion of the economic model.

Other pieces of equipment are being purchased as well as continuing supplies. The initial batch of oyster spat is in the water and we are evaluating better system of bagging small oyster spat and getting them overboard. We will continue to monitor the amount of effort required to cull and sort that spat as they grow and modify the size of the mesh bags as necessary.

FAMU St. Joe Project

Preliminary visits have been made to Port St. Joe to tour the site and meet with a resident who was a named plaintiff on a lawsuit against St. Joe Paper Company. The pleadings from the lawsuit, which has been completed, were shared with Dr. Worthen and Dr. Owens. The pleadings contain environmental reports, including environmental impact statements. These documents are being evaluated for environmental justice implications. Focus group and case 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 = 3

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

Dr. Marcia Allen Owens, “Florida A&M University & the Orlando Science Center: Enhancing the Ocean Literacy of Underrepresented Students and Their Teachers, Ocean Sciences Conference (Ocean Science and Mutualism), February 2010.

Dr. Marcia Allen Owens, “Environmental Health and Environmental Justice,” Invited Panel Testimony before the White House Council for Environmental Quality/Ocean Policy Taskforce Listening Session, October, 2009

Dr. Marcia Allen Owens, “Environmental Literacy & Pedagogy,” Black Belt Studies Conference, October 2009.

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

Currently there is one journal article under review.

1) Morgan State’s research in environmental and sustainability entrepreneurship related to the oyster harvesting project in Chesapeake Bay was submitted to the International Journal of Case Studies in Management:

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

We have received feedback from the editor and reviewers and will be resubmitting soon.

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

Performance Indicators for Goal 2:

1) Percentage of students working on ECSC-approved ISS research that present at conferences and/or publish in recognized journals. Goal for Year 4 - 100% of the students working on ISS related projects present at conferences and/or publish journals.

- 1) We have students working on all ISS projects and plan to have them prepare presentations for conferences in the upcoming year. A new doctoral student at MSU was recently added to the team who is interested in 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 - 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 have been invited to return in Summer 2010

3) Percentage of students working on ECSC-approved ISS projects employed by NOAA or related agencies/firms. Goal for Year 4 - 50% of the students working on ISS related employed by NOAA.

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

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

Performance Indicators for Goal 3:

1) Percentage of ECSC-approved ISS projects that include partnerships with NOAA affiliated agencies. Goal for Year 4 - 75% of the projects will have NOAA collaborations during Year 4.

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

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

2) Percentage of ECSC-approved project results/findings presented at NOAA sites by ISS faculty and /or students. Goal for Year 4 - 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

Larry Robinson and Michael Abazinge, Thematic Area Leaders

The primary accounting of ECSC student activities is contained in the EPP Student Tracker Data Base. Although detailed student data are reported separately it is important to note other educational activities herein.

Recruitment

During this period the ECSC has engaged in focused recruitment activities that have served to both attract highly competitive students and increase the visibility of the Center's accomplishments in research and outreach (see Table 5-A). The ECSC developed a professional display banner and table throw to assist in its' recruitment efforts. (*see appendix 5:A-B*)

Table I:5-A: Select ECSC Recruitment Activities September 2009 - February 2010

Conference	Location	Dates	Participants
NOAA-EPP Education and Science Forum	Washington, DC	November 12-14, 2010	All Universities
FAMU Education & Recruitment Fair	Orlando, FL Jacksonville, FL	November 20-21, 2010 November 24, 2010	FAMU
National Council for Science, Policy & the Environment (NCSE)	Washington, DC	January 20-21, 2010	FAMU, BCU

Florida A&M University Educational and Recruitment Fair

November 20-21, 2010, Orlando, FL; November 24, 2010, Jacksonville, FL

FAMU President presented an overview of the University which included the different colleges and schools. The Office of Student Affairs offered scholarships to high achieving high school students. Potential students visited booths and talked with recruiters. This event catered to high school junior and seniors.

10th Annual National Council for Science, Policy and the Environment (NCSE), The Green Pioneers Expo

January 20-21, 2010, Washington, DC

The conference brought together leaders in sustainable business, environmental policy, civil society, university faculty, students from across the nation, and educated citizens. Potential students visited booths and talked with recruiters. The recruitment expo catered mostly to graduate students.

New Students

Table I:5-B: New ECSC Students (* denotes prior ECSC Student pursuing a higher degree)

Student Name	Degree Program & Major	Institution
Karlisa Callwood	Ph.D., Marine Science	University of Miami

Philemon Kiriu	Ph.D., Environmental Science	Jackson State University
*Ariana Marshall	Ph.D., Environmental Science	Florida A&M University
Jolván Morris	Ph.D., Environmental Science	Florida A&M University
Christina Nica	Ph.D., Environmental Science	Jackson State University
Kim Tucker	Ph.D., Civil & Environmental Engineering	Florida A&M University
* Cary Bleasdale	M.S., Environmental Science	Bethune-Cookman University
* Rashan Moss	M.S., Environmental Science	Bethune-Cookman University
*Judith Sarkodee-Adoo	M.S., Environmental Science	Florida A&M University
Katherine Whitaker	M.S., Civil & Environmental Engineering	Florida A&M University
Hiracheta Domingo	B.S., Environmental Science	Texas A&M University
Frank Johnson	B.S., Environmental Science	Florida A&M University
Nancy Metayer	B.S., Environmental Science	Florida A&M University

K-12 Outreach Activities

FAMU High School Science Bowl Team

A New high school science bowl team was formed. Team members are: Erinma Kalu (Chiles High School), Obi Onyeozili (Rickards High School), Samuel Ichite (Rickards High School), Vivek Somasundaram (Lincoln High School), Patrick Holmes (Florida State High School), and David Brown (Godby High School). The team is coached weekly by graduate students Ariana Marshall and Zakiya Hoyett. The team will compete in March 2010. Three members of the prior team graduated high school and are now attending college. John Kershaw is majoring in Environmental Science at Ball State University; Jason Moore is majoring in Pharmacy at Florida A&M University majoring; and Xavier McGill is majoring in Business at Florida State University,

FAMU Environmental Science High School Summer Camp

Planning is in progress for the 2010 ESI High School Summer Camp. Applications were sent out to schools, parent, and email distribution lists. Advertisement was placed in the local newspaper and on television stations websites. The camp will be held June 7-26, 2010. (visit www.ecsc.famu.edu/camp2010)

FAMU K-8 Environmental Awareness Poster Competition was held March-May, 2009. The Planning is in progress for the 2010 Environmental Awareness Poster Contest. Letters were sent to local Elementary and Middle School.

Newsletter

The ECSC produced a newsletter during this period, “2008-2009: A Year in Review”. The newsletter highlighted ECSC news and activities. (visit www.ecsc.famu.edu/2008_2009_NOAA_ECSC_YEAR_IN_REVIEW.pdf)

Section II: Success Stories

Larry Robinson (ECSC Director and FAMU Vice President for Research) has been nominated by President Obama to become the Assistant Secretary of Commerce for conservation and management at the National Oceanic and Atmospheric Administration (NOAA). (visit <http://www.whitehouse.gov/the-press-office/president-obama-announces-more-key-administration-posts-012910>)

Rashan Moss (M.S. Bethune-Cookman University) won First Place in the Biology section for his oral presentation at the 17th Annual Florida Georgia Louis Stokes Alliance on Minority Participation (FGLSAMP) Conference held in Tampa, FL February 26-28, 2010. Rashan’s talk was entitled “Changes in the Hydrobiid Community of Blue Spring State Park, Volusia County, Florida”.

Sergey Reid (B.S. Geographic Information Sciences, TAMUCC) presented his research “Performance of a Water Level Predictive Model at Freeport, Texas” at the 9th TAMUCC Undergraduate Research Symposium in Corpus Christi on October 10, 2009 and won second place in the poster competition.

Dennis Apeti (Ph.D. Graduate, FAMU; NOAA NOS Physical Scientist) gave a seminar at FAMU Environment Sciences Institute on February 5, 2010. Dr. Apetit discussed “The Mussel Watch Program” and one of his studies in Alaska that characterize the environmental health of Kachemak Bay based on sediment quality assessment.

NOAA-EPP Forum (*November 12-14, 2010, Washington, DC*)

ORAL PRESENTATION Student Scholarship Presentation Award Recipients:

Remote Sensing and Satellites

2nd Place - **Paul Merani**, University of Nebraska

Living Marine Resources

2nd Place - **Sue Ebanks**, University of Miami/RSMAS

Environmental Education and Literacy; Social Science; and Ecosystems

3rd Place - **Ariana Marshall**, Florida A&M University

POSTER PRESENTATION Student Scholarship Presentation Award Recipients:

Weather, Hydrology, and Watersheds
2nd Place - **Melissa Shutte**, Delaware State University

Coastal Areas, Wetlands, and Oceans
2nd Place - **Adesuwa Erhunse**, Florida A&M University
(not directly supported)

SCIENCE FEST

Jessica Wise gave presentations and demonstrated experiments for 5 different sessions of 5th-8th graders. Her topic was "How Smog Clouds Are Created." Ms. Wise was assisted by **Judith Sarkodee-Adoo**.

Section II: NOAA ECSC Annual Meeting

NOAA ECSC Annual Meeting

The 2010 annual meeting of the ECSC was held January 31 through February 3, 2010 at the Hyatt



Regency Riverfront in Jacksonville FL. Participants included the co-PIs from FAMU and partner institutions, post-doctoral and research associates, and representatives from NOAA. These representatives included Jacqueline Rousseau, Director of the Educational Partnership Program, David Johnson, Chair of the NOAA ECSC Advisory Committee, and Kimani Kimbrough, NOAA-NOS. Research coordinators and personnel from several NERR sites also attended.

Brief statements of welcome by the ECSC director and NOAA representatives included the announcement that Dr. Larry Robinson had been nominated to the position of Assistant Secretary for Oceans and Atmosphere in the U.S. Department of Commerce by President Obama. This position requires senate confirmation. Meeting participants extended their congratulations to Dr. Robinson, although his leadership of the ECSC will be missed. This was followed by discussion of the External Evaluation Report from the ECSC external evaluation/program review that occurred in March 2009. It was noted that this review was positive, but also indicated areas where the ECSC program could be improved.

NOAA representatives Rousseau, Johnson, and Kimbrough then made brief presentations on the priorities of NOAA and NOS, with regard to ongoing and planned ECSC activities. Climate

research was identified as a major cross-cutting theme at NOAA, and it was suggested that current and future should be aligned with this priority. Marine spatial planning was also discussed as a high priority area for the agency. Another area of special interest is developing partnerships with federal and state agencies and non-governmental organizations. Additional priorities that were identified include developing and maintaining healthy, productive and sustainable coastal resources, improving weather and disaster warnings, better integrating scientific research efforts with management and stewardship, and improving communication, outreach and education efforts to the wider community.

Next, there were presentations by leaders of each of the five 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 Analysis and Data Development) about progress and activities in their respective areas. Bernadette Kelley of FAMU reported on the status of the Education and Outreach thematic area. The program objectives include developing a pipeline for the production of minority scientists and teachers in NOAA-relevant disciplines, enhancing curriculum and educational capabilities in these disciplines at partner institutions, and establishing postdoctoral programs to solidify interactions with NOAA scientists. She reported on specific examples of each of these activities at FAMU and partner institutions, and noted that education is not really a separate thematic area, but bridges and includes the activities within the other thematic areas.

Michael Reiter of Bethune-Cookman University gave an overview of activities in the Integrated Assessment thematic area. The purpose of this thematic area is to train students in integrated resource management, risk assessment and decision-making, particularly by developing and applying conceptual models. Conceptual models have been developed and applied as decision-making tools for ecosystem management at several NERR sites. He reported that a workshop had been held in April 2009 at Port Aransas, TX to develop a two-component conceptual model for the Mission-Aransas NERR. This workshop also included a training component, as students from several ECSC partner institutions participated in the model development. The thematic area participants are continuing to refine and improve conceptual models at other NERR sites on the Atlantic and Gulf coasts, and are exploring opportunities to develop such models in cooperation with several NERRs on the Pacific coast. Mark Harwell of Harwell Gentile and Associates also gave a brief presentation on risk assessment activities evaluating responses of Apalachicola Bay to hypothetical scenarios involving sea level rise and alterations in water inputs from the Apalachicola River.

Anthony Wilbon of Morgan State University reported on activities within the Integrated Social Sciences thematic area. The two major goals of this thematic area are to develop expertise of faculty and students in the social sciences at partner institutions and to enhance training and opportunities for underrepresented minority students in social science and management related fields. He discussed the ECSC's approach to incorporating training in the human dimensions of ecosystem management and noted that inclusion of social and economic dimensions in management and decision-making processes is an area of considerable interest to NOAA. He also reported on an ongoing project at MSU to develop an integrated model for a stable, sustainable oyster fishery in Maryland thru development of an oyster hatchery to produce and seed juvenile shellfish.

The activities of the Ecological Processes thematic area were summarized by Jennifer Cherrier of

FAMU. This thematic area engages students in research in the coastal, environmental and ocean sciences, with the objective of improving our understanding of the impacts of natural and anthropogenic stressors on the health and function of coastal and estuarine ecosystems. The thematic area has established a curriculum designed to develop core competencies and skills necessary for careers in coastal and ocean sciences. This curriculum includes a mixture of classroom and laboratory courses taught at FAMU and partner institutions, and field courses in partnership with various NERR sites. Proposals from FAMU and partner institutions for specific research projects within this thematic area have been submitted for peer review by ECSC and NOAA scientists. A major purpose of these reviews is to ensure robust linkages between research goals and student training. Specific proposals and topics were briefly reviewed in this presentation, along with recent publications, and additional funding sources that have been leveraged.

John Schalles of Creighton University presented the final thematic area report, Geospatial Analysis and Data Development. This thematic area develops tools for data acquisition and acquires geospatial data for other thematic areas, in addition to providing student training in modern remote sensing methods and geospatial techniques. Work to date has focused on acquiring high-resolution spectral and spatial data from NERR reserves using an aircraft-based hyperspectral imaging system, in conjunction with ground-based spectral analysis, and in-situ data collection. This data includes water quality, marsh vegetation, and other biological and chemical data from targeted NERR sites, as well as satellite imagery. In May 2009, an aircraft survey with a coordinated ground-truthing effort involving investigators and students from five partner institutions was conducted at the Grand Bay, MS NERR. This followed similar data collections at the NERR sites at Apalachicola Bay, Grand Bay, Delaware Bay, Chesapeake Bay, and the ACE Basin, SC in previous years. However, instrument problems rendered a significant fraction of the aircraft data unusable. Plans are underway to repeat the aerial survey at Grand Bay in 2010; there will be charge for this repeated use of the aircraft.

Charles Jagoe of FAMU gave a brief presentation about efforts to establish a joint research effort involving ECSC and the other four Cooperative Science Centers in the NOAA-EPP program. This effort followed discussions that began at a joint meeting of the Center Directors and Distinguished Scientists held at NOAA headquarters in September 2009. Given that most centers had already committed budgets and personnel time to other ongoing projects, it was agreed that the joint project should begin by identifying and examining existing data sets collected by the CSCs and cooperating NOAA offices. Existing data sets are being identified, and these will be used to address linkages across large spatial and temporal scales. Specific questions have not yet been formulated, but the broad thematic areas that will be addressed are climate change, and the effects of related perturbations (temperature changes, ocean acidification) on coastal and offshore resources. Discussions between scientists at participating institutions are ongoing.

Concurrent breakout sessions for each of the thematic areas were held on the afternoon of Feb 1 to allow in-depth discussions among the thematic area leads and co-PIs. Discussion topics included student training goals, scientific objectives, and future work plans. Topics addressed included the internal project reporting process, methods to track students to assure that they had received adequate training in field methods before beginning field work at NERR sites, and coordination of activities among thematic area PIs, co-PIs and NERR personnel. There was also discussion about the development of a handbook of standard lab and field methods to harmonize data collection

activities within the Ecological Processes thematic area, and ongoing and planned risk modeling activities in the Integrated Assessment group. The latter includes development of a coupled numerical model to predict the effects of alterations in freshwater inputs and sea levels on salinity and oyster production within the Apalachicola NERR. After the breakout sessions, the thematic area leads gave brief reports to the entire group about the discussion and identified action items.

On February 2, the attendees participated in a field trip to Sapelo Island, Georgia. This involved a drive from Jacksonville to Meridian GA, and to catch the 8:30 AM ferry to the Island. Upon arrival at the island, participants traveled by bus to the University of Georgia's Marine Institute. After a brief welcome by Melissa Booth of the Marine Institute, those members of the NOAA advisory committee that were present met separately, while ECSC investigators continued discussions in the concurrent breakout sessions that had begun the previous afternoon. The groups met in a joint session to share thoughts before lunch. After Lunch, the group attended presentations about the history and culture of Sapelo Island, focusing on the Hogg Hammock Community that has existed on the island since colonial days. The group then traveled to the headquarters of the Sapelo Island NERR for a presentation about the history of the program and current projects. The visit to the island concluded with a brief tour of various natural habitats of the reserve, including dunes, forest and saltmarsh.

The meeting concluded on the morning of Feb 3. Jennifer Cherrier of FAMU made a brief presentation and led a discussion about highlighting the visibility of ECSC within the scientific community, particularly at various scientific meetings and in scientific and educational organizations. Several of the participants at the ECSC Annual Meeting had arrived in Jacksonville before the official start of the meeting to allow additional time for discussion, particularly about repeating the Grand Bay NERR flyover, and about opportunities for developing a long-term mercury monitoring program in Grand Bay. These discussions were reported to the whole group during this session. The session concluded with remarks from Jacqueline Rousseau, Kimani Kimbrough, and David Johnson. These focused on future directions and challenges for the ECSC. Many of the participants stayed after the adjournment to discuss future directions, particularly the changes that would result from the departure of Dr. Robinson. Potential changes in the ECSC leadership were explored, as were several issues about the allocation of student funding and semi-annual reports. Discussions also involved strategies and timetables for submission of another proposal for the next 5 years of funding for the ECSC in response to an anticipated call from NOAA.



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

Appendix 1:B

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

NOAA/ECSC/EPIEH-TA Publications

Cho, H.J. and P. Biber Seed propagation protocol for Wigeongrass (*Ruppia maritima* L.) (Mississippi). Ecological Restoration. *accepted*

Cho, H.J. and D. Lu*. . 2010A water-depth correction algorithm for submerged vegetation spectra. Remote Sensing Letters 1(1): 29-35

Cho, H.J. and C. Nica*. 2010. A study of seagrass at Grand Bay National Estuarine Research Reserve, Mississippi. Proceedings of the 2009 MS Water Resource Conference 114-117

Cho, H.J., D. Lu*, and M. Washington*. 2010. Water correction algorithm application for underwater vegetation signal improvement. Proceedings of the 2009 MS Water Resource Conference 152-155

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

Cho, H.J. and Y.L. Sanders*. Note on Organic Dormancy of Estuarine *Ruppia maritima* seeds. Hydrobiologia 617: 197-201. 2009.

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., Vol 1(1): 37-50.

Wang, H., Hladik C., Huang W., Milla K., Edmiston L., Harwell M., and J. Schalles. 2010. Detecting and mapping water quality indicators in Apalachicola Bay, Florida using MODIS Terra 250 m imagery. International Journal of Remote Sensing. Vol 31, (2): 439-453.

NOTE:

Several of the above are also listed as Geospatial analysis and remote sensing products

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. Monitoring bioaccumulation of heavy metals using LIBS. NOAA-EPP Fifth Education and Science Forum. Washington, DC. Nov. 2009

Branch*, J., Martinez, J., Akpovo, C., Jagoe, C. Johnson, E. and L. Johnson. Trace metal detection in oyster tissue using a novel technique: Laser Induced Breakdown Spectroscopy. 30th annual meeting of the Society of Environmental Toxicology and Chemistry (SETAC) 2009. New Orleans, LA. Nov. 2009

Branch*, J., Martinez, J., Akpovo, C., Jagoe, C., Johnson, E., and L. Johnson. Application of single & dual pulse LIBS for trace metal oyster studies. OSA topical meeting: Laser applications to chemical, security, and environmental analysis (LACSEA). San Diego, CA. Feb. 2010

Brito*, A. Comparative feeding ecology and allometric growth of two spatially co-existing penaeid shrimps in Sofala bank fishery (central Mozambique). NOAA-EPP Fifth Education and Science Forum. Washington, DC. Nov. 2009

Cenelli*, M and McIntosh, D. Temperature and salinity dependent growth of weakfish. 2010 Watermen's Forum. Baltimore, MD. Jan. 2010

Cherrier, J., and A. Chauhan. Impact of dissolved organic matter (DOM) availability on bacterial community succession over a tidal cycle in Apalachicola Bay, FL. Fifth NOAA Education and Science Forum. Washington, D.C. Nov. 2009.

Cherrier, J., Dorsett*, A., Cable, J.E., and J.B. Martin. Hydrologic and biogeochemical controls on dissolved inorganic carbon cycling and flux in a subterranean estuary: A dual ^{14}C and ^{13}C tracer approach. AGU/ASLO/TOS Ocean Sciences Meeting. Portland, OR. Feb. 2010

Cho, H.J. and D. Lu*. Spectral algorithm for improved submerged aquatic vegetation signals. The Coastal and Estuarine Research Federation. Portland, OR. Nov. 2009

Davenport*, E., J. Anderson, and C. Fan. Modeling hurricane effects on zooplankton production using a simple NPZ numerical model. Fifth NOAA Education and Science Forum. Washington, D.C. Nov. 2009.

Dickens*, K., Richards, G., Watson, M., and Ozbay, G. Investigating uptake and colonization of *Vibrio parahaemolyticus* in eastern oysters (*Crassostrea virginica*) in relation to phytoplankton presence. Fifth NOAA Education and Science Forum. Washington, D.C. Nov. 2009.

Erhunse*, A., Alvarez, D., Gale, R., Gragg, R.D., and L. Robinson. Baseline assessment of spatial and temporal trends of perfluorinated alkyl substances in the Apalachicola river and bay. Fifth NOAA Education and Science Forum. Washington, D.C. Nov. 2009.
student poster presentation award winner

Jagoe, C. From acid rain to ocean acidification: how atmospheric pollutants threaten aquatic resources. NOAA-EPP Fifth Education and Science Forum. Washington, DC. Nov. 2009

Kenduzler, E., McHenry*, M. and Z. Arslan. Speciation of mercury in fish otolith by cold vapor generation atomic absorption spectroscopy. Seventy Fourth Annual Meeting of the Mississippi Academy of Sciences. Hattiesburg, MS. Feb. 2010

Kishinhi*, A., Tchounwou, P., Farah, I., Woodrey, M., Ruple, D. and M. Sims. Microbiological water quality assessment in Bayou Cumbest Mississippi. 5th International Symposium on Recent Advances in Environmental Health Research. MS. Sept. 2009

Kishinhi*, A., Tchounwou, P., Farah, I., Woodrey, M., Ruple, D. and M. Sims. Molecular Approach in Microbial Source Tracking in the Grand Bay Mississippi. Fifth NOAA Education and Science Forum. Washington, D.C. Nov. 2009.

Marshall, Ariana*, J., Robinson, L. Coastal Erosion Response Through Permitting in Three Northwest Florida Counties NOAA EPP Fifth Education and Science Forum. Washington, DC. Nov. 2009
student oral presentation award winner

McHenry*, M., Arslan, Z. and P. Tchounwou. Profiling mercury distribution in Grand Bay National Estuarine Research Reserve (NERR) by cold vapor generation AAS: Preliminary results from water, sediment and fish samples. Seventy Fourth Annual Meeting of the Mississippi Academy of Sciences. Hattiesburg, MS. Feb. 2010

Mohrman, C., Cooley, R., Woodrey, M. Nest microhabitat characterization and nest site selection by Mississippi diamondback terrapin (*Malaclemys terrapin pileata*) at Grand Bay National Estuarine Research Reserve (NERR) Mississippi. NOAA-EPP Fifth Education and Science Forum. Washington, DC. Nov. 2009

Muehllehner*, N., and C. Langdon. Carbonate chemistry of the Florida reef tract. NOAA-EPP Fifth Education and Science Forum. Washington, DC. Nov. 2009
student oral presentation award winner

Nica*, C. and H.J. Cho. Study of beds of *Ruppia maritima* and *Halodule wrightii* at Grand Bay NERR, MS. Sixth International Symposium on Recent Advances in Environmental Health Research. Jackson, MS. Sept. 2009

Pappas*, A., Ozbay, G., Lee, K., Reining, B., Ko, A., and Coyne, K. Evaluation of benthic diatoms as water quality indicators in the Blackbird Creek Watershed, Delaware. North American Diatom Symposium (NADS). Iowa Lakeside Laboratory, Milford, IO. Sept. 2009

Pappas*, A., Ozbay, G., Lee, K., Reining, B., Ko, A., and Coyne, K. 2009. Evaluation of benthic diatoms as water quality indicators in the Blackbird Creek Watershed, Delaware. Fifth NOAA Education and Science Forum. Washington, DC. Nov. 2009

Sarkodee-Adoo*, J. Sex ratios as a function of size in *Crassostrea virginica* Fifth NOAA Education and Science Forum. Washington, D.C. Nov. 2009

Schutte*, M., Guo, M. Monitoring and evaluation of water quality in Silver Lake, Delaware. Fifth NOAA Education and Science Forum. Washington, D.C. Nov. 2009

Smith, S., Cherrier, J. and J. Sarkodee-Adoo*. A comparison of inorganic carbon dynamics in two subtropical estuaries during spring floods: Apalachicola Bay, FL, and St. Joseph Bay, FL. Fifth NOAA Education and Science Forum. Washington, D.C. Nov. 2009

Warner, R., C., Fan. Characterization of reflectance spectra of phytoplankton cultures: Implications of remote sensing of HABs. Coastal and Estuarine Research Federation 20th Biennial Meeting. Portland, OR. Nov. 2009.

Washington, M.* and H.J. Cho. Development of water correction algorithm for underwater vegetation signals. Sixth International Symposium on Recent Advances in Environmental Health Research. Jackson, MS. Sept. 2009

Appendix 1:D

NOAA/ECSC/EPIEH-TA Leveraged Funded Proposals

Strengthening and Expanding Parallel Computing (SEPC) across STEM Curriculum. H. Chi and E. Johnson et al. (FAMU). U. S. Department of Education, Minority Science and Engineering Improvement Program. \$500,000.00 for 3 years.

United States-Brazil Higher Education Consortia Program. J. Jones and E. Johnson et al. (FAMU). U. S. Department of Education, Funds for the Improvement of Post-Secondary Education. \$255,000.00 for 4 years.

Speciation and Location of Heavy Metals in Oysters and Sediments. J. Branch*, J., Jackson, K., Jagoe, C., Johnson, E., and L. Johnson (FAMU). USDOE/SSRL. Beam time and equipment use for 2 years.

Strengthening environmental literacy through hands-on field wetland ecology classes. Cho, H.J. (JSU). Gulf of Mexico Alliance-Environmental Education. \$11,550 for 1 year.

Plants of the Mississippi coast. Cho, H.J (JSU). Mississippi Department of Marine Resources. \$26,383 total for 2 years

SAV restoration at Grand Bay NERR, MS. Cho, H.J. (JSU) and P.Biber (JSU). Mississippi Department of Marine Resources. \$72,840 total for 2 years.

UBM-Institutional: Enhancing Undergraduate Education and Training at the Intersection of the Biological and Mathematical Sciences through Research and Interdisciplinary Curriculum. Kwembe, T. (JSU) and Cho, H.J. (JSU). National Science Foundation. \$1,000,000 for 5 years.

Appendix 1:E

NOAA/ECSC/EPIEH-TA Leveraged Pending Proposals

An integrated assessment of the source(s), transport and fate of contaminants to the Apalachicola Bay National Estuarine Research Reserve (ANERR). Chauhan, A., J. Cherrier, T. Islam, C. Jagoe, (FAMU). Submitted to National Estuarine Research Reserve System Science Collaborative. \$900,000 for 3 years.

Educating future agriculture and food industry professionals in GIS, GPS and remote sensing technologies, with a Multi-state, Multi-Institutions Consortium. S. Sriharan (VSU), G. Ozbay (DSU), C. Fan (MSU), and F. San Juan (ECSU). Submitted to US Department of Agriculture. \$400,000 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 and committee member Dr. B. Scarborough-DENERR, rest of committee to be formed)

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 growth rates of Vibrio parahaemolyticus in benthic invertebrate (Crassostrea virginica) in relation to microalgae abundance*. expected graduation date Aug 2011 (Advisor Dr. G. Ozbay-DSU and committee member Dr. B. Scarborough-DENERR, rest of committee to be formed)

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)

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): *Effects of Pharmaceuticals and Personal Care Products on Freshwater Phytoplankton (tentative)*, expected graduation, April 2012 (Advisor Dr. L. Robinson-FAMU, committee to be formed).

Lorielle Jackson (BS, FAMU): *Toxicological Effects of Perfluoroalkyls in Bottle Nose Dolphins*. (Advisor Dr. L. Robinson-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*, expected graduation date April 2010 (Advisor Dr. L. Robinson-FAMU, committee to be formed).

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

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. (Advisors Drs. L. Robinson and 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). *Impacts of seasonal carbon and nitrogen flux on primary and secondary production in Apalachicola Bay, FL.* Expected date graduation April 2012. (Advisor Dr. J. Cherrier-FAMU, and committee members Dr. S. Smith-FAMU, Dr. J. Caffrey-UWF, 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 (M.S., FAMU). *Title yet to be determined*. 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). *Title yet to be determined*. expected graduation April 2012 (Advisor Drs. W. Huang and E. Johnson-FAMU, committee members Dr. J. Christensen-NOAA)

Jessica Wise (M.S., FAMU). Tentative title *Effects and impact of pH alterations on otolith microchemistry of fish*. Expected graduation date May 2011. (Advisor Dr. M. Abazinge, rest of committee to be formed)

Appendix 1:G

ECSC/EPIEH-TA Workshops Led or Hosted
nothing to report/not applicable to the EPIEH-TA



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. 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
5. Dr. Elizabeth H. Smith. Center for Coastal Studies, Texas A & M University – Corpus Christi, Corpus Christi, TX, 78412; email: elizabeth.smith@tamucc.edu
6. Dr. Zhiming Yang. Department of Agriculture and Natural Resources. Delaware State University, Dover, DE, 19901; email: zyang@dsu.edu
7. 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

8. 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].
9. 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].

10. Morgan, Nikki. 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]
11. 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]
12. 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]
13. Washington, Marvin. M.S. Thesis Student, Jackson State University. *Hyperspectral algorithm development for water effects*. [H.J. Cho, thesis advisor].
14. 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. Cho, H.J. and D. Lu*. 2010. A water-depth correction algorithm for submerged vegetation spectra. *Remote Sensing Letters* 1(1): 29-35
2. Cho, H.J. and C. Nica*. 2010. A study of seagrass at Grand Bay National Estuarine Research Reserve, Mississippi. *Proceedings of the 2009 MS Water Resource Conference* 114-117.
3. Cho, H.J., D. Lu*, and M. Washington*. 2010. Water correction algorithm application for underwater vegetation signal improvement. *Proceedings of the 2009 MS Water Resource Conference* 152-155.
4. Gitelson, A., D. Rundquist, G. Dall’Olmo, W. Moses, and B. Leavitt, 2009. Proximal sensing of individual lakes using field spectroradiometry. Chapter 2 in Chipman, J., L. Ohlman, and A. Gitelson, *Remote sensing methods for lake management: a guide for resource managers and decision-makers*. Madison, WI: North American Lake Management Society.
5. Wang, H., C. Hladik, H. Wuang, K. Milla, L. Edmiston, M. Harwell, and J. Schalles. 2010. Detecting the spatial and temporal variability of chlorophyll-*a* concentration and total suspended solids in Apalachicola Bay, Florida using MODIS imagery. *International Journal of Remote Sensing*, 31: 439-453.

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

1. Cho, H.J. and J. Watkins*. Seasonal and spatial variations of macrobenthic invertebrates in three Mississippi Gulf Coast bayous. *Journal of Mississippi Academy of Sciences*. (Submitted)
2. Cho, H.J. and P. Biber. Seed Propagation Protocol for Wigeongrass (*Ruppia maritima* L.) (Mississippi). *Ecological Restoration*. (Accepted)

NOAA/ECSC/GADD-TA Presentations

1. Cho, H.J. and D. Lu*. 2009. Spectral algorithm for improved submerged aquatic vegetation signals. The 2009 Coastal and Estuarine Research Federation. Portland, OR. November, 2009.
2. Fan, Chunlei. Characterization of water reflectance spectra variability: Implications for hyperspectral remote sensing in estuary waters. 2010 OneNOAA Science Discussion Seminar Series, NOAA-NOS, Silver Springs, MD. February, 2010.
3. Gitelson, A., D. Gurlin, W. Moses, and D. Rundquist, Remote estimation of chlorophyll-*a* concentration in inland and coastal waters: from close range to satellite observations. Ocean Sciences Meeting, Portland, Oregon. February, 2010.
4. Hladik, C., M. Alber, J. Schalles, A. Lynes, S. Pennings. Salt marsh habitat mapping on Sapelo Island, GA, using LIDAR and hyperspectral imagery. Coastal and Estuarine Research Federation Biennial Conference, Portland, OR. November, 2009.
5. Merani, P.F. *, D.C. Rundquist, and J.F. Schalles. Estimating above-ground biomass of salt marsh vegetation using hyperspectral measurements of canopy level reflectance. NOAA – Educational Partnership Program Biennial Meeting. Howard University, Washington, D.C. November, 2009.
6. Nica, C.C.*, and H.J. Cho. Study of beds of *Ruppia maritima* and *Halodule wrightii* at Grand Bay National Estuarine Research Reserve, Mississippi. NOAA – Educational Partnership Program Biennial Meeting. Howard University, Washington, D.C. November, 2009.
7. Nica, C. C.*, and H.J. Cho. 2009. Study of beds of *Ruppia maritima* and *Halodule wrightii* at Grand Bay NERR, MS. Sixth International Symposium on Recent Advances in Environmental Health Research. Jackson, MS. September, 2009.
8. Schalles, J.F., and D.N. Seminara*. Vegetation index comparisons of wetland vegetation patterns in three National Estuarine Research Reserves. Georgia Coastal Ecosystems – NSF Long Term Ecological Research Program Annual Meeting, University of Georgia, Athens, GA. January, 2010.
9. Schalles, J.F., C.M. Hladik, A.E. Altrichter, D.N. Seminara*, and P.B. Merani*. Geospatial partitioning of ecosystem components in coastal wetlands using masking and classification techniques with high resolution imagery. Coastal and Estuarine Research Federation Biennial Conference, Portland, OR. November, 2009.
10. Schalles, J., C. Hladik, S. Pennings, M. Steele, and A. Lynes. Extracting habitat features from hyperspectral wetland imagery at NOAA's Sapelo Island and Mission-Aransas National Estuarine

Research Reserves. NOAA – Educational Partnership Program Biennial Meeting. Howard University, Washington, D.C. November, 2009.

11. Schalles, J.F., C. Hladik, A. Altrichter, D. Seminara* and P. Merani*. Geospatial partitioning of ecosystem components in coastal wetlands using masking and classification techniques with high resolution imagery. Georgia Coastal Ecosystems – LTER External Panel Review, University of Georgia Marine Institute, Sapelo Island, FL. October, 2009.

12. Schalles, J.F., C. Hladik, S. Pennings, A. Lynes, M. Steele, and J. Carpenter. Extracting habitat features from hyperspectral imagery of the Duplin salt marshes at Sapelo Island, Georgia. National Science Foundation. Long Term Ecological Research – All Scientists Meeting. YMCA of the Rockies, Estes Park, CO. September, 2009.

13. Seminara, D.N.*, P.F. Merani*, and J.F. Schalles. Field spectroscopy of benthic habitats in the Grand Bay NERR. NOAA – Educational Partnership Program Biennial Meeting. Howard University, Washington, D.C. November, 2009.

14. Warner, R.A.*, and C. Fan. Characterization of reflectance spectra of phytoplankton cultures: implication of remote sensing of HABs. NOAA – Educational Partnership Program Biennial Meeting. Howard University, Washington, D.C. November, 2009.

15. Warner, R.A.*, C. Fan; A. Hartsig; R. V. Lacouture. Characterization of reflectance spectra of phytoplankton cultures: Implication of remote sensing of HABs. Coastal and Estuarine Research Federation Biennial Conference, Portland, OR. November, 2009.

16. Washington, M.* and H.J. Cho. 2009. Development of water correction algorithm for underwater vegetation signals. Sixth International Symposium on Recent Advances in Environmental Health Research. Jackson, MS. September, 2009.

17. Wood, John S.* Seagrass species discrimination using AISA hyperspectral imagery in Redfish Bay, Texas. Ocean Sciences Meeting, Portland, OR, February, 2010 ([Invited](#))

18. Yang, Z. , and A. Anoruo. Mapping *Phragmites* in St. Jones River Watershed, DE using AISA images. NOAA – Educational Partnership Program Biennial Meeting. Howard University, Washington, D.C. November, 2009.

NOAA/ECSC/GADD-TA Abstracts Accepted or Submitted

1. Merani*, P.B., D.C. Rundquist, 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. (Accepted)

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

3. Seminara, D.N.*, and J.F. Schalles. Vegetation indices to compare salt marsh spatial structure at NOAA estuarine reserves. Ecological Society of America Annual Meeting, Pittsburgh, PA, August, 2010. (Submitted)

Appendix 2-C Geospatial Analysis Group Leveraged Funding Activity

NOAA/ECSC/GADD-TA Funded Grants

1. Cho, H.J. and D. Mishra. National Aeronautics and Space Administration. Strengthening Global Climate Change Education through Remote Sensing Application in Coastal Environment using NASA satellite Data and Models. 2010 - 2013. (\$321 K).
2. Cho, H.J. and P. Biber. MS-AL Sea Grant Consortium. Habitat Suitability Index for Submerged Aquatic Vegetation of the Mississippi Coast. 2010 - 2011. (\$51.9 K).
3. Schalles, J.F. National Aeronautics and Space Administration. Improved Classification for Coastal Wetland Mapping using AISA Hyperspectral Imagery in the Mission-Aransas and Grand Bay National Estuarine Research Reserves. Nebraska Space Grant Office of the NASA National Space Grant College and Fellowship Program. 2008 – 2009. (\$11.4 K)
4. Schalles, J.F. National Science Foundation. 2006-present. Hyperspectral Imagery for Salt Marshes Mapping. Subproject of Georgia Coastal Ecosystems LTER Bridge Funding Supplement – Duplin River, Groundwater Input and Plant Production, Award No. NSF 99-82133 [\$25 K, as consultant salary to J. Schalles; affiliation continuing, with support to attend GCE annual meetings; \$5.8 K since 2007]

NOAA/ECSC/GADD-TA Proposals Pending

1. Cho, H.J. Gulf of Mexico Alliance-Environmental Education. Strengthening environmental literacy through hands-on field wetland ecology classes. 2010 – 2011. (\$11.6 K, Pending)
2. Schalles, J.F. Geospatial Training and Aerial Hyperspectral Imagery Analysis at NOAA National Estuarine Research Reserves. 2010 – 2011. NASA Nebraska Space Grant. (\$4.5 K, Pending)
3. Tyler, A. Natural Environment Research Council (United Kingdom). Global-scale reconnaissance of algal & cyanobacterial blooms in lake ecosystems: bio-optics, radiative transfer modelling & remote sensing (Project RECONCYCLE). University of Sterling, Sterling, U.K. [John Schalles (Creighton University) and Alex Gilerson (City University of New York) are Co-PI's on this proposal; if funded, we will participate in workshops and cruises in Europe and sponsor summer field projects in North Central and East Coast locations in the United States. 2010 - 2013. (Pending)

Appendix 2-D Geospatial Analysis Group – Other Achievements

Awards and Recognitions

1. Christine Hladik, former M.S. student with John Schalles and ECSC Geospatial Analyst at Florida A & M University, is the recipient of a NOAA NERR Research Fellowship at the Sapelo Island National Estuarine Research Reserve. Christine is currently a 4th year doctoral student in the Marine Science Department at the University of Georgia. Christine, under the supervision of Dr. Meryll Alber, is studying the relationships of marsh and upland hummock vegetation to geomorphic and hydrologic variables using hyperspectral ECSC AISA imagery from 2006, a 2009 high resolution lidar survey she arranged with the NCALM group at the University of Florida for elevation mapping, and extensive field surveys within SINERR – including over 5,000 Real Time Kinematic GPS benchmark readings across the Duplin River and Blackbeard Island salt marshes.
2. Paul Merani, ECSC Graduate Fellow, received 2nd place for a student oral presentation (Remote Sensing and Satellites Sections) at the NOAA EPP Fifth Education and Sciences Forum at Howard University (November, 2009). Paul is also serving as Student Director for the American Association of Geographers Student Honors Paper Competition, Remote Sensing Speciality Group, for the 2010 Annual Meeting of the AAG in Washington, D.C. this April.
3. John Schalles received the Creighton University, College of Arts and Sciences Annual Award for Professional Excellence in Scholarship (February, 2010).
4. John Woods, Ph.D. Student at Texas A & M University – Corpus Christi, presented an invited talk on his sea grass mapping research with ECSC AISA imagery at the 2010 Annual Ocean Sciences Meeting in Portland, Oregon (February, 2010).



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 **).

*Arismendez, S. S. 2010. Spatial, temporal, and climatic nutrient dynamics in the Copano Basin, Texas, USA. Dissertation chapter 3, Coastal and Marine System Science PhD Program, Texas A&M University-Corpus Christi, Texas. 46 pp.

*Arismendez, S. S., H. Kim, J. Brenner, and P. Montagna. 2009. Application of watershed analyses and ecosystem modeling to investigate land-water nutrient coupling processes in the Guadalupe Estuary, Texas. *Ecological Informatics* 4:243-253.

Brenner, J., and *S. S. Arismendez. 2009. Large Marine Ecosystems. *Encyclopedia of Earth* [http://www.eoearth.org/article/Large_marine_ecosystems].

Brenner, J., F. Moretzsohn, J. W. Tunnell, Jr., T. Shirley, and P. Michaud. 2009. Biodiversity of the Gulf of Mexico database: design and development. *Memorias del XIII Congreso Latinoamericano de Ciencias del Mar (ColacMar Cuba 2009)*. Havana, Cuba, October 26–30, ISBN: 978-959-300-005-5 (CD-ROM).

Huang, W. 2010. Hydrodynamic modeling and ecohydrological analysis of river inflow effects on Apalachicola Bay, Florida, USA. *Estuarine, Coastal and Shelf Science* 86: 526-534.

Islam T., W. Merrell, and W. Seitz. 2010. Galveston Futures: Developing a Disaster Resilient Community. *J. Geog. and Regional Planning*, Vol. 3(1), pp. 001-007.

Islam T., W. Merrell, W. Seitz, and R. Harris. 2009. Origin, Distribution and Timing of Texas Hurricanes: 1851-2006. *Natural Hazards Review*, Vol. 10 (4): 136-144, ASCE. [http://dx.doi.org/10.1061/\(ASCE\)1527-6988\(2009\)10:4\(136\)](http://dx.doi.org/10.1061/(ASCE)1527-6988(2009)10:4(136))

Moretzsohn, F., J. Brenner, P. Michaud, J. W. Tunnell, and T. Shirley. 2010. Biodiversity of the Gulf of Mexico Database (BioGoMx). Version 1.0. Harte Research Institute for Gulf of Mexico Studies, Texas A&M University-Corpus Christi, Corpus Christi, Texas. Dataset retrieved from OBIS-USA. Available at: <http://obisusa.nbi.gov>. Database description and disclaimer at: <http://gulfbase.org/> (13,626 species from the Gulf of Mexico).

Reiter, M. A., *M. Saintil, Z. Yang, and D. Pokrajac. 2009. Derivation of a GIS-based watershed-scale conceptual model for the St. Jones River Delaware from habitat-scale conceptual models. *J. Environ. Manag.* 90:3253-3265.

Reiter, M. A., P. C. Coggins, and M. E. Howse. 2009. Designing an integrated interdisciplinary Environmental Science curriculum using an IRMA chart: An example from Bethune-Cookman University. In: Filho, W. L. ed., *Environmental Education, Communication and Sustainability* Vol.

31: Sustainability at Universities: Opportunities, Challenges and Trends. Peter Lang Scientific Publishers. Ch. 12, pp 153-162.

Tunnell, J.W., Jr., D.C. Weaver, and T.C. Shirley. 2009. Recent research on South Texas topographic features: Ecology. Proceedings: Twenty-fifth Gulf of Mexico Information Transfer Meeting. Minerals Management Service, OCS Study MMS 2009-051, New Orleans, LA. Pp. 202-209.

Wang, H., C. M. Hladik, W. Huang, K. Milla, L. Edmiston, M. A. Harwell, and J. F. Schalles. 2010. Detecting the spatial and temporal variability of chlorophyll-a concentration and total suspended solids in Apalachicola Bay, Florida using MODIS imagery. *International Journal of Remote Sensing* 31(2):439-453.

Weaver, D.C., J. W. Tunnell, Jr., and T.C. Shirley. 2009. Recent research on South Texas topographic features: Mapping. Proceedings: Twenty-fifth Gulf of Mexico Information Transfer Meeting. Minerals Management Service. OCS Study MMS 2009-051, New Orleans, LA. Pp. 193-201.

In review:

*Arismendez, S.S., H. Kim, P.A. Montagan, and J.W. Tunnell, Jr. In review. Short-term storm effects on nutrient delivery and biogeochemical cycling in coastal waters. Submitted to *Journal of Environmental Management*, November 11, 2009.

Appendix 3:B

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

*Arismendez, S.S., H. Kim, P. A. Montagna, J. W. Tunnell, Jr. 2009. What role does Oso Bay play in the occurrence of hypoxia in Corpus Christi Bay? Presentation at the Coastal and Estuarine Research Federation Conference, Portland, OR, November 3-7, 2009.

*Arismendez, S.S. 2009. The effect of storm-driven nutrient on Oso Bay water quality: sources, biogeochemistry, and fate. Harte Research Institute weekly seminar series, Corpus Christi, Texas, October 23, 2009.

*Baluyot, R. and E. Smith. 2009. Texas Society for Ecological Restoration: "Creation of a Historic Landscape to Guide Restoration and Conservation Planning." New Braunfels, TX.

Brenner, J., F. Moretzsohn, J. W. Tunnell, Jr., T. Shirley, and P. Michaud. 2009. Biodiversity of the Gulf of Mexico database: design and development. *Memorias de ColacMar Cuba* 2009. Habana, Cuba.

Brenner, J., F. Moretzsohn, J. W. Tunnell, Jr., T. Shirley, and P. Michaud. 2009. Diseño y desarrollo de la base de datos de biodiversidad del Golfo de México. XIII Congreso Latinoamericano de Ciencias del Mar (ColacMar Cuba 2009). Havana, Cuba, October 26–30, 2009.

Islam T. 2009. Socio-economic Vulnerability of African Americans to Hurricanes in the Gulf States. ESI Seminar Series, Florida A&M University, Nov 4, 2009.

Islam T. 2009. Climatology and Scenarios of Landfalling Texas Hurricanes: 1851-2006. Proceedings of the 5th NOAA EPP Science and Education Forum, Washington DC.
http://ams.confex.com/ams/5EDUSCIFORM/techprogram/paper_161313.htm

Islam T. and *A. Marshall. 2010. Addressing Socio-economic Vulnerability to Hurricanes. American Planning Association's (APA) National Planning Conference, April 10-14, 2010, New Orleans, Louisiana.

Islam, T., *A. Marshall, E. Johnson, and L. Robinson. 2009. Socio-Economic Vulnerability of African Americans to Hurricanes in the Gulf States. 5th NOAA EPP Science and Education Forum, Nov 12-14, 2009, Washington DC.
http://ams.confex.com/ams/5EDUSCIFORM/techprogram/paper_162616.htm

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.

Smith, E. and J. Tarkington. 2009. Colonial Waterbird Society Annual Meeting: "Historic Habitat Mapping: The Aquatic Section". Houston, TX .

Tunnell, J. W., Jr. Current Status of Research in the Gulf of Mexico. Plenary Speaker at ColacMarCuba 2009, Havana, Cuba, 26-30 October 2009.

Appendix 3:C

ECSC/ IA Leveraged Funded Proposals

USDA, 2009-2011. \$50,000. Project: "Development of an Integrated Environmental Science program to Train Bachelors and Masters Students from Under-Represented Groups for Careers in Natural Resources Management." U.S. Forest Service Southern Research Station Director's Initiative. PI: M. Reiter.

US Department of State, Bureau of Educational and Cultural Affairs 2010-2011. Fulbright Scholar-in-Residence Program. \$29,000 + travel and support funding (@\$70,000 total). Proposal to bring Dr. Mamdouh Nasr (Associate Vice-Dean for Research, School of Agricultural Economics, Ain Shams University, Cairo Egypt) to Bethune-Cookman University for the 2010-2011 academic year as a Fulbright SIR. PI: M. Reiter.

Appendix 3:D

ECSC/ IA Leveraged Pending Proposals

Gulf of Mexico Alliance Environmental Education Network, 2010-2011. \$9350. "Minority Students and Community Outreach on Hurricane Preparedness and Adaptation. T. Islam and E. Johnson.

NOAA-RISA. 2010-2014. \$3,500,000. "Southeast RISA: Climate Change and its impacts". T. Islam, L. Robinson, J. Cherrier, and E. Johnson.

Appendix 3:E

ECSC/ IA Student Awards

Texas Society for Ecological Restoration 2009. Student Travel Award for Paper Presentation. New Braunfels, TX 2009. Rosaleen Baluyot.

Appendix 3:F

ECSC/ IA Workshops Led or Hosted

Aug. 2009, Dover DE. Blackbird Mini-Modeling Workshop. Dr. Michael Reiter.

Oct. 2009, Refugio TX. Land Use/Land Cover Map Reading Skills Outreach Program for 5th, 6th, and 8th graders. Dr. Elizabeth Smith.

Various Dates 2009, Corpus Christi TX and environs. Groundtruthing activities in the Mission-Aransas Watershed for the Texas Ecosystems Mapping Project (Texas parks and Wildlife). Dr. Elizabeth Smith and Rosaleen Baluyot.



Appendix 4 Integrated Social Sciences

Appendix 4:B 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. (IN REVIEW). Case Study: Entrepreneurship in the Chesapeake Bay Oyster Industry. *International Journal of Case Studies in Management*.

Appendix 4:C NOAA/ECSC/ISS Presentations

Dr. Marcia Allen Owens, “Florida A&M University & the Orlando Science Center: Enhancing the Ocean Literacy of Underrepresented Students and Their Teachers, Ocean Sciences Conference (Ocean Science and Mutualism), February 2010.

Dr. Marcia Allen Owens, “Environmental Health and Environmental Justice,” Invited Panel Testimony before the White House Council for Environmental Quality/Ocean Policy Taskforce Listening Session, October, 2009

Dr. Marcia Allen Owens, “Environmental Literacy & Pedagogy,” Black Belt Studies Conference, October 2009.

Appendix 4:D NOAA/ECSC/ISS Leveraged Funded Proposals

ISS had no leveraged funded proposals for this period

Appendix 4:E NOAA/ECSC/ISS Leveraged Pending Proposals

ISS has no leveraged funded proposals pending for this period

Appendix 4:F ECSC/ISS Student Projects

ISS has no student projects for this period

Appendix 4:G ECSC/ISS Workshops Led or Hosted

ISS has no workshops led for this period



Appendix 5
Education and Outreach
Supporting Information

Appendix 5:A: ECSC Display Banner

The banner is a vertical rectangular graphic with a blue background. At the top left is the NOAA logo. To its right, the text 'Environmental Cooperative Science Center' is displayed in white, with 'Florida A&M University - Lead Institution' in smaller white text below it. The main title 'Discover Opportunities in Environmental Science' is centered, with 'Environmental' and 'Science' in a large, white, serif font and 'Discover Opportunities in' in a smaller, white, sans-serif font. Below the title are four small, square photographs showing people engaged in various activities: a group of people on a beach, a group of people in a classroom or meeting, a group of people in a laboratory, and a group of people outdoors. Below the photos, the text 'NOAA - ECSC Partners' is followed by a list of partner institutions: Florida A&M University, Bethune Cookman University, Creighton University, Delaware State University, Jackson State University, Morgan State University, Texas A&M University-Corpus Christi, University of Miami, and University of Nebraska-Lincoln. At the bottom, the text 'Apalachicola National Estuarine Research Reserve', 'Delaware National Estuarine Research Reserve', 'Grand Bay National Estuarine Research Reserve', and 'Mission-Aransas National Estuarine Research Reserve' is listed. The contact information 'www.ecsc.famu.edu (850) 412-7797' is at the bottom. The background of the banner features a scenic image of a body of water and a forested shoreline.

Appendix 4:B: ECSC Table Throw

