ECSC
Environmental Cooperative Science Center

Performance Report for Cooperative Agreement No: NA11SEC4810001

For the period from September 1, 2011-February 29 2012

Submitted By:

Florida Agricultural and Mechanical University (Lead Institution)

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

National Oceanic and Atmospheric Administration
Environmental Cooperative Science Center

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Executive Summary

This is the first semi-annual report for this cooperative agreement, which began on September 1 2011. During the reporting period, subcontracts were established between the partner institutions (Texas A&M Corpus Christi, Jackson State University, Delaware State University, Creighton University and the University of Texas-Brownsville) and the lead institution (Florida A&M University). During this reporting period,

- We developed and submitted a Strategic Plan, an Implementation Plan, a Science Plan, and a Student Development Plan, as required by the NOAA EPP. These were submitted to NOAA EPP for comments and approval. These will be revised as needed and implemented during the next reporting period.

- We developed and maintain a website, prepared recruiting materials, initiated an ongoing series of meetings and conference calls among the partners to plan and coordinate center activities, and established and advertised staff and postdoctoral positions that are funded by the current award.

- We recruited and provided support to graduate and undergraduate students at the participating institutions. These students are currently enrolled in classes and are developing research proposals and projects that address the NOAA and NOS missions and agency needs.

- We planned and organized the NOAA EPP Sixth Education and Science Forum at Florida A&M University on March 26-28 2012. This forum continues a series of biannual meetings that brings together faculty and students from all of the Cooperative Science Centers, as well as NOAA scientists and managers, CSC alumni now working for NOAA or in other environmentally-related careers, and others from the federal, state, and local science and policy community. Invited speakers for the present meeting included representatives from NOAA, the Gulf of Mexico Alliance, the Florida Department of Environmental Protection, the US Army Corps of Engineers, and several universities. Over 90 oral presentations and 90 posters were submitted.

I. Status of Award Tasks

A. Research and Training Activities

The ECSC has four core goals that are essential to its overall vision to provide a well-integrated framework for informing coastal resource management through integrated science that will balance societal demands and the preservation of sustainable GOM coastal ecosystems The four goals are to: *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 stressor,; 3) 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) Facilitate community education and outreach relating to the function and relevance of coastal ecosystems and the services they provide to society.* Of these four core goals, ECSC research and training activities focus on core goal #'s 1-3 and so performance metrics yearly deliverables are organized accordingly. Much progress was made during this reporting period toward achieving our year one deliverables. We developed and implemented an internal ECSC student tracker database to capture all progress students make as they matriculate through the ECSC training program. With input from our Technical Monitors and Advisory Council Chair we established and implemented a process that will greatly facilitate ECSC faculty/student/post doc exchange with NOAA scientists and staff. The ECSC Executive Committee has made great strides in working toward the establishment of both the ECSC Center Wide Certification Course (ECSC-CWCC) and we are on track with achieving our goal of having this fully implemented by the end of year 2. The Executive Committee has also made good progress in development of the ECSC webinar series. We will initiate trials this summer with the intention of having the seminar program in operation by the fall semester. Below we list the ECSC Core Goals 1-3 with aligned research and training performance metrics and progress for this reporting period toward Center wide year one deliverables (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.

<u>YEAR ONE PERFORMANCE METRICS AND DELIVERABLES</u>

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

Performance Measures Goal #1(Recruitment)

- 10% of the total number of students budgeted for the ECSC will have been recruited
  - A total of 22 students have been recruited into the program, well over 10% of the total number provided for in the budget.
- One of the three budgeted post-doctoral research associates will have been recruited and hired
  - Good progress has been made on this deliverable by the end of year one. The post-doc positions were advertised, and applications received. Committees have now been formed to review applications and select candidates for interviews.

- 10% of the total number of students recruited into the ECSC will participate in experiential opportunities in NOAA mission-relevant sciences
  - Good progress has been made toward achieving this deliverable. A proposal synopsis template for faculty led, student-centered research was developed for Center-wide use. These proposal synopses will be used for several purposes, including ensuring that all ECSC research is NOAA/NOS relevant, and that all ECSC students are provided with high quality experiential research opportunities. It is our intent and expectation that all ECSC faculty/student research will be represented by a proposal synopsis and by the end of year one at least 10% of ECSC students will be engaged accordingly.
- 10% of the total number of students recruited into the ECSC will be engaged in ECSC approved research activities
  - Good progress has also been made toward achieving this deliverable. The proposal synopsis template for faculty led, student-centered research discussed above will facilitate this performance measure. These synopses will be used for several purposes, one of which is to ensure that all student research is both ECSC and NOAA/NOS relevant.

Performance Measures Goal #1 (Training)

- Percentage of ECSC partner institutions where ECSC-relevant core STEM courses have been identified and integrated into ECSC student study plan
  - We are in the process of developing a matrix that lists all ECSC relevant STEM core courses at ECSC partner institutions. We are confident that we will be able to meet our goal of 100% of these classes as having been identified by the end of the one year reporting period.
- Integration of currently existing ECSC core-competency curriculum into a center-wide core competency (CWCC) certification short course will be 50% complete
  - The ECSC Executive Committee has been meeting monthly via teleconference calls as well as a face to face meeting in late March to discuss and plan the ECSC Center-Wide Core Competency Certification short course. We are making very good progress, and by the end of year one this ECSC CWCC course will be 50% complete, and complete and fully implemented by the end of year 2.
- Development and design of a monthly ECSC webinar series will be 50% complete
  - The ECSC Executive Committee has been meeting monthly via teleconference calls as well as face to face in late March to also discuss and plan the ECSC Webinar Series. We have come to consensus for the format for this webinar and will be hosting trials of it over the summer so that it can be fully implemented this fall.

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

Performance Measures

- 10% of the total number of students recruited into the ECSC will be assigned ECSC faculty advisors

- All students recruited into this new cooperative agreement have been assigned an ECSC advisor.

- 50% ECSC Post-Docs assigned ECSC faculty advisors
  - We are in the process of hiring ECSC postdocs. Once individuals have been hired and their interests and skills are known, they will be paired with a faculty advisor
- A NOAA specialist/scientist mentor will be identified for 10% of the total number of students recruited into the ECSC
  - Good progress has been made toward achieving this deliverable. Proposal synopses for faculty led, student-centered research will be developed and submitted Center-wide. These synopses will be used for several purposes, including to help identify a NOAA specialist/scientist mentor for each ECSC student.
- A NOAA specialist/scientist mentor will be identified for 50% of the of the ECSC post docs
  - We are in the process of hiring ECSC postdocs. Once hired, they will also develop a proposal synopsis and internal ECSC proposal. We will use these synopses to identify a NOAA specialist/scientist mentor for each ECSC post doc.
- 25% of the total ECSC faculty will have developed an ECSC approved research proposal (mandatory for ECSC funding)
  - Good progress has been made toward achieving this deliverable. The proposal synopses required center wide will ensure that all ECSC research is NOAA/NOS relevant. Once approved by both the ECSC Leadership Team and the NOAA ECSC Technical Monitors and Advisory Council, faculty will be required to develop complete proposals. We are currently in the process of revising our proposal guideline requirements, templates, and review guidelines for alignment with the goals and objectives of this new award. We fully expect that at least 25% of all ECSC faculty will have developed their respective research proposals by the end of year one.

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

- 5% of the total ECSC faculty will establish collaborations with ECSC regional observing partners, NERR and NMS scientists, and/or local and regional coastal managers

  As proposal synopses and full proposals are developed, effective collaborations with our regional observing partners, NERR and NMS scientists, and/or local and regional coastal managers will be identified. We are confident that we will be able to reach the goal of 5% by the end of year one
- 2 % ECSC faculty will present research findings at NOAA facilities

- We continue to work on this, but expect that by the end of the summer that at least 2% of the ECSC faculty will have presented their research at a NOAA facility.

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. However, each area maintains synergy with other focus areas in support 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

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.

> John Schalles, Drew Seminara and Jim Gibeaut met with researchers and administrators at the Mission-Aransas NERR (MANERR) in Texas to discuss relevant ecosystem characterization studies, mapping, and data management projects. John Schalles, Drew Seminara and Jim Gibeaut met in Corpus Christi in October to discuss objectives of the Ecosystem Characterization focus area.

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

> Worked with MANERR and ECSC team members to identify potential projects that require an interdisciplinary approach. John Schalles and Drew Seminara are working with Jennifer Cherrier to develop a vegetation classification with World View 2 imagery of coastal wetlands at Snipe Island, Florida and preparing for field survey work in April, 2012.

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.

> Working with the ECSC Executive Committee, we began developing ideas for topics to be covered and the logistics for various webinars or training workshops/courses.

4) Encouraging and assisting ESCS 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

Worked with ECSC student, Diana Del Angel, to write a manuscript for submission to Geomorphology based on here recently completed master's thesis on beach and dune dynamics.

Worked with ECSC student, Diana Del Angel, to prepare an abstract and presentation on her recently completed MS thesis involving beach and dune dynamics for the sixth annual EPP conference.

Worked with ECSC student, John Wood, to prepare an abstract and presentation for the sixth annual EPP conference.

Worked with ECSC student, John Wood, in preparing a portion of a book chapter on sea grass mapping, based in part on his Ph.D. dissertation research.

Worked with ECSC student, John Olley, in preparing and giving an oral talk on improved algorithms for predicting phytoplankton chlorophyll at the Ocean Sciences Meeting in Salt Lake City in February and in preparing a poster on his thesis research for the sixth annual EPP conference.

Ecological Processes

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

Curriculum review is currently underway at partner institutions, and we are planning a center wide core competency short course. We developed and submitted Science and Student Development plans to NOAA-EPP during this reporting period, and these plans detail specific goals, objectives, strategies and milestones for achieving this strategic objective.

2) Mentoring and assisting ECSC students to conduct research in areas relevant to NOAAs interest in healthy, sustainable coastal ecosystems

Ecological processes faculty and students are preparing research synopses to focus their research and align their work with NOAA goals and needs. As these are submitted and approved, specific projects can be identified and their alignment with NOAAs mission can be demonstrated. In addition, faculty in this focus area have applied for or secured additional leveraged external funding for NOAA mission relevant areas, including marine pollution, ocean acidification, an coastal management issues, 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

Several student projects are underway or in planning phases that will involve our NERR partners at Apalachicola, Grand Bay and Mission-Aransas, as well as the Flower Garden Banks National Marine Sanctuary. Scientists at various NOAA centers, including the Hollings Lab and NCCOS, have been contacted about serving on student committees. Greater details on these will be included in the next semiannual report, after reseach synopses have been submitted and approved, and as full proposals are developed.

4) Developing content for a certification 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

The ECSC Executive Committee has met monthly via teleconference calls, with a face to face meeting in late March to discuss and plan the ECSC Center-Wide Core Competency Certification short course. These meetings have also included discussions and plans for the ECSC Webinar Series. We have come to consensus about the format for this webinar, and will test software and videoconferencing capabilities for this purpose over the summer so that it can be fully implemented this fall.

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 presented papers at several meetings, including the Ocean Sciences meeting in February 2012, the Coastal and Estuarine research Foundation Meeting in November 2011, and the American Fisheries Society Meeting in 2011, as listed in Appendix 3. Because this is the first reporting period for this cooperative agreement, we do not yet have publications submitted from any of the newly recruited students, but anticipate progress in this area in future reports.

Forecasting and Modeling

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

Students have taken one course in Experimental Design and will take a course in Natural Systems Modeling. Began working with the ECSC Executive committee to develop an outline for dedicated workshops and intensive courses to provide this training.

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

Two students have been recruited. We are developing study plans and will then recruit NOAA scientists to serve on committees.

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

Members of this focus area began working with the ECSC Executive committee to develop an outline for dedicated workshops and intensive courses to provide this training.

4) Encouraging and assisting ESCS 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

Work in this strategic objective is in progress**.**

Social and Economic Processes

1) Providing students with additional 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 the ECSC Executive committee we have begun to develop an outline for the dedicated workshops and intensive courses. Potential activities include survey simulations and ecosystems services valuation exercises.

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

Two meetings have taken place with the Mission Aransas NERR to discuss research and outreach opportunities in the human dimensions. Once the coordinator is on staff at MANERR we will begin to target specific opportunities.

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

Human dimension focused students presented at the EPP Forum in March 2012. The results of this research are currently being developed into a manuscript for publication.

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

This is currently in progress.

Policy and Decision Tools

1) 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

Through participation in Executive Committee meetings and other less formal meetings, Professors Abrams and Abate have developed a plan for "Policy and Decision Tools" curriculum that will become part of the Short course for all program student participants and will likely be one of the core competencies. They also have compiled plans to begin FAMU College of Law student participation. Starting in Summer 2012 students will work on an hourly basis in the program undertaking legal research activities in support of the Short Course materials in the Summer of 2012. Beginning in Fall 2012 and thereafter, the Decision and Policy Tools, two students will join the program on a sponsored student research basis (undergraduate level funding).

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

Efforts to further integrate the policy and decision tools components into the larger ECSC-NOAA collaboration are being explored. These discussions within the ECSC and with other stakeholders will influence the longer term deliverables that the Policy and Decision Tools effort will provide to the program.

3) 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

Through participation in Executive Committee meetings and other less formal meetings, Professors Abrams and Abate have developed a plan for "Policy and Decision Tools" curriculum that will become part of the Short course for all program student participants and will likely be one of the core competencies. They also have compiled plans to begin FAMU College of Law student participation. Starting in Summer 2012 students will work on an hourly basis in the program undertaking legal research activities in support of the Short Course materials in the Summer of 2012. Beginning in Fall 2012 and thereafter, the Decision and Policy Tools, two students will join the program on a sponsored student research basis (undergraduate level funding).

4) 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

In addition to the Short Course materials, the areas already being targeted for work include:

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

C. Preparation and Planning for the 2012 NOAA-EPP Forum

The 6th NOAA Educational Partnership Program was planned for Mar 26-28 2012, hosted by the Environmental Cooperative Science Center at Florida A&M University, Tallahassee FL. Planning and preparation for this forum occurred during this award period. Activities included logistics for the forum venues on the Florida A&M campus, as well as hotel, audiovisual, catering and other arrangements. A website was established, and abstracts were solicited from all EPP Cooperative Science Center faculty and students, as well as NOAA partners. Distinguished speakers were identified and invited for plenary and technical sessions.

A major activity was the organization and planning of the technical sessions, including selecting submitted abstracts for oral and poster presentations. The intent was to maintain a student-centered focus for the meting while also showcasing relevant faculty and NOAA research and training efforts. To this end, the ECSC organizers organized the technical sessions into 4 thematic areas, based on the next-generation NOAA strategic plan. The thematic areas were 1) Healthy Oceans, 2) Weather Ready Nation, 3) Climate Adaptation and Mitigation, and 4) Resilient Coastal Communities and Economies. J. Cherrier (ECSC DD) and J. Tunnell (TAMU-CC ECSC PI) took the lead in organizing the technical sessions for the forum. These chairpersons were assisted by the NOAA EPP office, Bernadette Kelley (ECSC E&O Lead), Charles Jagoe (ECSC DS), ECSC focus area leads, CSC leadership from other centers and ECSC staff. Initial efforts focused on planning how to organize all sessions to ensure integration between CSC's research activities as well as E&O activities. Next, an abstract solicitation and submission procedures were developed, and the website was modified to include instructions for abstract preparation and submittal. Guidelines for abstract review and assignment were developed, and committees established to perform the reviews for each of the focus areas. These committees reviewed and assigned of all submitted abstracts into each technical session thematic areas, and identified who would chair/preside over each of thematic technical sessions.

D. Preparation of Management Plans

Another major activity during this reporting period was the preparation and submission of several management plans to NOAA-EPP as required as a condition of this new award. ECSC leadership prepared and submitted 1) Strategic Plan, 2) Implementation Plan, 3) Science Plan, and 4) Student Development Plan. Each details objectives, strategies, methods, goals, and milestones for various aspects of the ECSC. These were reviewed by NOAA, and comments returned after the end of this reporting period. These are currently in revision and the final versions will be discussed in the next semi-annual report.

Appendix 1. Students Recruited and Supported

Last Name	First Name	Institution	Degree Objective
Connally	Patrick	FAMU	MS
Caldwell	Jason	FAMU	PhD
Milton	Ashley	FAMU	PhD
Pree	Krystal	FAMU	PhD
Sibble	Daryl	FAMU	PhD
Tucker	Kimberly	FAMU	PhD
Morris	Jolvan	FAMU	PhD
Taylor	Angelique	FAMU	BS
Curtis	Judson	TAMU-CC	PhD
Del Angel	Diana	TAMU-CC	MS
Hutchison	Lauren	TAMU-CC	PhD
Nash	Harriet	TAMU-CC	PhD
Pillado	Maria	TAMU-CC	MS
Wood	John	TAMU-CC	PhD
McComb	Jacqueline	JSU	PhD
Clark	Shelton	JSU	PhD
Olley	John	Creighton	MS
Tamez	Claudia	UT-B	MS
Marquez	Mario	UT-B	MS
Martinez	Crystal	UT-B	MS
Montemayor	Isidro	UT-B	BS
Camarillo	Samuel	UT-B	BS

Appendix 2. Publications

Abate R.S., 2011 A Tale of Two Carbon Sinks: Can Forest Carbon Management Serve as a Framework to Implement Ocean Iron Fertilization as a Climate Change Treaty Compliance Mechanism?, 1 Seattle J. Environ. L. 1

Abrams, Robert H., 2012. Water, Climate Change, and the Law: Integrated Eastern States Water Management Founded on a New Cooperative Federalism, 42 Environmental Law Reporter 10433

Abrams, Robert H., *Legal Convergence of East and West in Contemporary American Water Law*, 42 Environmental Law, 42 Environmental Law 65

Apeti, D.A., Y. Kim and G.G. Lauenstein. 2011. Occurrence of disease and parasites in oysters from the Chesapeake Bay: NOAA Mussel Watch Program. Chapter 10. In: Mason, A.L., D. Apeti, and D. Whitall (eds.), National Centers for Coastal Ocean Science (NCCOS) Research Highlights in the Chesapeake Bay. NOAA Technical Memorandum NOS NCCOS 128, National Ocean Service, National Centers for Coastal Ocean Science, Silver Spring, MD. pp. 83-96.

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

Cameron* KS, Buchner V and Tchounwou PB. 2011. Exploring the molecular mechanisms of nickel-induced genotoxicity and carcinogenicity: a literature review. Rev Environ Health, 6(2): 81-92.

Chen, J., F.X. Han, F. Wang, H. Zhang, and Z. Shi. 2012. Accumulation and phytotoxicity of microcystin-LR in rice (Oryza sativa). Ecotoxicology and Environmental Safety. 76: 193–199.

*Coopersmith, E. J., B. Minsker, and P. Montagna. 2011. Understanding and forecasting hypoxia using machine learning algorithms. *Journal of Hydroinformatics* 13:64 80. DOI:10.2166/hydro.2010.040.

Dash, P., Walker, N., Mishra, D., Hu, C., Pinckney, J., and D'Sa, E. 2011. Estimation of cyanobacterial pigments in a freshwater lake using OCM satellite data, *Remote Sensing of Environment*, 115, 12, 3409-3423.

Evans*, E.D., Anjaneyulu Y., and P.B. Tchounwou. 2012. Effects of hurricane Katrina on land cover within the Grand Bay National Estuarine Research Reserve in Mississippi, USA. Chapter 6 in: Environmental and Food Safety and Security for South Eastern Europe and Ukraine. NATO Science for Peace and Security Series C. Environmental Security. Vitale (Ed). ISBN 978-94-007-2952-0. Springer Science BV. Dordrecht, Netherland. pp 173-188.

Ford, S.E., J. Paterno, E. Scarpa, N.A. Stokes, Y. Kim, E.N. Powell and D. Bushek. 2011. Widespread survey finds no evidence of *Haplosporidium nelsoni* (MSX) in Gulf of Mexico oysters. Diseases of Aquatic Organisms 93:251-256.

Froeschke, J., and G. W. Stunz. 2012. Hierarchical and interactive habitat selection in response to abiotic and biotic factors: The effect of hypoxia on habitat selection of juvenile estuarine fishes. Environmental Biology of Fishes 93:31-41.

Garmendia, L., M. Soto, U. Vicario, Y. Kim, M. P. Cajaraville and I. Marigómez. 2011. Application of a battery of biomarkers in mussel digestive gland to assess long-term effects of the *Prestige* oil spill in Galicia and Bay of Biscay: Tissue-level biomarkers and histopathology. Journal of Environmental Monitoring 13:915–932.

Han, F.X., Y. Su, Z. Shi, Y. Xia, W. Tian, V. Philips, D.L. Monts. 2012. Mercury distribution and speciation in floodplain soils and uptake into native earthworms (Diplocardia spp.). *Geoderma* 170: 261–268.

Heckscher, C. M. 2010. Delaware Photuris fireflies (Coleoptera: Lampyridae): New state records, conservation status, and habitat associations. Entomological News 121:498-505. *[Although date is 2010 it was published in 2012*

Kelly, J., F.X. Han, Y. Su, Z. Shi, Y. Xia, V. Philips, D.L. Monts. 2012. Rapid determination of mercury in contaminated soil and plant samples using Hg Direct Analyzer without sample preparation, A comparative study. *Water Air and Soil Pollution* (in press).

Khodaverdiloo, H., M. Rahmanian, S. Rezapour, S.G. Dashtaki, H. Hadi, and F.X. Han. 2012. Effect of Wetting-Drying Cycles on Redistribution of Lead in Some Semi-Arid Zone Soils Spiked with a Lead Salt. Pedosphere 22(3): 304: 313.

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

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Montagna, P., G. Ward, and B. Vaughan. 2011. The importance of freshwater inflows to Texas estuaries. In: Griffin, R.C. (ed.), Water Policy in *Texas: Responding to the Rise of Scarcity*, The RFF Press, Washington, D.C. pp. 107-127.

Odewumi, CO, Buggs R, Badisa VL, Latinwo LM, Badisa RB, Ikediobi CO, Darling-Reed SF, and Owens MA. 2011. Mitigative action of monoisoamyl-2,3-dimercaptosuccinate (MiADMS) against cadmium-induced damage in cultured rat normal liver cells," *Toxicology In Vitro.* 25(8):1733-1739.

Owens, M.A. 2011. I Am, Because We Are; and Since We Are, Therefore I Am. *in* Carmichael, C. Hoekenga, A. Riggs, J. Phillips (Eds.) National Council of Churches EcoJustice Program, Washington DC.

Owens, M.A. 2011. African Americans and Community Engagement in Higher Education: Community Service, Service-Learning, and Community-Based Research, *Teaching Theology and Religion* 14(2), 192-194.

Palmer, T. A., P. A. Montagna, J. B. Pollack, R. D. Kalke, and H. R. DeYoe. 2011. The role of freshwater inflow in lagoons, rivers, and bays. *Hydrobiologia* 667: 49-67. DOI: 10.1007/s10750-011-0637-0

Pollack, J. B., T. A. Palmer, and P. A. Montagna. 2011. Long-term trends in the response of benthic macrofauna to climate variability in the Lavaca-Colorado Estuary, Texas. Marine Ecology Progress Series 436: 67–80. doi:10.3354/meps09267

Pollack, J. B., H. -C. Kim, *E. K. Morgan, and P. A. Montagna. 2011. Role of flood disturbance in natural oyster (*Crassostrea virginica*) population maintenance in an estuary in South Texas, USA. *Estuaries and Coasts* 34:187–197. DOI 10.1007/s12237-010-9338-6

Powell, E.N., J. Morson, K.A. Ashton-Alcox and Y. Kim. Accommodation of the sex ratio in eastern oysters (*Crassostrea virginica*) to variation in growth and mortality across the estuarine salinity gradient in Delaware Bay. Journal of the Marine Biological Association of the United Kingdom (JMBA-11-11-OA-0329). *In Press.*

Santos, C.P., C. Carollo, and D.W. Yoskowitz, 2012. Gulf of Mexico Ecosystem Service Valuation Database (GecoServ): Gathering ecosystem services valuation studies to promote their inclusion in the decision-making process. Marine Policy. *In Press*.

Tunnell, J.W., Jr., and G.F. Crozier. 2011 (dated 2010, released 12/2011). Foreword – Gulf of Mexico Marine Labs. *Gulf of Mexico Science*, Special Edition – Gulf of Mexico Marine Labs 23 (1&2):1-4.

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Tunnell, J.W., Jr. 2011 (dated 2010, released 2011). History of the Harte Research Institute for Gulf of Mexico Studies at Texas A&M University-Corpus Christi. Gulf of Mexico Science, Special Edition – Gulf of Mexico Marine Labs 23 (1&2):56-70.

Tunnell, J.W., Jr. 2011 (dated 2010, released 12/2011). “Windows on the Sea” Southern Association of Marine Laboratories: The First 25 Years. Gulf of Mexico Science, Special Edition – Gulf of Mexico Marine Labs 23 (1&2):230-235.

Wang Y, Aker* WG, Hwang HM, Yedjou CG, Yu H, Tchounwou PB. 2011. A study of the mechanism of in vitro cytotoxicity of metal oxide nanoparticles using catfish primary hepatocytes and human HepG2 cells. Sci Total Environ. 409(22):4753-62.

Appendix 3. Presentations

Abate, R.S. 2011. Human Rights and the Environment panel, Second Annual Environmental Law and Justice Symposium, FAMU College of Law, November 11-12, 2011, Orlando FL.

Abrams, R.H. 2012. Water Law: East Meets West, American Bar Association 30th Annual Water Resources Conference, February 24, 2012, San Diego, CA

Abrams, R.H. 2012. Legal Convergence in Water Law, 2012 Water Law Update, Barry University School of Law, January 13, 2012, Orlando, FL

Abrams, R.H. 2011. Hydrofracking Impacts on Water Resources, University of Toledo, School of Law, November 4, 2011, Toledo, OH

Abrams, R.H. 2011. Water Law East and West: A 21st Century Perspective, Lewis & Clark Law School, October 7, 2011, Portland OR

Abrams, R.H. 2011. Delaware River Basin Commission 50th Anniversary, October 19, 2011, Delaware River Water Gap, PA

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

*Curtis, J. M., G. W. Stunz, M. W. Johnson, and S. L. Diamond. 2011. Quantifying Delayed Post-Release Mortality in the Gulf of Mexico Recreational Red Snapper Fishery Using Acoustic Telemetry. American Fisheries Society 141st Annual Meeting. Seattle, WA.

*Curtis, J. M., G. W. Stunz, M. W. Johnson, and S. L. Diamond. 2012. Estimating delayed mortality of red snapper discards using acoustic telemetry. Southern Division of the American Fisheries Society. Biloxi, MS.

*Curtis, J. M., G. W. Stunz, M. W. Johnson, and S. L. Diamond. 2012. Quantifying delayed post-release mortality in the Gulf of Mexico recreational red snapper fishery using acoustic telemetry. Texas Chapter of the American Fisheries Society 37th Annual Meeting. Galveston, TX.

Dash, P.. 2011. Atmospheric Correction, Vicarious Calibration and Development of Algorithms for Quantifying Cyanobacterial Blooms from Oceansat-1 OCM Satellite Data. AGU Fall Meeting, San Francisco, CA, Dec 2011

Han F.X. 2011. Biogeochemistry of mercury in floodplain soils of Oak Ridge, Tennessee (USA) and uptake into native earthworms. 2011. Eighth International Symposium on Recent Advances in Environmental Health Research, Jackson, MS. Sept 2011

Han F.X., Y. Su, Y. Xia, V. Philips, D.L. Monts. 2012. Biogeochemistry of Mercury in the Ecosystem of Oak Ridge, TN (USA). Mississippi Academy of Science Annual Meeting. Hattiesburg, MS.

Han. F.X. 2012. Global Environmental Challenges: Global Warming, Energy and Bioenergy, and Mercury Pollution, Bridge to the Doctorate Students, Jackson State University.

Heckscher, C. M. Delaware's wetland fireflies in the genus Photuris (Coleoptera). Delaware Wetlands Conference. Dover, Delaware. January 2012.

*Hutchison, L., P. Montagna, and D. Scholz. 2011. Stakeholder perceptions of ecosystem services of coastal habitats. Coastal and Estuarine Research Federation Biennial Conference. Daytona Beach, FL, November 2011

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

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

Kishinhi* SS, Tchounwou PB, Farah IO and Lukasik J. Molecular Approach to Microbiological Examination of Water in the Grand Bay National Estuarine Research Reserve (NERR) in Mississippi. Eighth International Symposium on Recent Advances in Environmental Health Research, Jackson, MS. Sept 2011

McLaughlin, R. 2011. Summary of State of the Gulf Summit. Coastal Bend and Bays Foundation Speakers Forum. Corpus Christi, TX. *Invited speaker*.

McLaughlin, R. 2011. International Cooperation in Managing Offshore Hydrocarbons in the Gulf of Mexico. State of the Gulf Summit. Houston, TX.

McLaughlin, R. 2011. The Importance of the Clean Water Act, NRDA and Other Legislative Initiatives for Ecosystem Restoration in the Gulf. State of the Gulf Summit. Houston, TX. *Moderator*.

McLaughlin, R. 2011. Living Shorelines in Texas. Coastal and Estuarine Research Federation Biennial Conference. Daytona Beach, FL, November 2011

McLaughlin, R. 2011. Oil Drilling Policy: Reducing the Risk and Impact of Future Spills. Pew Fellows Program in Marine Conservation Annual Meeting. Key Largo, Florida. *Invited speaker*.

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

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

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

Moretzsohn, F., J. Brenner, P. Michaud, J.W. Tunnell, Jr., and T. Shirley. 2011. Gulf of Mexico biodiversity inventory and beyond. World Congress on Marine Biodiversity 2011. Aberdeen, Scotland. September, 2011.

Moretzsohn, F., J.W. Tunnell, Jr., and L. McKinney. 2011. Biodiversity baseline and the Deepwater Horizon Oil Spill. SOST Deepwater Horizon Oil Spill Principal Investigator One Year Update Workshop. St. Petersburg, Florida. October, 2011.

Owens, M.A. Connecting Knowledge, Belief, Values and Action: Informing Climate Literacy by Using Autobiographies to Articulate Environmental Worldviews, American Geophysical Union, San Francisco, CA. December 2011.

*Nash, H.L., J.W. Tunnell, Jr., and S. Furiness. 2012. Biological contributions of South Texas Banks to Gulf of Mexico Large Marine Ecosystem, Subtropical Biology Conference. Edinburg, Texas. January, 2012.

Neely, R. and M.A. Owens. Bahamians and Climate Change: An Analysis of Risk Perception and Climate Change Literacy. American Geophysical Union, San Francisco, CA. December 2011.

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

Schalles, J., J. Olley, C. Hladik, J. O'Donnell. Comparing algal chlorophyll spatial patterns within and between Gulf and East Coast National Estuarine research reserves. Coastal and Estuarine Research Federation Biannual Meeting, Daytona Beach FL, November 2011.

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

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

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

Stunz, G. W., J. T. Froeschke, M. M. Reese Robillard, P. A. Montagna, and J. Beseres Pollack. 2011. Dewatering of estuaries: Nekton respond to alterations in freshwater inflow. Coastal and Estuarine Research Federation Biannual Meeting, Daytona Beach FL, November 2011

Yoskowitz, D.W. 2011. A Healthy Gulf Economy for the 21st Century. Summit 2011: State of the Gulf of Mexico. Houston, TX.

Yoskowitz, D.W., C. Carollo, J. Beseres-Pollack, and C. Santos. 2011. Sea level rise and changing ecosystem services provided by marsh in Galveston Bay, Texas" Coastal and Estuarine Research Federation Biennial Conference. Daytona Beach, FL. November 2011

Yoskowitz, D.W. 2011. Science to Inform Ecosystem Restoration in the Gulf of Mexico and Beyond, sponsored by COMPASS and Consortium for Ocean Leadership. Washington, D. C.

Appendix 4. External Funding (Proposals Submitted and Ongoing)

Kim Y. Health survey of Mississippi Oysters. Mississippi Department of Marine Resources. Amount: $153,408. 2012 (submitted).

Kim Y**.** Investigating the Environmental Fate and Health Impact of Deep Horizon Oil Spill in Mississippi Coastal Areas. Mississippi Alabama Sea Grant Consortium. Amount: $229,666. (submitted).

Kim Y. NOAA National Status and Trends Mussel Watch Project Contract (2012 to 2014) as a subcontractor for histopathology analysis. Eric Powell (PI) and Yungkul Kim. (submitted).

Walker, N., *Dash, P., Bargu, S., and D'Sa, E. Rapid detection of cyanobacterial blooms using near real-time satellite data in an urban oligohaline estuary, Lake Pontchartrain, Louisiana, NOAA Amount: $651,067 (submitted).

Chauhan, A., Jagoe, C.H. , White, J.R and J. Hall-Spencer. Ocean Acidification: understanding effects of high CO_2-low pH conditions on microbially-mediated food web processes using a

submarine vent system as a proxy for future oceans. $ 1,493,239 (2012-2016) National Science Foundation (submitted).

Ecosystem Services Provided by Gulf of Mexico Habitats: Tools, Valuation, and Application. Gulf of Mexico Sea Grant Consortium. Co-PIs: D. Yoskowitz (HRI), C. Carollo (HRI), J. Ritchie (NGI), A. Krupnick (RFF), J. Cebrian (DISL), J. Fourqurean (FIU), J. Pollack (TAMUCC), J. Gibeaut (HRI), P. Montagna (HRI), and S. Nanez-James (GMF). 2012 to 2014. $648,000 (submitted).

Gulf of Mexico Ecosystem Report Card Framework. EPA Gulf of Mexico Program. CO-PIs: L.D. McKinney (HRI) and J.W. Tunnell (HRI). 1 January 2012 to 31 December 2012. $305,394.00 (submitted).

Gulf of Mexico Ecosystem Health Report Card (Ecosystem Workshop grant). Walton Family Foundation. Co-PIs: L.D. McKinney (HRI) and J.W. Tunnell (HRI). April to December 2012. $250,000 (submitted).

Gulf of Mexico Ecosystem Health Report Card (Implementation grant). Walton Family Foundation. Co-PIs: L.D. McKinney (HRI) and J.W. Tunnell (HRI). 2012 to 2015. $3,254,164.00 (submitted).

Movement and population connectivity of fishes across estuarine seascapes. NOAA – Sea Grant. Co-PIs: J. Rooker (TAMUG) and G. Stunz (HRI). Feb 2012 to Jan 2014. $308,588.

Stakeholders and Participatory Parties in the Gulf of Mexico and A Healthy Gulf and a Healthy Economy. Shell Exploration and Production. Co-PIs: D. Yoskowitz (HRI) and C. Leon (CONABIO). 2012. $166,000.

South Texas artificial reef monitoring: Fish community assessment. Texas Parks and Wildlife Department. PI: G. Stunz (HRI). Sept 2011 to Aug 2013. $442,356.

Supporting Coral Reef Ecosystem Resilience in the Wider Caribbean via a Community-based Network of Marine Reserves at Reef Fish Spawning Aggregation Sites. NOAA. Co-PIs: W. Heyman, R. McLaughlin (HRI), and S. Kobara. 1 October 2012 to 1 September 2014. $299,022 requested (final proposal submitted 14 Feb 2012, rejected 22 March 2012).

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. PI: P. A. Montagna (HRI). Jun 2011 to May 2014. $58,360.

Macrobenthos Monitoring in Mid-Coastal Estuaries – 2012. Texas Water Development Board. PI: P. A. Montagna (HRI). Jan 2012 to Dec 2012. $30,000.
Status and Trends in the Corpus Christi Bay Area – Phase 2: Data Analysis. Coastal Bend Bays & Estuaries Program, Project 1105. PI: P. A. Montagna (HRI). Oct 2011 to August 2012. $40,000.00.

Integrated Multi-scale Study of Climatic Impacts on Watershed and Downstream Coastal Environments. Estuary Modeling Component, Funded by National Aeronautics & Space Administration Award Number, NNX11AE42G via a subcontract from the University of Texas at Austin award UTA11-000400. PI: P. A. Montagna (HRI). Jun 2011 to May 2012. $50,000.

Acute effect of oil on northern Gulf of Mexico reef communities. Florida Institute of Oceanography/BP. Co-PIs: W. Patterson (UWF) and Jagoe C. (FAMU) $167,376 (2010-2012)

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

Tracing the intrusion of the GOM-2010 oil spill on coastal and marine food webs using radiocarbon and stable isotopes. Co-PIs: J. Cherrier with J.P. Chanton (FSU), L. Chasar (USGS), and K. Craig (FSU). Florida Institute of Oceanography/BP. $297,258 (2010-2012)

Impacts from MC252 oil on ecologically and commercially important plankton of the Gulf of Mexico. Florida Institute of Oceanography/BP. Co-PIs: D. Rumbold (FGCU) and Jagoe, C. (FAMU). $ 350,779 (2010-2012)