

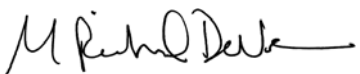


DESIGNING A MULTI-STATE AND REGIONAL FRAMEWORK FOR CMSP AND
DECISION-MAKING: A SOUTH ATLANTIC ALLIANCE INITIATIVE


PHASE 1

This cooperative agreement proposal is submitted to the NOAA Coastal Service Center in response to the
Funding Opportunity Title: NOAA Regional Ocean Partnership Funding Program –
FY2011 Funding Competition – Focus Area 1
Opportunity Number: NOAA-NOS-CSC-2011-2002721

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January 1, 2012 to June 30, 2013

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PROJECT SUMMARY

Project Name/Title: Designing a Multi-State and Regional Framework for CMSP and Decision-Making: A South Atlantic Alliance Initiative – Phase 1

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Project Summary: The goal of this revised South Atlantic Alliance (Alliance) effort is to initiate work on the development of a multi-state and regional framework for coastal and marine spatial planning (CMSP) in the Southeast U.S. through the development of relevant decision-support tools based on Alliance Action Plan priorities in multi-use ocean planning and hazards planning and (2) distribution of regionally compatible and relevant spatial information and data to support multi-scale coastal and ocean management decision-making. Our original proposal included six project components; however, given reduced funding and time, our revised proposal now focuses on the following two of the original six:

1. Build the Regional Information Management System (IMS) portal to support Coastal Marine Spatial Planning & other information management needs of the SAA. This component includes the initiation of work on the following:
 - a. Identification of state and regional data, planning tools, and technology requirements of resource managers and assess products and tools for CMSP and decision-making,
 - b. Development of a multi-state and regional, multi-scale information management framework for coastal and marine spatial planning, and
 - c. Identification, development, assessment, and access to spatial decision-support tools for addressing priority multi-scale, multi-sectoral coastal and ocean planning needs.
2. Develop and apply a new digital geospatial analysis tool for performing a consistent regional evaluation of vulnerability to coastal hazards.

Partners: The diverse composition of the project team demonstrates the commitment to coordinate across governmental, academic, and non-governmental communities. In addition to the partnerships that will cut across project components, significant and extensive partnerships have been (and will continue to be) developed for each component.

Proposed Funding: Project Period = January 1, 2012 to June 30, 2013; Funding Request = **\$784,431**

DESIGNING A MULTI-STATE AND REGIONAL FRAMEWORK FOR CMSP AND DECISION-MAKING: A SOUTH ATLANTIC ALLIANCE INITIATIVE - PHASE 1

GOALS AND OBJECTIVES

The goal of this South Atlantic Alliance effort is to:

Initiate work on the development of a multi-state and regional framework for coastal and marine spatial planning in the southeastern U.S. through the (1) development of relevant decision-support tools based on South Atlantic Alliance Action Plan priorities in multi-use ocean planning and hazards planning and (2) distribution of regionally compatible and relevant spatial data and information to support multi-scale coastal and ocean management decision-making.

The Alliance originally identified the following six primary program components to meet this goal over a proposed two-year period:

1. Identify state and regional data, planning tools, and technology requirements of coastal and ocean resource managers and assess products and tools from Objectives 2 through 6 for their utility in CMSP and multi-scale coastal and ocean resource decision-making.
2. Develop a multi-state and regional, multi-scale information management framework for coastal and marine spatial planning.
3. Develop and apply a new digital geospatial analysis tool for performing a consistent regional evaluation of vulnerability to coastal hazards.
4. Establish and include in the CMSP framework a water quality metadata database of the southeast U.S. region to support landscape-scale conservation planning.
5. Provide spatial habitat mapping, modeling, and satellite derived oceanographic data in support of ecosystem-based fisheries management.
6. Identify, develop, assess and provide access to spatial decision-support tools for addressing priority multi-scale, multi-sectoral coastal and ocean planning needs.

The revised budget and reduced time-frame has required the Alliance to focus its efforts over the 18-month period on the following components:

1. Build the Regional Information Management System (IMS) portal to support Coastal Marine Spatial Planning & other information management needs of the SAA. This component includes the initiation of work on the following:
 - a. Identification of state and regional data, planning tools, and technology requirements of resource managers and assess products and tools for CMSP and decision-making,
 - b. Development of a multi-state and regional, multi-scale information management framework for coastal and marine spatial planning, and
 - c. Identification, development, assessment, and access to spatial decision-support tools for addressing priority multi-scale, multi-sectoral coastal and ocean planning needs.
2. Develop and apply a new digital geospatial analysis tool for performing a consistent regional evaluation of vulnerability to coastal hazards.

It should be noted that the South Atlantic Alliance leadership has made a commitment to seek alternate sources of funding to support, at least in part, the work that was originally proposed to be performed under Components 4 (water quality metadata database) and 5 (spatial fisheries habitat mapping).

BACKGROUND AND PURPOSE

The South Atlantic Alliance

The goal of the South Atlantic Alliance (Alliance) is to promote collaboration on coastal and ocean issues among the states of North Carolina, South Carolina, Georgia and Florida, and with the support and interaction of federal agencies, academe, regional organizations, non-governmental organizations, and the private sector, sustain and enhance the region's coastal and marine resources. The Alliance is poised to regionally implement science-based actions and policies that balance coastal and marine ecosystems capacities to support both human and natural systems, as put forth by the Governors of the four states in their Partnership Agreement (<http://www.southatlanticalliance.org/agreement.htm>).

The Alliance's Framework document (<http://www.southatlanticalliance.org/docs/framework.htm>) specifies four initial Priority Issue Areas and broad goals approved by the Governors as being of concern to all four states: (1) Healthy Ecosystems; (2) Working Waterfronts; (3) Clean Coastal and Ocean Waters; and (4) Disaster-Resilient Communities. These four Priority Issue Areas form the basis for the Alliance Action Plan (http://www.southatlanticalliance.org/docs/Action_Plan.pdf), which identifies specific issues, objectives, and strategies to make progress towards fulfilling the Alliance Mission.

The Alliance Proposal: Responding to State, Regional and National Needs

The Alliance has worked to develop a proposal that will provide the basis for local, state, and regional coastal and marine spatial planning (CMSP) efforts. The original proposal had its initial focus on four priority area issues identified by the Alliance to meet both its priorities and those of NOAA for CMSP – multi-sector ocean planning, coastal vulnerability, water quality, and fisheries; this revised proposal will focus on the first two issues. Our long-term goal to focus attention on both decision-maker engagement and the development and distribution of technical products that can be used to support resource management efforts at multiple scales. Ultimately, these products will include: (a) regional data standards; (b) data sets, databases, and associated metadata; (c) spatial data layers; and (d) decision-support tools. In addition to evaluation, refinement, and development of specific products, the Alliance team will work towards the development of a framework for information distribution, including use of a regional web portal.

Recognizing the Relationships between Local, State, and Regional Planning and Decision-making

Depending on the management questions being asked and the associated legal authorities for implementation, it is imperative that the development of management-driven technical products and CMSP be applied at multiple scales; that is, at local, state, regional, and even some cases, national scales. For example, a coastal community may be interested in how to increase resiliency by evaluating the relationships between and among sea level rise, coastal development, and conservation of coastal habitats. Or, as is currently being considered by several states along the Atlantic coast, efforts may focus on the creation of state-level ocean plans that identify sites for potential offshore alternative energy development while maintaining key ecological and ocean use areas (e.g., fishing grounds). Understanding that spatial planning efforts and resource decision-making may occur at different scales, the Alliance believes there is value in considering how regional engagement can help reduce redundancy, increase efficiencies and coordination, mitigate jurisdictional boundary discrepancies, and provide a broader context regarding ecological resources and human use that do not stop at jurisdictional boundaries. This proposal represents both the various scales at which planning and decision-making can be enhanced and the variety of roles that the Alliance can serve in supporting these efforts.

PARTNERSHIPS

The success of this proposal is dependent on coordination across jurisdictional boundaries and areas of expertise. The composition of the project team demonstrates the commitment to coordinate across

governmental, academic, and non-governmental communities. Significant and extensive partnerships have been (and will continue to be) developed for each and for all components.

Creation of a Regional Technical Team

The development of this proposal represents a strong collaboration between end users and researchers. This proposal also represents the first opportunity for the Alliance to initiate support for the data and information management capacity necessary to realize the opportunities presented by coordinating and leveraging the resources of the four South Atlantic states. Core to fostering project-wide partnerships and collaborations will be the creation of a project-wide Regional Technical Team (RTT) to provide coordination across Program Components (including those to be supported with other funds) and to ensure active engagement of coastal zone, fisheries, and water quality resource managers throughout the duration of the program. Participation on the RTT will consist of representatives from the following three sectors:

- State management agencies, including NCDENR, SCDHEC, SCDNR, GADNR, FLDEP, FWCC
- Federal agencies, including NOAA CSC, NOAA NMS, NOAA NERRS, USACE, USGS, NPS, FWS, SAFMC
- Research and technical experts – component projects, including SECOORA, ROFFs, SkIO, UGA

To ensure effective operations, the size of the RTT will be limited. We anticipate two representatives from each state, one representing policy interests and the other data management expertise. One representative from each of the federal programs identified will be included. The research and technical experts will include at least one representative from each of the four project components (multi-use CMSP, coastal hazards vulnerability, water quality metadata database, spatial fisheries habitat mapping).

The RTT will play an integrative role in (a) identifying state and regional data, planning tools, and technology requirements of coastal and ocean resource managers and assess products and tools from the four components; (b) developing a multi-state, regional, multi-scale technical CMSP framework; and (c) testing framework functions through incorporation of issue-specific (hazards vulnerability and multi-use planning, initially) elements.

Partnerships by Component

In addition to the overarching project partnership developed through the RTT, partnership teams have been established that will ensure effective development of specific, tailored technical products. These partnerships will collaborate across the overall proposal through the RTT, but will allow focus on individual projects and the engagement of partners specific to each component area. Appendix A1a includes a listing of selected program efforts and partner organizations that will be engaged in team efforts for the two program components to be addressed in this one-year effort.

Multi-use Coastal and Marine Spatial Planning: SECOORA’s technical team includes Duke Marine Geospatial Ecology Lab (MGEL), Center for GIS at Georgia Tech University (CGIS), University of South Carolina (USC) and The Nature Conservancy (TNC), all of which have experience and expertise in developing spatial decision-support tools that can be used with stakeholders to make management decisions. This technical team will be paired with representatives from state agencies (NCDENR, SCDHEC, SCDNR, GADNR, FLDEP, FWCC) who have the authority to implement ocean planning at the state level and the knowledge of existing state datasets and needs related to CMSP. Additionally, representatives from federal agencies, including NOAA’s Coastal Services Center, National Marine Sanctuary Program and National Estuarine Research Reserve Program (NERR) CDMO; US Geological Survey (USGS); US Army Corp of Engineers (USACE); and NPS will engage to provide input on relevant federal products, tools, experience and datasets.

Geospatial Tool for Regional Hazard Vulnerability Assessment: This project component is being carried out by a partnership comprised of highly qualified scientists and managers from each of the four states. All the members of this group have been actively engaged in coastal hazard assessment and planning over the past five-to-ten years. The state representatives are:

- North Carolina: Drs. JP Walsh and Reide Corbett, East Carolina University and Steven Underwood, NC Division of Coastal Management (NCDENR)
- South Carolina: Dr. Scott Howard, South Carolina Geological Survey and Matt Slagel, South Carolina Office of Coastal and Resource Management (SCDHEC-OCRM)
- Georgia: Dr. Clark Alexander, Skidaway Institute of Oceanography, Dr. Chester Jackson, Georgia Southern University and Jill Andrews and Jennifer Kline, both from the Georgia Department of Natural Resources (GADNR)
- Florida: Drs. John Jaeger and Peter Adams, University of Florida who will coordinate directly with Julie Dennis at the Florida Department of Economic Opportunity's Division of Community Development and with the Southeast Florida Regional Climate Change Compact

In addition, each of these groups will work with their state Sea Grant programs, emergency management agencies, and coastal resource protection divisions (if not already a partner in the project) to make sure that the project results are disseminated widely.

AUDIENCES

The primary audiences for the CMSP framework and the products and tools developed through this program are state and federal coastal resource managers that require access to information and tools to support coastal and ocean multi-use management and decision-making. Specific audiences for the project components, which are extensive, are provided in Appendix A1b, but in summary, they will include for the coastal hazards assessments component state and county emergency planners, coastal resource protection managers, coastal development and planning boards, and Federal conservation, public works, defense and research agencies. The web portal and hazards geospatial tool will be relevant to a broad community of coastal managers, researchers, and planners interested in identifying relevant data for resource management decisions. Specific audiences for the multi-use coastal and marine spatial framework will include the coastal zone management authorities in the four states, along with federal authorities, to begin the initial process for establishing a regional basis to state and federal CMSP.

APPROACH

Alliance Proposal Strategy

The Alliance leadership decided early in the process to proactively work towards the development of an Alliance proposal submission in response to the NOAA FFO. As a result, the Alliance prepared and circulated a formal solicitation for Detailed Letters of Intent (DLoIs) and for Independent Proposals seeking letters of endorsement. The Alliance stated that it was interested in considering for inclusion in its proposal **only those efforts** that address priority Alliance action items in at least one of the Alliance priority focus areas AND incorporate and integrate significant elements of coastal and marine spatial planning. As a result of this solicitation, 10 DLoIs and no independent proposals were submitted by the deadline. The Alliance established a five-member external Evaluation Panel to review the 10 DLoIs; in their review, they were asked to pay particular attention to a number of criteria, including the following:

- Demonstrate regional applicability, even if initiated at a smaller scale;
- Include tangible partnerships with state and federal resource agencies and, where applicable, incorporate regional capabilities in the southeast U.S.;
- Support and directly interact with targeted regional stakeholders and partners; and
- Provide data, information, and products or decision-support tools needed to concomitantly address selected regional priorities from the Alliance Action Plan and NOAA's CMSP interests.

The Evaluation Panel reached consensus on its recommendations for the Alliance; four DLoIs were selected to be incorporated within the Alliance's initial proposal submission on December 10, 2010 to NOAA, and an additional DLoI was recommended for an independent proposal submission for Alliance endorsement. This revised proposal reflects a reduction in effort; two of the four components are included within this revised plan of work. It is the intent of the Alliance to seek and secure funding for the two components (Component 4 - water quality metadata database and Component 5 - spatial fisheries habitat mapping) from other sources; if such funding is acquired, these components will be re-integrated within the planning and implementation framework of the Alliance's strategy outlined below.

Program Management and Oversight

We recognize that the success of this Alliance initiative and its ability to accomplish its stated mission of initiating the development of a multi-state and regional framework for CMSP based on Alliance priorities for resource managers and decision-makers at a variety of scales depends heavily on our ability to integrate the findings of the Alliance team into useful protocols and products. To this end, we will foster interactions among all Alliance Component PIs throughout the duration of the project. We propose to hold at least two retreats (see Appendix A1b for Milestone chart) of Alliance EPT representatives, the PIs, the Alliance Regional Coordinator, and the Component PIs to focus on developing the framework for data integration and identifying additional opportunities for and achieving increased collaborations. The PIs clearly understand the need to collaborate and their proposed efforts reflect this. The Project Management Team (DeVoe, Boltin-Kelly, Alliance Program Coordinator), the Regional Technical Team, and the component PIs will ensure that the collaborations that this initiative will require to accomplish the overall Alliance goal for this initial project will be fostered.

The Project Management Team, along with the lead PIs, will coordinate and manage the goals and objectives of this effort, which will include the following tasks:

1. Schedule presentations before professional audiences, community groups and local government councils and commissions to describe the Alliance, its program, and the benefits to accrue.
2. Convene (at least) two retreats (over the 18-month period) involving the Alliance PIs to foster the process of information integration, product development, and data management and delivery.
3. Convene meetings of the Technical/Resource Teams concurrently with the PI retreats to share results and seek and incorporate feedback.
4. Organize team presentations before the Alliance Executive Planning Team and the Alliance Steering Group upon request.
5. Review progress to date, begin linking the program components into a CMSP framework, and refine project objectives for the remaining term of the program.
6. Manage and oversee the preparation of progress, annual, and final technical and financial reports.

Approaches by Component and Objective

The Alliance's revised package contains now includes two integrated project components that focus on Alliance Priority Action Plan Items and demonstrate linkages to NOAA's interests in developing regional CMSP efforts. An overview of the approaches to be taken to address each objective for each of the two components is presented below, along with detailed methodologies, follows.

Component 1. Building the Regional Information Management System (IMS) portal to support Coastal Marine Spatial Planning & other information management needs of the SAA

Multi-use Coastal and Marine Spatial Planning: SECOORA's technical team includes Duke Marine Geospatial Ecology Lab (MGEL), Center for GIS at Georgia Tech University (CGIS), University of South Carolina (USC) and The Nature Conservancy (TNC), all of which have experience and expertise in developing spatial decision-support tools that can be used by stakeholders to make management

decisions. This technical team will be paired with representatives from state agencies (NCDENR, SCDHEC, SCDNR, GADNR, FLDEP, FWCC) who have the authority to implement ocean planning at the state level and the knowledge of existing state datasets and needs related to CMSP. Additionally, representatives from federal agencies, including NOAA's Coastal Services Center, National Marine Sanctuary Program and National Estuarine Research Reserve System (NERRS) CDMO; US Geological Survey (USGS); US Army Corp of Engineers (USACE); and National Park Service (NPS) will engage to provide input on relevant federal products, tools, experiences and datasets.

Objective 1: Assessment of user needs, technical requirements, and existing information management tools. [Hernandez and Alliance Program Coordinator, with SECOORA Team; Alexander; Sea Grant Extension and Outreach staff; PIs]

Background: The development of this proposal represents a strong collaboration between end users and researchers. Implementation of Objective 1 will establish a foundation of collaboration for the project to assure relevance, usability and efficiency in the execution of tasks. This proposal also represents the first opportunity for the Alliance to support the data and information management capacity necessary to realize the opportunities presented by coordinating and leveraging the resources of the four South Atlantic states. As a first step in developing the needed capacity, and executing and integrating the work described in Objectives 2 through 6, ongoing communication and collaborative learning among the principle participants in this proposal is necessary to define the requirements for the information management system and other products to be developed as part of this proposal.

For this objective, the sub-objectives will be to:

- i. Define the 'carefully crafted questions' to be used to demonstrate the functionality of the Information Management System (IMS) that will be developed in Objective 2, which is focused on multi-level and multi-sector coastal and ocean planning.
 - a. The users, i.e. state managers, will be asked to identify the key questions and/or management issues that should be supported and addressed by a comprehensive IMS by answering "What decision do you need to make, and how will the available information be utilized to inform your decision-making?"
 - b. Given funding limitations, the focus will be to develop the datasets necessary to address the chosen question(s) or management issue(s) as a demonstration of the functionality of the IMS.
- ii. Understand the data management and related technical requirements of co-PIs, and SAA theme teams.
- iii. Identify databases that should be included as part of the IMS to be developed as part of Objectives 2 and 3.
- iv. Define the states' data management capability and existing architecture with regard to interfacing with the IMS. We will determine:
 - a. The specifications of the states' current data management systems, and
 - b. How those systems would be best supported by the IMS,
 - c. What operating systems, data analysis tools (i.e., ArcGIS, GoogleEarth, custom built tools), and data formats are currently utilized (shapefiles, GML, KML), and
 - d. Whether there are limitations or concerns (i.e. firewall issues) with utilizing a regional portal, etc.
- v. Identify and prioritize significant data gaps and needs for new data layers.
- vi. Review other IMS, i.e. other regional portals, federal partner products, and ongoing projects (e.g. SC Wind Energy Task Force, NC Coastal Habitat Protection Plan, GA CZM 309 Strategy, NERR CDMO, National Information Management System, NOAA's Digital Coast, National Marine Cadastre, etc.) to ensure compatibility, no duplication of effort and determine whether they meet the requirements for the SAA.

- vii. Assess the requirements of the NIMS and as appropriate and feasible will ensure compatibility with NIMS requirements for data standards and data accessibility.
- viii. Confirm the management issue(s) to utilize for the demonstration of the IMS. (See Objective 3). Sediment management is proposed by our team, but will be confirmed during this initial assessment effort. We will identify what data, i.e. bottom geology, habitats, and analyses are required, as well as what decisions need to be made and how stakeholders will utilize information?

Process: A kick-off meeting of project participants will be held in Month 1 to review a work plan, coordinate tasks and schedules, and develop interview questions. SECOORA will conduct interviews of managers and other intended users in coordination with technical experts, and develop an assessment report.

Deliverables:

- Report on state manager decision support needs, and technical specifications, requirements, capabilities, and limitations.
- Report on existing information management systems and their potential applicability for the SAA.
- Confirmation of management issue for the IMS demonstration. Note: If time and resources allow, more than one management issue may be addressed.

Objective 2: Design the IMS, evaluate and prioritize current state and regional data sets directly related to priority management issue(s), and assess interoperability standards and protocols that enable integration and analysis of prioritized data. [Hernandez and SECOORA team, with Alliance Program Coordinator; PIs]

This objective will design an IMS for the SAA that provides access to data, information, and analytical tools to include identifying data interoperability standards, scale-relevant (i.e., spatial and temporal) state and regional datasets. The subcomponents of this objective are to:

- i. Confirm appropriate technical staff from states, SAA PIs, and federal partners to participate in design discussions.
- ii. Identify and adopt as appropriate data standards, formats, and protocols that enable comparison and interchange between states and enable creation and/or use of commonly required regional data layers, and support multi-use and multi-level planning and decision-making;
- iii. Support state and regional level data identification (i.e., data mining), development, transformation, and enhancement;
- iv. Design a prototype virtual IMS to serve as the initial foundation for CMSP in the Southeast that builds on the existing SECOORA DMAC program;
 - a. The location of data repositories, products, and analytical tools may be existing state and/or federal data warehouses linked to the SECOORA information portal.

Process: Regular conference calls and/or webinars will be utilized to coordinate project participants and plan the IMS. Additionally, appropriate team members will analyze and/or create data layers to be incorporated into the IMS and support the demonstration of its functionality.

Deliverables:

- Prioritized list of data sets with general descriptions (metadata), list of data gaps (SECOORA)
- IMS organizational framework and documentation of interoperability standards and protocols (USC)
- Interoperable existing and new data sets (GA Tech, SCDNR, TNC, USC, Duke) that can be used for multiple management decisions and analyzed in a geospatial framework

Objective 3: Develop an initial IMS (regional portal) that meets the core needs of the Alliance and demonstrate its capability to support analysis of management issues [Hernandez and SECOORA Team, with Alliance Program Coordinator; Alexander; PIs]

Background: In support of the Integrated Ocean Observing System (IOOS[®]), the initial OceanUS Data Management and Communications (DMAC) Steering Team recommended the establishment of regionally-based data and IM components to manage widely distributed coastal and marine environmental and human use data via a sophisticated system that can organize, retrieve, aggregate, document and disseminate data, derived information, and analytical tools for a variety of purposes and applications.

In the Southeast there is an enormous volume of near-real-time and historical data available from instruments measuring and monitoring the ocean and coastal waters and air along with human use data collected for planning and regulatory purposes. Considerable progress has been made in establishing a regional data management infrastructure via the efforts of the SECOORA DMAC team. While currently most of the data being served are real-time physical coastal and ocean observations, the robust capabilities and infrastructure already in place make expansion of the existing SECOORA system to serve Alliance needs very cost-effective. This expansion would meet state and regional needs for ready access to interoperable data sets and associated metadata, information products, and relevant spatial analysis tools. Building upon existing IM capabilities of the project team and an understanding of state, regional, national, and international guidelines and recommendations for data management, a prototype IMS will be developed that will:

- i. Maintain an inventory of existing databases and GIS data layers;
- ii. Support identification and adoption of standard data ontologies, file formats, and transport protocols;
- iii. Maintain, utilize, and adapt existing infrastructures to promote flexibility, efficiency, and usability – that is, avoid imposing a comprehensive yet expensive and disruptive restructuring exercise;
- iv. Via a virtual Web portal, promote accessibility of data, information, and applications, such as through open access to all data and utilization of open source and proprietary software as appropriate; and
- v. Develop the IMS as a South Atlantic Alliance product to be maintained by SECOORA.
- vi. Incorporate needs and products from project Components into the data management framework.

Process: Utilize results of Objectives 1 and 2 develop IMS options via a technical workshop to create a prototype IMS

Deliverables:

- Prototype IMS that can support core SAA data needs. (USC/SECOORA (Lead), Duke/GA Tech/TNC/State data experts (consultants), state managers (review))
 - Metadata. The system will support development of and access to the data documentation that describe data sets, including development and use of a common vocabulary, identification of required metadata fields, agreement upon sites for publication of metadata, and commitment to publish metadata in a timely fashion.
 - Data Discovery. The system will establish the capacity for searching and locating desired data sets and products and for manipulating accessed data.
 - Data, Information and Tool Transport. Data and products will be capable of transport over the Internet in a transparent, interoperable manner.
 - On-Line Browse. Data will be readily accessed and evaluated through common Web browsers.
 - Data Archive. Mechanisms for secure, long-term storage of data will be established.

- Data Communications. The communications infrastructure for accessing and transporting data and data products will be implemented.
- Data Transformation. Existing state databases will be transformed to conform to the data standards and formats.
- Success will be measured via the assessments conducted as part of Objective 1.
- Demonstration of use of IMS through a Sediment Management decision-making case study via a user testing session. One demonstration will be held in each state, and one at an SAA meeting. (SECOORA, other appropriate team members)
- Technical paper that describes the long-term IMS framework for the Alliance (USC)

Objective 4: Provide recommendations for Decision Support Tools that either exist or could be developed to facilitate decision-making and address SAA priorities. [Hernandez, Alliance Program Coordinator; SECOORA Team; Alexander; Sea Grant Extension and Outreach staff; PIs]

Background. Over the last several years, discussions at the national and state levels have focused on the role that spatial planning can play in supporting multi-use decision-making in coastal and marine environments. Planning can occur at multiple scales to meet identified management needs. In the Southeast, coastal states are initiating state-level ocean planning as part of their Coastal Zone Management (CZM) Section 309 Strategies. In addition, smaller localized plans are being considered for issue-specific management, such as offshore wind energy development and nearshore sediment management.

The member organizations that comprise the SECOORA Technical Team, including Duke Marine Geospatial Ecology Lab (MGEL), Center for GIS at Georgia Tech University (CGIS), University of South Carolina (USC) and The Nature Conservancy (TNC), have experience and expertise in developing spatial decision-support tools that can be used with stakeholders to make management decisions (see sidebar). These experts will be actively engaged during technical, policy, and data need discussions in order to establish priorities for multi-sectoral coastal and ocean planning based on management needs.

In addition, team members will lead the review of available spatial-decision support tools for their applicability to state and regional priorities identified in Objective 1. Finally, these organizations will be responsible for the development, refinement and enhancement of spatial data layers required for coastal and ocean planning (Objective 2). All of these efforts will be used to inform the assessment of spatial decision-support tool(s) that can be used by state, regional and local managers during the CMSP process.

The goal of this project component is to work with coastal managers to evaluate user-friendly online decision support tools focused around priority coastal and ocean management issues. The decision-support tools to be evaluated will be multi-sectoral and provide through-the-web GIS capability to query and extract information, develop scenarios, and facilitate stakeholder buy-in by affording these groups the opportunity to share their own options and scenarios. As such, these tools would help empower managers and facilitate the participation that is critical to the success of any effort to implement multi-sectoral coastal and ocean planning. The SECOORA technical team will hold regular conference

Sample Spatial Decision Support Tools

SERDP Marine Mammal Habitat Modeling (MGEL) – designed to allow Naval training exercises to work around marine animal seasonal movement patterns.
<http://serdp.env.duke.edu/>

Assessment of Energy Production Potential from Tidal Streams in the United States (CGIS) - developed as a decision support tool for industry professionals, government agencies, academics and others interested in assessing tidal energy for any location along the entire US coast.
<http://128.61.208.178/tidalenergy/index.html>

Coastal Resilience (TNC) - develop to provide access to information that communities can use to make decisions regarding resources at risk from sea level rise and coastal hazards.
<http://coastalresilience.org/>

calls and meetings to ensure coordination on tool evaluation across organizations and will work through to incorporate the needs of coastal managers and enable review of spatial products.

The subcomponents of this evaluation of existing decision-support tools that meet the needs of the management team are:

- i. Review literature and ongoing work to ensure no redundancy with existing work that is already.
- ii. Leverage Duke's existing work to conduct hands on evaluations of existing and emerging CMSP tools, and conduct others as appropriate for this project.
- iii. Engage NOAA and other federal partners, in addition to states.

Process: Duke will lead the effort with USC/SECOORA/GA Tech/TNC providing ideas on tools and review of the paper. A webinar between technical experts and state managers showcasing options for decisions support tools that could be developed to meet SAA priorities will be held.

Deliverables:

- White paper with recommendations for appropriate tools ((Duke (lead), Ga Tech, TNC, USC))
- Webinar and summary notes, slides (Duke)

Component 2. *Develop and apply a new digital geospatial analysis tool for performing a consistent regional evaluation of vulnerability to coastal hazards in the southeastern U.S.* [Alexander]

Risk and vulnerability in coastal settings is intimately related to a specific combination of climate change phenomena and associated impacts that are not observed together in any other geographic setting. Riverine flooding, Nor'easter and hurricane waves, storm surge, rising sea level, increasing demands on freshwater resources, salt water intrusion, highly complex wetland habitats and ecosystems, and rapidly growing population and built environment all combine to produce a gently sloping, ecologically sensitive, and high-value environment that, in some cases, extends inland over 50 kilometers from the coast. Natural (e.g., sea-level rise, storm surge, erosion, flooding, hurricanes, extreme wind events) and manmade (e.g., building in low-lying areas, lack of strict setbacks from eroding shores) coastal hazards contribute to the potential vulnerability of the region and influence the health and stability of coastal ecosystems and communities. Vulnerability to these hazards is vital to understand so that coastal resource managers, municipal planners, and emergency management entities can plan for adaptation to, and mitigation of, these vulnerabilities as they manifest in the future.

Nearly a decade ago, the USGS conducted a vulnerability assessment of the U.S. Atlantic coastline to long-term sea-level rise and classified shoreline segments based on their susceptibility to potential impacts using a coastal vulnerability index (CVI). Since the study was released, new/updated datasets and technologies have emerged that can be used to provide a higher spatial resolution, more robust analysis of coastal vulnerability for the southeastern U.S. coast. Limitations in software tools at that time restricted the USGS study to the linear oceanfront shores of barrier islands. New software tools and techniques now enable the detailed analysis of vulnerability to coastal hazards along an island's ocean front and backbarrier shorelines, as well as to estuarine shorelines.

The current version of AMBUR (1.0) provides functions for performing shoreline change analyses that include advance transect casting techniques, expanded data output (tabular and geospatial), and graphical output. The package allows import and export of geospatial data in ESRI shapefile format and provides tools for quantifying historical shoreline movements, predicting future shoreline locations and identifying changes in shoreline classification along the shore. Output from the analyses includes data tables, graphics, and geospatial data, which are useful in rapidly assessing trends and for assisting coastal managers with management decisions. This is an open-source package that can be easily customized to

perform additional statistical, graphical, and geospatial functions to assess coastal vulnerability along a shoreline.

Objectives: AMBUR ('Analysis of Moving Boundaries Using R'), a state-of-the-art, open source, digital shoreline analysis tool developed by co-PI Jackson, was designed to be extensible. These objectives will enhance AMBUR's capabilities to capture attributes that bear on vulnerability to coastal hazards.

Objective 1. Develop a new release of AMBUR that will integrate newer, higher-resolution data sets and other types of datasets (vegetation, soils, population, anthropogenic modifications) that could not previously be included in automated coastal hazard assessments. Our sub-objectives are to:

- a. Program AMBUR to capture data attributes from multiple polygonal and/or grid geospatial data**
- b. Program statistical, graphical, and geospatial outputs specific to hazard vulnerability assessments.**

Background: Our approach to achieving our goal is to develop a new version of AMBUR that will integrate newer, higher-resolution data sets and other types of data sets (vegetation, soils, population, anthropogenic modifications) that could not previously be included in automated coastal hazard assessments. Once the new version of AMBUR is complete, we will use it to perform Hazard Vulnerability Assessments along selected estuarine shorelines in each of the four states. Funding constraints require that we limit our analysis to pilot studies of selected areas in each state instead of the whole SAA coastal region.

Process: A new release of AMBUR will be customized to perform additional analyses that go beyond the scope of traditional shoreline change studies and include hazard vulnerability assessments (HVAs). In order to improve the functionality of AMBUR to perform such assessments, the software must be enhanced to work with polygon and grid geospatial data formats in addition to polyline data. Currently, AMBUR has the ability to capture historical shoreline positions and classifications schemes alongshore using transects that intersect a shoreline polyline. A primary goal in the development phase of this project will be to program AMBUR to cast transects along the shoreline and intersect multiple polygonal and/or grid geospatial data, such as those mentioned above, to obtain individual and vulnerability parameters alongshore. Additional statistical, graphical, and geospatial outputs will be programmed specific to hazard vulnerability assessments in addition to the existing shoreline change analysis output. For example, a new tool to assess wind/wave fetch will be created to assist with investigating inlet and estuarine shoreline settings not subject to open ocean waves.

In addition to analyses that can be conducted along each developed barrier island shoreline, the broader scale vulnerability of other coastal shorelines must also be assessed to provide vulnerability information useful to both managers and citizens who live not only along the ocean shore, but in other areas open to storm surge, erosion and coastal flooding. These broader-scale assessments are performed using an HVA, modified to reflect the specific climate change phenomena and impacts that are pertinent to the geologically distinct sections of the southeastern US coast, using polygon or grid-based spatial analyses within a GIS, in some ways similar to those conducted by NOAA's Coastal Services Center (e.g, the Community Vulnerability Assessment Tool, 1999). The addition of these established techniques for vulnerability assessment to new, high-resolution datasets of coastal parameters will create products directly applicable to the development of adaptation strategies for the southeastern U.S. coast, and that could be transferred to other areas of the US and world.

Deliverables:

- Complete state-specific datasets pertaining to physical characteristics, exposure, human population, and ecosystems/habitats of the four States' coastal counties

- An enhanced version of AMBUR, a cutting-edge, existing shoreline change analysis tool
- A new Hazard Vulnerability Analysis (HVA) model

Objective 2. Use the enhanced AMBUR to perform Hazard Vulnerability Assessments along state-identified, high-priority estuarine shorelines in each state.

Background: Currently, baseline datasets of the physical characteristics of the southeastern coast are needed for vulnerability assessments of oceanfront and estuarine shorelines to natural phenomena (e.g., sea-level rise, storms). Furthermore, up-to-date analyses of hazard vulnerability (e.g., shoreline erosion) are needed that incorporate new datasets, technologies, and methodologies to better assist coastal managers with science-based decisions and to provide a framework for future assessments. This scope of work provides for compiling existing and creating new coastal datasets, developing tools and methodologies for assessing hazard vulnerability to natural phenomena, conducting estuarine shoreline analyses, and evaluating and applying the results. The focus of this work plan is the region of highest priority for vulnerability assessment in each state. These high priority areas will be determined in discussions between the researchers and coastal management partner teams in each state. Given limited funding, the focus will be on estuarine shorelines because greater attention has previously been paid to the oceanfront shorelines in our states.

Process: This vulnerability assessment will be carried out in four phases, the first and second of which will occur simultaneously. Alexander (Skidaway) will serve as the lead PI, coordinating with all co-PIs and assuming all reporting responsibilities. We will hold three coordination meetings at Skidaway Institute during the life of this project; the first coordination meeting will take place at Skidaway shortly after funds are awarded. The first phase of the project will be focused on gathering well-established existing information and newly created datasets. The second phase will be focused on revising AMBUR to perform hazard vulnerability analyses. The third phase will consist of analysis and results synthesis. The fourth phase will focus on result dissemination by our management co-PIs in the Coastal Zone Management Programs in each state.

Phase 1: Identification, Compilation, & Construction of Datasets (March 2012 - March 2013)

Work will be performed using ESRI ArcGIS 10 and will conform to Federal NGDC metadata standards. Major tasks to perform in this project phase will include:

- Identify and acquire datasets pertaining to physical characteristics, exposure, human population, and ecosystems/habitats of the four States' coastal counties.
- For high-priority estuarine areas in each state, compile datasets within a GIS framework and prepare datasets for analysis using the shoreline change and Hazards analysis tools to be developed in this project
- Create and/or update datasets where necessary or applicable.

Phase 2: Develop Tools and Methodologies (March 2012 – Oct 2012)

- Enhance AMBUR with new functions for performing coastal vulnerability assessments along oceanfront and estuarine shorelines by examining the intersection of transects with GIS-based coastal characteristics datasets.
- Develop a new HVA tool for southeastern US coastal regions that incorporates the distinct characteristics of these coastlines, using the USGS CVI as a starting point.
- Develop methodologies for analyzing polygons and/or grids within GIS for coastal regions, using NOAA Coastal Services Center tools as a starting point.
- Compare the results of an AMBUR estuarine shoreline change analysis with prior results of shoreline change analysis that was performed using the Digital Shoreline Analysis System (DSAS) from the USGS.

Phase 3: Vulnerability Assessments of Estuarine Shorelines (Oct 2012 – March 2013)

- Perform hazard vulnerability assessment of estuarine shorelines (focused on state-identified high-priority sites).
- Construct maps for estuarine shorelines with HVA results (focused on state-identified high-priority sites).

Phase 4: Evaluation and Application of Results of Vulnerability Assessments (April 2013 - Aug 2013)

- Work with local governments to evaluate the usefulness, benefits, or perceived shortcomings of the results.
- Distribute estuarine shoreline data and vulnerability information to coastal stakeholders in a format that is useful to them (e.g., information meetings, static maps, web portal).

Deliverables:

- Maps for high-priority estuarine shorelines with HVA results
- A comparison between AMBUR results and those from the older, USGS DSAS program
- Hazard results served over several web portals (NCCOHAZ and Georgia Geohazards Portals)

A note on our resource management partners is appropriate here. Because the primary end-users of the data are our co-PI or collaborating project partners, and will be involved in the decision-making process for hazard criteria, areas to be assessed, and final form of results, we feel that they will have an intellectual investment in the tools and that we will have automatic buy-in from those who have direct responsibility for managing the coasts of the South Atlantic Alliance. Our strong ties to our management partners means that close coordination and product dissemination will occur as long as some funding can be identified to support the effort. Funds are provided for manager participation in NC (as a subcontract to ECU) and SC (as a separate contract). The GA DNR has decided to forgo a budget for the current project, although they will participate fully by carrying out their coordination with State, county and municipal officials as part of their Coastal Zone Management program activities. In Florida, policies that address vulnerability to coastal flooding and the impacts of rising sea level are implemented at the county level as part of comprehensive development plans. Funding is available to support management engagement with this project because Florida has an ongoing, NOAA-funded, Community Resiliency Initiative to develop sustainable coastal communities through targeted technical assistance. We will directly coordinate with Julie Dennis, the liaison for the NOAA project, as well as with two county-level projects (the Southeast Florida Regional Climate Change Compact and the Satellite Beach sea-level initiative) currently addressing adaptation to rising sea-level, to determine critical areas for vulnerability assessments.

EXPECTED OUTCOMES/SUCCESS METRICS

Component 1. Building the Regional Information Management System (IMS) portal to support Coastal Marine Spatial Planning & other information management needs of the SAA

- Identification of requirements for the information management framework and decision support tools.
- Regular meetings of the RTT are planned, and continued participation by key members throughout the project life will be one metric of success. The RTT will serve as evaluators and beta testers of products, with a success metric being favorable assessment reports, which indicate that the developed products meet the needs of their intended users.
- Assessment Reports for the products being developed.
- A long-term success metric will be the utilization of the products beyond the life of this project. The Alliance (and SECOORA) will be responsible for surveying end-users one year after project completion to assess continued data/data product usefulness.

- A robust, IM framework supporting the following data management functions tailored in support of the needs of the Alliance:
- Initial development of two decision support tools that can be used by coastal managers in multi-objective ocean planning. The short-term measure of success will be that the tools meet the need of coastal managers which will be assessed during the beta-testing process implemented through the RTT (Objective 1). Long term success will be measured by the number of projects that incorporate these tools into their CMSP efforts.

Component 2. Develop and apply a new digital geospatial analysis tool for performing a consistent regional evaluation of vulnerability to coastal hazards in the southeastern U.S.

- A current, consistent database of geospatial information for each of the four partner states, in a common format that will enhance regional CMSP. Success will be determined by the presence of compatible datasets at collaborating institutions and our ability to perform hazard analyses across state boundaries.
- An enhanced software tool capable of performing Hazard Vulnerability Assessments (HVAs) of oceanfront and estuarine coastal settings. Success will be determined by the demonstration of the software tool's capabilities. The software and user manual will be available on a project website.
- A consistent Hazard Vulnerability Assessment for high-priority estuarine shorelines within the Alliance region. Success will be determined by the distribution of assessment results via websites, publications and workshops. An additional success metric will be the extent to which these results are incorporated into coastal decision-making, as determined by discussions with state agencies, local governments and other stakeholders.

BENEFITS

General

This proposal will provide stakeholders of the four states of the Alliance with two major outcomes that will significantly further regional priorities established in the recently adopted Governors' Action Plan. The primary benefit will be a well-defined, common framework for data collection, management, and access for a broad range of users in the region involved with coastal and marine spatial mapping. Secondary benefits include significant advancements in regional data collection and its application relating to shoreline vulnerability, a key core Alliance priority.

The new data management framework, to be developed in conjunction with our federal and NGO partners, will provide the foundation for priority issue-based CMSP for the individual states and the region as a whole. These initial applications will be models for integrated research, observation, and mapping for other Alliance regional priorities. In sum, the proposal will produce tools and regionally-specific applications needed for CMSP. Additional benefits of the proposal include efficiencies and economies of scale relating to the collection and maintenance of data, the creation of user-specific interfaces or portals for data, and heightened collaboration among researchers, resource managers, state agencies, Federal partners, NGOs and the private sector. The procedures for coordination associated with each component of the proposal will also serve as models for engagement, trust, and management for future Alliance activities.

Benefits by Component

Geospatial Tool for Regional Hazard Vulnerability Assessment: At its most fundamental, this component is an important and critical step toward effective CMSP in the southeastern U.S. This project is focused on using geospatial technologies to develop and compile data sets that are critical to effective planning in the coastal zone. First, this project, by its very nature, will identify some of the most vulnerable areas along the estuarine sectors of the coast using objective CMSP approaches, and will improve our understanding of the incentives and disincentives for development in these areas. The specific knowledge

of the individual hazards that make an area of the coast vulnerable will aid in better informing coastal development decisions and in mitigating their effects. Second, this project draws on recognized state experts in the hazards field, drawing on their experience and knowledge to develop the best criteria to be used in assessing hazard vulnerability in different coastal settings. The outcome of this project will be a well-defined methodology and software tool for assessing coastal hazard vulnerability in an unbiased fashion that satisfies the need for regional standards for monitoring and mapping beachfront and estuarine shoreline changes. This new tool will be applicable to any coastal region of the United States or the world, and provides a mechanism to identify target areas in a larger region that are most in need of management and planning resources. Also, our analysis will identify some areas that are vulnerable to sea level rise, thereby identifying coastal biological resources that are most at risk from sea-level rise. Results from our analyses will be integrated into ongoing and developing programs within the four southeastern states to disseminate hazards information (e.g., NC COHAZ website and GA Geohazards portal).

Multi-use Coastal and Marine Spatial Planning: The Coastal Management Programs in North Carolina, South Carolina, and Georgia have all included coastal and ocean planning as a focal area in their new Coastal Zone Management Act Section 309 Plans. In July 2011, the Florida Department of Economic Opportunity’s Division of Community Development, the Florida Department of Environmental Protection and Florida Division of Emergency Management began the Community Resiliency Initiative, focused on creating sustainable coastal communities through targeted technical assistance. Key to successful implementation of a coastal and marine spatial planning process is availability and implementation of decision-support tools that incorporate the best available spatial data and enable interactive stakeholder engagement. The decision-support tools developed through this project component will be designed specifically to meet coastal-decision maker needs in the southeast. Rather than developing a set of parallel tools within individual coastal programs, the desire is to have a set of tools that facilitate individual state coastal and ocean planning efforts but also provide consistency in data and methodology that will assist in taking a regional look at CMSP and comparing across jurisdictional boundaries. The expertise of the team assembled will enable the development of tools to incorporate lessons learned from earlier projects and building upon tools used to support CMSP in other regions.

MILESTONE SCHEDULE

See Appendix A1b for a detailed Milestone schedule of tasks and activities.

PROJECT BUDGET

Summary budget information is provided below; detailed budgets, budget justifications, and Indirect Cost Rate Agreements are located in Appendices A2a, A2b, and A2c, respectively.

Component	Year 1
Program Management	\$ 54,853
Coastal Vulnerability (Alexander, lead)	\$377,578
Multi-use CMSP (Hernandez, lead)	\$352,000
TOTAL	\$ 784,431