

SOUTH ATLANTIC REGIONAL RESEARCH PLAN: DEVELOPMENT AND APPLICATION OF COASTAL REGIONAL PRIORITIES

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Abstract. The South Atlantic Regional Research Project (SARRP, <http://www.grc.uga.edu/sarrp.htm>) is a regional, multi-agency project to develop a coordinated coastal and ocean research plan for the southeastern United States (from NC to FL). The South Atlantic effort was funded by National Sea Grant-NOAA and was conducted in concert with similar projects in other Sea Grant regions across the US and Insular Pacific. The project's primary goals are to identify priority coastal and ocean research needs for the region and to foster productive cooperation among regional partners. The SARRP plan was released in April 2010 after a three-year process that involved federal, regional, state and academic partners from throughout the region. The plan identifies 27 research priorities, which were aligned with the four themes that are also being used by the South Atlantic Governor's Alliance: Healthy Ecosystems, Working Waterfronts, Clean Coastal and Ocean Waters, and Disaster-Resilient Communities. We are currently collecting information describing ongoing or planned activities that are relevant to each priority, as well as identifying areas specifically aligned with the missions of particular agencies and organizations. This paper will describe the process by which the plan was developed, highlighting the key research priorities identified in the research plan and presenting an update on synergy with other regional initiatives.

INTRODUCTION

The South Atlantic Regional Research Project (SARRP) recently released a research plan for the southeastern U.S. (Laporte et al. 2010). The plan is intended for use by the scientific community, funding agencies, and other groups interested in addressing high priority research needs for the coastal and ocean area that runs from the northern border of North Carolina to the southern tip of Florida at Florida Bay. The 27 research priorities presented in the document are the result of a three-year process that involved an extensive network of scientists and managers from federal and state agencies, regional organizations, and academic institutions, with stakeholder input from public, private and nongovernmental constituents. This paper briefly

describes the SARRP process and then highlights the types of questions associated with each research priority.

METHODS

From its inception, the South Atlantic Regional Research Project has been a true regional collaboration. Development of the SARRP plan was coordinated by the Georgia Coastal Research Council under the direction of an Organizing Committee consisting of representation from the four SARRP Sea Grant programs. The Organizing Committee reviewed documents, helped identify partners, and

A Regional Advisory Group, with high-level representation from state, regional and federal interests in the southeastern states, helped to guide the project and ensure that it was well-coordinated with other regional efforts. The Regional Advisory group formed the core of a larger Strategy Team, which included additional coastal experts from agencies, research and educational institutions (see Table 1). The process employed to produce the SARRP plan involved gathering input from 170 existing relevant documents, regional experts, and a broad stakeholder survey. Over 4,000 copies of the survey were distributed, with additional distribution through open access on the web. Of the 552 respondents who began the survey, 524 finished, resulting in a completion rate of 95%. There were 182 respondents from FL 120 from GA 114 from NC and 95 from SC. The results of these efforts were used to develop a draft framework that aligned the SARRP efforts with both the Ocean Research Priorities Plan (National Science and Technology Council 2007) and the broad themes identified by the Governors' South Atlantic Alliance¹ - the southeast's regional ocean partnership. In April 2009, SARRP convened a Strategy Team Workshop. Participants were given the draft SARRP Table 1. Organizations represented on the SARRP Strategy Team. Organizations marked with an asterisk were also part

¹ Governors South Atlantic Alliance website <http://www.southatlanticalliance.org/>

Federal

National Oceanic and Atmospheric Administration:
National Sea Grant *
Coastal Services Center *
National Estuarine Research Reserves*
National Marine Sanctuaries Programs
National Centers for Coastal Ocean Science, Hollings
Marine Laboratory
South Atlantic Fishery Management Council *
U.S. Geological Survey*
U.S. Environmental Protection Agency*
U.S. Army Corps of Engineers*
U.S. Department of Interior: National Park Service*
U.S. Fish and Wildlife Service Region IV *
Dept. of Homeland Security: FEMA*
U.S. Department of Agriculture, Natural Resources
Conservation Service*

Regional

Governors' South Atlantic Alliance*
Southeast Regional Partnership for Planning and
Sustainability U.S. Dept. of Defense*
Southeast Aquatic Resources Partnership*
Southeast and Caribbean Regional Team* – NOAA
SE Coastal Ocean Observing Regional Association*
Center for Ocean Sciences Education Excellence -SE
The Nature Conservancy

State

NC Dept. of Environment and Natural Resources:
Division of Coastal Management*
Division of Marine Fisheries*
Division of Water Quality*
SC Dept. of Natural Resources
Marine Resources Division*
Marine Resources Research Institute*
SC Dept. of Health & Environmental Control:
Ocean and Coastal Resource Management*
Water Quality Division*
GA Dept. of Natural Resources:
Coastal Resources Division*
Department of Community Affairs*
Environmental Protection Division*
FL Dept. of Environmental Protection*
FL Fish and Wildlife Conservation Commission*

Academic

Southern Association of Marine Laboratories *
Skidaway Institute of Oceanography*
Marine Economics, Florida Sea Grant
College of Law, University of Florida
South Carolina Sea Grant Consortium Extension Program
Coastal Georgia Regional Development Center
Department of Anthropology, East Carolina University

Intl. Hurricane Research Center, Dept. of Civil &
Environmental Engineering, Florida Intl. Univ.
Ctr. for Marine - Wetland Studies, Coastal Carolina Univ.
SC Coop. Fish & Wildlife Research Unit, Clemson Univ.
Coastal and Oceanographic Dept, Civil and Coastal
Engineering, University of Florida
Harbor Branch Oceanographic Institute, Florida Atlantic
University

Other

Georgia Ports Authority

Alliance Framework (Alber and Laporte 2009) as well as additional information gathered in the *Needs Assessment* (SARRP 2009) and the *Stakeholder Survey Summary* (Laporte and Bryant 2008). These resources provided the launching point for the Team to identify top research priorities for each of the four priority themes of the South Atlantic Alliance (Healthy Ecosystems, Working Waterfronts, Clean Coastal and Ocean Waters, and Disaster-Resilient Communities). Workshop participants were tasked with identifying priority issues that are relevant to the region, management-critical, timely, tractable, and offer value for societal applications.

The priority research needs that received the highest number of votes at the Strategy Team Workshop were used to develop the research priorities issues for the SARRP draft plan. The Organizing Committee then worked with the GCRC to add background information about the importance of each issue in the southeast and to add further examples of research questions that were relevant to each topic. The complete draft was circulated to the Strategy Team for comment and was also made available on the SARRP website.

RESULTS

The priority research issues identified in the SARRP plan are organized according to the four themes of the Governors' South Atlantic Alliance. They are listed below in a highly condensed form along with examples of the types of questions that fit each topic. Note that the issues were all identified as "high priority" and are presented without further ranking. For complete descriptions of the theme areas and details of the priority issues, see Laporte et al. (2010).

Healthy Ecosystems - Develop detailed maps of coastal habitats and species distributions in the South Atlantic Region:

Habitat maps –The Nature Conservancy has produced an ecoregional assessment of the Carolinian region (DeBlieu et al 2005) that includes some of this information (e.g.,

shellfish beds, shoreline types), and there are also habitat maps developed by the South Atlantic Fisheries Management Council (e.g., sea grasses, corals). The Council identified a high priority need for improved mapping of subtidal areas (near-shore, mid-shelf, shelf edge, and deep water) (SAFMC 1998).

Species distributions – Although there is information on the distributions of managed fish stocks, there is a need to collect coordinated data on the distribution and abundance of organisms such as invertebrates, seabirds, and marine mammals, on a regional scale.

Assess the impacts of climate change on coastal habitats and species – How do changes in temperature affect rates of nutrient cycling or the virulence of pathogens? How sensitive are deepwater corals to changes in pH? Models are also needed to understand and predict effects at a regional scale (e.g., which areas are most vulnerable to increased storm surge? how will changes in sea level affect benthic and pelagic habitats?). What types of natural variability and fluctuations are observed in marine populations? How do we separate climate effects from other drivers of change, such as land use and development changes and increasing populations in coastal watersheds?

Evaluate the effectiveness of ecological restoration – Does a former rice field with restored tidal flow provide the same ecosystem functions as an undisturbed wetland? What criteria need to be developed for use in measuring restoration success?

Understand linkages and interdependencies among ecosystems – How might a reduction in freshwater inflow to an estuary affect the extent of tidal freshwater wetlands, and how might that in turn affect striped bass populations that move between these areas and systems hundreds of miles away?

Improve and expand ecosystem-based management models for the southeastern region – There is a need to collect data that inform ecological models (e.g., information on diet, primary and secondary production and species interactions), particularly for important fisheries (e.g., gag grouper).

Quantify the relative importance of fishing and other factors on abundances. – What is the relative importance of various factors that may be related to declining fish stocks (e.g., overfishing, natural variability, habitat loss, variations in freshwater inflow, water quality, climate change, predator-prey interactions or disease) for different organisms, particularly for fish classified by the National Marine Fisheries Service as overfished in the southeast

region (red snapper, snowy grouper, pink shrimp, black sea bass, red porgy)? Can we develop a reliable composite index that reflects the overall fisheries status of broad regions such as the outer continental shelf or salt marsh estuaries?

Develop sustainable harvesting and seafood culture techniques – Research is needed to create and use sustainable fishing techniques that minimize impacts to habitats and nontargeted species. Additionally, culture of selected shellfish (hard clams, oysters) and fish species (red drum, cobia, southern flounder, black sea bass, red porgy), should be studied to help reduce pressure on wild stocks.

Examine habitat and population recovery patterns following physical disturbances – What is the trajectory of recovery- for an organism and/or for the environment - from events natural disturbances (e.g., storms) or from human activity (e.g., dredging)?

Develop water budgets and minimum flow estimates for coastal systems – How will the operation of a dam affect the salinity distribution in an estuary? How will changes in overland runoff associated with development affect groundwater infiltration? Do changes in groundwater flow affect salt marsh dieback events? Which tidal creeks are most sensitive to changes in inflow from uplands? What are the minimum flow requirements for different coastal ecosystems of the southeast region?

Working Waterfronts - Assess current demographics and trends for working waterfronts – How has the business footprint of the southeastern U.S. coastal zone changed over the past three decades? What traditional and existing working waterfront activities have been affected by changing demographics and population shifts? What are the implications of increased population density in terms of quality of life? How do changing demographics affect workplace literacy or emergency management programs?

Evaluate the impacts of human activities on working waterfronts – How do rising waterfront property values affect the southeastern shrimp fishery? How do changes in the real estate tax structure affect small businesses? What is the economic impact of different permitting policies for docks and set-backs? What approaches are available for communities to prevent and address the loss of culturally important, traditional activities?

Evaluate sustainable development techniques – What is the efficacy of various methods for increasing infiltration

to reduce stormwater runoff? How well do different types of buffers or stormwater ponds trap pollutants (and do these ponds serve as reservoirs for these pollutants and harmful algae)? Which dock designs minimize environmental impacts?

Assess the impacts of energy extraction in the coastal zone – What are the onshore implications of offshore energy development to our coastal communities? (e.g., transmission lines, fabrication, hooking into the grid, cabling). What are the ecological risks and societal perspectives associated with offshore drilling, wind power, and other energy-related activities?

Develop ecosystem service methodologies for assessing coastal and oceanic areas – Can we use conceptual models to assess the benefits and losses related to different development scenarios that are practical to apply?

Evaluate the effectiveness of efforts to inform decision-making regarding coastal resources – How do individuals and institutions actually make resource decisions? What impediments prevent good science from fostering good decisions, and how and where should results of scientific research be applied to achieve the best societal response?

Clean Coastal and Ocean Waters - Enhance environmental monitoring – There is a need for more robust monitoring of nearshore areas (e.g., surf zone, tidal zone, and estuaries). One approach would be to develop a tiered strategy for monitoring that can be used to characterize systems at a broad scale, which can then be followed with targeted sampling in problem areas. Parameters that would be useful to measure include currents, turbidity, surface waves, water levels, wind conditions, pH, harmful algal blooms, pathogens, nutrient concentrations, and chemical contaminants. However, techniques to monitor some of these are still not available.

Develop detection techniques for pathogens and contaminants – There are several emerging chemicals of concern, such as pharmaceuticals and other persistent organic pollutants, which are not well-studied in terms of their potential effects on ecosystems. Real-time techniques need to be developed to indicate and quantify the presence of human pathogens such as fecal coliforms and viruses. Apex predators may serve as sentinel species for monitoring pathogen and contaminant (including microplastics) concentrations.

Identify sources of pollutants to coastal waters – Information is needed on upstream land use, percentage of

impervious cover, amount of runoff, concentrations of pollutants in the inflow, and residence times of the receiving waters. Studies are also needed to evaluate how different land use practices affect downstream loading. How do small changes in fill, changes in vegetation cover, or different building styles affect runoff and sedimentation? What are the sources of pathogens that result in closures of beaches and shellfish beds?

Develop coupled biological/physical models for the region – Coupled models for the coastal ocean would provide information about circulation patterns, coastal upwelling, and the movement of nutrients and pollutants in the area. They could also be used to evaluate alternative scenarios and project climate and weather impacts such as drought, changes in the quality and amount of freshwater inflow, and flooding.

Assess the implications of land use change – The cumulative impacts of the myriad ways that humans modify the environment are not clear, and we do not understand the feedbacks between human and natural systems (e.g., how do changes in beach quality affect property values?). How are ecosystem services affected by increasing human population density and development along tidal creeks? Are we losing important spawning habitat as a consequence of land use change? Is there a carrying capacity for humans in the Southeastern coastal zone? How can land use change be managed to minimize deleterious effects on natural resources?

Evaluate the sources, transport, and fate of sediments – Sediments can have high concentrations of metals and organic contaminants, which can affect benthic organisms as well as the quality of the overlying water. There is a need for studies on the flux of sediment to coastal areas (is sediment supply adequate for maintaining salt marsh elevation relative to sea-level rise?), for information on where it tends to accumulate (where are the hot spots for water quality problems?), and for models of sediment transport (how is sediment movement affected by wind or boat traffic?).

Disaster-Resilient Communities - Assess vulnerability to natural hazards – Is shoreline erosion increasing as a consequence of human alteration? Region wide, which areas are most vulnerable to storms or sea-level rise due to their location and geomorphology? Which areas are most vulnerable due to their population density and the location and resilience of their built infrastructure? How do these two areas overlay?

Develop coastal inundation models – Although there are

DISCUSSION

numerous types of such models available, there is a need for an integrated assessment and validation testing of these models at scales that are relevant for regional resource management, planning, and decision-making. It is also important to acquire high precision topobathy for sea-level/flooding predictions (which is also necessary for accurate circulation models). Observations of wind, currents, and other environmental conditions that can be obtained from an offshore observing network are also important components for model verification.

Evaluate adaptation strategies – What options are there to reduce vulnerability or increase resilience of coastal communities to hazards such as flooding, hurricanes, and erosion in the southeast? Should a community purchase low-lying areas that are likely to transform into intertidal marsh in response to rising sea level? What are the potential physical, societal, and economic consequences of different strategies? Answering these questions will require engineering studies on the resilience of coastal infrastructure to natural disasters. Why are we not using information on vulnerability to promote or implement adaptation?

Develop economic models for hazards – What are the economic effects of changing beach renourishment practices? What is the cost-benefit of armoring versus retaining natural shorelines? How might changes in flood insurance policies affect coastal development and the relative economic risks due to hurricanes?

Assess people's perceptions, at a regional scale, regarding the risk of living/buying on the coast – If residents are aware of hazards including storm surge and sea-level rise but are not motivated to take action, what are the reasons for this disconnect? Conversely, if they are not well informed regarding the economic, safety, and quality-of-life related risks of living along the coast, what are the regional differences in knowledge and motivation so that education and outreach programs can be locally tailored?

Assess cultural resources in coastal communities and include them in resource planning – There is a need to develop research and informational partnerships to identify and ameliorate the threats to our cultural resources, both living (extant African American and Tribal communities) and archeological. Comprehensive assessments and mapping of these resources are needed. What is their vulnerability to coastal hazards including sea-level rise?

Throughout our three-year process, committed resource professionals, key agency staff and academic scientists have consistently invested their time and resources to cooperate in the development of this regional plan addressing critical coastal and ocean priorities. We have also been approached by several investigators interested in aligning their proposed work with SARRP research priorities. One of our most important partners is the Governors South Atlantic Alliance, which is working to increase regional collaboration to sustain and enhance environmental (coastal/ marine), natural resource, economic, public safety, social and national defense missions of the states and the region. The draft SARRP results were provided to the Alliance as a resource document as they developed their *Action Plan* (Governors' South Atlantic Alliance 2010), and is thus in place to inform the research component of that process as it moves forward. There is also significant overlap in membership between the SARRP Regional Advisory Group, Strategy Team and the Alliance's Executive Planning Team.

The dynamic partnerships that have been fostered by the SARRP project, and the research priorities plan itself, provide a solid foundation to address many high-priority regional scientific research issues for a broad array of stakeholders in the Southeast. For example, SARRP priorities offer uniquely multi-agency results as our region undertakes Coastal and Marine Spatial Planning, as outlined in the National Ocean Policy (Obama 2010). The Council on Environmental Quality's final report recommends that regional planning bodies work with regional science advisory bodies and other technical entities to identify priority scientific research needs. SARRP is in a position to inform these science advisory boards and others (Council on Environmental Quality 2010).

To further facilitate the plan, we have been collecting information describing ongoing or forthcoming activities that are relevant to each priority and have identified research topics specifically aligned with the missions of particular agencies and organizations. The Strategy Team workshop also identified opportunities for policy, education and outreach. We are currently working to identify a variety of potential collaborative projects that support the regional-scale research priorities described in this report. The SARRP plan provides a strong foundation for coordinated research, and the network of institutions and individuals that produced the plan will serve as an ongoing platform for coordination, collaboration, and resource sharing in the southeastern region.

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