



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



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For the period from March 1 2014-August 31 2014

Submitted By:

Florida Agricultural and Mechanical University (Lead Institution)

Creighton University, Delaware State University, Jackson State University, Texas A&M University-Corpus Christi, and University of Texas-Brownsville

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

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Executive Summary

A number of education, research and administrative goals and milestones were met during this reporting period (March 1, 2014-August 31, 2014) to advance the ECSC mission “to educate a new generation of environmental professionals, particularly from under-represented minorities, in the NOAA-related sciences, and to develop natural and socioeconomic science research products and policy/decision making tools in support of NOAA’s mission and objectives in coastal environmental science and management”. The ECSC consists of Florida A&M University (as lead institution) and Texas A&M-Corpus Christi, Jackson State University, Delaware State University, Creighton University and the University of Texas-Brownsville. Four core goals are essential to the ECSC mission: 1) Increase the number of well trained and highly qualified scientists and managers, particularly from under-represented minority groups, entering the NOAA and NOAA-related workforce; 2) Enhance the scientific understanding of human interactions with the coastal environment in support of NOAA’s place-based management specifically as it relates to the response of coastal and marine ecosystems to natural and human induced stressors; 3) Improve the scientific basis for coastal resource management by developing tools and research products to characterize, evaluate, and forecast coastal and marine ecosystem responses to natural and human induced stressors; and 4) facilitate community education and outreach relating to the function and relevance of coastal ecosystems and the services they provide to society.

EPP Performance Measures:

Across the six partner institutions, we provided support to 48 graduate and undergraduate students during this reporting period. Six of these students graduated during this reporting period. All ECSC supported students are enrolled in classes and engaged in research projects that are closely aligned with NOAA and NOS goals and mission. While NOAA and its partner agencies recruit their scientists and managers primarily from the natural sciences, there is a growing awareness of the need for training in socio-economic disciplines. The training of ECSC supported students addresses the following EPP education performance measures:

- 1) Number of students from underrepresented communities who are trained and graduate in NOAA-mission sciences annually. *34 of the 48 students from underrepresented communities have been recruited into the program and are being trained.*
- 2) Number of students who are trained and graduate in NOAA mission sciences annually. *A total of 48 students have been recruited into the program and are fully supported by ECSC. Our target for this reporting period was to have recruited 75% of the total number of students that were budgeted for in this five-year agreement, and we have exceeded this goal.*
- 3) Number of students trained. *ECSC directly supported and trained a total of 48 BS, MS, Ph.D. and JD students during this reporting period. An additional 757 were trained in 36 courses in NOAA-relevant disciplines offered by ECSC faculty at their respective institutions during this period. The distribution of the students by institution and the course offerings are in Section II.B (below). These students are enrolled in degree programs and have taken at least one ECSC course that is required by their major.*
- 4) Number of EPP funded students who are hired by NOAA, NOAA contractors and other environmental, natural resource, and science agencies at the Federal, State, local and tribal levels, in academia and the private sector. *One student graduated under the current cooperative agreement has been hired by a contractor during this reporting period. However,*

NOAA has hired 10 ECSC students that were funded under previous cooperative agreements, and 22 others are employed in NOAA-related disciplines by other agencies at the federal, state and local levels or in the private sector.

In addition to training at the undergraduate and graduate levels, ECSC includes an outreach program to engage students at the middle and high school levels with the goal of establishing and maintaining a holistic pipeline for students in the STEM disciplines, particularly from underrepresented minorities, into the NOAA workforce.

5) Number of outreach participants engaged in NOAA mission relevant learning opportunities. *ECSC outreach activities engaged about 200 students and other stakeholders, in NOAA-related learning opportunities during this reporting period.*

The ECSC uses research addressing natural and social science dimensions of environmental issues in the northern Gulf of Mexico as a tool to train the next generation of scientists and managers for the NOAA-relevant workforce. ECSC faculty led-student centered research focuses on specific problems and projects related to the NOAA and NOS missions as outlined in their strategic plans. Each student, in coordination with ECSC faculty, prepares a synopsis of their proposed research including direct participation and guidance by NOAA scientists and use of NOAA facilities and resources. This ensures that that student projects address the NOAA and NOS missions. Details of individual student research projects are presented below in the body of the report. Synopses of student research projects are submitted to NOAA Technical Monitors for comments and input to ensure alignment with NOAA and NOS missions and agency goals. The following research performance objectives were addressed:

6) Number of NOAA science and administrative personnel engaged in ECSC education and outreach, scientific research, and education functions. *ECSC has two Technical Monitors. ECSC has established a Center advisory board composed of 4 scientists from NOAA and 2 from the academic community to assist in ECSC planning, management, education and research activities. Sixteen NOAA scientists have been identified as committee members/collaborators for student projects.*

7) Number of students and faculty who participate in and complete postdoctoral level research programs in support of the NOAA mission. *Three postdoctoral positions are funded in this cooperative agreement. All postdoctoral positions have been filled.*

8) Number of peer-reviewed papers published in NOAA mission sciences by scientists (faculty, postdoctoral fellows, and students) sponsored by NOAA EPP. *During the reporting period, ECSC faculty and students published a total of 17 peer-reviewed papers in disciplines related to the missions of NOAA and NOS. Ten more publications are in press.*

9) Funds leveraged with NOAA EPP funds (including student support). *ECSC faculty served as PIs or co-PIs on external grants totaling over \$25 million during this reporting period. These leveraged funds came from 43 different external grants. This includes 8 grants totaling \$ 3,500,000 newly funded during this award period. ECSC faculty also submitted an*

additional 11 grant proposals that are pending or were not funded during this reporting period.

Research and training activities of the ECSC focus areas address specific goals and objectives identified as important by the National Ocean Service (NOS) and the National Centers for Coastal Ocean Science (NCCOS). Faculty led, student centered projects in address multiple objectives in the NCCOS Strategic Plan and the NOS Priorities Roadmap. Examples include: 1) characterizing impacts of harmful algal blooms on coastal ecosystems, 2) quantifying the extent, magnitude and risks of coastal pollution, as addressed by the student projects on effects of oil spills, cycling and accumulation of mercury in coastal systems, impacts of pollutants on corals, and mitigation of surface and subsurface contaminant loading to coastal waters, and 3) developing strategies for placed-based conservation that use ecosystem valuation methods as addressed by projects that use social valuation methods to manage ecosystem services.

Research results and outcomes include the work of five students who graduated during this reporting period. Of these students, highlights are their research on restoration status of the Bahia Grande Estuary and an analysis of historic and current mercury pollution in Lavaca Bay. These addressed strategic objectives identified by NOAA, NOS, and NCCOS on the extent, magnitude and risks of coastal pollution and resilient coastal communities.

Administrative plans and structures have been developed to facilitate the research and teaching goals of the ECSC. Additionally, new communication tools have been implemented to share activities, data and products among partner institutions, with NOAA, and with the broader scientific community. Our Strategic, Implementation, Science, and Student Development Plans have been developed, reviewed and revised, as required by the NOAA EPP. ECSC personnel also established and continue to maintain an up to date website to inform NOAA, the scientific community, potential students and collaborators, and other stakeholders. ECSC has also prepared and distributed recruiting materials, and initiated an ongoing series of meetings and conference calls among the partners to plan and coordinate center activities. A webinar series for sharing ECSC outputs and outcomes across the participating institutions has been established. ECSC Research Coordinator at Mission-Aransas Charles Foster was hired in August 2014. A Student Affairs Coordinator, Dr. Richard L. Walker, was also August 2014. A third Postdoc, Dr. Lisa Wickliffe, was also hired to fill the Socioeconomic Postdoctoral position in August 2014.

I. Status of Award Tasks

A. Status of Goals/Objectives

The NOAA ECSC goals/objectives are: *1) to increase the number of well trained and highly qualified scientists and managers, particularly from under-represented minority groups entering the NOAA and NOAA-related workforce, 2) to enhance the scientific understanding of human interactions with the coastal environment in support of NOAA's place-based management specifically as it relates to the response of coastal and marine ecosystems to natural and human induced stressors, 3) to improve the scientific basis for coastal resource management by integrating natural and social science research to develop tools and research products to characterize, evaluate, and forecast coastal and marine ecosystem responses to natural and human induced stressors, and 4) to facilitate community education and outreach relating to the function and relevance of coastal ecosystems and the services they provide to society.*

These goals are central to achieving ECSC's mission of training students, particularly from minorities that are underrepresented in the STEM disciplines, in natural and social sciences that are relevant to NOAA. They are also necessary to achieve the ECSC vision of informing coastal resource management through integrated science that balances societal demands and sustainable GOM coastal ecosystems.

Development and implementation of tools and research programs occurred during this reporting period to facilitate effective research and training activities. The ECSC webinar series continued with three additional webinars during this reporting period. An ECSC internal student tracker database to capture all progress students make as they matriculate through the ECSC training program was developed by ECSC faculty and staff and implemented across all partner institutions. In addition, ECSC has implemented Taskstream software, which allows detailed evaluation of student progress, including coursework, research activities and accomplishments. This software will also be used to develop and implement individual student plans and track student progress, as discussed in the ECSC Student Development Plan.

The ECSC has established and implemented a process to facilitate ECSC faculty/student/post doc mentoring by NOAA scientists and staff, and ensure alignment of student research projects with NOAA strategic objectives and interests. Graduate students entering the program work with ECSC advisors and NOAA mentors to develop projects, and submit internal proposals for review by the ECSC leadership and NOAA technical monitors. To date, 23 proposal synopses have been developed and submitted, and more are being developed and undergoing review and revision. Fifteen NOAA scientists are collaborating on these projects, and we are working with NOAA technical monitors and NOAA staff scientists to identify additional NOAA personnel to serve as collaborators and mentors for projects.

The research and training performance metrics as identified in our Science Plan, are listed below, as well as accomplishments and Center wide deliverables for this reporting period (i.e. as outlined in Appendix B of the Science Plan). We also report progress made during this reporting period within each of the 5 focus areas.

PERFORMANCE METRICS AND DELIVERABLES

ECSC Goal #1: Expanding the pipeline for under-represented minority students into NOAA-related sciences and workforce.

Performance Measures for Goal #1(Recruitment)

- By the end of year 3, 90% of the total number of students budgeted for the ECSC will have been recruited
 - At the end of the 3rd year of this cooperative agreement, a total of 48 students are funded by the program. The Center’s goal was to have at least 90% of the students recruited. This goal has been met and exceeded (96%).
- Three post-doctoral research associates will have been recruited and hired
 - Three postdoctoral research associates have been hired. Two positions were filled in earlier years of this cooperative agreement, as detailed in previous semiannual reports. The postdoctoral position in socio-economics was filled with the hiring of Dr. Lisa Wickliffe in August 2014.
- By the end of the third year, at least 90% of the total number of students recruited into the ECSC will participate in experiential opportunities in NOAA mission-relevant sciences
 - A template for synopses of faculty led, student-centered research was developed for Center-wide use. These proposal synopses are used to ensure that all ECSC research is NOAA/NOS relevant, and that all ECSC students are provided with high quality experiential research opportunities. Each proposed graduate student project includes a NOAA scientist as collaborator and/or committee member. ECSC students have been offered various opportunities to participate in experiential learning/activities. These include proposed projects that are reviewed by ECSC focus area leads, center management and NOAA technical monitors. ECSC also offered a webinar series for all students including special workshops (e.g. research writing workshop).
- By the end of the third year, at least 75% of the total number of students recruited into the ECSC will be engaged in ECSC approved research activities
 - All graduate students (100%) have developed or are developing proposals for research projects that will be reviewed and approved by ECSC faculty and NOAA scientists. These synopses will be used for several purposes, one of which is to ensure that all student research is relevant to both ECSC and NOAA/NOS. The synopses were submitted to NOAA technical monitors for comment.

Performance Measures for Goal #1 (Training)

- Percentage of ECSC partner institutions where ECSC-relevant core STEM courses have been identified and integrated into ECSC student study plan
 - All partner institutions (100%) have participated in this process and identified and integrated relevant courses into their curricula. The ECSC has developed a matrix that lists all ECSC relevant STEM core courses at partner institutions.
- Integration of currently existing ECSC core-competency curriculum into a center-wide core competency (CWCC) certification short course will be 100% complete
This has been accomplished. The course was offered for the first time to 17 ECSC students in August 2013, and again in August 2014 to a new cohort of 16 students.
- Development and implementation of a monthly ECSC webinar series will be 100% complete, and webinars on NOAA relevant topics will be held regularly during the academic year.
This has also been accomplished. ECSC has offered three webinars during this reporting period. These include:
 - NSF REU Proposal Writing Research Meeting, April 2014
 - Fundulus as a Phylogenetic Model for Ecological Risk Assessments: Increasing Ecological Relevance and Reducing Uncertainty presented by Mark Dugo (ECSC-JSU PhD candidate), May 2014
 - Careers in Environmental Science, NOAA ECSC graduate Dr. Donatto Suratt, June 2014

ECSC Goal #2: Enhance the scientific understanding of human interactions with the coastal environment in support of NOAA's place-based management.

Performance Measures

- By the end of the third year of the cooperative agreement, 75% of the total number of students recruited into the ECSC will be assigned ECSC faculty advisors
This goal has been met and exceeded. All students (100%) recruited into this new cooperative agreement have been assigned an ECSC advisor.
- By the end of the third year of the cooperative agreement, three post docs will be hired, and will be partnered with ECSC faculty and NOAA advisors
Three postdoctoral positions have been filled and partnered with ECSC advisors; one has identified and is working with a NOAA advisor. The ECSC is in the process of identifying NOAA mentors for the other two.

By the end of the third year of the cooperative agreement, a NOAA specialist/scientist mentor will be identified for 75 % of the total number of students recruited into the ECSC

The ECSC is working to achieve this goal as scheduled. Most graduate student projects have individuals from NOAA who have agreed to serve in this capacity (see lists of affiliated personnel for each focus area in the sections below).

- By the end of the third year of the cooperative agreement, all ECSC faculty led student projects will have an ECSC approved research proposal (mandatory for ECSC funding)
 - The proposal synopses that are required center wide ensure that all ECSC research is NOAA/NOS mission relevant. The faculty at all of the partner institutions of the ECSC have participated in developing these proposals. After

review by both the ECSC Leadership Team and the NOAA ECSC Technical Monitors, the student projects will be revised and finalized.

ECSC Goal #3: Improve the scientific basis for coastal resource management through development of tools and research products to characterize, evaluate, and forecast coastal and marine ecosystem responses to natural and human induced stressors.

Performance Measures

- By the end of this reporting period, 15% of the total ECSC faculty will establish collaborations with ECSC regional observing partners, NERR and NMS scientists, and/or local and regional coastal managers
 This has been achieved. The submitted proposal synopses identify specific collaborations between ECSC faculty, students, and regional observing partners, NERR and NMS scientists, and/or local and regional coastal managers
- By the end of this reporting period, 4 ECSC faculty/postdocs or students will present research findings at NOAA facilities
 During this reporting period, one ECSC graduate student presented a webinar, which included participants from NOAA headquarters and several line offices.

B. Focus Area-Specific Progress

The ECSC is organized into five integrated and complimentary focus areas: Ecosystem Characterization; Ecological Processes; Social and Economic Processes; Forecasting and Modeling; and Policy and Decision Tools. A unique set of strategies for student research and training was developed for each focus area. In addition, each focus area maintains synergy with the other focus areas to support the common research, education and outreach goals of the ECSC. Progress during this reporting period for each focus area and its associated strategies is summarized below.

Ecosystem Characterization

Table I.B.1. Faculty, students and NOAA collaborators identified to date participating in the ecosystem characterization focus area.

Jim Gibeaut	TAMUCC	Faculty, focus area lead
John Schalles	Creighton	Faculty
Christopher Heckscher	DSU	Faculty
Mingxin Guo	DSU	Faculty
Lori Lester	DSU	Postdoctoral Associate
Fengxiang Han	JSU	Faculty
Padmanava Dash	JSU	Faculty
Jacqueline McComb	JSU	Ph.D. Student
Jeanna Dampler	JSU	MS Student
Marimar Guterrez-Ramirez	DSU	MS Student
John O'Donnell	Creighton	MS Student
Luz Lumb	TAMUCC	MS Student
Michael Rittenhouse	TAMUCC	MS Student
Melinda Martinez	TAMUCC	MS Student

Mark Woodrey	GBNERR	Research Coordinator/Collaborator
Jenna Wanat	ANERR	Research Coordinator/Collaborator
Sally Morehead	MANERR	Research Coordinator/Collaborator
Patricia Tester	NOAA-NCCOS	NOAA Scientist/Collaborator
Kevin Gallo	NOAA-NESDIS	NOAA Scientist/Collaborator
S.Morton	NOAA-NCCOS	NOAA Scientist/Collaborator

Personnel associated with this focus area are identified in Table IB.1. Additional NOAA collaborators for student projects will be identified as particular student research proposals are finalized. The following research projects have been developed in this focus area and submitted to our technical monitors to assure alignment with NOAA goals and mission:

Identifying critical habitat needs of the Aransas-Wood Buffalo Population of the endangered whooping crane, Grus Americana TAMUCC student Luz Lumb, advisor James Gibeaut

Estimation of Salt Marsh Vegetation Biomass at Large Scale and Decadal Time Series. Creighton Student John O'Donnell, advisor John Schalles, NOAA collaborator K. Gallo

Biogeochemistry of the Grand Bay Reserve and its Effect on Environmental Quality JSU student Jacqueline McComb, Co-Advisors Fengxiang Han and Paul Tchounwou

Apalachicola NERR barrier island stopover ecosystems: local, regional, and seasonal carry-over effects DSU student Mariamar Guterrez, advisor C. M. Heckscher (also in Ecological Processes focus area).

Quantification of Harmful Algal Blooms (HABs) in the Grand Bay JSU student Jeanna M. Dampier, advisor Padmanava Dash. NOAA collaborator S. Morton

Research and training activities in this focal area address specific goals and objectives identified as important by the National Ocean Service (NOS) and the National Centers for Coastal Ocean Science (NCCOS). Faculty led, student centered projects in this focal area address multiple objectives in the NCCOS Strategic Plan and the NOS Priorities Roadmap. For example, a NCCOS Strategic Plan objective is to better characterize impacts of harmful algal blooms on coastal ecosystems, and an NOS Roadmap strategy (C1.3.1) is to strengthen detection and observation of ecological hazards: both are addressed by the project of J. Dampier on HABs. NCCOS identifies characterizing extent and risks of coastal pollution as a strategic goal and objective (project of J. Dampier on biogeochemistry and environmental quality in Grand Bay NERR); they also identify characterizing coastal ecosystem and habitat vulnerabilities to climate change and sea level variation as another strategic objective (J. O'Donnell's project on salt marsh vegetation changes over decadal scales; M. Guterrez project on barrier island ecosystem connectivity). Finally, the NCCOS strategic plan identifies spatial management of coastal and marine resources as a priority, particularly ecologically important habitats and species (addressed by the project of L. Lumb on critical habitat needs by endangered Whooping Cranes).

Status of benchmarks for this focus area include:

1) Training students working in this focus area in the development of geospatial databases, geospatial analysis, mapping techniques, and remote sensing through work on specific problems in our partner NERRS and the FGBMS.

Faculty from the ecosystem characterization and ecological processes focus areas initiated, facilitated and participated in an ECSC field research and training campaign that was held within and around the Mission Aransas NERR and other sites along the Texas Gulf Coast between Corpus Christi and Brownsville TX in June-July 2014. ECSC students from 5 of the 6 institutions (FAMU, TAMU-CC, Delaware State, Creighton and UTB) had the opportunity to learn new skills in the areas of vegetation identification, marsh ecology, GPS/RTK usage, and water quality assessment. This survey work provided data necessary to geospatially classify the main coastal wetland and shore habitats using acquired satellite imagery. Additional details are presented in Section II. D below.

Melinda Martinez made much progress in her study to determine the spatio-temporal variation in sediment accretion rates in our Barrier Island Observatory on Mustang Island. She sampled marker horizons and installed sediment accretion plates and rods and water level loggers in a variety of back barrier wetland habitats.

Michael Rittenhouse designed his field experiments and fabricated sediment traps to determine the efficacy of sargassum as a sediment trap and its importance in dune building. He successfully collected hours of data over the summer.

2) Providing research problems that require students working in the geospatial sciences to work with students and researchers in policy, economics, and ecosystem sciences to accomplish objectives.

Student projects in this focus are designed to be interdisciplinary. Examples include habitat mapping and identification and evaluation of ecosystem services and the physical, biological, and policy issues of beach maintenance activities. Another example is use of long term, archival satellite imagery (ex. Landsat Thematic Mapper) to examine coastal ecosystem dynamics and wetland plant productivity over the past three decades.

3) Developing content for a certification course, webinars, or tutorials that will provide all ECSC students with an understanding of proper data management and introduce students to tools and technologies for geospatial data management, mapping, and analysis to apply in their projects.

Using the proposed curriculum formulated by the focus area lead and faculty within this focus area, a lecture and training activity was developed for the Center Wide Core Competency Course (CWCC), to implement the following learning outcomes:

1. Students demonstrating the ability to read spatial data in maps;
2. Students demonstrating a basic ability to store, process, and create spatial data sets using mapping software;
3. Students demonstrating an understanding of the tools needed for creating simulations of landscape-level change scenarios

The training activity included the creation of habitat track log delineations and examining how these features had changed over time using historical Google Earth imagery. The activity looked at how development of a residential community in Franklin County, FL on the Gulf coast had drastically changed the neighboring landscape. This was offered as part of the CWCC in August 2013 and again in August 2014.

4) Encouraging and assisting ECSC students to present geospatial research findings and products at NOAA or professional meetings and to submit their written findings for publication in peer-reviewed journals.

MS student, Luz Lumb, co-authored a report to the Gulf Coast Prairies Landscape Conservation Cooperative titled “Employing the Conservation Design Approach on Sea-Level Rise Impacts on Coastal Avian Habitats along the Central Texas Coast.” Much of her thesis research is incorporated in the report.

As student projects develop and data and results are obtained, faculty in this focus will continue to work with students and encourage them to communicate their findings at professional meetings and in peer-reviewed journals.

Ecological Processes

Table I.B.2. Faculty, students and NOAA collaborators identified to date participating in the ecological processes focus area. *indicates the student graduated during this reporting period.

Charles Jagoe	FAMU	Faculty, Distinguished Scientist, Focus area lead
Jennifer Cherrier	FAMU	Faculty
Michael Abazinge	FAMU	Faculty, Director
Ping Hsieh	FAMU	Faculty
Daniel Osborne	FAMU	Postdoctoral Associate
Paul Tchounwou	JSU	Faculty
Ibrahim Farah	JSU	Faculty
Yungkul Kim	JSU	Faculty
Fengxiang Han	JSU	Faculty
John Schalles	Creighton	Faculty
Christopher Heckscher	DSU	Faculty
Gulni Ozbay	DSU	Faculty
Kevina Vulinec	DSU	Faculty
Greg Stunz	TAMUCC	Faculty
Wes Tunnell	TAMUCC	Faculty
Paul Montagna	TAMUCC	Faculty
David Hicks	UTB	Faculty
Carlos Cintra-Buenrostro	UTB	Faculty
Alejandro Fierro	UTB	Faculty
LaTrisha Allen	FAMU	Ph.D. Student
Tiffany Baskerville	FAMU	Ph.D. Student
Jason Caldwell	FAMU	Ph.D. Student
Daryl Sibble	FAMU	Ph.D. Student
Mario Marquez	FAMU	Ph.D. Student
Shelton Clerk*	JSU	Ph.D. Student
Jacqueline McComb	JSU	Ph.D. Student
Mark Dugo	JSU	Ph.D. Student
Maria Pillado*	TAMUCC	Ph.D. Student

Judson Curtis*	TAMUCC	Ph.D. Student
Portia Caldwell	FAMU	MS Student
Patrick Connally	FAMU	MS Student
Endia Casley	FAMU	MS Student
Claudia Tamez*	UTB	MS Student
Crystal Martinez	UTB	MS Student
Monica Delgado	UTB	MS Student
Rebekah Rodriguez	UTB	MS Student
Alan Kneidel	DSU	MS Student
Mariammar Guiterrez-Ramirez	DSU	MS Student
Tyler Hansberry	FAMU	BS Student
Ashlyn Ford	FAMU	BS Student
Andrea Pugh	FAMU	BS Student
Justyn Lewis-Washington	FAMU	BS Student
Jamila Tull	FAMU	BS Student
Josh Barth	DSU	BS Student
Erin Bowens	JSU	BS Student
Kiera Johnson	JSU	BS Student
LaTasha McLemore	JSU	BS Student
David Evans	NOAA-NCCOS	NOAA Scientist/Collaborator
Steve Morton	NOAA-NCCOS	NOAA Scientist/Collaborator
Geoff Scott	NOAA-NCCOS	NOAA Scientist/Collaborator
Latoya Miles	NOAA-OAR	NOAA Scientist/Collaborator
Robert Warner	NOAA-NCCOS	NOAA Scientist/Collaborator
Elizabeth Turner	NOAA-NCCOS	NOAA Scientist/Collaborator
W. L. Balthis	NOAA-NCCOS	NOAA Scientist/Collaborator
P. Etnoyer	NOAA-NCCOS	NOAA Scientist/Collaborator

Personnel associated with this focus area are identified in Table IB.2. Additional NOAA collaborators for student projects will be identified as the student research proposals for this focus area are finalized. Research projects that have been developed in this focus area and submitted to the NOAA ECSC Technical Monitors to assure alignment with NOAA goals and mission are:

Development, Testing, and Deployment of an Instrument for the Measurement of the Exchange of Ammonia Between the Atmosphere and Fertilized Corn Fields. FAMU student Jason Caldwell, advisor E. Johnson. NOAA collaborator L. Myles

Apalachicola NERR barrier island stopover ecosystems: local, regional, and seasonal carry-over effects DSU student Mariamar Guiterrez, advisor C. M. Heckscher (also in Ecosystem Characterization focus area).

Coral and Zooxanthellate Health FAMU student Portia Caldwell: advisors C. Jagoe and E. Johnson. NOAA collaborator R. Warner.

Determining Zooxanthellate Coral Health After Exposure to Sub-lethal Stressors. FAMU student Endia Casley: advisors E. Johnson and C. Jagoe. NOAA collaborator R. Warner.

A Biophysical Model Study of the Bi-directional Exchange of Ammonia Between Plants and Soils in the Midwest. FAMU student Jason Caldwell, advisor E. Johnson. NOAA collaborator L. Myles

Evaluating The Effectiveness of Residential Rain Garden Water Retention System to Mitigate Surface and Subsurface Contaminant Loading To Apalachicola Bay, Florida. FAMU student Patrick Connally, advisor J. Cherrier, NOAA Collaborator G. Scott

Barnacles as potential indicators of ecosystem status in South Texas estuaries. UTB student Crystal Martinez, advisors Alejandro Fierro and Carlos Cintra-Buenrostro, NOAA collaborator E. Turner

Comparing the current trophic transfer of mercury in Lavaca Bay with data collected 20 years ago. TAMU-CC student Maria Pillado, advisor Dr. Paul Montagna, NOAA collaborator David Evans.

Development and evaluation of a multi-metric index to assess restoration status of the Bahia Grande estuary, Cameron County Texas. UTB student Claudia A. Tamez, advisor David Hicks. NOAA collaborator W. Balthis.

*Nutrient input effects on *Karenia Brevis* and *Pseudo-nitzschia* and subsequent marine mortalities in the Gulf of Mexico.* FAMU student Kimberly Tucker, advisor J. Cherrier, NOAA collaborator S. Morton

Assessment of biomarker responses in coastal fishes to the Deepwater Horizon oil spill. FAMU Student L. Allen. Advisor C. Jagoe, NOAA Collaborator P. Pennington.

Tracing Indigenous Bacterial Community Responses to Aged and Refractory Carbon Sources in the Marine Environment: A Biogeochemical and Molecular Approach. FAMU student Tiffany Baskerville, advisor J. Cherrier, NOAA collaborator M. DeLorenzo.

Modeling of Nitrates and Phosphorus in Apalachicola River Watershed Runoff Using BASINS and HSPF. FAMU student Amy Edwards, advisor E. Johnson

Biogeochemistry of the Grand Bay Reserve and its Effect on Environmental Quality JSU Student Jacqueline McComb, Advisor F. Han.

Assessing deep-water coral assemblages inhabiting relic coral banks off the Texas coast. UTB Student Rebecca Rodriguez. Advisor D. Hicks, NOAA Collaborator P. Etnoyer

The research and training activities underway in this focal area address specific goals and objectives identified as important by the National Ocean Service (NOS) and the National Centers for Coastal Ocean Science (NCCOS). Multiple objectives in the NCCOS Strategic Plan and the NOS Priorities Roadmap are supported by the faculty led, student centered projects in this focal area. An NCCOS strategic goal and objective is to characterize the extent, magnitude and risks of coastal pollution; this is addressed by the student projects listed above on effects of oil spills, cycling and accumulation of mercury in coastal systems, impacts of pollutants on corals, and mitigation of surface and subsurface contaminant loading to coastal waters. The NOS Priorities Roadmap emphasizes the importance of place-based conservation and coastal intelligence to support sustainable uses of the environment. Student studies of barrier island ecosystems, deepwater coral assemblages in coastal waters, and modeling approaches to nutrient runoff

problems in coastal systems as listed above support these priorities. NCCOS goals and objectives for coastal ecosystem management, including assessments of ecosystem health and services, are supported by student projects evaluating the use of barnacles as ecological indicators, developing metrics to understand the success of ecosystem restoration efforts in disturbed areas, and researching relationships between nutrient loading and harmful algal blooms in the Gulf of Mexico. The latter also addresses a specific NCCOS goal and objective of characterizing the causes of HABs and their impacts on coastal ecosystems.

Projects being developed that have not yet been formally submitted are:

Nitrogen dynamics and decomposition of seagrass (Thalassia testudinum) blade and rhizome litter in a shallow water system. UTB Student Monica Delgado.

Fundulus as a phylogenetic model for ecological risk assessments: increasing ecological relevance and reducing uncertainty. JSU Student Mark Dugo

Relationships between coastal wather patters and the use of barrier islands by trans-gulf migrants. DSU student Alan Kneidel

Status of benchmarks for this focus area include:

1) Providing ECSC students with key knowledge, skills and abilities to address NOAA's needs in coastal stewardship and management related to ecosystem processes, status and health.

All partner institutions offer courses in STEM disciplines relevant to the NOAA mission; courses taught during this reporting period are listed below in section II.B. As reported in section II.C of this report, the Center Wide Core Competency (CWCC) short course was held in August 2014 at the Florida State University Marine Lab. The purpose of the course is to assure that students in the program have a common set of basic skills and knowledge in coastal ecosystem science and management. Curriculum, lab and field activities, and expected learning outcomes were developed and presented with input from the ecological processes focus area lead, faculty and postdocs. Additional details about ECSC plans to train students to address NOAA's needs are articulated in our Science and Student Development plans, including specific goals, objectives, strategies and milestones for achieving this strategic objective.

2) Mentoring and assisting ECSC students to conduct research in areas relevant to NOAA's goal of healthy, sustainable coastal ecosystems.

Faculty and students from this focus area have submitted research proposal synopses to align their work with NOAA goals and mission. A total of 14 projects have been submitted for review from this focus area, and additional projects are being developed for review. NOAA scientists and Technical Monitors have reviewed or are reviewing these to ensure alignment of the projects with NOAA's mission and goals. The inclusion of a NOAA collaborator on projects further strengthens the relevance of the student projects to NOAA's mission-driven research. We are collaborating with a NOAA scientist in NCCOS to identify potential student projects and to link students to NOAA mentors with appropriate backgrounds and expertise. In addition, faculty in this focus area have applied for or secured additional leveraged external funding that includes additional student support, for NOAA mission relevant areas, as detailed in Appendix 4.

3) Establishing research collaborations involving graduate and undergraduate students among ECSC faculty, NOAA, NERR and NMS specialists/scientists and local/regional coastal managers.

Select graduate student projects that are placed based involving the NERRs are underway or in planning phases. These projects will involve our NERR partners at Apalachicola, Grand Bay and Mission-Aransas (see list above). Scientists at various NOAA centers, including NCCOS, OAR and NMFS are serving on student committees and providing research advice and mentoring (see table I. B. 2 above). Christopher M. Heckscher (DSU PI), Lori A. Lester (DSU ECSC Post Doc), Mariamar Gutierrez-Ramirez (DSU graduate student), and Alan H. Kneidel (DSU graduate student) continued work at ANEER on the potential impacts of climate change on stopover habitat availability/use on St. George Island, Florida in April-May 2014. This research was conducted in collaboration with Megan Lamb at the Apalachicola National Estuarine Research Reserve. A website has been created describing their field work: <http://www.forgottencoastflorida.blogspot.com/> and this is linked to the main ECSC website <http://www.ecsc.famu.edu/>

In addition, Joshua N. Barth (DSU undergraduate student) conducted research on whether loss of freshwater ponds due to sea level rise affects waterfowl habitat availability in DNERR, and studied the effectiveness of beach nourishment on Delaware Beaches.

4) Developing content for a course, webinars, or tutorials that will provide all ECSC students a deeper understanding and appreciation for coastal ecosystem sciences, including the impacts of anthropogenic stressors and climate change on these systems.

Ecological processes faculty participated in the development of the ECSC Center-Wide Core Competency (CWCC) short course, first offered to a group of ECSC students from all the partner institutions in August 2013 and taught again in August 2014. During this reporting period, planning was also underway for a short course in Assessing Ecosystem Health, to be taught by NOAA scientists from the NCCOS/Oxford laboratory at FAMU and UTB in September 2014. The ECSC webinar series continued with presentations from ECSC faculty, students and NOAA scientists. ECSC webinars are recorded and archived webinars are available for viewing at <http://www.ecsc.famu.edu/>

5) Leading, encouraging and supporting students in presenting research findings at NOAA or professional meetings and submitting research results for publication in peer-reviewed journals.

ECSC students and faculty mentors presented papers at a number of scientific meetings during this reporting period, as listed in Appendix 3. A total of nine papers with student authors were presented at meetings of the American Chemical Society, the Joint Aquatic Sciences Meeting of the Association for the Sciences of Limnology and Oceanography, the Benthic Ecology Society, The Texas Academy of Science, the Southern Division of the American Fisheries Society, the Texas Bays and Estuaries Symposium, and the Delaware NERR Research Symposium.

Four peer-reviewed papers were published with students from this focus area as coauthors during this reporting period, as listed in Appendix 2. Focus area faculty continue to work with and encourage students to present their work at professional meetings, and to publish their findings in NOAA-relevant journals. In addition, an undergraduate student working with Dr. Cherrier, Angelique Taylor (non-ECSC student), was selected as to participate in the NOAA-funded Woods Hole PEP program for Summer 2014.

Forecasting and Modeling

Table I.B.3. Faculty and students identified to date participating in the forecasting and modeling focus area.

Paul Montagna	TAMU-CC	Faculty, Focus area lead
Elijah Johnson	FAMU	Faculty
Wenrui Huang	FAMU	Faculty
Amy Edwards	FAMU	Ph.D. Student
Brittany Blomberg	TAMUCC	Ph.D. Student
Daryl Sibble	FAMU	Ph.D. Student
Duc Le	FAMU	Ph.D. Student
John Foret	NOAA/ NMFS/SEFSC/EHCFC	NOAA collaborator
Latoya Miles	NOAA/ARL	NOAA collaborator

Personnel associated with this focus area are identified in Table I.B.3. NOAA collaborators for student projects will be identified and recruited as the student research proposals for this focus area are finalized. Research projects that have been developed and submitted to our technical monitors to assure alignment with NOAA goals and mission in this focus area are:

Ecological forecasting to optimize oyster reef restoration success. TAMU-CC student Brittany Blomberg, advisor Paul Montagna, NOAA collaborator John Foret.

Modeling of nitrates and phosphorus in Apalachicola River watershed runoff using BASINS and HSPF software. FAMU student Amy E. Edwards, advisor Elijah Johnson

Integrated hydrological and water quality model for the Apalachicola River and Watershed. FAMU student Duc Le. Advisor Wenrui Huang.

Research and training activities in the forecasting and modeling area support goals and objectives of importance to the National Ocean Service (NOS) and the National Centers for Coastal Ocean Science (NCCOS). For example, faculty led, student centered projects on ecological forecasting to improve oyster reef restoration, to model nutrient concentrations in coastal watersheds, and to integrate hydrological and water quality models directly address objective C13.1.2, Improve Ecological Forecasts, as given in the NOS Priorities roadmap. These projects also support the goals and objectives of NCCOS for coastal ecosystem management, particularly the need to “model and forecast ecosystem services vulnerabilities to differing coastal and ocean uses” as articulated in the NCCOS Strategic Plan.

Status of benchmarks for this focus area include:

1) Providing ECSC students with skills to analyze and model natural phenomena and create forecasts, simulations, or scenarios that can be used to support decision making tools relevant to NOAA’s mission:

Amy Edwards is learning how to use the watershed modeling computer program HSPF.

Duc Le is using a statistical model for water quality studies in the Apalachicola River.

Daryl Sibble is learning how to use the computer program SurfAtm for his dissertation project.

Brittany Blomberg is learning how to use Simile software for emergy analysis.

Brittany Blomberg and Duc Le attended the 2014 ECSC Center-Wide Core Competency Course in St. Teresa, FL.

2) Establishing mentoring opportunities for modeling and forecasting-related research collaborations with ECSC faculty, NOAA specialists/scientists and local/regional coastal managers

Daryl Sibble is working with NOAA Scientist Latoya Myles on a project that involves the modeling of the deposition and emission of ammonia.

3) Developing coursework and webinar opportunities that train ECSC students to learn modeling and forecasting techniques, and how to use them to evaluate outcomes related to coastal areas and NOAA mission-relevant sciences

The focus area lead was involved in the development and presentation of the forecasting and modeling module of the Center Wide Core Competency Course (CWCC) held in August 2014. NOAA ECSC students received training on the use of models during this course.

4) Encouraging and assisting ECSC students to present modeling-related research findings at NOAA or professional meetings, organize information and create manuscripts, and submit their written findings for publication in peer-reviewed journals

Student Publications:

Blomberg, B.N. and P.A. Montagna. 2014. Meta-analysis of Ecopath models reveals secondary productivity patterns across the Gulf of Mexico. *Ocean & Coastal Management* 100: 32-40.

Student Presentations:

Blomberg, B.N., J.B. Pollack and P.A. Montagna. 2014. Comparative analysis of trends in oyster reef restoration effort and funding in Atlantic and Gulf of Mexico ecoregions of the United States. Texas Bays and Estuaries Meeting, Port Aransas, Texas, April 23-24, 2014.

Social and Economic Processes

Table I.B.4. Faculty and students participating in the Social and Economic Processes focus area.

David Yoskowitz	TAMU-CC	Faculty, Focus area lead
Richard McLaughlin	TAMU-CC	Faculty, Focus area lead
Dwayne Fox	DSU	Faculty
Marcia Owens	FAMU	Faculty
Mayra Lopez	TAMU-CC	MS Student
Krystal Pree	FAMU	Ph.D Student
Symone Johnson	DSU	MS Student
John Carlson	NOAA-NMFS	NOAA collaborator
Maria Dillard	NOAA-NCCOS	NOAA collaborator

Personnel associated with this focus area are identified in Table I.B.4. Additional NOAA collaborators for student projects will be identified and recruited as the student research proposals for this focus area are finalized. Research projects that were developed and submitted to our technical monitors to assure alignment with NOAA goals and mission for this focus area are:

Conservation plan for the sand tiger shark in mid-Atlantic nearshore coastal habitats. DSU student Symone Johnson, advisor Dwyane Fox (also in Policy and Decision Tools). NOAA collaborator J. Carlson.

The Socioeconomic Impact of Harmful Algal Blooms in the Gulf of Mexico: A Study of the Risks and Impacts to Subsistence Seafood Harvesters. FAMU student Krystal Pree. Advisor E. Johnson.

Using Social Valuation to Identify and Manage Ecosystem Services in the Mission-Aransas National Estuarine Research Reserve (MA-NERR), Texas. TAMU-CC Student Mayra Lopez, advisors David Yoskowitz and Michael Starek, NOAA collaborator M. Dillard.

Specific goals and objectives identified as important by the National Ocean Service (NOS) and the National Centers for Coastal Ocean Science, particularly in the NCCOS Strategic Plan and the NOS Priorities Roadmap, are supported by faculty led, student centered projects in the social and economic processes focal area. For example, the need for developing strategies for place-based conservation that use ecosystem valuation methods are articulated in the NOS Priorities Roadmap (PB1.2). This need is addressed by projects that use social valuation methods to manage ecosystem services in MA-NERR, and assess socioeconomic impacts of harmful algal blooms. The latter also addresses the NCCOS strategic objective of characterizing the impacts of HABs on humans and coastal ecosystems. The NCCOS strategic objective of effective and sustainable management of coastal resources is supported by development of conservation plans for marine resources such as sand tiger sharks; this work also supports NCCOS to evaluate the effectiveness of management actions in marine and coastal areas.

Status of benchmarks for this focus area include:

1) Providing students with exposure to environmental and sustainability economics through content in a short course and dedicated workshops in order to integrate the human dimensions in environmental decision-making.

Working with ECSC leadership and the Policy and Decision Tools focus area team developed the next unit for the CWCC that was offered in the Summer of 2014.

2) Establishing human dimension education and outreach opportunities with stakeholders through our NERR partners.

Mayra Lopez has participated in marsh and mangrove monitoring and measurement in the MA-NERR.

Working with Dr. Maria Dillard of Hollings Marine Lab (NCCOS) in Charleston, South Carolina, Mayra Lopez conducted a research project during the Summer of 2014 assessing the social values of the natural resources of the MA-NERR.

3) Mentoring and assisting ECSC students to present their findings at NOAA sponsored and professional meetings and help with their submission of their manuscripts for publication in peer-reviewed outlets.

During this reporting period, students developed and submitted abstracts for the upcoming NOAA-EPP forum to be held in October 2014. Faculty advisors continue to work with the students to prepare publications and encourage presentations at NOAA and scientific meetings.

4) Establishing a network of human dimensions professionals to act as a mentor group for ECSC students including individuals from NGOs, government, academia, and the private sector.

Dr. Maria Dillard (NCCOS) has been asked to mentor Mayra Lopez.

Policy and Decision Tools

Table I.B.5. Faculty and students identified to date participating in the Policy and Decision Tools focus area. *indicates the student graduated during this reporting period.

Robert Abrams	FAMU	Faculty, Focus Area Lead
Randall Abate	FAMU	Faculty
Dwayne Fox	DSU	Faculty
Richard McLaughlin	TAMU-CC	Faculty
Marcia Owens	FAMU	Faculty
Symone Johnson	DSU	MS Student
Kayann Chambers	FAMU	JD Student
Loren Vasquez	FAMU	JD Student

Personnel associated with this focus area are identified in Table I.B.5.

Specific goals and objectives identified as important by the National Ocean Service and the National Centers for Coastal Ocean Science are addressed in the policy and decision tools focus area. These objectives are presented in the NCCOS Strategic Plan and the NOS Priorities Roadmap and are supported by faculty led, student centered activities. Specific items from the NOS Priorities Roadmap and including R2.2 “Enhance capacity at the community level to understand and effectively communicate and address risks associated with coastal hazards” PB2.1.2 “Develop and test new integrated tools and information to support decision making on critical problems confronting managers” are addressed by work on climate change implications for marine and coastal law, compensating stakeholders for climate induced damages, transboundary issues in marine and coastal systems, and legal and policy aspects of offshore drilling and oil rig decommissioning. These topics also support NCCOS objectives to “evaluate the effectiveness of management actions in coastal and marine areas”, “develop impact scenarios for proposed uses in the coastal oceans” and “develop new conservation and restoration strategies for coastal ecosystems impacted by climate change”.

Status of benchmarks for this focus area include:

1. Encouraging and assisting ESCS students to present policy-related research findings at NOAA or professional meetings and to submit their written findings for publication in peer-reviewed journals.

Loren Vasquez is currently serving as editor-in-chief of the FAMU Law Review.

2. Providing ECSC students with skills to analyze natural and social science research outcomes and translate them into decision making tools relevant to NOAA's mission

Kayann Chambers is a member of the Law Review.

3. Establishing mentoring opportunities and policy-related research collaborations with ECSC faculty, NOAA specialists/scientists and local/regional coastal managers

Kayann Chambers—participated in an internship with the NOAA International Program Office, Washington, D.C. Summer of 2014

4. Developing coursework and webinar opportunities that train ECSC students to effectively evaluate the appropriateness of policy and management options related to coastal areas and NOAA mission-relevant sciences

Kayann Chambers and Loren Vasquez participated in the 2014 ECSC CWCC in St. Teresa, Florida.

C. Cross-Center Collaborations

Several cross-center collaborations are underway in addition to the projects reported above within the ECSC's focus areas. The ECSC lead CSC Collaborative project is entitled '*An Environmental and Economic Assessment of an Activated Green Infrastructure Approach for Managing Urban Stormwater Contaminant Loading to Coastal Waters*' and was approved by NOAA-EPP in January 2014. This project is trans-disciplinary, integrating contributions from natural, applied, life, and socioeconomic scientists from 3 of NOAA's EPP Cooperative Science Centers (ECSC, CREST, and NCAS), and from NOAA/NOS. Early ideas that eventually translated into this collaborative effort were first germinated during faculty and student discussions at the poster competition at the March 2012 EPP Forum. The faculty collaborators on this project are as follows: from the ECSC Jennifer Cherrier (Project PI) & Charles Jagoe; from CREST Balazs Fekete, Yehuda Klein, Reza Khanbilvardi & Shakila Merchant; and from NCAS Loren White & Vernon Morris. This CSC Cross Center Collaborative project will be an integral part of their research and training for 2 ECSC post docs (Dan Osborne & Lisa Wickliffe), 2 ECSC graduate students (Claudia Tamez & Kevin Williams), 1 CREST graduate student (Jose Pillich), 1 CREST undergraduate student (Rowan Bado), and 1 NCAS graduate student.

The goal of this cross center collaboration is to evaluate the efficacy of an on-site activated green infrastructure management approach for urban coastal water resource sustainability using a novel 'blue' technology, eco-WEIR™ (patent pending), developed by ECSC faculty and students. The eco-WEIR™ technology augments green infrastructure systems to maximize the efficiency of pollutant removal from stormwater run-off and also allow for water storage and reuse. The project involves detailed environmental and socioeconomic assessments of an eco-WEIR activated green infrastructure system

located on the City College of New York campus located in West Harlem, NY. The project goals include (1) establishing a quantitative baseline of the active garden system's hydrologic budget and its contaminant removal efficiencies, (2) performing socioeconomic assessments of the active garden system approach and (3) assessing both the environmental and socioeconomic impacts of this approach on a broader scale as well as its potential for local water conservation. This project is directly in line with NOAA's long term goal of resilient coastal communities and economies and the results of this work will benefit NOAA as well as local, state, and federal managers and policy makers by helping to incentivize the mitigation of non-point source run-off. Progress over the past 6 months includes the following:

- A site on the CCNY campus was selected for the eco-WEIR activated green infrastructure system installation. The selected site was formerly a derelict site. The installation will not only provide us with the necessary environmental performance data but will also be perfect for evaluating how the installation of green infrastructure can enhance urban livability
- In August, Jennifer Cherrier, Dan Osborne (ESCS postdoc) and Claudia Tamez (ECSC PhD student) traveled again to NYC to meet with CREST faculty and CCNY staff to finalize plans for the system installation. Due to site constraints at this site (i.e. bedrock outcroppings and subsurface municipal utilities), however, they learned that it will be necessary to build an above ground system. The housing structure for above ground system has been designed and reviewed by CREST civil engineers for structural integrity. These design plans are currently being reviewed by the CCNY Vice President for Campus Planning & Facilities Management and his team. If approved, system installation is scheduled for early October.
- A series of pre-installation socioeconomic assessments have already been performed: a) assessments of current urban heat island effect at this site and b) a survey of people's feelings/willingness to gather at or pass through this derelict site.
- Hydrologic data has been gathered regarding surface flow paths at this site as well as the connectivity of the stormwater drains of this site with the municipal combined sewage overflow system and it's outfall into the adjacent Hudson River.
- Community outreach efforts have been carried out to raise awareness about this project. Jennifer Cherrier (ECSC) convened a meeting of local community stakeholders (2 nonprofits), urban planners, and the CCNY research team in May. Following this meeting she gave a public presentation organized by one of the non-profit organizations (Trees NY and the SoHarlem: Creative Outlet) about green infrastructure and the NOAA funded installation. Shakila Merchant (CREST) convened a series of meetings with faculty and students at the CCNY Colin Powell School for Civic and Global Leadership. And finally, a CREST students, Jose Pillich, worked with local high school students at the SoHarlem: Creative Outlet teaching them about green infrastructure and how it can offset urban heat island effects

ECSC is also cooperating in a joint project with the LMRCSC and NCAS to evaluate the potential effects of climate change on productivity and forage fish dynamics. A proposal on this topic, co-authored by the ECSC Distinguished Scientist, Charles Jago, entitled "*Trophic ecology of forage fishes: linking primary productivity to fisheries production*" was submitted to EPP during a previous reporting period. Field collections for this project began in April 2013, and continued is winter-spring 2014. The ECSC is responsible for field collections of forage fish (Menhaden), plankton and water chemistry data at locations in the northern Gulf of Mexico;

work to date has focused on the Apalachicola NERR. ECSC will also be responsible for analyzing samples for various contaminants, including mercury, and for data analysis, archiving and reporting.

Another project that includes all four CSCs is an intensive summer camp/training activity for new undergraduate students entering the CSCs. This summer camp was first hosted at the University of Maryland-Eastern Shore in the summer of 2013, and another session occurred during this reporting period in the summer of 2014. The cross-center summer camp has acquired external (NSF) funding. Students at the camp were taught by faculty, staff and graduate students from the CSCs. The intent is to increase student awareness of the breadth and scope of CSC activities and the NOAA mission, as well as facilitating interactions among students and faculty from the CSCs and the broader NOAA community.

In addition to formal collaborations involving three or more CSCs, ECSC faculty and students regularly collaborate with colleagues at other CSC on smaller projects. Examples include an ongoing collaboration between C. Jagoe and B. Stevens (Distinguished Scientists at the ECSC and LMRCSC, respectively) on contaminants in red crabs and edible whelks, and another ongoing collaboration between J. Schalles (Creighton University) and S. Ahmed and A. Gilerson (CREST) on optical measurements/remote sensing of chlorophyll and CDOM in coastal waters.

II. Education and Outreach Activities

Status of benchmarks

The training of the next generation of scientists and managers in the STEM disciplines relevant to the NOAA mission is the major goal of the ECSC. To this end, the ECSC has created and maintains a pipeline to advance students from K-12 through undergraduate and graduate studies. ECSC activities are student centered, and all our research activities have a core student training component. As reported above in Section I, the ECSC supported 48 graduate and undergraduate students during this reporting period, mostly (about 80%) from minorities that are underrepresented in the STEM and socioeconomic disciplines relevant to the NOAA mission. These have been partnered with ECSC advisors, and work with NOAA scientist/mentors to provide research and career advice. A list of students supported during this reporting period, with their degree objectives and respective partner institutions is presented in Appendix 1. All students work with ECSC advisors and NOAA scientists to develop a research project directly aligned with the goals and mission of NOAA, and particularly with our partner line office the National Ocean Service. Graduate student proposed projects have been submitted to the NOAA ECSC Technical Monitors to assure alignment with these goals.

A. Degrees Offered

Students in the ECSC can earn degrees in a variety of STEM disciplines from the six partner institutions. Degree offerings include:

FAMU: BS, MS, Ph.D. in Environmental Science. BS, MS Biology, BS, MS Chemistry. JD in Law with concentration in Environmental Law. FAMU also has 9 other Ph.D. programs: chemical engineering; civil engineering; electrical engineering; mechanical engineering; industrial engineering; biomedical engineering; physics; pharmaceutical sciences; and educational leadership.

- Creighton: B.S. in Atmospheric Science, Biology, and Environmental Science with Environmental Science concentrations in Global Environmental Systems, Organismal and Population Ecology, Pollution and Environmental Toxicology, and Environmental Policy and Society, M.S. in Atmospheric Science, Environmental Science
- DSU: B.S. in Natural Resources, Agricultural Science, Plant Biology with concentrations in: Wildlife Biology, Fisheries Science, Environmental Science, M.S. in Natural Resources, Agricultural Science, Plant Biology_with concentrations in: Wildlife Biology, Fisheries Science, Environmental Science
- TAMU-CC: B.S. in Biology, Geology, Chemistry, GIS, Environmental Sciences, M.S. in Biology, Environmental Sciences, Fisheries and Aquaculture, Ph.D. in Coastal and Marine System Sciences, Marine Biology
- UTB: B.S. in Biology, Chemistry, Environmental Science, M.S. in Biology, Chemistry, Environmental Science
- JSU: B.S. in Earth System Science, Biology with Biology concentrations in Environmental Science, Marine Science, M.S. in Hazardous Materials Management, Environmental Sciences with Environmental Science concentrations in: Environmental Science and Marine Science, Ph.D. in Environmental Science.

B. Students Trained/ Courses Offered

B.1 Students Trained

STUDENTS TRAINED			
Institution March 1, 2014-August 31, 2014			
Florida A&M University			
	Discipline	Number of students in Degree Programs (experiential learning & supervised research)	Number of Students Trained
	B.S. in Environmental Sciences, with concentrations in: Environmental Monitoring and Instrumentation, Environmental Restoration and Waste Management, Environmental Policy, and Environmental Toxicology/Risk Assessment M.S. in Environmental Sciences, with concentrations in: Environmental Biotechnology, Environmental Restoration, Marine and Estuarine Environments, Environmental Policy and Management, and Radiation Protection Ph.D. in Environmental Sciences, with concentrations in: Environmental Chemistry, Biomolecular Science, Environmental Policy and Management, Aquatic and Terrestrial Ecology J.D. through the College of Law, with concentrations in: Environmental law and policy	Ph.D.- 9 M.S.- 3 J.D.- 4 B.S.-5	281
Creighton University			
	Discipline	Number of students in Degree Programs (experiential learning & supervised research)	Number of Students Trained
	B.S. in Atmospheric Science, Biology, and Environmental Science with Environmental Science concentrations in: Global Environmental Systems, Organismal and Population Ecology, Pollution and Environmental Toxicology, and Environmental Policy and Society M.S. in Atmospheric Science, Environmental Science	M.S.- 1	62
Delaware State University			
	Discipline	Number of students in Degree Programs (experiential learning & supervised research)	Number of Students Trained
	B.S. in Natural Resources, Agricultural Science, Plant Biology with concentrations in: Wildlife Biology, Fisheries Sciences, Environmental Science M.S. in Natural Resources, Agricultural Science, Plant Biology with concentrations in: Wildlife Biology, Fisheries Sciences, Environmental Science	M.S.- 3 B.S.- 2	24
Jackson State University			
	Discipline	Number of students in Degree Programs (experiential learning & supervised research)	Number of Students Trained
	B.S. in Earth System Science, Biology with Biology concentrations in: Environmental Science, Marine Science M.S. in Hazardous Materials Management, Environmental Sciences with Environmental Science concentrations in: Environmental Science and Marine Science Ph.D. in Environmental Science	Ph.D.- 4 B.S.- 3	225
Texas A&M University- Corpus Christi			
	Discipline	Number of students in Degree Programs (experiential learning & supervised research)	Number of Students Trained
	B.S. in Biology, Geology, Chemistry, GIS, Environmental Sciences M.S. in Biology, Environmental Sciences, Fisheries and Aquaculture Ph.D. in Coastal and Marine System Sciences, Marine Biology	Ph.D.- 4 M.S.- 6	31
University of Texas-Brownville			
	Discipline	Number of students in Degree Programs (experiential learning & supervised research)	Number of Students Trained
	B.S. in Biology, Chemistry, Environmental Science M.S. in Biology, Chemistry, Environmental Science	M.S.- 4	134
ECSC Total (September 1, 2013-February 28, 2014)		48	757

B.2. ECSC Courses Offered

ECSC COURSES			
Institution	March 1, 2014-August 31, 2014		
Florida A&M University			
	Course Title	Professor	Number of Students
	Fundamentals of Environmental Science	E. Johnson	54
	Environmental Modeling Principles	E. Johnson	7
	Contaminant Hydrogeo	E. Johnson	2
	Marine Microbiology w/ lab	J. Cherrier	4
	Environmental Policy & Risk Management	M. Owens	9
	Environmental Ethics	M. Owens	7
	Source/Cont Environmental Pollution	M. Abazinge	3
	Intro to Environmental Sciences	M. Abazinge	23
	Hydraulics	W. Huang	42
	Hydraulics Engineering	W. Huang	8
	Water Law	R. Abrams	10
	Civil Procedure II	R. Abrams	50
	Animal Law	R. Abate	29
	Public International Law	R. Abate	24
	Ocean and Coastal Law	R. Abate	9
Students Trained			281
Creighton University			
	Course Title	Professor	Number of Students
	Environmental Toxicology	J. Schalles	18
	Zoology	J. Schalles	38
	Ecology, Geography, and Health of Lakes	J. Schalles	6
Students Trained			62
Delaware State University			
	Course Title	Professor	Number of Students
	Wetlands Biology	D. Fox	6
	Ornithology	C. Hecksher	6
	Advanced Ecosystems	C. Hecksher	6
	Ecosystems	C. Hecksher	6
Students Trained			24
Jackson State University			
	Course Title	Professor	Number of Students
	Environmental Science Seminar	P. Tchounwou	13
	General Zoology	I. Farah	84
	General Zoology Lab	I. Farah	76
	Chemistry Seminar	F.X. Han	52
Students Trained			225
Texas A&M University- Corpus Christi			
	Course Title	Professor	Number of Students
	Coastal Management and Ocean Law	R. McLaughlin	16
	Experimental Design	P. Montagna	11
	Coastal Geo-Environments & Change	J. Gibeaut	4
Students Trained			31
University of Texas-Brownsville			
	Course Title	Professor	Number of Students
	General Biology III	A. Fierro	57
	Conservation Biology	A. Fierro	25
	Current Issues in Biology	A. Fierro	5
	Ecology	C. Buenrostro	21
	Historical Geology	C. Buenrostro	15
	Biostatistics	D. Hicks	11
Students Trained			134
Total Students Trained by ECSC Faculty			757

C. Center-Wide Core Competency

In August 2014, the NOAA/FAMU Environmental Cooperative Science Center again hosted a required Center Wide Core Competency certification training course for its students. It is an intensive, hands-on 5-day course designed to provide ECSC students with an overview of practices and approaches used in integrated science in support of coastal resource management. During the 5-day course a variety of technology tools were used to instruct and gauge student acquisition of the course related knowledge and skills. TaskStream, a web based tool, allows for the assessment of student learning. The course is topically based and evaluates the various demands placed on coastal systems by human uses, together with management approaches and policies for balancing these demands with ecosystem health, functionality and resilience. Students learn approaches and techniques used in the 5 ECSC focus areas, as well as gaining hands-on experience in field sampling and safe boating practices. All students are required to complete the Boating Safety Course with exam at <http://www.boatus.org/> prior to the starting date of the CWCC short course.

To cohesively tie together all of the information learned regarding approaches and techniques used in all 5 focus areas, the course culminates with student teams working on a problem based-learning activity focused on impacts of land use practices on coastal ecosystem and socioeconomic health, which challenges students to effectively integrate course related knowledge gains and hone their communication skills by adopting roles as different stakeholder groups with differing points of view. Specifically, students considered the efficacy of a proposed residential development community in Franklin County, Florida and were asked to evaluate it from 4 stakeholder points of view: environmental activists, land developers, fishermen and the local government. Students were broken up into 4 groups such that each would represent one of the above stakeholder points of view (POV) and were asked to develop a 20 minute 'pitch' to orally present to the other stakeholder groups in a simulated 'town hall' meeting. This problem-based learning activity challenged the students to think outside of the box when it comes to real world decision-making, demonstrate knowledge of the local system, and integrate what they learned from the course's focus area activities. In addition to these activities the CWCC course also included 3 special presentations from the following speakers:

- Dr. Geoffrey Scott (Chair of the Department of Environment Health Sciences, University of South Carolina; former Director of NOAA NCCOS)
- Steve Leitman (Environmental Scientist and Expert on the Apalachicola-Chattahoochee-Flint River System)
- Lee Edmiston (Manager of the Apalachicola National Estuarine Research Reserve and Former Director of the Florida Coastal Office)

Additional information and photos of taken during the course are available at <http://www.ecsc.famu.edu/newspress-releases/noaa-ecsc-2014-center-wide/>

There were 16 ECSC students in the 2014 Cohort with representation from all of our partner institutions and from students working in each of the ECSC focus areas. Pre- and post-assessments revealed an average of 34% learning gains for this student cohort.

D. Center Wide Field Research and Training Campaign

The ECSC has a long history of combined remote sensing/ground truthing campaigns at National estuarine Research Reserves. From 2002-present a total of seven NERR sites have been surveyed using imagery and hyperspectral data collected from aircraft and satellites, combined with ground truthing in terrestrial, aquatic, and wetland areas. Some NERRs have been surveyed multiple times to assess changes due to disasters (oil spills, hurricanes), invasive species, anthropogenic stressors, and climate change effects. These campaigns involve both ECSC students and faculty, and provide data for student projects as well as intensive, hands-on training in remote sensing methodologies and field survey techniques. In June July 2014, 23 participants in representing five of the six ECSC partner schools plus ECSC staff members from Grand Bay and Mission-Aransas NERRs participated in the campaign (this included 8 graduate students, 5 undergraduate students, 2 ECSC post-docs, 4 faculty, and 4 staff). The work took place in the last week of June and the third week of July at field sites where high resolution satellite imagery and hyperspectral data (from DigitalGlobe, using the WorldView 2 satellite) was acquired. Three areas were targeted for satellite data acquisition and ground truthing: Redfish Bay and Mud Island in the Mission-Aransas NERR, Mustang Island (Harte Center Coastal Observatory, near Corpus Christi TX), and the Bahia Grande Lagoon restoration project in the northern Rio Grande / Laguna Madre area near Brownsville TX, a UTB research site.

Activities were designed to provide data for classifications, predictive algorithms, and management data products from the WorldView2 satellite imagery included wetland and upland vegetation community assessments, water quality surveys, geomorphology / precision elevation surveys of island and beach habitats, and avian community habitats for foraging and nesting. ECSC obtained 6 useable satellite image sets (2 m, 8 band color, and 1 m panchromatic) from DigitalGlobe for polygons of Bahia Grande (2 set), South Mustang Island (1 set), Redfish Bay and Mud Island (2 images), and Aransas National Wildlife Refuge (1 set). Additional activities to process and apply the field survey data are currently underway. John Schalles plans to visit Texas for 4 weeks in February 2015 to work with students, faculty, and staff at TAMU-CC, UTB, and Mission-Aransas NERR in order to complete data processing and assist in product and predictive algorithm development.

E. Education and Outreach for K-12 students

2014 FAMU SOE Summer Camp -From June 9th through the 27th, twenty-four high school students were exposed to hands on laboratory experiments, guest lectures, and several field trips with a focus on "Anthropogenic Stressors". Four local high school science and mathematics teachers were asked to participate in the camp as "Teacher Researchers". The teachers served as counselors, mentors and instructors. Summer camp lectures and labs focused on NOAA mission related subjects. Additionally, a career development component was added to the camp curriculum.

In addition to summer camp activities, the ECSC supports a FAMU High School Ocean Science Bowl Team. During this reporting period the Science Bowl Team practiced twice a week to prepare for upcoming competitions.

The ECSC NERR Research Coordinators, Christina Mohrman and Megan Lamb, hosted and participated in several public presentations and workshops. During this reporting period, the coordinators engaged approximately 200 members of the public (including teachers and students).

ECSC JSU faculty (within Biology dept.) participated in the development and implementation of the JSU Summer Bridge Program to enhance the science, mathematics and communication skills of K-12 students and facilitate their transition to college. May 28-June 25 and June 30-July 31 Approx. 65 students.

ECSC student John O'Donnell assisted in the NSF Georgia Coastal Ecosystems Project Schoolyard High School Teacher Workshop at the University of Georgia Marine Institute at Sapelo Island, Georgia the week of July 20, 2014. John introduced groups of high school teachers to estuarine monitoring and transect analysis using a YSI 6600 multi-instrument sonde, took teacher groups into salt marsh habitats to demonstrate vegetation characterizations with GPS and other survey techniques, and held a laboratory session in the use of Google Earth to map and display salt marsh survey data.

In April 2014, ECSC DSU students Mariamar Gutierrez-Ramirez and Alan Kneidel presented a seminar on their research at the Apalachicola National Estuarine Research Reserve (ANERR). The seminar was attended by 40 individuals. Eastpoint, FL.

In June 2014, ECSC Postdoctoral Associate Lori Lester and ECSC graduate student Alan Kneidel conducted a demonstration for Ecoquest Day Camp at St. Andrews School. The demonstration was attended by 20 students (5 to 10 years old) and three K-12 teachers. Middletown, DE.

TAMU-CC- Tunnell, J.W. Project Manager for Houston Museum of Natural Science to develop an exhibit about sharks. It is called "Shark!", and it opened to the public on the 29th of August and tells the story of the current plight of sharks around the world, as well as discuss current research and conservation. The HMNS has about 3 million visitors per year.

TAMU-CC. Stunz, Greg Shark Week 2014 - Discovery Channel, "Monster Hammerhead." The program trails the legendary hammerhead that has been swimming along the Florida shoreline for the past 60 years. Filmed June 2014, Aired August 2014.

Kiii-TV, "Shark Tales from the Harte Research Institute's Marine Biologists."

<http://www.kiiitv.com/story/26194930/shark-tales-from-the-harte-research-institutes-marine-biologists>. August 4, 2014.

Kiii-TV, "*TAMUCC Experts Discuss Dangers of Sharks in Gulf Coast.*"

<http://www.kiiitv.com/story/25883142/tamucc-experts-discuss-dangers-of-sharks-in-gulf-coast>. June 26, 2014.

The Zone, Austin's Sports Talk Radio AM 1300. "*Latest happenings in Gulf Fisheries*". The Great Outdoors with Ken Milam. June 8, 2014.

Kiii-TV, "*Summit Concentrates on State of Gulf*"

<http://www.kiiitv.com/story/25062427/summit-concentrates-on-state-of-gulf>. March 24, 2014.

ECSC student Mayra Lopez volunteered with several organizations during this reporting period:

Mission Aransas Wildlife Refuge Vegetation Sampling
MA-NERR Mud Island Vegetation Sampling
Community Glass and Monofilament Recycling Event
Destination Imagination Student Challenge Program

III. Success Stories

Forty-eight graduate and undergraduate students were supported and trained by the ECSC during this reporting period, including thirty-four students from minorities underrepresented in the STEM disciplines.

John O'Donnell, M.S. in Atmospheric Science (Creighton), Environmental Track at Creighton University, participated in two National Science Foundation research cruises on the RV Savannah.

FAMU JD students Cynthia McGee and Cameryn Rivera graduated May 2014

FAMU MS students Portia Caldwell and Endia Casley traveled to Hawaii in June 2014 to work with NCCOS, Navy, and Rutgers scientists to study stress in coral larvae from polluted areas in Pearl Harbor.

FAMU JD student Loren Vasquez placed second in the annual Dean Frank Maloney Environmental Law Writing Competition, sponsored by the Environmental and Land Use Law Section of the Florida Bar. A press release with more information is available here: <http://law.famu.edu/go.cfm/do/Event.View/evid/151.html>. The paper has been accepted for publication in the Seattle Journal of Environmental Law (forthcoming Fall 2015).

TAMU-CC PhD student, Elena Kobrinski, selected to be a member of the 2014 film competition jury for the BLUE Ocean Film Festival & Conservation Summit, held in St. Petersburg, Florida, November 3- 9, 2014.

TAMU-CC MS student Mayra Lopez received 2014 Rising Scholars Scholarship \$1000 and 2014 TAMUCC College of S&E Scholarship \$1000.

TAMU-CC PhD student Judd Curtis, ECSC-PhD student, defended his PhD dissertation this summer and graduated with his PhD in Marine Biology from Texas A&M University-Corpus Christi in August 2014.

UT-B MS student Claudia Tamez (ECSC student) successfully defended her M.S. Thesis on April 11th 2014. She is currently enrolled at FAMU's Ph. D. Program.

UT-B MS student Rebekah Rodriguez (ECSC student) participated in an internship on August 8-31, 2014 aboard the Okeanos Explorer Research Cruise.

IV. Revisions to Tasks as Described in the Original Grant Award, Amendments and Impact to the Award

No revisions to report at this time.

Appendix 1. Students recruited and supported during this reporting period.

*Graduated during this reporting period.

Last Name	First Name	Institution	Degree Objective	Expected Graduation Date
Allen	LaTrisha	FAMU	PhD	May 2015
Baskerville	Tiffany	FAMU	PhD	Dec 2014
Caldwell	Jason	FAMU	PhD	May 2015
Caldwell	Portia	FAMU	MS	May 2015
Casley	Endia	FAMU	MS	August 2015
Chambers	Kayann	FAMU	JD	May 2015
Connally	Patrick	FAMU	MS	Dec 2015
Edwards	Amy	FAMU	PhD	May 2015
Ford	Ashlyn	FAMU	BS	May 2015
Hansberry	Tyler	FAMU	BS	May 2015
Le	Duc	FAMU	PhD	May 2015
Lewis-Washington	Justyn	FAMU	BS	May 2015
Marquez	Mario	FAMU	PhD	May 2016
*McGee	Cynthia	FAMU	JD	May 2014
Pree	Krystal	FAMU	PhD	May 2015
Pugh	Andrea	FAMU	BS	May 2015
*Rivera	Cameryn	FAMU	JD	May 2014
Sibble	Daryl	FAMU	PhD	May 2015
Tucker	Kimberly	FAMU	PhD	May 2015
Tull	Jamila	FAMU	BS	May 2015
Vasquez	Loren	FAMU	JD	May 2015
O'Donnell	John	Creighton	MS	May 2015
Barth	Joshua	DSU	BS	May 2016
Gutierrez-Ramirez	Mariammar	DSU	MS	May 2015
Jenkins	Benjamin	DSU	BS	May 2015
Johnson	Symone	DSU	MS	May 2015
Kniedel	Alan	DSU	MS	May 2015
Bowens	Erin	JSU	BS	May 2015
*Clerk	Shelton	JSU	PhD	May 2014
Dampier	Jeanna	JSU	PhD	May 2015
Dugo	Mark	JSU	PhD	May 2015
Johnson	Keara	JSU	BS	May 2015
McComb	Jacqueline	JSU	PhD	Dec 2015
McLemore	LaTasha	JSU	BS	May 2015
Blomberg	Brittany	TAMU-CC	PhD	Dec 2014
*Curtis	Judson	TAMU-CC	PhD	August 2014
Kobrinski	Elena	TAMU-CC	PhD	May 2015

Lopez	Mayra	TAMU-CC	MS	Dec 2014
Lumb	Luz	TAMU-CC	MS	August 2014
Martinez	Melinda	TAMU-CC	MS	May 2015
*Pillado	Maria	TAMU-CC	MS	May 2014
Rittenhouse	Michael	TAMU-CC	MS	Dec 2014
Rodriguez	Maria	TAMU-CC	MS	May 2015
Delgado	Monica	UT-B	MS	Dec 2016
Martinez	Crystal	UT-B	MS	May 2014
Rodriguez	Rebekah	UT-B	MS	Dec 2015
*Tamez	Claudia	UT-B	MS	May 2014

Appendix 2. Peer Reviewed Publications. ECSC student authors are identified by *

Appendix 2.a Published (17, 6 with student authors, 4 student first authors)

Arias, E. with J.W. Tunnell and 14 other authors. 2014. Mexico (chapter). pp. 254-260 In Jackson J.B.C., M.K. Donovan, K.L. Cramer, and V.V. Lam (eds). Status and Trends of Caribbean Coral Reefs: 1970-2012. Global Coral Reef Monitoring Network, IUCN. Gland, Switzerland. 306pp.

Ates, M., Z. Arslan, V. Demir, J. Daniels, and I.O. Farah. 2014. Accumulation and toxicity of CuO and ZnO nanoparticles through waterborne and dietary exposure of goldfish (*Carassius auratus*). Environmental Toxicology. 2014.

Ates, M., M.A. Dugo*, V. Demir, Z. Arslan, and P.B. Tchounwou. 2014. Effects of copper oxide nanoparticles to sheephead minnow (*Cyprinodon variegatus*) at different salinities. Digest Journal of Nanomaterials and Biostructures 9(1):369-377.

Blomberg, B.N.* and P.A. Montagna. 2014. Meta-analysis of Ecopath models reveals secondary productivity patterns across the Gulf of Mexico. Ocean & Coastal Management 100: 32-40.

Chen, J., F.X. Han, and P. Tchounwou. 2014. Biogeochemistry in recycling of trace elements and heavy metals. In Microbiology for Minerals, Metals, Materials and Environment. Abhilash, B. D. Pandey, K. A. Natarajan (eds.). CRC Press. ISBN 9781482257298.

Chen J., Y.Li, L.Zhou, M. Xian, F.X. Han, L.Gan, and Z. Shi. 2014. *In situ* bioimaging of hydrogen sulfide uncovers its pivotal role in regulating nitric oxide-induced lateral root formation. PLoS ONE 9(2): e90340. doi:10.1371/ journal.pone.0090340

Curtis, J.M*., G.W. Stunz, R.D. Overath, and R.R. Vega. 2014. Otolith chemistry discriminates natal origins of hatchery versus wild spotted seatrout. Fisheries Research 153:31-40.

Drumhiller, K.L., G.W. Stunz, M.W. Johnson, S. L. Diamond, and M.M. Reese Robillard. 2014. Venting or rapid recompression increase survival and improve recovery of red snapper with barotrauma. Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science 6:190-199.

Gorai AK, F. Tulus, and P.B. Tchounwou. 2014. A GIS based approach for the association between air pollution and asthma in New York state, USA. Int J Environ Res Public Health 11(5):4845-4869.

Hensgen, G.M., G.J. Holt, S.A. Holt, J.A. Williams, and G.W. Stunz. 2014. Habitat quantity, connectivity, and proximity influence nekton community diversity in fragmented seagrass landscapes. Marine Ecology Progress Series 507:139-152.

Hicks, D.W., L. Lerma, J. Le, T.C. Shirley, J.W. Tunnell, R. Rodriguez* and A. Garcia. 2014. Assessing fish communities of six remnant coral algal reefs off the South Texas coast. Proceedings of the 66th Gulf and Caribbean Fisheries Institute, November 4 - 8, 2013, Corpus Christi, Texas, USA.

McComb J*, T.C. Alexander, F.X. Han, and P.B. Tchounwou. 2014. Understanding biogeochemical cycling of trace elements and heavy metals in estuarine ecosystems. *Journal of Bioremediation & Biodegradation* 5(3).

Nash, H*. and R. McLaughlin. 2014. A policy approach to establish an international network of marine protected areas in the Gulf of Mexico region. *6 Australian Journal of Maritime and Ocean Affairs* 1-35.

Nevins, J.A., J. Beseres Pollack, and G.W. Stunz. 2014. Characterizing nekton use of the largest unfished oyster reef in the U.S. in comparison to marsh edge and nonvegetated estuarine habitats. *Journal of Shellfish Research* 33:227-238.

Paudel, B. and P.A. Montagna. 2014. Modeling inorganic nutrient distributions among hydrologic gradients using multivariate approaches. *Ecological Informatics* 24:35-46.

Thomas, J., D. Wafula, A. Chauhan, S. Green, R. Gragg and C. Jagoe. 2014. A survey of Deepwater Horizon (DWH) oil-degrading bacteria from the eastern oyster biome and its surrounding environment. *Frontiers in Microbiology* doi:10.3389/fmicb2012.00149

Turner, E.L., D.A. Bruesewitz, R.F. Mooney, P.A. Montagna, J.W. McClelland, A. Sadovskii, and E.J. Buskey. 2014. Comparing performance of five nutrient phytoplankton zooplankton (NPZ) models in coastal lagoons. *Ecological Modelling* 277: 13–26.

Zhu, Y., L.Q. Ma, X. Dong, W. Harris, J.C. Bonzongo, and F.X. Han. 2014. Ionic strength reduction and flow interruption enhanced colloid-facilitated Hg release in contaminated soils. *Journal of Hazardous Materials* 264:286-292.

Appendix 2.b In press (10, 2 with student authors, 1 student first author)

Abate, R, and S. Krijecki. Climate change impacts on ocean and coastal law: Scientific realities and legal responses. *Climate Change Impacts on Ocean and Coastal Law: U.S. and International Perspectives*. Oxford University Press. In press.

Bryan, A.L., J.W. Snodgrass, H.A. Brant, C.S. Romanak, C.H. Jagoe, G.A. Mills, and I.L. Brisbin. 2014. Precipitation influences on uptake of a global pollutant by a coastal avian species. *Environmental Toxicology and Chemistry*. In Press.

Cherrier, J., S.K. Valentine*, B. Hamill, W.H. Jeffrey, and J. F. Marra. Light-mediated release of dissolved organic carbon by phytoplankton. *Journal of Marine Science*. In press.

Fierro-Cabo, A. and A. Rentfro. 2014. First record of the tropical house gecko (*Hemidactylus mabouia* Moreau de Jonnès, 1818) in Texas: Is an earlier gecko invader about to be displaced ?. *Bioinvasions Records*. In Press.

Hicks, D., L. Lerma, J. Le, T.C. Shirley, J.W. Tunnell, R. Rodriguez*, and A. Garcia. Assessing fish communities of six remnant coral algal reefs off the South Texas coast. *Proceedings of the Gulf and Caribbean Fisheries Institute, Volume 66*. In Press.

McLaughlin, R., Responding to Climate Change Impacts to Fisheries and Marine Habitat in the Gulf of Mexico. Randall S. Abate (ed.). *Climate Change Impacts on Ocean and Coastal Law*. Oxford University Press. Anticipated publication December, 2014.

Nash, H*. and J.W. Tunnell, Jr. Mapping the South Texas banks. *Proceedings of the Gulf and Caribbean Fisheries Institute, Volume 66*. In Press.

Oakley, J.L., J. Simons, and G.W. Stunz. 2014. Spatial food web dynamics mediated by oyster reef and other estuarine habitat types in a subtropical estuary. *Journal of Shellfish Research*. In Press.

Tunnell, J.W., Jr., N. Barrera, and F. Moretzsohn. *Texas seashells – A field guide*. Texas A&M University Press, College Station, TX. In press.

Tunnell, J.W., Jr. and J.W. Tunnell. *Pioneering archaeology in the Texas coastal bend: The Pape-Tunnell collection*. Texas A&M University Press, College Station, TX. In press.

**Appendix 3. Presentations. ECSC student authors are identified by *
(47, 13 with student authors, 12 as first author)**

Aguilar G. and A. Fierro-Cabo. Sabal palm's safety net: Coyote's balancing interaction on seed predators. Texas Academy of Science 117th Annual Meeting. Galveston, TX. March 7-8, 2014.

Allen, L.*, D. Johnson, K. Farris, W.Patterson, J. Tarnecki and C. Jagoe. Assessment of PAH exposure and effects in aquatic systems after oil spills: Responses of selected biomarkers in fish following the Deepwater Horizon accident. Joint Aquatic Sciences Meeting. Portland, OR. May 2014.

Asowata, D., K. Dotson, J. Billa, I. Tsorxe, S. Adzanu, F.X. Han, and M. Ankrah. Radiological implications of road construction materials to workers. Annual Meeting of the Health Physics Society. Baltimore, MD. July 2014.

Barth, J.*, L. Lester, and C. Heckscher. Effects of sea level rise on freshwater impoundments for migratory waterbirds. Delaware National Estuarine Research Reserve Research Symposium. Dover, DE. March 21, 2014.

Billa, J., F.X. Han, S. Didla, I. Tsorxe, O. Brempong, and H. Yu. Assessment of radioisotopic transfer factor (TF) in selected vegetation samples. American Chemical Society Annual Meeting. Dallas, TX. March, 2014.

Carradine, M., J. Dimpah, J. Billa, S. Adzanu, M. Ankrah, and F.X. Han. Mobility of isotopes from the terrestrial environment to vegetation. Annual Meeting of the Health Physics Society. Baltimore, MD. July 2014.

Chen, R. F., J.E. Cable, C. Meile, J.E. Cherrier, G.B. Gardner, X.C. Wang, J.F. Schalles, F. Peri, and H.N. Schiebel. Dissolved organic carbon (DOC) export from salt marshes. Joint Aquatic Sciences Meeting. Portland, OR. May 2014.

Cherrier, J., and A. Bolques. The green horizon: Can green infrastructure address runoff and climate change challenges?. Joint Aquatic Sciences Meeting. Portland, OR. May 2014.

Curtis, J.M.*, G.W. Stunz, M.W. Johnson, and S.L. Diamond. Ultrasonic acoustic telemetry reveals delayed mortality estimates and post-release behavior patterns in Gulf of Mexico red snapper. Southern Division of the American Fisheries Society. Charleston, SC. 2014.

Didla, S., M. Atkins, M. Ankrah, F.X. Han, and J. Billa. Radiological assessment of soils and water collected near a coal mining facility. Annual Meeting of the Health Physics Society. Baltimore, MD. July 2014.

Dong, R., L. Lawson, F.X. Han, C. Rogers, Z. Arslan, and H. Yu. Adsorption study of cesium, strontium, and cobalt on iron(III) and manganese oxides under various

biogeochemical conditions. American Chemical Society Annual Meeting. Dallas, TX. March 2014.

Dorodor, M., J. Pittman, J. Billa, S. Adzanu, M. Ankrah, and F.X. Han. Assessment of radon levels in water wells on Alcorn State University campus. Annual Meeting of the Health Physics Society. Baltimore, MD. July 2014.

Dorsey, L., I Green, M. Reese, J Billa, F.X. Han, S. Adzanu, and M. Ankrah. Radioactivity studies on farm raised and Mississippi river catfish, Annual Meeting of the Health Physics Society. Baltimore, MD. July 2014.

Fligor, C.W. and G.W. Stunz. Habitat characterization of year-one and year-two red drum and spotted seatrout. National Conference on Undergraduate Research. Lexington, KY. 2014.

Gibeaut, J., E.B. Taylor, D. Del Angel, A.A. Reisinger, and M.J. Starek. Living with sea level rise on Texas barrier islands. Ocean Sciences Meeting, American Geophysical Union. Honolulu, Hawaii. <http://www.eposters.net/pdfs/living-with-sea-level-rise-on-texas-barrier-islands.pdf>

Gilson, Gina F., J.F. Schalles, and J.P. O'Donnell*. Quantifying spatial variability of microbenthic algae using optical reflectance measurements. Nebraska Academy of Science Annual Meeting, Nebraska Wesleyan University, Lincoln, NE. April 2014.

*Hall, Q.H., G.W. Stunz, J. Williams, and M. Robillard. Effects of reopening Cedar Bayou on estuarine-dependent species. Texas Bays and Estuaries Meeting. The University of Texas Marine Science Institute, Port Aransas, TX. 2014.

Heckscher, C.M. Delaware State University NOAA Environmental Cooperative Science Center: Education and research partnerships with National Estuarine Research Reserves. Delaware National Estuarine Research Reserve Research Symposium. Dover, DE. March 21, 2014.

Hernandez T., A. Martinez A, G. Aguilar, and A. Fierro. Predator preferences and predation intensities on sabal palm (*Sabal mexicana* Mart) seeds. 16th Annual Research Symposium, University of Texas-Brownsville. Brownsville, TX. April 4, 2014.

Jagoe, C.H., L. Allen*, D. Rumbold, and A.N. Loh. PAH concentrations and biomarkers of exposure in plankton and neuston from coastal waters in the Gulf of Mexico after the Deepwater Horizon oil spill. Joint Aquatic Sciences Meeting. Portland, OR. May 2014.

*Jose, P., G.W. Stunz, and M.J. Ajemian. Historical and current trends in Texas' nearshore shark assemblage. Texas Bays and Estuaries Meeting. The University of Texas Marine Science Institute. Port Aransas, TX. 2014.

- Kling, T., M.J. Ajemian, J.J. Wetz, and G.W. Stunz. Gear selection: Video analysis of artificial reefs vertical longline videos. Celebrate Undergraduate Research and Creativity (CURC) Showcase. Colorado State University, Fort Collins, CO. 2014.
- Lawson, L., R. Dong, F.X. Han, C. Rogers, Z. Arslan, and H. Yu. Environmental fates and transformation of Cs, Co, And Sr in the Soils of US coastal ecosystem. Mississippi Academy of Science Annual Meeting. Hattiesburg, MS. 2014.
- Lawson, L., R. Dong, F.X. Han, C. Rogers, Z. Arslan, H. Yu. 2014. Distribution and transformation of Cs, Co, and Sr in the soils of south US coastal ecosystem. American Chemical Society Annual Meeting. Dallas, TX. March 2014.
- Laing, R., C. Mensah, J. Billa, S. Adzanu, M. Ankrah, and F.X. Han. Qualitative analysis of NORM activity levels in sludge samples collected from a paper mill. Annual Meeting of the Health Physics Society. Baltimore, MD. July 2014.
- Lester, L. Effects of sea level rise on barrier island habitat availability for neotropical migrating birds. Departmental Seminar. Department of Agriculture and Natural Resources. Delaware State University. Dover, DE. April 10, 2014.
- Lester, L. and J. Suss. Effects of nest depredation and anthropogenic activities on diamondback terrapins (*Malaclemys terrapin*) in Delaware. Delaware National Estuarine Research Reserve Research Symposium. Dover, DE. March 21, 2014.
- Lyons, G. R.F. Chen, and J. Cherrier. Dissolved organic carbon (DOC) outwelling from a FL Big Bend coastal wetland system. Joint Aquatic Sciences Meeting. Portland, OR. May 2014.
- Martinez, C.* and A. Fierro-Cabo. Barnacles as potential indicators of estuarine system recovery. Texas Academy of Science 117th Annual Meeting. Galveston, TX. March 7-9, 2014.
- McComb J.*, F. X. Han, and P. Tchounwou. Biogeochemistry of carbon, heavy metals, and trace elements in the grand bay national estuarine research reserve. American Chemical Society Annual Meeting. Dallas, TX. March, 2014.
- McIntosh L. and A. Fierro-Cabo. Macroinvertebrate community composition of a reflooded resaca as a potential indicator of successional stage. Texas Academy of Science, 117th Annual Meeting. Galveston, TX. March 7-8, 2014.
- McLaughlin, R. Organizer and Master of Ceremony, Session on the Gulf of Mexico as an international sea, State of the Gulf of Mexico Summit. Houston, TX. March 24-27, 2014.
- McLaughlin, R. International Strategies. Harte Charitable Foundation Meeting, Corpus Christi, TX. April 2014.

McLaughlin, R. The future of transboundary hydrocarbon development in the Gulf of Mexico. CIIMAR Sixth Meeting and Celebration of Global Oceans Day, Playa del Carmen, Mexico. June 2014.

Montagna, P.A. Freshwater inflow to estuaries: Water run to waste?. Texas Bays and Estuaries Meeting. UT Marine Science Institute, Port Aransas, TX. April 23-24, 2014.

Montagna, P.A. Freshwater inflow to estuaries: Water run to waste?. Clean Waters Initiative, Estuary Programs and Freshwater Inflows Meeting. Houston-Galveston Area Council. Houston, TX. May 7, 2014.

O'Donnell, J.P.* and J.F. Schalles. Using three decades of Landsat TM satellite data to examine the biomass of Georgia coastal salt marsh vegetation. University of Georgia Marine Institute Summer Seminar Series. June 2014.

Osborne, D., K. Cressman, C. Mohrman, and M. Tfaily. Determining the source of dissolved organic matter in coastal estuaries. Joint Aquatic Sciences Meeting. Portland, OR. May 2014.

Quaye, D., D. Afua, J. Billa, S. Adzanu, F. X. Han and M. Ankrah. Radioactivity studies on selected tobacco products commonly used in the US. Annual Meeting of the Health Physics Society. Baltimore, MD. July 2014.

Rodriguez, R.*, D.W. Hicks, J.W. Tunnell, T.C. Shirley, P.J. Etnoyer, and E. Hickerson. Assessing deep-water coral assemblages inhabiting relict coral banks off the Texas coast. 117th Annual Meeting of the Texas Academy of Science. Galveston, TX. March 7-8, 2014.

Rodriguez, R.E.*, D.W. Hicks, J.W. Tunnell, T.C. Shirley, P.J. Etnoyer, and E.L. Hickerson. Assessing deep-water coral assemblages inhabiting relict coral banks off the South Texas coast. The 43rd Annual Benthic Ecology Meeting. Jacksonville, FL. March 19-22, 2014.

Rodriguez, R.E.*, D.W. Hicks, J.W. Tunnell, T.C. Shirley, P.J. Etnoyer, and E.L. Hickerson. Deep-water coral assemblages of relict reefs off the south Texas coast. Texas Bays and Estuaries Meeting. Port Aransas, TX. April 23-24, 2014.

Rodriguez P.A., L. McIntosh, and A. Fierro-Cabo. Developing a mass-size relationship for *Melanoides tuberculata*, a potential ecological indicator for resacas. 16th Annual Research Symposium, University of Texas-Brownsville, Brownsville, TX. April 4, 2014.

Streich, M.K., M.J. Ajemian, and G.W. Stunz. Abundance and size structure of red snapper among natural and artificial habitats in the northwestern Gulf of Mexico. The Texas Chapter of the American Fisheries Society. Pottsboro, TX. 2014.

Tamez, C.*, and D.W. Hicks. Characterizing the ecological status of southernmost Texas

estuaries using benthic-based metrics. The 43rd Annual Benthic Ecology Meeting. Jacksonville, FL. March 19-22, 2014.

Tsorxe, I., O. Brempong, C. Thompson, J. Billa, S. Adzanu, M. Ankrah, and F.X. Han. Residential radon concentration study: Assessment of spring and summer radon concentration in rural Mississippi. Annual Meeting of the Health Physics Society. Baltimore, MD. July 2014.

Appendix 4. External Funding (Proposals Submitted and Ongoing)

Appendix 4a. External Funding (Ongoing Funding) (35)

Artificial reef monitoring and research program. Texas Parks and Wildlife Department. D. Hicks and C. Cintra Buenrostro. 2013-2015. \$449,986.00

Assessing potential post-spill benthic impacts from the Deepwater Horizon oil spill. NOAA/Industrial Economics Inc. P. Montagna (PI). 2013-2016. \$837,562.

Assessment and prioritization of Gulf of Mexico coastal ecosystems affected by alterations in freshwater inflow. U. S. Environmental Protection Agency. P. Montagna (PI). 2010-2014. \$210,680.

Broadening the “TEXANN” footprint in the Gulf of Mexico: Offshore fish tracking at an unprecedented scale. Fondren Foundation. G. Stunz (PI), M. Ajemian (Co-PI). \$50,000. Note: partner project with the below grant

Broadening the “TEXANN” footprint in the Gulf of Mexico: Offshore fish tracking at an unprecedented scale. Hamman Foundation. G. Stunz (PI). \$30,000. Note: partner project with the above grant

Coastal marine spatial planning; Task 2; Subtask 1: Data inventory, characterization, and compilation. Texas General Land Office. J. Gibeaut (PI). 2012-2014. \$271,436

Coastal remote sensing and geospatial analysis within the Georgia coastal ecosystems domain. National Science Foundation. J.F. Schalles (P.I.). In: LTER: Georgia Coastal Ecosystems-III. (Merryl Albert, Lead PI). December 1, 2012 - October 31, 2018. \$108,000 for subcontract to Creighton. \$5,000,000 total.

Deep sea ecosystem services; Workshop on relative valuation. Exxon Mobil Corporation. D. Yoskowitz (PI). 2013-2014. \$120,021.

Determination of season abundance and density of nekton species in/near Cedar Bayou pre- and post-opening. Aransas County. G. Stunz (PI), Zapp Sluis (Co-PI). \$153,184.

Development of radiochemistry education and research program at Jackson State University. Co PIs Yu, Z. and F.X Han. NRC-HQ-12-G-38-0038 Nuclear Regulatory Commission. July 2012- June 2015. \$213,087.

Dissolved oxygen monitoring and modeling of Oso Bay. City of Corpus Christi/Espey Consultants, Inc. P. Montagna (PI). 2013-2014. \$65,000.

Dolphin fish in GOM. Rotary Club of Corpus Christi Harvey Weil Sportsman Conservationist Award Trust. G. Stunz (PI). 2011-2014. \$10,000.

Ecological assessment of the Adriatic VII as an artificial reef. D. Hicks (PI). GlobalSantaFe Drilling Company. 2013-2014. \$145,000.00

Evaluation of ecosystem services. EPA. J. Gibeaut (PI). 2009- 2014. \$199,762.

GEMS/Restoration portal. Gulf of Mexico Foundation/NOAA. J. Gibeaut (PI). 2013-2014. \$39,996.

Gulf of Mexico Alliance – GRI. GRI Information and Data Center. J. Gibeaut (PI). 2013-2014; \$3,250,000.

Gulf of Mexico alliance regional ocean partnership administration and coordination. Gulf of Mexico Alliance/NOAA. EIA PIT 2013. J. Gibeaut (PI). 2013-2014. \$36,000.

Human impacts on the environment at high latitudes: Fate, effects and transport of contaminants near an Antarctica scientific base. U. S. Army DOD/Texas A&M Research Foundation. P. Montagna (PI). 2013-2014. \$54,690.

IEC Deepwater Horizon - Shoreline change assessment. Industrial Economics Inc. J. Gibeaut (PI). 2013-2014. \$212,442.

Integrated multi-scale study of climatic impacts on watershed and downstream coastal environments. NASA/University of Texas at Austin. P. Montagna (PI). 2011-2014. \$150,000.

Interagency agreement between: The University of Texas at Austin & TAMUCC/HRI. UT-Austin BEG. R. McLaughlin (PI). 2011-2014. \$4,500.

Invasive lionfish in Cuba. Lounsbery Foundation. W. Tunnell (PI). 2011-2014. \$75,000.

Jackson State University's Center of Excellence in Science, Technology, Engineering and Mathematics Education. U.S. Department of Defense. P. Tchounwou (PI). March 2011 – February 2015. \$3,920,396

Living with sea level rise in Texas. Houston Endowment and additional funding is being sought from other sources. \$790,000.

Microbenthic algal densities in the Duplin watershed. National Aeronautics and Space Administration - Nebraska Space Grant. J.F. Schalles (PI). September 2013 – May 2014. \$5,000.

Minimum flow and level analysis of benthic macrofauna in the Caloosahatchee estuary. South Florida Water Management District. P. Montagna (PI). 2013-2014. \$29,568.11

Modeling and analysis tools for nutrient dynamics in the Gulf of Mexico. NOAA award number NA11NOS0120024 via a subcontract from Texas A&M Research Foundation. P. Montagna (PI). Jun 2011 to May 2014. \$58,360.

MRI: Acquisition of elemental stable isotope chemistry (ESIC) mass spectrometer. National Science Foundation. G. Stunz (Co-PI), L. Cifuentes (PI), X. Hu (Co-PI), M. Wetz (Co-PI), and T. Naehr (Co-PI). \$419,259.

Mustang and North Padre Island beach maintenance impacts and recommendations for best management practices, funded under the Texas Coastal Erosion Planning and Response Act, J. Gibeaut PI \$60,000. Note: Includes support for student research.

Remote sensing of lakes in the Midwest and New England regions of the United States. National Environmental Research Council (United Kingdom). J.F. Schalles and A.A. Gilerson (Research Affiliates). Remote sensing of lakes in the Midwest and New England regions of the United States. In: (Andrew Tyler, Project Lead) Global Observatory of Lake Responses to Environmental Change (GloboLakes). October 1, 2012 – September 30, 2017.

Sharks with spectators: Real-time, global tracking of Texas marine apex predators for science, education, and outreach. Texas State Aquarium Wildlife, Conservation, and Research Fund. G. Stunz (PI), M. Ajemian (Co-PI). \$20,000.

South Texas artificial reef monitoring: Fish community assessment along the coastal bend. Texas Parks and Wildlife Department. G. Stunz (PI), M. Ajemian (Co-PI). \$604,928.

Strengthening the Environmental Science Ph.D. Program at Jackson State University U.S. Department of Education – Title III Program. P. Tchounwou (PI). October 2009 – September 2014. \$9,000,000.

Suspended sediment dynamics of shallow wind-driven estuaries: A remote sensing approach. NASA-Washington. J. Gibeaut (PI). FY 2014. \$30,000.

Why are black drum starving in Baffin Bay? An ecosystem-based approach. Coastal Bend Bays and Estuaries Program. G. Stunz (PI), J. Pollack (Co-PI), M. Ajemian (Co-PI), and M. Zapp Sluis (Co-PI). \$60,000.

Appendix 4b. External Funding (Newly funded during this reporting period) (8)

Assessing potential post-spill benthic impacts from the Deepwater Horizon oil spill National Oceanic and Atmospheric Administration via a subcontract from Industrial Economics, Inc. P.A. Montagna (PI). January 2014 – September 2014. \$523,981.

Developing next generation novel nanomaterials for cleaning up radionuclides, US Department of Energy. F. Han (PI). 2014. \$16,000.

Implementation of the iSnapper smartphone application to collect data across all recreational sectors in the Gulf of Mexico. National Oceanic and Atmospheric Administration – Marine Recreational Information Program. G. Stunz (PI), D. Yoskowitz (Co-PI). \$353,734.

Investigation of the relative habitat value of oil/gas platforms and natural banks in enhancing stock building of reef fish in the western Gulf of Mexico. National Oceanic and Atmospheric Administration – Marine Fisheries Initiative. G. Stunz (PI), M. Ajemian (Co-PI). \$242,299.

Minimizing discard mortality in Gulf of Mexico Red Snapper. National Oceanic and Atmospheric Administration – Bycatch Reduction Engineering Program. G. Stunz (PI), M. Ajemian (Co-PI). \$258,275.

Resaca Rangers: Establishing a school-based network to monitor ecosystem health of the Lower Rio Grande Valley resacas and estuaries. NOAA B-WET. A. Fierro Co-PI. July 2014-July 2016.

Strengthening STEM doctoral programs at Jackson State University. C. Meyers (PI), P. Tchounwou (Activity Director). U.S. Department of Education Title III Strengthening Historically Black Graduate Institutions (HBGI) Program. \$1,907,384 for year 1.

Texas Coastal Management Program Section 309 Assessment & Strategies Report 2016-2020. Texas General Land Office. Richard McLaughlin (PI). \$196,402.

Appendix 4c. External Funding (Submitted during this reporting period) (11, 2 with student authors)

A novel gastrointestinal model for assessment of bioavailability and bio-accessibility of heavy metals and trace elements on children's playgrounds. F. Han (PI). 2014. \$450,000. Submitted to NIH.

Collaborative research: An isotope fingerprinting study to assess the role of submarine groundwater discharge in driving coastal hypoxia. National Science Foundation. J. Cherrier (co-PI,) with R. Peterson (PI, CCU) et al. \$636,305 for 3.0 years. (1 mos summer)

Consortium for coastal ecosystem services and restoration science. Gulf of Mexico Research Initiative. J. Cherrier (participant,) with P. Leberg (PI, UL-Lafayette) et al. \$12,000,000 for 2.0 years. (2 mos summer)

Equipment support for emerging underwater research and technology program. D.W. Hicks. Submitted to Department of Defense, Army Research Office.

Gulf of Mexico Research Initiative: Assessing the vulnerabilities to oil spills and climate change for avian indicator species of two coastal habitats of the Northern Gulf of Mexico. Miguel Acevedo (PI). [Amount requested \$13,191.5 K; Period of Award January 1, 2015 – December 31, 2017; Proposal submitted June, 2014. In Review. Note: Creighton Subcontract to John Schalles, a Lead Co-PI and member of Executive Management Team for the project]

Integrated STEM experiences for all students through multidisciplinary research, innovation, education and engagement: A systemic multilevel transformation initiative. C. Meyers (PI), P. Tchounwou (Institutional Lead). \$3,947,188 for 4 years Submitted to U.S Department of Education.

Key plant-animal interactions for the natural propagation of sabal palm (*Sabal mexicana*) and the conservation of palm forests in Texas and Tamaulipas. A. Fierro (PI). Submitted to Caesar Kleberg Foundation for Wildlife Conservation.

Reducing discard mortality of red snapper in the Gulf of Mexico recreational fishery. G. Stunz (PI), J. Curtis* (Co-PI). \$30,000. Submitted to Texas Research and Development Fund.

REU Site: Environmental problems and solutions on the Gulf Coast (EPaS-GC). C.H. Jagoe (PI) and A. Chauhan (Co-PI). \$259,057 over 3 years. Submitted to National Science Foundation.

The Texas Barrier Reef: Awareness, exploration, and conservation of a Texas legacy. Hicks, D.W. and R.E. Rodriguez.* Submitted to Robert & Helen Kleberg Foundation.

Training of a diverse radiochemistry professionals at Jackson State University. F. Han (PI). \$473,593. Submitted to NRC.

Appendix 5. Abbreviations and links

ANERR Apalachicola National Estuarine Research Reserve

CSC - Cooperative Science Center

DSU-Delaware State University

EPP - Educational Partnership Program

ECSC - Environmental Cooperative Science Center

FAMU- Florida A&M University

GBNERR – Grand Bay National Estuarine Research Reserve

Florida CPALMS – Florida Department of Education’s platform for educators to Collaborate, Plan, Align, Learn, Motivate and Share

JSU – Jackson State University

MANERR – Mission-Aransas National Estuarine Research Reserve

TAMUCC – Texas A&M Corpus Christi

UTB – University of Texas Brownsville

Links

ECSC website <http://www.ecsc.famu.edu>

ECSC Environmental Science Summer Camp for high school and middle school students
<http://www.ecsc.famu.edu/camp2014/index.htm>