

Annual Science Research Plan

2010-2011



FLORIDA OCEANS AND COASTAL
COUNCIL

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Executive Summary

Florida is the only continental state largely surrounded by coastal seas and ocean. Our state's character, nature, and future are driven by and depend upon the waters that surround it. Its citizens and visitors are never more than 75 miles from salt water and Florida's economy is heavily dependent on its oceans and coastal ecosystems.

To forecast, manage, or abate critical threats to Florida's marine resources and to wisely use those resources requires accurate assessments; continuous monitoring; and real-time abilities to predict and interpret changes to the physical; chemical, biological; geological; and socioeconomic components of our marine ecosystems. It also requires integrated data and information sharing amongst resource managers and other interested parties to achieve wise decision making.

Created by The Oceans and Coastal Resources Act, §161.70, et seq., Florida Statutes, The Florida Oceans and Coastal Council is charged with coordinating coastal and marine research, identifying research gaps and creating an annual Research Plan, and recommending new strategies that enhance management and conservation efforts for our coastal and marine resources.

The Council sought and has compiled stakeholder input to recommend a funding level of \$2.43 million during fiscal year 2010-2011. Fulfilling the resource assessment will contribute the needed data and research analyses to evaluate the positive and negative impacts on Florida's marine resources that might occur from climate change, offshore oil and gas exploration and production, development of alternate energy sources, seafood harvesting, transportation, and recreation.

Climate Change

Five priorities focus on down-scaling data and models to locally relevant levels; establishing baselines; identifying processes; and quantifying risks to minimize the effects of climate change on Florida's population and natural resources.

Water Quality

Four priorities are research and monitoring; coastal observing; harmful algal blooms; and modeling to achieve the improvement and maintenance of water quality to support coral and oyster reefs; seagrass beds; fish & wildlife; and beach activities.

Ocean and Coastal Ecosystems

Four priorities encompass mapping; hydrologic linkages; research & modeling; and ocean and coastal economics to develop and improve comprehensive understanding of sustainable natural systems.

Tools and Technology

Five priorities include coastal and ocean observing systems; remote & real-time sensors; data management & prediction; assessment tools; and mapping and monitoring cost reduction.

Ocean Governance

Three priorities embrace marine spatial planning & assessment; public outreach; and marine spatial planning to fulfill the central core of ecosystem-based management.

The Council stresses that this Research Plan is not intended to replace ongoing state-funded research efforts and partnerships. These research recommendations are based on identified research gaps to supplement research already under way; eliminate duplication of efforts; and advance agency missions.

Introduction

Florida is the only continental state largely surrounded by coastal seas and ocean. Florida's character, nature, and future are driven by and depend upon the waters that surround it. Florida encompasses 58,560 square miles, including 4,308 square miles of fresh and brackish water, bordered by a tidal shoreline 2,276 miles in length and 4,000 square miles of estuaries. Florida's marine waters extend 3.5 statute miles into the Atlantic Ocean and 10.4 statute miles into the Gulf of Mexico with Florida's Gulf Coast composing the eastern shore of America's only Mediterranean-type sea: the 600,000 square mile Gulf of Mexico. Its citizens or visitors are never more than 75 miles from salt water.

Florida's 18 million residents, 84 million tourists, and economy are heavily dependent on its oceans and coastal ecosystems. Florida's coastal Gross Domestic Product (GDP) for 2006 was almost \$562 billion, which represents a 17.4% increase from 2003 totals (Florida Ocean Coastal Economies Report, 2008). Florida's ocean economy contributed \$25 billion to the state GDP during 2005. In 2006, Florida's coastal counties made up over 79% of the state's economic productivity, yet the shoreline counties occupy only 56% of the land area.

To abate critical threats and take advantage of opportunities to use Florida's marine resources requires accurate assessments, continuous monitoring, and real-time ability to predict and interpret changes to the physical, chemical, biological, geological, and socioeconomic components of our marine ecosystems. It also requires a fully integrated system to allow resource managers and other interested parties to share data and information in making their decisions. Virtually all of the research priorities outlined in this plan can contribute needed data and research analyses to help evaluate the positive and negative impacts on Florida's marine resources that might occur through offshore oil and gas exploration and production, seafood harvesting, transportation, and recreation.

The Oceans and Coastal Resources Act, §161.70, et seq., Florida Statutes, created the Florida Oceans and Coastal Council (Council) in 2005. The Secretary of the Department of Environmental Protection, the Executive Director of the Fish and Wildlife Conservation Commission, and the Commissioner of the Department of Agriculture and Consumer Services each appoint specialized scientists and experts who serve as voting members of the Council. Designees of the agency heads serve as *ex-officio* members, with the Department of Environmental Protection and the Fish and Wildlife Conservation Commission acting as co-chairs.

The Council is charged with coordinating coastal and marine research, identifying research gaps, creating an annual Research Plan, and recommending new strategies that enhance management and conservation of our coastal and marine resources.

Understanding Florida's Oceans and Coasts

Florida's Constitution states that it "shall be the policy of the state to conserve and protect its natural resources..."¹ Success mandates that we use creative public and private partnerships, pursue opportunities to leverage funds, use our universities and research laboratories, and coordinate our efforts with local, state, and federal agencies. A complete discussion of the Council's overall research priorities is contained in the Science Research Overview that is available at: www.FloridaOceansCouncil.org.

This Research Plan is based upon prioritized resource management needs collected from state and local government agencies with coastal and oceans resource management responsibilities and augmented by input from nongovernmental organizations regarding their view of the state's resource management needs. The Council compared these management needs with available research to identify where research funding was needed. Two common themes emerged throughout the lists of priorities: 1) understand and predict environmental change on an ecosystem level, and 2) develop science-based solutions to environmental challenges.

The Council recommends the following areas of research emphasis in FY 2010–11:

Climate Change

The Council's 2009 report, "Effects of Climate Change on Florida's Ocean and Coastal Resources," informs the 2010-11 Annual Science Research Plan by identifying knowledge gaps at broad and specific levels. Providing guidance to minimize effects of climate change on Florida's population and natural resources will entail investigation into these key areas.

Research Priorities – Climate Change:

1. **Scaling data and models:** Apply global, hemispheric, and continental data and models to Florida and its adjoining oceanic environments, for example, by modeling sea-level rise based on Intergovernmental Panel on Climate Change scenarios. Emphasis is on collaborative, statewide efforts with peer review.
2. **Establishing baselines:** Define existing conditions, status and trends for the major categories of effects identified in the 2009 Council report, for example, by monitoring and mapping the effects of climate change on coral reef communities.
3. **Understanding processes:** Define cause-and-effect relationships between climate drivers or effects and the explicit responses of coastal and ocean ecosystems, for example, by developing and testing models that assess the impact on fisheries productivity from climate-driven changes to Florida's estuarine habitats.
4. **Quantifying risks:** Predict changes in the sustainability of natural resources and their values or beneficial uses for humans, using robust and understandable methods, for example, by adopting standard statewide projections for beach endangerment.

¹ Florida Constitution, Article II, Section 7.

Water Quality

Water quality is of critical importance to Florida—it determines what biological communities can live in a water body, whether the water is harmful to humans, and whether the water is suitable for other designated uses. With an economy driven by our aquatic environments, maintaining water quality to support coral or oyster reefs, seagrass beds, fishing, and beach activities must be a high priority.

Research Priorities—Water Quality:

1. **Research and monitoring:** Examine the effects of excess nutrients on living coastal resources and relate them to causes and sources, and to human activities. The intent is to support cost-effective resource management programs to improve oceans and human health.
2. **Statewide coastal observing:** Create real-time biotic and abiotic measurements to guide water quality management, marine resource management, and navigation and hazard response.
3. **Harmful algal bloom research:** Better predict the occurrences of harmful algal blooms to protect tourism and commercial and recreational fisheries, and inform watershed management for ocean health.
4. **Dynamic modeling:** Develop hydrodynamic, water quality, and coastal/ocean ecosystem models to support a better understanding of cause-and-effect between uplands activities, coastal freshwater discharges, and estuarine and marine biological communities.

Ocean and Coastal Ecosystems

Florida's ocean and coastal ecosystems are critical to maintaining the recreational and commercial economic activity they support. It is critical to maintain these ecosystems as sustainable natural systems. These resources are shaped by geology, water movement, and the plants and animals themselves interacting on a variety of scales: kilometers to millimeters. Comprehensive understanding of these ecosystems through reliable baseline information is critical to supporting wise management decisions.

Research Priorities—Ocean and Coastal Ecosystems:

1. **Mapping:** Characterize the sea floor and coast, including the distribution and abundance patterns of coastal marine organisms. Emphasis is on the gaps in mapping identified by the state resource management agencies at the Florida Mapping Workshop.²
2. **Hydrological linkages:** Improve the understanding of coastal and ocean hydrology, including the linkages between freshwater input and coastal waters. Emphasis should be on water budgets, hydrologic modeling, and factors affecting and controlling freshwater input to coastal and nearshore waters.



² Joint Florida Department of Environmental Protection/U.S. Geological Survey/Southeast Regional Partnership for Planning and Sustainability workshop held during February 2007 on Florida mapping priorities. Available at: <http://www.dep.state.fl.us/MarineMapping/priorities.htm>.

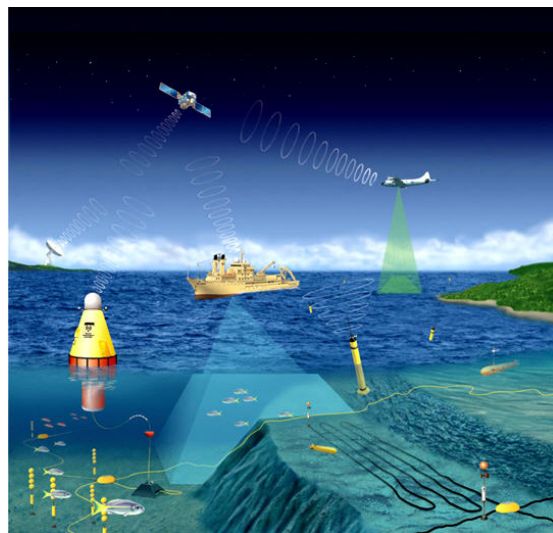
3. **Research and modeling:** Understand and describe linkages between ocean and coastal habitats and the living marine resources they support. One area of emphasis is the effects of marine protected areas on surrounding populations. Fisheries and their linkages to habitats are an important part of these studies.
4. **Ocean and coastal economics:** Increase our understanding of the values of nonmarket resources and issues such as the costs and benefits of beach nourishment and beach restoration.

Tools and Technology

Fulfilling Florida’s need to observe and predict environmental change and the ecosystem responses of its coastal waters provides abundant opportunity for the development and implementation of cost-effective tools and technologies to understand, monitor, and improve the health of Florida’s resources.

Research Priorities—Tools and Technology:

1. **Coastal and ocean observing systems:** Implement a mix of in-water platforms and buoys, shipboard surveys, remote sensing, and computer models for the continuous monitoring of climate change impacts, water quality, and status of marine resources. The goal is to create a sustained interdisciplinary observing system that spans all of Florida’s waters from the outer shelf to coastal estuaries and rivers. Emphasis is on extending and integrating capabilities, and filling gaps in existing coastal observations by implementing the Florida Coastal Ocean Observing System Strategic Implementation Plan.
2. **Remote and real-time sensors:** Provide improved abilities to determine the status and trends of our coastal waters and their inhabitants through sensor development for biological and chemical monitoring, as well as fish and wildlife tagging and tracking.
3. **Data management and prediction:** Improve the coordinated collection, handling, quality control, sharing, and interpretation of research and monitoring data. Centralized coordination of model development to provide predictions and user-friendly web-based posting of information and model predictions are needed to inform and support science-based decisions by management agencies and the general public.
4. **Assessment tools:** Develop the means and methods to assess biological community status and trends, rapid assessments of natural resources, and the evaluation of management efforts.
5. **Reduce costs:** Develop innovative tools and integrate data to decrease the costs of mapping and monitoring the state’s coasts and oceans.



Ocean Governance

Ecosystem-based management is an integrated and adaptive approach to management that considers the entire ecosystem—the organisms, their interactions, and the chemical, physical, and human social environment that surrounds and sustains them. The goal is to maintain a healthy, productive and resilient ecosystem so that it can sustainably provide the services human beings want and need today and in the future.

Marine spatial planning, at the core of ecosystem-based management, has made considerable progress since it was made a priority in the Council's Annual Science Research Plan 2006-07. Existing spatial data and information have been assessed and assembled in geographic information system format, including key resources, benthic habitats, biological diversity, physical and chemical parameters, bathymetry, and sediments. Human uses have also been mapped, including shipping lanes, pipelines and cables, minerals leases, protected areas, fishing zones, and aquaculture sites to name a few. The sources of this information include publications, databases and local knowledge.

Research Priorities—Ocean Governance:

1. **Marine spatial assessment and mapping:** Geographic information systems overlay existing maps showing areas where information is abundant and areas where there are significant information gaps. Data and information gathering must continue and the maps must be updated. Ultimately, these maps must allow assessments of changes and provide parameters for models to help predict the future under different scenarios of management and environmental change.
2. **Public outreach:** The importance of geographic information system layered maps in visually representing complex use problems, engaging the stakeholders, and directing solutions cannot be over-emphasized. Public outreach in the use of the geographic information system maps must be expanded through website development, public meetings, and demonstrations at public forums. Public meetings are critical to filling information gaps and building a constituency for more comprehensive ocean governance.
3. **Marine spatial planning:** Resource assessment maps are the basis for the development of an ocean management plan, which will ultimately require cooperation between the state and federal governments in authorizing legislation and funding. While sectoral planning has been used in the ocean for many years, comprehensive planning is unprecedented. Several features are important to note. Planning in the ocean is flexible because private ownership is not a factor. Plans may be created for specified uses and periods and allowed to lapse or turn over to other uses. Finally, planning is an adaptive process as performance must be monitored and evaluated against the goals that are established at the outset.

Priorities and Funding for FY 2010–2011

The Council requests the following to accomplish its statutory responsibilities.

1. Administration and operation:

Florida Oceans and Coastal Council – costs for meetings and support staff to create annual Research Plan and oversee research proposals and contracts.

Recommended funding = \$181K

2. Legislatively defined duties:

Resource Assessment Project –maintain publicly available Resource Assessment providing information on the location and status of the natural and human resources in Florida’s coastal and ocean realm. This resource assessment work is a necessary tool for effective ocean management and marine spatial planning.

Recommended funding = \$250K

3. Research Priorities:

Ocean and Coastal Funding – seed monies to nurture public and private partnerships, pursue opportunities to leverage funds, creatively use universities and research laboratories, and coordinate efforts with local, state, and federal agencies.

Recommended funding = \$2.0M

The Council's Research Accomplishments

- The Council issued a report for the new Energy and Climate Commission entitled *The Effects of Climate Change on Florida's Oceanic and Coastal Resources*.
- The Council sponsored the National Ocean Economics Program at Monterey Bay Aquarium Research Institute to complete *Phase II: Florida Ocean and Coastal Economies Report*:
 - Made presentations to the Governor and Cabinet and the Coastal Cities Summit on the economic impact of Florida's ocean and coastal economy; and
 - Hosted the Florida Coastal and Ocean Economics Forum to present the work to the public and Florida's marine industries.
- Multiple Coastal Ocean Observing System projects were completed through a contract with the Florida Coastal Ocean Observing System Consortium involving about 200 scientists, staff, and students, leveraging \$2.5 million in nonstate funding. These projects include the following:
 - Production of the Florida Coastal Ocean Observing System Strategic Implementation Plan. (Florida Coastal Ocean Observing System Consortium, with input from other interested parties)
 - Addition of a nitrate chemical sensor which aids in understanding nutrient fluctuations and water quality at a location off northwest Florida that already makes physical and meteorological observations, to continue the development of an interdisciplinary ocean observing system. (Florida State University)
 - Installation of two high-frequency radars along the coast of southeast Florida to expand the existing array northwards and obtain high-resolution surface current and wave data that are used in search and rescue and for safe maritime operations. (University of Miami)
 - Deployment of three sub-surface physical oceanographic moorings and one sub-surface biological observing system on the Central East Florida Shelf to begin observations in a data-sparse region, including the *Oculina* Bank, a Habitat Area of Particular Concern. (Florida Institute of Technology, Harbor Branch Oceanographic Institute at Florida Atlantic University, Nova Southeastern University)
 - Deployment of one physical oceanographic and meteorological surface mooring off northeast Florida to begin observations in a data-sparse region in the protected north Atlantic right whale breeding area. (University of North Florida, with assistance from the University of South Florida)
 - Production of high-resolution, Florida-specific satellite data images and movies of sea-surface temperature and ocean color to show fronts, eddies, and biological productivity; these are used for snapper, grouper, king mackerel, and sardine fisheries. (Roffer's Ocean Fishing Forecasting Service, Inc. [ROFFS™])
 - Development of a Florida-wide ocean-atmosphere model by incorporating influences such as the Loop Current and the Gulf Stream System to provide boundary conditions for high-resolution, smaller-domain (e.g., estuarine) models, to move towards three-dimensional forecasting capabilities. (Florida State University)
 - Development of a high-resolution estuarine and shelf model for the northeast Florida region, using boundary conditions provided by the Florida-wide model, which will provide initial steps for modeling water quality from the St. Johns River to Ponce de Leon Inlet. (University of Florida)
 - Conducting Florida Coastal Ocean Observing System Consortium planning workshops and an Ocean Tracking Network workshop that discussed a worldwide network of transmitters to track the

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movement of marine life such as sharks, tunas, billfishes, and sea turtles. (Florida Coastal Ocean Observing System Consortium, Mote Marine Laboratory, Florida Institute of Oceanography)

- Data management to provide access to ongoing observations, models, and products. (Florida Coastal Ocean Observing System Consortium)

- Outreach activities, including the development of a DVD. (Florida Coastal Ocean Observing System Consortium)

- Work continued on the Resource Assessment for Florida, which provides internet-based information about the location and status of Florida's natural and human resources.

- Work continued on the Research Review for Florida, which provides internet-based information on existing ocean and coastal research in Florida. This helps identify research gaps and prevent duplication of effort.

- The Council co-sponsored three conferences/workshops:

- 11th Annual International Coral Reef Symposium;

- Coastal Cities Summit; and

- Florida Fish and Wildlife Conservation Commission's Florida's Wildlife: On the Frontline of Climate Change

- The Council's support of the Florida Water Resources Monitoring Council enabled the Monitoring Council to draft a Florida Coastal Monitoring Action Plan.

- The Council co-sponsored the Gulf of Mexico Alliance's Monitoring Forum, which focused on data comparability and coastal nutrient criteria.

- The Council solicited and incorporated input from 17 Florida resource-management agencies and entities. This information was used to perform a broad-based assessment of resource management needs and to prioritize the research needed to address those needs.

- The Council's Annual Science Research Plan has been used by state agencies to guide their actions in the areas of research and resource assessment.

- Priorities identified by the Council are being used to shape the newly formed regional collaborations of the Gulf of Mexico Alliance and South Atlantic Alliance.

- A Resource Assessment to provide internet-based information about the location and status of Florida's natural and human resources has been initiated.

- A Research Review to provide internet-based information on existing ocean and coastal research in Florida has been initiated. This will help identify research gaps and prevent duplication of effort.

- The Council completed a white paper on aquaculture that explores opportunities and hindrances for expanding aquaculture's role in Florida.

Council Reports

The Effects of Climate Change on Florida's Ocean and Coastal Resources, A Special Report to the Florida Energy and Climate Commission, 2009

Phase II: Florida Ocean and Coastal Economies Report, 2008

Florida Coastal Ocean Observing System Strategic Implementation Plan, 2008

Integrated Data Management Functional Requirements and Metadata Elements, 2008

Resource Assessment User and Functional Requirements, 2008

Research Review, internet-based information on existing ocean and coastal research in Florida (available:

<http://ocean.floridamarine.org/focc/overview.cfm>), 2007–2008

Current Status and Opportunities for Marine Stock Enhancement and Aquaculture in Florida, 2007

Coastal and Ocean Research Management Needs, 2007

- The Council partnered with the Florida Water Resources Monitoring Council to support establishing metadata standards to improve the use of existing Florida data.
- Council actions stimulated the creation of an organized ocean-observing effort for Florida that includes public/private partnerships.
- The Geospatial Assessment of Marine Ecosystems (GAME) Project is gathering existing biological and physical information in a web-based geographic information system (GIS) format. The goals are to identify critical information gaps and to define and map Florida's marine ecosystems.
- The Council's emphasis on mapping prompted a joint state–federal interagency workshop to assess existing information and identify and prioritize mapping needs for Florida. Results from the workshop have already influenced projects funded through other sources. For example, a website was established with information to help with the coordination of mapping within the state (<http://www.dep.state.fl.us/MarineMapping>). The information was integrated into the U.S. Geological Survey's Florida Shelf Habitat Mapping Project, the Response of Florida Shelf Ecosystems to Climate Change.
- Priorities identified by the Council influenced the National Ocean Research Priorities Plan.