

SOUTH CAROLINA OCEAN REPORT

**A FOUNDATION FOR IMPROVED
MANAGEMENT AND PLANNING IN SOUTH CAROLINA**



**REPORT OF THE
SC OCEAN PLANNING WORK GROUP**

July 2012

Forward

South Carolina's ocean waters are critical to the state's economy, maritime culture, and quality of life. A healthy, productive coast and clean public beaches have sustained coastal communities economically for generations by attracting tourism, commercial and recreational fisheries and fostering the development and expansion of other industries. Over the past several decades, sand extraction, maritime commerce, port operations, and military activities have expanded significantly and now factor prominently in long-term planning and decision-making. Our ports and shipping have enhanced the economic linkages between the coast and upstate regions. Today, wind energy and ocean aquaculture may be just over the horizon for South Carolina. As ocean-related activities increase, there is a greater than ever need to understand the interactions between ocean uses and to ensure the ecological and economic sustainability of the state's ocean resources.

Given the significant economic impacts of ocean-related industries in South Carolina, it is critical for the State to take an active role in ocean resource planning and management. Coastal tourism, fisheries, and energy facilities generate (or have the potential to generate) the majority of our state's revenues. However, planning and management of ocean activities is the responsibility of numerous state and federal agencies. There is an overarching need for the state to consider opportunities for improved interagency collaboration, ocean research, mapping, and policy development to adequately manage offshore activities and plan for associated onshore facilities and connections. The ultimate goal is to reduce future use conflicts, make wise financial investments, and ensure that the responsible use of our ocean resources will support a strong coastal economy for generations to come. We hope that this report, which provides both technical and policy-relevant information and ideas, will provide a strong foundation for future ocean management in South Carolina.

*Carolyn Boltin-Kelly
Robert Boyles
John Mark Dean
Rick DeVoe
Cindy Fowler
Paul Gayes
Catherine Vanden Houten*

*Trish Jerman
Marvin Pontiff
Dwayne Porter
Paul Sandifer
Leslie Sautter
Brian Smith
David Whitaker*

Acknowledgements

This report would not have been possible without the dedicated commitment, time, and energy of the Ocean Planning Work Group and staff of the SC Department of Health and Environmental Control's Office of Ocean and Coastal Resource Management:

Project Managers: Melissa Rada, Policy Analyst, Coastal Services Division
 *Braxton Davis, Director of Policy and Planning Division

Staff Contributors: Elizabeth von Kolnitz, Program Coordinator, Coastal Services Division
 Matt Slagel, Shoreline Management Specialist, Coastal Services Division
 Blair Williams, Manager, Wetland Permitting Section
 Barbara Neale, Senior Program Analyst
 Dan Burger, Director, Coastal Services and Administration
 Marian Page, Program Manager, Coastal Services Division
 *Sadie Drescher, Research Specialist of Policy and Planning
 *Mark Messersmith Research Specialist of Policy and Planning
 Virginia Shervette, University of South Carolina

*At the release of this report:

Braxton Davis is Director of the NC Department of Environment and Natural Resources, Division of Coastal Management;

Sadie Drescher is a Watershed Planner for the Center for Watershed Protection; and
Mark Messersmith is a Biologist for the US Army Corps of Engineers.

Financial assistance provided under Cooperative Agreement NA08NOS4190423 by the Coastal Zone Management Act of 1972, as amended, administered by the Office of Ocean and Coastal Resource Management, National Oceanic and Atmospheric Administration.

Cover photograph courtesy of the SC Department of Natural Resources.

Members of the Ocean Planning Work Group

SC Department of Health and Environmental Control, Office of Ocean and Coastal Resource Management

Carolyn Boltin-Kelly, Deputy Commissioner
Marvin Pontiff, Assistant Deputy Commissioner

South Carolina Department of Natural Resources, Marine Resources Division

Robert Boyles, Deputy Director
David Whitaker, Assistant Deputy Director

South Carolina Energy Office

Trish Jerman, Manager, Energy Efficiency, Conservation and Outreach
Catherine Vanden Houten, Manager, Renewable Energy Programs

South Carolina Sea Grant Consortium

M. Richard DeVoe, Executive Director

NOAA Coastal Services Center

Cindy Fowler, GIS Integration and Development Program Manager
Brian Smith, Coastal Ecologist

NOAA Hollings Marine Laboratory

Dr. Paul Sandifer, Chief Science Advisor, NOAA, National Ocean Service, and Senior
Science Advisor to the NOAA Administrator

University of South Carolina

Dr. Dwayne Porter, Chair, Department of Environmental Health Sciences
Dr. John Mark Dean, Professor Emeritus

Coastal Carolina University

Dr. Paul Gayes, Director, Center for Marine and Wetland Studies

College of Charleston

Dr. Leslie Sautter, Associate Professor, Dept. of Geology and Environmental Geosciences

Acronyms

ACT	WCGA Seafloor Mapping Action Coordination Team
ASMFC	Atlantic States Marine Fisheries Commission
BCB	South Carolina Budget and Control Board
BIMP	North Carolina Beach and Inlet Management Plan
BOEM	Bureau of Ocean Energy Management
BOEMRE	Bureau of Ocean Energy Management, Regulation, and Enforcement
BOW	DHEC - Bureau of Water
BSEE	Bureau of Safety and Environmental Enforcement
CalCOFI	California Cooperative Oceanic Fisheries Investigation
CCEHBR	NOAA's Center for Coastal Environmental Health & Biomolecular Research
CEQ	White House Council on Environmental Quality
CES	South Carolina Coastal Erosion Study
CMSP	Coastal and Marine Spatial Planning
COP	Construction and Operations Plan
CRC	North Carolina Coastal Resources Commission
CRMC	Rhode Island Coastal Resources Management Council
CSC	NOAA Coastal Services Center
CSMP	California's Seafloor Mapping Program
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
CZMP	Coastal Zone Management Plan
DCM	NCDENR Division of Coastal Management
DENR	North Carolina Department of Environment and Natural Resources
DEP	Florida Department of Environmental Protection
DHEC	South Carolina Department of Health and Environmental Control
DMF	Massachusetts Division of Marine Fisheries
DMR	Maine's Department of Marine Resources
DOD	United States Department of Defense
DOI	United States Department of the Interior
DWR	NCDENR Division of Water Resources
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EMC	NC Environmental Management Commission
EPA	United States Environmental Protection Agency
EPAct	Energy Policy Act of 2005
FDACS	Florida Department of Agriculture and Consumer Services
FEMA	Federal Emergency Management Administration
FEP	SAFMC Fishery Ecosystem Plan
FERC	Federal Energy Regulatory Commission
GAP	General Activities Plan
GOMA	Gulf of Mexico Alliance
GoMMI	Gulf of Maine Mapping Initiative

GRSMMP	Gulf Regional Sediment Management Master Plan
GSAA	Governors' South Atlantic Alliance
HAPC	Habitat Areas of Particular Concern
HML	NOAA's Hollings Marine Laboratory
INTERMAR	Office of International Activities and Mineral Resources
IOOS	Integrated Ocean Observing System
LNG	Liquefied Natural Gas
MARMAP	Marine Resources Monitoring, Assessment, and Prediction Program
MDAR	Massachusetts Department of Agricultural Resources
MEPA	Massachusetts Environmental Policy Act
MMS	Minerals Management Service
MOA	Memorandum of Agreement
MORIS	Massachusetts Ocean Resources Information Systems
MOU	Memorandum of Understanding
MPA	Marine Protected Area
NEPA	National Environmental Policy Act
NMFS	NOAA National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOC	National Ocean Council
OCRM	DHEC - Office of Ocean and Coastal Resource Management
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
ODFW	Oregon Department of Fish and Wildlife
OPC	California Ocean Protection Council
OPTF	National Interagency Ocean Policy Task Force
OPWG	South Carolina Ocean Planning Work Group
ORMP	Hawaii's Ocean Resources Management Plan
PSC	South Carolina Public Service Commission
ROW	Right of Way Grants
RSM	Regional Sediment Management
RTF	Regulatory Task Force for Coastal Clean Energy
RUE	Rights of Use and Easement
SAB	South Atlantic Bight
SAFMC	South Atlantic Fishery Management Council
SAMP	Special Area Management Plan
SCAC	Shoreline Change Advisory Committee
SCDNR	South Carolina Department of Natural Resources
SCDNR-MRRI	SCDNR – Marine Resources Research Institute
SCECAP	South Carolina Estuarine & Coastal Assessment Program
SEAMAP	Southeast Area Monitoring and Assessment Program
SECOORA	Southeast Coastal Ocean Observing Regional Association
SHPO	South Carolina State Historic Preservation Office
SLA	Submerged Lands Act
SMP	Sediment Master Plan
TNC	The Nature Conservancy
USACE	United States Army Corps of Engineers

USFWS
USGS
USMC
WCGA

United States Fish and Wildlife Service
United States Geological Survey
United States Marine Corps
West Coast Governors' Agreement

Contents

Executive Summary	9
Chapter 1: Introduction	13
Background	14
Process	15
Similar Initiatives in Other Coastal States	16
Layout of this Report	18
Chapter 2: Ocean Authorities in South Carolina	23
State and Federal Ocean Boundaries	25
Summary of State Authorities.....	27
Summary of Federal Authorities.....	28
Summary of Regional Authorities	30
Chapter 3. Living Marine Resources and Habitats	35
Living Marine Resources / Marine Habitat Management in South Carolina	40
Marine Artificial Reefs	40
Fisheries and Ecosystem Based Management	41
Experiences in Other States	43
SC Living Marine Resources and Habitats Workshop Outcomes	44
Chapter 4. Ocean Energy Development.....	49
Offshore Wind Energy Development	50
Renewable Ocean Energy Policy and Research Initiatives in South Carolina	51
Wind Energy in Other Coastal States	58
Regulatory Pathways	60
Offshore Oil and Gas Development.....	67
Recent Policy Initiatives in South Carolina	67
Regulatory Pathways	68
SC Ocean Energy Workshop Outcomes	72
Chapter 5. Sand Resources	75
Sediment Management in South Carolina	78
SC Coastal Erosion Study.....	78
SC Shoreline Change Advisory Committee.....	78
SCDNR Historical Data Study on Beach Nourishment Projects	79

Regional Sediment Management	80
Regulatory Pathways for Offshore Sand Mining.....	81
State Pathway	81
Federal Pathway	82
Regional Sediment Management in Other States	85
SC Regional Sediment Management Workshop Outcomes	87
Chapter 6. Marine Aquaculture	91
Marine Aquaculture in South Carolina.....	95
Regulatory Pathways	97
Aquaculture in State Waters	97
Aquaculture in Federal Waters	100
Marine Aquaculture in Other States	101
SC Ocean Aquaculture Round Table Outcomes.....	105
Chapter 7: Ocean Mapping in South Carolina	109
Ocean Mapping in South Carolina.....	110
Coastal Erosion Program (1994-1999)	110
South Carolina Coastal Erosion Study.....	111
Mapping Activities by the College of Charleston.....	113
Comprehensive Spatial Mapping Effort of South Carolina’s Ocean Resources and Activities	115
Multipurpose Marine Cadastre – SC Renewable Energy Task Force Viewer.....	116
Mapping Activities by the US Army Corps of Engineers	116
The Nature Conservancy’s Carolinas Ecoregional Assessment	117
Benthic Habitat Mapping Projects in South Carolina.....	119
Ocean Mapping in Other States	120
SC Ocean Mapping Workshop Outcomes	123
Chapter 8. Ocean Monitoring in South Carolina	127
Ocean Monitoring in South Carolina.....	128
Monitoring Water Quality in Long Bay, South Carolina	129
Regional Ocean and Coastal Monitoring	130
Ocean Monitoring in Other States	132
SC Ocean Monitoring Workshop Outcomes	133
Chapter 9. Emerging Frameworks for Ocean Management	137

Comprehensive Ocean Planning.....	137
Coastal and Ocean Planning in the South Atlantic Region.....	139
Coastal and Marine Spatial Planning in Other Coastal States	140
Ocean Leasing.....	141
Ocean Leasing Frameworks in Other Coastal States	143
Chapter 10. Conclusions.....	145
Appendix 1: Ocean Planning Work Group Workshops	153
Appendix 2: Record of Public Comment	163

Executive Summary

South Carolina has a rich maritime history and culture, with economic and social connections that extend from the Lowcountry to the Upstate. Today, the state's economy continues to depend on a healthy and productive fishing industry, thriving coastal tourism, and competitive port facilities and operations. A wide range of important economic and national security-related activities occur in South Carolina's ocean waters, including military operations, port and vessel traffic, recreational and commercial fishing, and dredged material disposal. Newly emerging and expanding ocean activities, such as increased interest in wind energy and sand extraction for beach renourishment projects, can also contribute to the state's economic and social well-being in the coming decades – provided that South Carolina plans for these activities to ensure that they are conducted in a fair, safe, and sustainable manner while preserving traditional economic and recreational uses and protecting fragile habitats. In considering the potential for benefits, impacts, and conflicts between future ocean activities, state and federal agencies, through partnerships with universities and the private sector, can fulfill their public trust responsibilities and help South Carolina make meaningful investments in an ocean-based economy.

The SC Department of Health and Environmental Control's Office of Ocean and Coastal Resource Management (DHEC-OCRM) is responsible for planning and permitting fixed facilities and other activities within South Carolina's coastal waters, which extend out to three nautical miles offshore. DHEC-OCRM also has responsibility for determining whether activities in federal waters are consistent with the state's coastal zone management policies. State ocean waters include critical habitats for commercially and recreationally important fisheries, as well as significant mineral and sand resources. Due to their proximity to land, state waters are also subject to a growing range of potential human activities including sand mining, ocean aquaculture, submerged transmission cables and energy facilities. Recognizing a need for cooperation between government agencies to clarify ocean resource policies and to improve and increase predictability in future decision-making, DHEC-OCRM established an Ocean Planning Work Group in 2008 to consider emerging ocean resource issues and develop this report to guide future ocean research, data collection and mapping, and policy considerations.

Over the past several years, other ocean planning and policy development efforts have been initiated by our partner agencies and the SC General Assembly. In 2008, a Regulatory Task Force on Coastal Clean Energy was created by the SC Energy Office to promote a regulatory environment conducive to alternative energy development in state waters. The Task Force has met for the past three years and provided a series of recommendations to the SC Wind Energy Production Farms Feasibility Study Committee in support of wind energy development, including measures to improve the regulatory environment. This Wind Study Committee spent one year evaluating the feasibility of wind energy production farms (Dec. 2009), and in agreement with the Regulatory Task Force, recommended that the state develop a comprehensive leasing framework and “marine spatial plan” for state waters. Earlier, a separate South Carolina Legislative Study Committee was created to examine the feasibility of offshore natural gas development and it released recommendations in support of offshore natural gas exploration (2008). At the regional scale, a Governors’ South Atlantic Alliance was established in 2010 and released an Action Plan addressing four high priority issue areas shared by North Carolina, South Carolina, Georgia, and Florida: Healthy Ecosystems, Working Waterfronts, Clean Coastal and Ocean Waters, and Disaster-Resilient Coastal Communities.

The Ocean Planning Work Group was formed to increase information exchange among agencies and researchers, and to develop this “foundational” report to help guide future ocean research, education, and policy discussions. The Group initially consisted of a limited number of representatives from federal and state agencies and universities, with hopes of expanding its communications with a broader collection of agencies and stakeholders with ocean interests in South Carolina. The recommendations in this report were based on a series of public meetings and workshops that covered priority topic areas, including living marine resources, ocean energy development, sand resources, ocean aquaculture, ocean monitoring and mapping, and ocean management frameworks.

Based on results of the public workshops that are described in Appendix 1, in addition to Ocean Planning Work Group discussions and research, the following recommendations are set forth in Chapter 10 of this report:

- 1-1 Develop a South Carolina Ocean Action Plan to ensure the sustainable use of our ocean resources.***
- 1-2 Coordinate with stakeholders, elected officials, and the public on ocean management issues to educate and gain input regarding preferred ocean uses.***
- 2-1 Reduce use conflicts and impacts to living marine resources from new and expanding ocean activities.***
- 3-1 Facilitate offshore wind energy development in South Carolina.***
- 3-2 Establish a leasing framework for state ocean waters.***
- 4-1 Develop a Regional Sediment Management Plan for South Carolina.***
- 5-1 Encourage sustainable coastal and ocean aquaculture development in South Carolina.***
- 6-1 Invest in seafloor and ocean use mapping in South Carolina's state ocean waters.***
- 7-1 Improve ocean monitoring information exchange and investment.***

PAGE INTENTIONALLY LEFT BLANK

Chapter 1: Introduction

South Carolina is a maritime state where fisheries, navigation, and working waterfront communities have always been important both economically and culturally. Recreational and commercial fishing is a way of life for many who live here, and for many who visit. South Carolina ports contribute nearly \$45 billion in economic activity each year.¹ In addition, clean and healthy public beaches and ocean are integral to South Carolina's coastal tourism industry. As discussed in Chapter 3, marine fisheries provide over a billion dollars in economic value to the state.² Coastal tourism is responsible for approximately half of a \$17 billion tourism industry in South Carolina.³ And a recent study has indicated that the impact of outdoor recreation from coastal tourism is approximately \$7.046 billion.⁴ It is essential for South Carolina resource agencies to manage ocean and coastal resources responsibly and proactively in order to ensure the sustainable economic health of these valuable resources.

In addition to their economic importance, South Carolina's ocean waters include critical habitats for commercially and recreationally important fisheries, as well as significant energy, mineral, and sand resources. Ocean waters are also the focus of expanding activities, including placement of artificial reefs, military exercises, navigation and port facilities, sand mining, dredged material disposal, and stormwater discharges, as well as growing interests in offshore energy development and marine aquaculture. To accommodate these emerging and expanding activities, there is a need for strengthened cooperation among local, state, and federal agencies to clarify and coordinate ocean resource conservation, management, and use policies, and to improve and increase predictability in decision making. Recognizing this need, the SC Department of Health and Environmental Control's Office of Ocean and Coastal Resource Management (DHEC-

¹ SC State Ports Authority. *South Carolina Port Volume Up for Year*. Press Release 5/17/2011. Retrieved October 2011, http://www.port-of-charleston.com/spa/news_statistics/news/pressroom/pressroom.asp.

² SC Dept. of Natural Resources. *Status of Marine Fisheries in South Carolina*. SC Living Marine Resources and Habitats Workshop. Charleston, SC. December 2, 2010. http://www.DHEC.gov/environment/ocrm/ocean_planning.htm.

³ Travel Industry Association. *The Economic Contribution of Tourism in South Carolina: 2006 Tourism Satellite Account Results*; and *The Economic Impact of Domestic Travel on South Carolina Counties*, 2006. Retrieved October 2011, http://www.scprt.com/files/Research/SC_TSA_%202006_Report_1-29-08.pdf; <http://www.scprt.com/files/Research/2006SCReport8-20-07.pdf>.

⁴ Dr. Woodward, Douglas P. and Dr. Paulo Guimaraes. 2009. *Underappreciated Assets: The Economic Impact of South Carolina's Natural Resources*. University of South Carolina Moore School of Business. Retrieved October 2011, <http://www.dnr.sc.gov/green/index.html>

OCRM) established an Ocean Planning Work Group in 2008 to consider existing, expanding, and emerging ocean resource issues and help prioritize future research, data collection and mapping, and policy needs to enhance ocean management in South Carolina.

Background

Generally, South Carolina’s ocean resources and uses have been managed in a fragmented manner, as resource management has focused on individual resources and case-by-case activities, and often on a site-specific basis in response to permit applications. For instance, the SC Department of Natural Resources (SCDNR) regulates fishing activities in state waters; DHEC-OCRM evaluates the site-specific and cumulative impacts of any fixed structures in state waters, as well as activities in federal waters that may impact the coastal zone; DHEC’s Bureau of Water (BOW), among other duties, regulates discharges and impacts to water quality. Until recently, South Carolina has not undertaken a comprehensive or “big picture” examination of ocean resource and use management. New and expanding ocean activities may pose significant pressures on the state’s ocean resources. A more coordinated approach to ocean management is needed to minimize potential use conflicts and enhance opportunities for jobs and economic growth.

A 2006 “State of the Knowledge” report summarized the efforts and experiences of other coastal states in ocean planning and management.⁵ At that time, at least six coastal states had undertaken ocean planning efforts for their respective state waters and often included federal waters within an expanded area of state interest. Since then, a number of states have also undertaken more spatially-explicit planning efforts to develop specific ocean facility siting standards through significant public and stakeholder engagement – a process commonly referred to as “marine spatial planning.”⁶

DHEC-OCRM launched an Ocean Planning Initiative under its five-year Coastal Program Enhancement Strategy for high priority issues (2006-2011). This initiative was supported by

⁵ DHEC-OCRM. 2006. *State Ocean Management Plans and Policies: Synthesis Report*. http://www.DHEC.gov/environment/ocrm/ocean_management.htm.

⁶ The White House Council on Environmental Quality. 2010. *Final Recommendations of the Interagency Ocean Policy Task Force*. Retrieved July 2010, http://www.whitehouse.gov/files/documents/OPTF_FinalRecs.pdf.

federal Coastal Zone Management Act Enhancement Grants from the National Oceanic and Atmospheric Administration (NOAA; US Department of Commerce). The South Carolina strategy intended to address growing pressures related to sand extraction, an increasing interest in offshore energy development, and potentials for conflicts between emerging/expanding activities and living marine resources. Other contemporary issues include dredged material disposal, submerged lands leasing, military training exercises, and the expansion of ocean stormwater outfalls.

In early 2008, DHEC-OCRM brought together a steering committee that consisted of federal and state agency representatives who had expressed interest in ocean planning. The steering committee recommended the establishment of an Ocean Planning Work Group (OPWG) with representatives from federal and state agencies and academic institutions. The OPWG was formed to: 1) improve information exchange across agencies and academic institutions focused on ocean-related issues; and 2) develop management recommendations for consideration by state and local officials.

Process

The OPWG was formally established in 2008, and developed a three-year work plan that culminated in the development of this report. To gain significant stakeholder input, the Work Group decided to host a series of topic-oriented workshops to gather input from other agencies, academic institutions, industry and interested stakeholders, and members of the public. High priority topic areas identified by the OPWG included: living marine resources and habitats; offshore energy; sand resource management; offshore aquaculture; and ocean mapping and monitoring. At each workshop, a series of guest speakers provided background information on the topic, and then workshop participants were engaged to help identify gaps in data and/or regulatory regimes and management priorities for the state. Following each workshop, notes summarizing the meeting outcomes were drafted and released for review by participants and other stakeholders. All workshop notes, presentations, and other information have been hosted on a special Ocean Planning webpage dedicated to this effort:

http://www.DHEC.gov/environment/ocrm/ocean_planning.htm.

Similar Initiatives in Other Coastal States

Several other coastal states have recently released ocean planning or ocean management plans.

Examples include:

- *Developing a Management Strategy for North Carolina's Coastal Ocean* (2009).
- *Massachusetts Ocean Management Plan* (2009).
- *Rhode Island Ocean Special Area Management Plan* (2010).
- *The California Ocean Council Five-Year Strategic Plan* (2006).
- *Oregon's Ocean Resources Management Plan* (1991).

These planning efforts have generally focused on improving state ocean resource management and agency coordination, encouraging the use of renewable energy, mapping ocean resources and uses, and improving ecosystem health.

North Carolina

North Carolina's Ocean Policy Steering Committee released its Management Strategy to guide future research and to develop policy recommendations for North Carolina's coastal ocean.⁷ The Steering Committee recommended comprehensive management for sand sources and state needs; establishment of a leasing program for state-owned submerged lands, water column, and air space; clarification of existing roles of regulatory agencies; prohibition of new outfalls and the decommission of existing ones; a technical assessment of the feasibility for marine aquaculture; and an update to ocean maps.⁸

Massachusetts

Massachusetts' Ocean Management Plan fulfills a legislative mandate to develop an ocean plan for the state.⁹ The focus of the plan is to balance and protect the natural, social, and economic interests through integrated management; protect the ecosystem; encourage wise use of marine resources including renewable energy, sustainable uses, and infrastructure; and incorporate new knowledge to address changing social, technological, and environmental conditions.¹⁰ The Plan

⁷ NC Ocean Policy Steering Committee. 2009. *Developing a Management Strategy for North Carolina's Coastal Ocean*. <http://www.ncseagrant.org/home/coastal-connections/law-policy>.

⁸ *Id.*

⁹ MA Oceans Act of 2008.

¹⁰ Massachusetts Office of Energy and Environmental Affairs. (2009). *Ocean Management Plan*. August 2010. <http://www.mass.gov/?pageID=eoeeahomepage&L=1&L0=Home&sid=Eoeea>.

lays out how it will be administered including the establishment of a trust fund, mitigation measures, proposed regulatory changes, and ongoing planning. In addition, the Plan maps identified use areas, and areas for protection. It also includes a baseline assessment and science framework to prioritize future scientific research and data acquisition that will support future updates of the Plan.¹¹

Rhode Island

Rhode Island Coastal Resources Management Council (CRMC), along with other partners, developed an Ocean Special Area Management Plan (SAMP) to be enforceable under its Coastal Zone Management Plan.¹² The RI Ocean SAMP defines use zones through research and planning, integrating science with public input, and serves as a coastal management and regulatory tool.¹³ Themes of the SAMP include ecology, climate change, cultural resources, fisheries, recreation and tourism, marine transportation and navigation, infrastructure, renewable energy, and other offshore developments.¹⁴

California

In 2006, the California Ocean Protection Council (OPC) released a five-year Strategic Plan to protect the state's ocean and coastal resources.¹⁵ The Plan's goals included enhancing the capacity and performance of agency programs; improving ocean and coastal habitats and water quality; increasing healthy ocean and coastal wildlife populations and communities; and promoting ocean and coastal awareness and stewardship.¹⁶ In addition to the above goals, program priorities for 2009-2010 included research and seafloor mapping, and understanding of physical processes and habitat structure including climate change mitigation and adaptation.¹⁷

¹¹ *Id.*

¹² Rhode Island Coastal Resources Management Council. (2010). *Rhode Island Ocean Special Area Management Plan*. Retrieved September 2010. <http://seagrant.gso.uri.edu/oceansamp/>.

¹³ RI CMRC 2010.

¹⁴ *Id.*

¹⁵ The California Ocean Protection Council. 2006. *A Vision for Our Ocean and Coast*. Retrieved August 2010, <http://www.opc.ca.gov/strategic-plan/>.

¹⁶ *Id.*

¹⁷ CA OPC Program Priorities for 2009 through 2010. <http://www.opc.ca.gov/2009/01/ocean-protection-council-program-priorities-for-2009-through-2010/>.

Oregon

Oregon developed an ocean plan for state and federal waters in the early 1990s, which was adopted as part of the state's coastal zone management program.¹⁸ The ocean plan focused specific policies toward an "Ocean Stewardship Area" from 0-50 nautical miles offshore. Policies were developed related to oil and gas drilling, and marine mineral exploration. The policy recommendations developed for important marine habitats applied beyond state waters to include the continental shelf.¹⁹ The ocean plan provided guidance in the development of the state's Territorial Sea Plan,²⁰ which is presently being amended to develop and adopt a "Marine Spatial Plan" (MSP). The MSP will aid decision makers in evaluating new offshore activities while protecting important marine habitat, and preserving traditional ocean uses such as commercial fishing.²¹

In addition to individual state ocean planning efforts, all coastal states of the United States (except Alaska) are now engaged in some form of regional (multi-state) partnership on coastal and ocean issues.²² These regional efforts are also described in later chapters of this report.

Layout of this Report

This report provides an overview of ocean authorities in South Carolina, followed by issue-oriented chapters, which include: Living Marine Resources and Habitats, Ocean Energy Development, Sand Resources, Ocean Aquaculture, Ocean Mapping, Ocean Monitoring, and Emerging Ocean Management Frameworks. Each topic-oriented chapter concludes with a summary of results from a public workshop hosted by the Ocean Planning Work Group (OPWG) that are described in greater detail in Appendix 1. The Conclusions chapter includes final recommendations of the OPWG for consideration by state and local elected officials, as well as the ocean resource management community. The OPWG's recommendations were developed

¹⁸ Oregon Coastal Management Program. 1990. *Oregon Ocean Resources Management Plan* (Ocean Plan). http://www.oregon.gov/LCD/OCMP/Ocean_TSP.shtml.

¹⁹ *Id.*

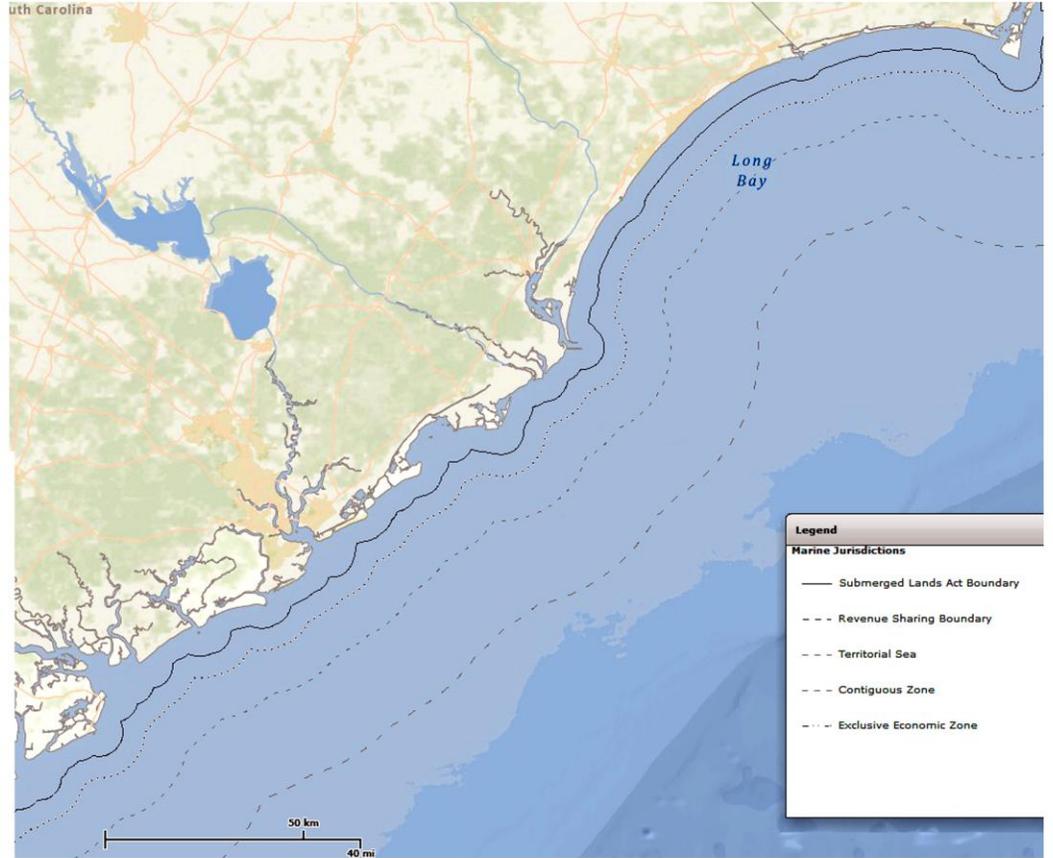
²⁰ Oregon Coastal Management Program. 1994. *Territorial Sea Plan*.

²¹ Klarin, Paul. Marine Affairs Coordinator, Oregon Coastal Mgmt. Program. *Oregon Marine Spatial Planning*. Coastal States Organization Meeting, Monterey, California. Oct. 2010.

²² Coastal States Organization. *Priorities for a National Policy for the Oceans, Coasts, & Great Lakes*. July 30, 2009 P. 5. Retrieved November 2010 <http://coastalstates.org.seedevelopmentprogress.com/publications-news/>.

with considerable public and stakeholder input, along with research support provided by DHEC-OCRM staff.

PAGE INTENTIONALLY LEFT BLANK



Ocean Authorities in South Carolina

Photo credits:

(Top, left) State of South Carolina
(Center, left) South Carolina Legislature Online
(Top, right) BOEM/NOAA Marine Cadastre
(Bottom, left) marvel.wikia, http://marvel.wikia.com/Atlantic_Ocean
(Center, right) Wikipedia, http://en.wikipedia.org/wiki/File:Law_gavel.jpg
(Bottom, right) US Department of State

Chapter 2: Ocean Authorities in South Carolina

In South Carolina, ocean management has traditionally focused on fisheries and related activities through the Department of Natural Resources management authorities and programs. More recently, ocean planning efforts have developed in response to increasing interests in non-fishery related activities, expressed in part through the establishment of two separate legislative study committees by the SC General Assembly to consider the feasibility of offshore natural gas exploration and wind energy development in the state's ocean waters (Act 170 of 2007, and Act 318 of 2008; described in Chapter 4). Additionally, the SC Energy Office convened a Regulatory Task Force for Coastal Clean Energy to identify regulatory obstacles that may hinder offshore wind energy development. In an effort to improve to ocean management in the southeastern region, the Governors' South Atlantic Alliance was formed to address shared concerns and issues across the Carolinas, Georgia, and Florida.

At the federal level, the Oceans Act of 2000 (PL 106-256) authorized the establishment of the US Commission on Ocean Policy (Ocean Commission) to make recommendations for a coordinated and comprehensive national ocean policy that would promote various national objectives. The Ocean Commission was constituted in 2001 and comprised of sixteen Presidential appointees. The Commission's 2004 report included over 200 recommendations for a coordinated and comprehensive approach to ocean and coastal management in the United States.²³ At the same time, the privately-sponsored Pew Oceans Commission was formed in 2000 and made up of eighteen representatives from the science, fishing, conservation, government, education, business, and philanthropic communities. The Pew Oceans Commission released its recommendations in 2003 to help guide the federal government in managing the nation's marine environments.²⁴ Among other recommendations, both Commissions called for enhanced ocean governance by improving agency organization and coordination, establishing a unified national ocean policy, and supporting regional (multi-state) approaches to coastal and ocean issues.²⁵

²³ US Commission on Ocean Policy. *An Ocean Blueprint for the 21st Century*. Final Report. Washington DC 2004 ISBN#0-9759462-0-X.

²⁴ The Pew Oceans Commission. *America's Living Oceans Charting a Course for Sea Change*. Report to the Nation. May 2003.

²⁵ Members from South Carolina included the Honorable Joseph P. Riley, Jr., Mayor of Charleston, who served on the Pew Oceans Commission; and Dr. Paul Sandifer, Senior Science Advisor to the NOAA Administrator, who

In response to the Ocean Commission’s report, the Bush Administration’s 2004 US Ocean Action Plan recognized the importance of the nation’s oceans, coasts, and Great Lakes, and called for general improvements in ocean governance, agency coordination, research and science, and enhancements in the use and conservation of coastal and ocean resources.²⁶ It also committed the Administration to work toward an ecosystem-based management approach and established a Cabinet-level Committee on Ocean Policy. However, the Joint Ocean Commissions Initiative, which evaluates the annual progress being made by the nation and coastal states in implementing the recommendations of the two Commissions, initially reported that “the lack of significant progress at the federal level to commit adequate funding and affect meaningful ocean policy reforms hinders national improvement.”²⁷ In June 2009, an Interagency Ocean Policy Task Force was established and co-led by the White House Council on Environmental Quality (CEQ) and the Office of Science and Technology Policy.²⁸ In July 2010, the Task Force released its final recommendations, which were adopted through Executive Order 13547 for “Stewardship of the Ocean, Our Coasts, and the Great Lakes.” This Executive Order established “a national policy to ensure the protection, maintenance, and restoration of the health of ocean, coastal, and Great Lakes ecosystems and resources, enhance the sustainability of ocean and coastal economies, preserve our maritime heritage, support sustainable uses and access, provide for adaptive management to enhance our understanding of and capacity to respond to climate change and ocean acidification, and coordinate with our national security and foreign policy interests.”²⁹ It also created a National Ocean Council to guide federal agencies in implementation of the policy.

This chapter provides an overview and discussion of existing jurisdictional boundaries (Figure 1), as well as state, local, and federal ocean authorities in South Carolina. More detailed

served on the US Commission on Ocean Policy, worked with the more recent Interagency Ocean Policy Task Force, and presently serves as a member of the South Carolina Ocean Planning Work Group.

²⁶ US Ocean Action Plan. 2004.

²⁷ The Joint Ocean Ocean Commission Initiative. *The US Ocean Policy Report Card*. 2007. Retrieved March 2009, <http://www.jointoceancommission.org/rc-reports.html>.

²⁸ Council on Environmental Quality. The Interagency Ocean Policy Task Force. <http://www.whitehouse.gov/administration/eop/ceq/initiatives/oceans>.

²⁹ Exec. Order No. 13547 (July 19, 2010).

regulatory “pathways” or processes for reviews of specific ocean activities are described in subsequent, topic-oriented chapters.

State and Federal Ocean Boundaries

South Carolina State Waters (0-3 Nautical Miles): In South Carolina, the state holds title to submerged lands and resources out to three nautical miles offshore.³⁰ The Submerged Lands Act of 1953 gave all coastal states jurisdiction out to (at least) three nautical miles from the “baseline,” which is normally measured from the low water line or shoreline.³¹

Territorial Sea (0-12 Nautical Miles): Historically, the United States claimed waters out to three nautical miles as its territorial sea. In 1988, President Reagan proclaimed a 12-nautical mile territorial sea in accordance with international law. Every coastal nation has sovereignty over the air space, water column, seabed, and subsoil of its territorial sea, subject to certain rights of passage for foreign vessels.³²

Contiguous Zone (12-24 Nautical Miles): In 1999, President Clinton signed a Presidential Proclamation formally extending the United States' contiguous zone from 12 nautical miles to 24 doubling the area within which the US Coast Guard and other federal authorities can enforce United States environmental, customs and immigrations laws at sea.³³

Exclusive Economic Zone (12-200 Nautical Miles): The Exclusive Economic Zone is an area where the United States has sovereign rights and fishery management authority over all fish and fishery resources.³⁴

³⁰ S.C. CONST. art. XIV, § 2.

³¹ 43 U.S.C. §§1301-1315 (2010).

³² The American Presidency Project. Proclamation 5928 – Territorial Sea of the United States. December 27, 1988. Retrieved October 2011, <http://www.presidency.ucsb.edu/proclamations.php>.

³³ The American Presidency Project. Proclamation 7219 - Contiguous Zone of the United States September 2, 1999. Retrieved October 2011, <http://www.presidency.ucsb.edu/proclamations.php>.

³⁴ 16 U.S.C. § 1811 (2010).

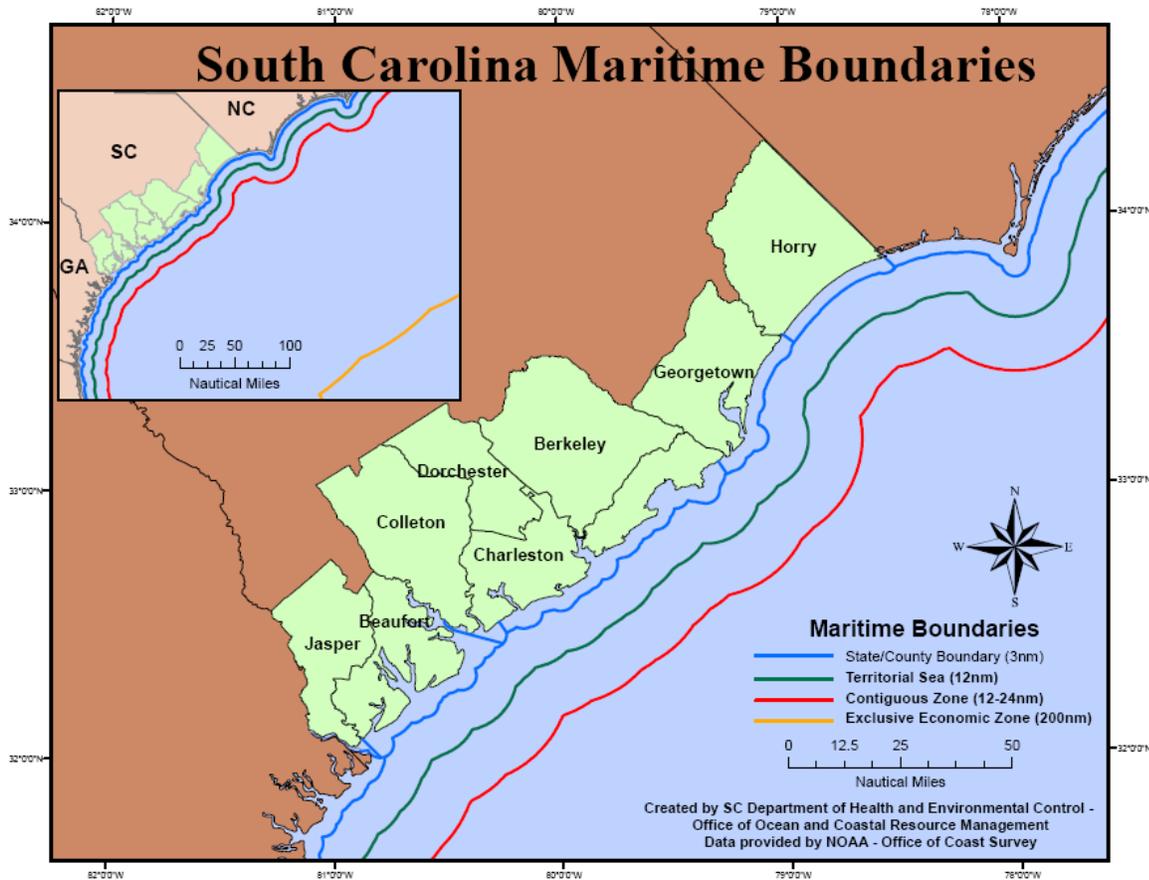


Figure 1. Ocean jurisdictions along the coast of South Carolina.

Continental Shelf (12-200 Nautical Miles or Outer Edge of Continental Margin): The laws and jurisdictions of the United States are extended to the subsoil and seabed of the outer Continental Shelf, to all artificial islands, and to all installations and other devices permanently or temporarily attached to the seabed for the purpose of exploring for, developing, or producing resources.³⁵

³⁵ 43 U.S.C. § 1333 (2010).

Summary of State Authorities

For some proposed activities off of South Carolina’s coast, multiple state and federal agencies will be involved. State agencies in South Carolina that have permitting authorities with a mandate to manage and protect South Carolina’s coastal and ocean resources include multiple offices within DHEC, such as the Office of Ocean and Coastal Resource Management,³⁶ the Environmental Quality Control Bureaus of Water Quality and Air Quality,³⁷ and Land and Waste Management (for oil and gas exploration, drilling, transportation and production in SC).³⁸ Other state agencies that have jurisdiction over ocean activities include the SC Department of Natural Resources, which manages for marine and wildlife resources;³⁹ the SC Public Service Commission,⁴⁰ which regulates the construction of any major utility facility, including offshore wind turbines; and the SC Budget and Control Board, which has control over all state lands including submerged lands out to three nautical miles.⁴¹ For any activity in South Carolina ocean waters, there are resource agencies, state planning entities, environmental organizations, various stakeholders and the public who may comment during permitting process.

Coastal Zone Management Act

The federal Coastal Zone Management Act (CZMA) was enacted in 1972 to encourage coastal states to be proactive in managing ocean and coastal resources by balancing competing uses, environmental, and economic concerns. The Department of Health and Environmental Control’s Office of Ocean and Coastal Resource Management (DHEC-OCRM) is the designated state agency responsible for implementing South Carolina’s federally approved Coastal Management Program (CMP).

The South Carolina CMP details the specific coastal and ocean activities subject to management, the authorities and enforceable policies of the state program, the boundaries of the state’s coastal zone, and coastal management concerns. DHEC-OCRM undertakes its responsibility through direct and indirect regulatory authorities and through coordination with federal, state and local governments.

South Carolina’s coastal zone boundary stretches from the eight coastal county inland borders to ocean waters out to three nautical miles (nm). All waters beyond three nm and out to 200 nm are federal waters for which South Carolina has no jurisdiction. However, the South Carolina CMP does provide the state with the legal authority to review and influence decisions regarding activities in federal waters through the CZMA’s “federal consistency” provision.

Under the CZMA, federal agency activities that are likely to have effects on resources or activities within a state’s coastal zone are required to be consistent to the maximum extent practicable with the enforceable policies of that state’s Coastal Zone Management Program. In addition, projects receiving federal authorizations and/or funding must be consistent with state enforceable policies. The federal consistency provision of the CZMA helps ensure the balanced use and protection of coastal resources and fosters consultation and coordination between states and federal agencies.

³⁶ S.C. Code Ann. §§ 48-39-10 *et seq* (2010).

³⁷ S.C. Code Ann. §§ 48-1-10 *et seq* (2010) .

³⁸ S.C. Code Ann. §§ 48-43-10 *et seq* (2010).

³⁹ S.C. Code Ann. §§ 50-1-5 *et seq*; §§ 50-3-10 *et seq*.; §§ 50-5-10 *et seq*.; §§ 50-15-10 *et seq*.; among others.

⁴⁰ S.C. Code Ann. §§ 58-33-10 *et seq* (2010).

⁴¹ S.C. Code Ann. §§ 1-11-70 – 115 (2010).

County and city governments can establish local ordinances governing some types of ocean activities, out to one nautical mile for a city,⁴² and out to three nautical miles for a county.⁴³ All counties have authorities not inconsistent with the laws of the state, “including the exercise of these powers in relation to health and order in counties or respecting any subject as appears to them necessary and proper for the security, general welfare, and convenience of counties or for preserving health, peace, order, and good government in them.”⁴⁴ It is therefore possible that specific state ocean authorities could be expanded upon, but not contravened, by local policies or ordinances.

Summary of Federal Authorities

At the federal level, various agencies are mandated to evaluate projects for impacts to the environment, including impacts to the coastal zone, endangered species, sensitive habitats, water quality, and air quality. In addition, ocean resources are managed for preferred uses such as commercial fisheries, energy development, conservation, navigation, and trade, among others.

For any federal activity, the National Environmental Policy Act (NEPA) requires that an Environmental Assessment (EA) or Environmental Impact Statement (EIS) be prepared by the lead federal agency.⁴⁵ Through this process, environmental impacts are evaluated and alternatives must be considered. The NEPA process helps public officials make decisions based on an understanding of the environmental consequences of a proposed activity and take actions that protect, restore and enhance the environment. In addition, the federal Coastal Zone Management Act’s (CZMA) consistency provision requires the lead federal agency or the project applicant to determine whether the proposed activity is likely to affect any South Carolina coastal zone uses or resources (within state waters).⁴⁶ If so, the agency or applicant must submit its consistency determination to the DHEC-OCRM.

⁴² S.C. Code Ann. § 5-7-140 (2010).

⁴³ S.C. Code Ann. §§ 4-3-2 *et seq* (2010).

⁴⁴ S.C. Code Ann. § 4-9-25 (2010).

⁴⁵ 42 U.S.C. §§ 4331 *et seq* (2010).

⁴⁶ “Section 307 (16 USC §1456), known as the federal consistency provision, grants states authority to review federal activities, licenses and permits that have reasonably foreseeable effects on any land or water use or natural resource of the coastal zone. These activities must be consistent to the maximum extent practicable with the enforceable policies of a coastal state’s federally approved coastal management program.” Coastal States Organization. Federal Consistency Fact Sheet. June 8, 2008; and, See 15 C.F.R. part 930, subparts C – F for definitions of all federal actions included.

In compliance with the Endangered Species Act⁴⁷ and the Magnuson-Stevens Fishery Conservation and Management Act,⁴⁸ the US Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) must be consulted if or when impacts to endangered species or fishery stocks are anticipated. In addition, depending on the proposed activity, Clean Water Act (CWA) provision(s) relating to the discharging of oil or other pollutants into ocean waters; or discharging dredged material or fill into the ocean, will apply.⁴⁹ The CWA authorizes water quality programs, requires federal effluent limitations and state water quality standards, and requires permits for the discharge of pollutants into navigable waters.⁵⁰ Under Section 10 of the Rivers and Harbors Act, the US Army Corps of Engineers (USACE) has the authority to review and regulate certain structures and activities that are located in or that affect navigable waters of the United States.⁵¹ The Outer Continental Submerged Lands Act (OCSLA) extends the USACE's jurisdiction to the seaward limit of federal jurisdiction.⁵² The Energy Policy Act of 2005 (EPAAct)⁵³ authorizes the Department of the Interior's (DOI) Bureau of Ocean Energy Management (BOEM)⁵⁴ to grant leases on the Outer Continental Shelf (OCS) in support of energy development, including offshore renewable energy and alternate uses in federal waters.⁵⁵ The Federal Power Act authorizes the Federal Energy Regulatory Commission (FERC) to regulate the transmission of electricity, natural gas, and oil, and to coordinate hydroelectric projects.⁵⁶ In 2009, DOI and FERC entered into a Memorandum of Understanding to clarify jurisdictional authorities regarding renewable energy projects on the OCS (see Chapter 4 for details of these authorities).⁵⁷ EPAAct also expanded FERC's authorities under the Federal Power

⁴⁷ 16 U.S.C. §§ 1531 *et seq* (2010).

⁴⁸ 16 U.S.C. §§ 1801 *et seq* (2010).

⁴⁹ 33 U.S.C. §§ 1321 *et seq* (2010).

⁵⁰ 33 U.S.C. § 1342 (2010).

⁵¹ 33 U.S.C. § 403 (2010) .

⁵² 43 U.S.C. § 1332 (2010).

⁵³ Pub. L. 109-58 (August 8, 2005).

⁵⁴ On October 1, 2011, the Department of Interior Bureau of Ocean Energy Management, Regulation, and Enforcement (BOEMRE), formerly known as the Minerals Management Service, was separated into two Bureaus: Bureau of Ocean Energy Management (BOEM) - responsible for managing development of the nation's offshore resources; and the Bureau of Safety and Environmental Enforcement (BSEE) - responsible for enforcing safety and environmental regulations.

⁵⁵ 43 U.S.C. §1337 (2010).

⁵⁶ 16 U.S.C. 791 *et seq* (2010) .

⁵⁷ MOU Between the U.S. Dept. of Interior and the Federal Energy Regulatory Commission, April 9, 2009. Retrieved February 25, 2011, <http://www.ferc.gov/legal/maj-ord-reg/mou.asp>.

Act and the Natural Gas Act providing it with broad powers relating to the siting of transmission lines and liquefied natural gas facilities.⁵⁸

Summary of Regional Authorities

South Atlantic Fisheries Management Council

The South Atlantic Fishery Management Council (SAFMC) is responsible for the conservation and management of fish stocks within federal waters off of the North Carolina, South Carolina, Georgia, and east Florida coasts out to 200 miles in accordance with the Magnuson Fishery Conservation and Management Act of 1976 (MFCMA), as amended.⁵⁹ In 1996, Congress passed the Sustainable Fisheries Act, which amended the MFCMA and renamed it “Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006.”⁶⁰ The law was enacted to protect marine fish stocks with requirements to prevent and stop overfishing, minimize by-catch, and protect habitat. The Act “mandates the use of annual catch limits and accountability measures to end overfishing, provides for widespread market-based fishery management through limited access programs, and calls for increased international cooperation.”⁶¹

In April 2009, the SAFMC released its Fishery Ecosystem Plan for the South Atlantic, which builds on its 1998 Habitat Plan and provides a more thorough review of the South Atlantic ecosystem.⁶² The Plan contains six volumes comprised of detailed descriptions of habitats and species; coastal communities and managed fisheries; threats to the ecosystem and recommendations; and research and data needs for the South Atlantic region. The SAFMC currently manages eight fisheries, including: coastal migratory pelagics, coral and live bottom habitat, dolphin and wahoo, golden crab, shrimp, snapper grouper, spiny lobster, and Sargassum.⁶³ There are approved Fishery Management Plans for each managed species.⁶⁴

⁵⁸ Pub. L. 109-58 (August 8, 2005).

⁵⁹ P.L. 94-265.

⁶⁰ P.L. 104-297.

⁶¹ NOAA Fisheries Feature. <http://www.nmfs.noaa.gov/msa2007/>.

⁶² South Atlantic Fishery Management Council (SAFMC). 2009. *Fishery Ecosystem Plan of the South Atlantic Region*. Retrieved August 2010, <http://www.safmc.net/Home/EcosystemHome/tabid/435/Default.aspx>.

⁶³ SAFMC. Fishery Management Plans. Retrieved August 2010.

<http://www.safmc.net/Library/FisheryManagementPlansAmendments/tabid/395/Default.aspx>.

⁶⁴ *Id.*

Atlantic States Marine Fisheries Commission

The Atlantic States Marine Fisheries Commission (ASMFC) was formed in 1942 by the fifteen Atlantic coastal states from Maine to Florida to coordinate the conservation and management of shared nearshore fishery resources for sustainable use.⁶⁵ Twenty-four Atlantic coastal fish species are focused upon and for those that have significant presence in state waters, ASMFC works closely with the SAFMC in the development of fishery management plans.⁶⁶ Each state is represented by three Commissioners, including the director of the state's marine fisheries management agency, a state legislator, and a governor's appointee. The ASMFC's focus in stewardship of marine fisheries resources and the Commission's five main policy areas include interstate fisheries management, research and statistics, fisheries science, habitat conservation, and law enforcement.⁶⁷

Governors' South Atlantic Alliance (GSAA)

Following the lead of other coastal states initiating regional collaboration of ocean and coastal research, planning, and management, and to collectively address shared issues along the southeastern coast, the Governors of North Carolina, South Carolina, Georgia, and Florida formed an agreement to work together on issues impacting the future of ocean health and sustainability for all four states.⁶⁸ The Alliance published its first Action Plan in December 2010, which will be updated every five years.⁶⁹

The Action Plan guides the efforts of the Governors' South Atlantic Alliance as they work together to address key environmental, economic, and cultural issues facing the region's ocean and coast.⁷⁰ The Action Plan focuses on four priority topic areas: healthy ecosystems, working waterfronts, clean coastal and ocean waters, and disaster-resilient communities.⁷¹ Each priority area contains specific goals, and "objectives and actions" designed to protect and promote the

⁶⁵ Atlantic States Marine Fisheries Commission. About Us. Retrieved August 2010. www.asmfc.org.

⁶⁶ ASMFC. Managed Species. Retrieved October 2011, <http://www.asmfc.org/>.

⁶⁷ ASMFC. About Us.

⁶⁸ Governors' South Atlantic Alliance *Agreement*. Retrieved October 2010, <http://www.southatlanticalliance.org/agreement.htm>.

⁶⁹ Governors' South Atlantic Alliance *Action Plan*. Retrieved October 2010, <http://www.southatlanticalliance.org/>.

⁷⁰ *Id.*

⁷¹ *Id.*

region's most important natural, cultural, and economic resources.⁷² Working with political leaders and other stakeholders, an Implementation Plan was developed to establish specific strategies for advancing the goals and objectives of the Action Plan.⁷³

⁷² *Id.*

⁷³ Governors' South Atlantic Alliance *Implementation Plan 2011*. Retrieved October 2011, <http://www.southatlanticalliance.org/documents.htm>.



Living Marine Resources and Habitats

Photo credits:
(Top, left) Jennifer Barbour
(Top, right) Dreamstime.com
(Bottom, left) NOAA Fisheries Service
(Bottom, right) Patrick Jodice, Clemson University

Chapter 3. Living Marine Resources and Habitats

As South Carolina enters a new era of requests for ocean energy development, continuing or expanding sand extraction for beach renourishment, growing interest in marine aquaculture, and new or expanding military operations, there will be a potential for increasing conflicts among different ocean user groups. These additional demands highlight a need to develop more specific policies and standards to reduce conflicts and adequately evaluate the potential for impacts to ocean resources. Management decisions must consider potential impacts to living marine resources and habitats, and impacts on the recreational and commercial fishers who depend on these resources and contribute over a billion dollars in economic value to the state each year.⁷⁴

To address these issues, stronger interactions are needed between fisheries management and coastal management. Fisheries management focuses on regional and state-based approaches to ensure sustainable biodiversity, fishery resources and protection of key habitats and water quality. Coastal management involves permitting of fixed facilities and the evaluation of impacts upon natural resources and use conflicts in state ocean waters. Through close cooperation, fisheries and coastal managers can ensure that traditional commercial and recreational fisheries in South Carolina are fully considered in the siting of new ocean facilities, evaluation of permit proposals, and ocean plans developed to reduce future use conflicts and impacts to marine resources and habitats.

South Carolina has approximately 2,876 miles of tidal shoreline, over 380,000 acres of continental shelf, 500,000 acres of tidal bottoms, and 504,450 acres of salt marsh, which provide favorable habitat for various living marine resources including shrimp, fish, turtles, mammals, and sea birds.⁷⁵ Based on past mapping efforts described in Chapter 7, the majority of South Carolina's ocean bottom is sandy, with approximately 20 percent consisting of natural (hard bottom) reef habitats and artificial reefs.⁷⁶ The hard bottom/reef areas provide habitat for various fish species including black

⁷⁴ SC Dept. of Natural Resources. *Status of Marine Fisheries in South Carolina*. SC Living Marine Resources and Habitats Workshop. Charleston, SC. December 2, 2010. http://www.DHEC.gov/environment/ocrm/ocean_planning.htm.

⁷⁵ South Carolina Sea Grant Consortium. Fisheries/Living Marine Resources Program. Retrieved January 7, 2011. <http://www.scseagrant.org/Content/?cid=43>.

⁷⁶ Dr. Bob Van Dolah, Marine Resources Research Institute, South Carolina Department of Natural Resources. *A Review of Offshore Marine Habitats, Resources, and Issues in South Carolina*. SC Living Marine Resources and Habitats Workshop. Charleston, SC. December 2, 2010. http://www.DHEC.gov/environment/ocrm/ocean_planning.htm.

sea bass or black fish dominant in more shallow areas and various sharks, sheepshead, Atlantic croaker, tripletail, greater amberjack, Atlantic spadefish, great barracuda and king mackerel. Live hard bottoms also attract fisheries depending on season including: bluefish, black drum, spotted seatrout, some flounder species, snapper, grouper, and porgy, among others.⁷⁷ Shrimp, which are important to South Carolina's fishing industry, inhabit muddy, inshore areas; and as adults, move into the oceanic nearshore sand bottom areas.⁷⁸

Commercial and recreational fisheries are valuable contributors to the state's economy.⁷⁹ The largest of the state's fisheries include targeted finfish, crustaceans, and shellfish.⁸⁰ For commercial fisheries, shrimp trawling has traditionally been and still is the state's largest commercial fishery.⁸¹ Other important fishing includes finfish, particularly snapper and grouper conducted outside state waters, along with commercial crabbing and commercial shellfish (e.g., oysters and clams).⁸² Commercial fishing occurs inshore and offshore. The seafood produced by these fisheries is also important to the general public. A survey of the general public conducted in the Charleston area found that 95% of respondents agreed that it is important to have locally caught fish and shellfish for human consumption.⁸³

In 2011, the SCDNR sold 4,219 commercial fishing licenses to about 1,360 individuals, of which 87% were residents of South Carolina.⁸⁴ The vast majority of these citizens derive all or most of their income from commercial fishing in state or nearby water. The total value of landed seafood products in recent years has been about \$20 million per year.⁸⁵ Important fishing centers along the coast include Little River, Georgetown, McClellanville, Mount Pleasant, Folly Beach, Rockville, Edisto Island, St. Helena Island, and Hilton Head. Traditionally important fisheries include shrimp trawling, blue crab potting, oyster and clam harvesting, shad netting, and offshore

⁷⁷ SC Department of Natural Resources. Retrieved March 2011, <http://www.dnr.sc.gov/marine/habitat/index.html>.

⁷⁸ SC Dept. of Natural Resources via email correspondence. April 2011.

⁷⁹ University of South Carolina Moore School of Business. 2009. *Underappreciated Assets: The Economic Impact of South Carolina's Natural Resources*. Retrieved January 11, 2011. <http://www.dnr.sc.gov/green/index.html>.

⁸⁰ Mell Bell, SC Dept. of Natural Resources. *Status of Marine Fisheries in South Carolina*. SC Living Marine Resources and Habitats Workshop. Charleston, SC. December 2, 2010. http://www.DHEC.gov/environment/ocrm/ocean_planning.htm.

⁸¹ *Id.*

⁸² *Id.*

⁸³ Martin, Hammitt, and Sheppard. Charleston Harbor Project: Resident attitude study. 1997.

⁸⁴ SC Dept. of Natural Resources via email correspondence. October 2011

⁸⁵ *Id.*

hook-and-line fishing.⁸⁶ Numerous fish markets provide fresh, local seafood to South Carolina citizens and visitors. Additionally, South Carolina is widely recognized for its abundance of high quality seafood restaurants, many of which offer locally produced seafood.

Recreational fisheries share some of the same targeted fish, shrimp, crab, and shellfish resources, and occur offshore, nearshore, and in estuarine waters. Recreational fishing also occurs from shore and on artificial reefs. In 2006, the US Fish and Wildlife service estimated that South Carolina had about 325,000 saltwater anglers. Recreational saltwater fishing license sales peaked at 223,000 in 2011, although this number does not include thousands of gratis licenses (senior citizens) and fishermen under 16 who are not required to have a license.⁸⁷ Additionally, South Carolina has fifteen licensed ocean fishing piers where thousands of anglers fish legally without a license. There were 520 licensed charter boats in 2011 that took 326,341 unlicensed anglers fishing on 10,500 trips.⁸⁸ South Carolina's recreational fishing industry is estimated to contribute approximately \$594.5 million per year to the state's economy.⁸⁹

In addition to fisheries, marine mammals, sea turtles, and sea birds must be considered in ocean planning. Marine mammals found in South Carolina include whales, dolphins, manatees, and harbor seals, all of which come close to shore and often enter estuaries. Several are listed as endangered or threatened. South Carolina also has its own bottlenose dolphin stock.⁹⁰ Marine mammals in South Carolina are facing a wide range of potential impacts from various ocean activities, including:

- active sonar training by the military, which could potentially affect behavior and cause displacement, and can cause hemorrhaging in the ears;
- open ocean and coastal aquaculture, which could result in impacts from pharmaceuticals, disease, excessive nutrient input, or entanglement;
- wind farms, which could cause local disturbances including construction noise, underwater noise, boat traffic, helicopter traffic, and migration disruption;
- cruise and container ships, which can hold ballast water carrying diseases or invasive species, may cause noise impacts, and can have collisions;

⁸⁶ *Id.*

⁸⁷ SC Dept. of Natural Resources via email correspondence. October 2011.

⁸⁸ *Id.*

⁸⁹ *Id.*

⁹⁰ Wayne McFee, National Ocean Service, NOAA. *Marine Mammals*. SC Living Marine Resources and Habitats Workshop. Charleston, SC. December 2, 2010. http://www.DHEC.gov/environment/ocrm/ocean_planning.htm.

- eco-tourism, which may result in interactions with people, illegal feeding, and disturbances in tidal creeks;
- fisheries, which can result in entanglement, depredation, and competition for food; and
- marine debris, which can also result in entanglement and ingestion.⁹¹

There are four species of sea turtles found in South Carolina, all of which are endangered or threatened: loggerheads, Kemp's ridley, leatherbacks, and green sea turtles. It is well known that sea turtles utilize South Carolina's inshore, nearshore and offshore waters during the majority of the year.⁹² Some turtles nest in other areas but use South Carolina for foraging habitat; while some use South Carolina's beaches for nesting and foraging habitat.⁹³ In South Carolina, approximately 100 sea turtles per year are found stranded, and the main causes of mortality for sea turtles are strikes by water craft and disease.⁹⁴ Threats to sea turtles can also occur from fishing techniques including trawling, long-lining, hook and line, pots/traps, and channel nets. Shrimp trawls and channel nets require the use of turtle excluder devices to reduce turtle mortality. Additional threats may come from non-fisheries activities including legal and illegal harvesting, channel dredging, mineral extraction, research and conservation activities, power generation activities, vessel strikes, human presence, military activities, salvage operations, construction and development, ecosystem alterations, and pollution.⁹⁵ Effective planning for potential impacts to sea turtles from offshore activities will need to consider regional-scale ecological implications and management efforts.

In the South Atlantic region, there are breeding seabirds, wintering and wandering seabirds, northern breeders, and tropical breeders.⁹⁶ Shorebirds, wading birds, and sea ducks are not technically seabirds but live along the coastline and should be considered in ocean planning. As with marine mammals and sea turtles, seabirds travel constantly over political and geographic boundaries. Coastal islands provide breeding sites or habitat for nesting, foraging, loafing and

⁹¹ *Id.*

⁹² DuBose Griffin, Sea Turtle Coordinator, SCDNR. *Sea Turtles*. SC Living Marine Resources and Habitats Workshop, Charleston, SC. December 2, 2010. http://www.DHEC.gov/environment/ocrm/ocean_planning.htm.

⁹³ Griffin 2010.

⁹⁴ *Id.*

⁹⁵ *Id.*; and SC Dept. of Natural Resources. *Sea Turtles*. <http://www.dnr.sc.gov/marine/pub/seascience/seaturtle.html>

⁹⁶ Dr. Patrick Jodice, USGS South Carolina Cooperative Fish & Wildlife Research Unit. *Marine and Coastal Avifauna of the South Atlantic Bight*. SC Living Marine Resources and Habitats Workshop. Charleston, SC. December 2, 2010. http://www.DHEC.gov/environment/ocrm/ocean_planning.htm.

chick-rearing, along with providing roosting sites, migratory stopover sites, and wintering sites.⁹⁷ Factors that determine where birds will colonize depend on the extent of undisturbed habitat, the presence of predators, food availability, social attraction, population dynamics, and competition for food and space.⁹⁸ There are several important seabird areas along South Carolina's coastline (Figure 2). Data has been collected on nesting trends for various seabirds to help researchers understand the status of habitat use and foraging habits and behaviors.⁹⁹ The results of these kinds of analyses should be considered in ocean planning for the management of seabirds.¹⁰⁰

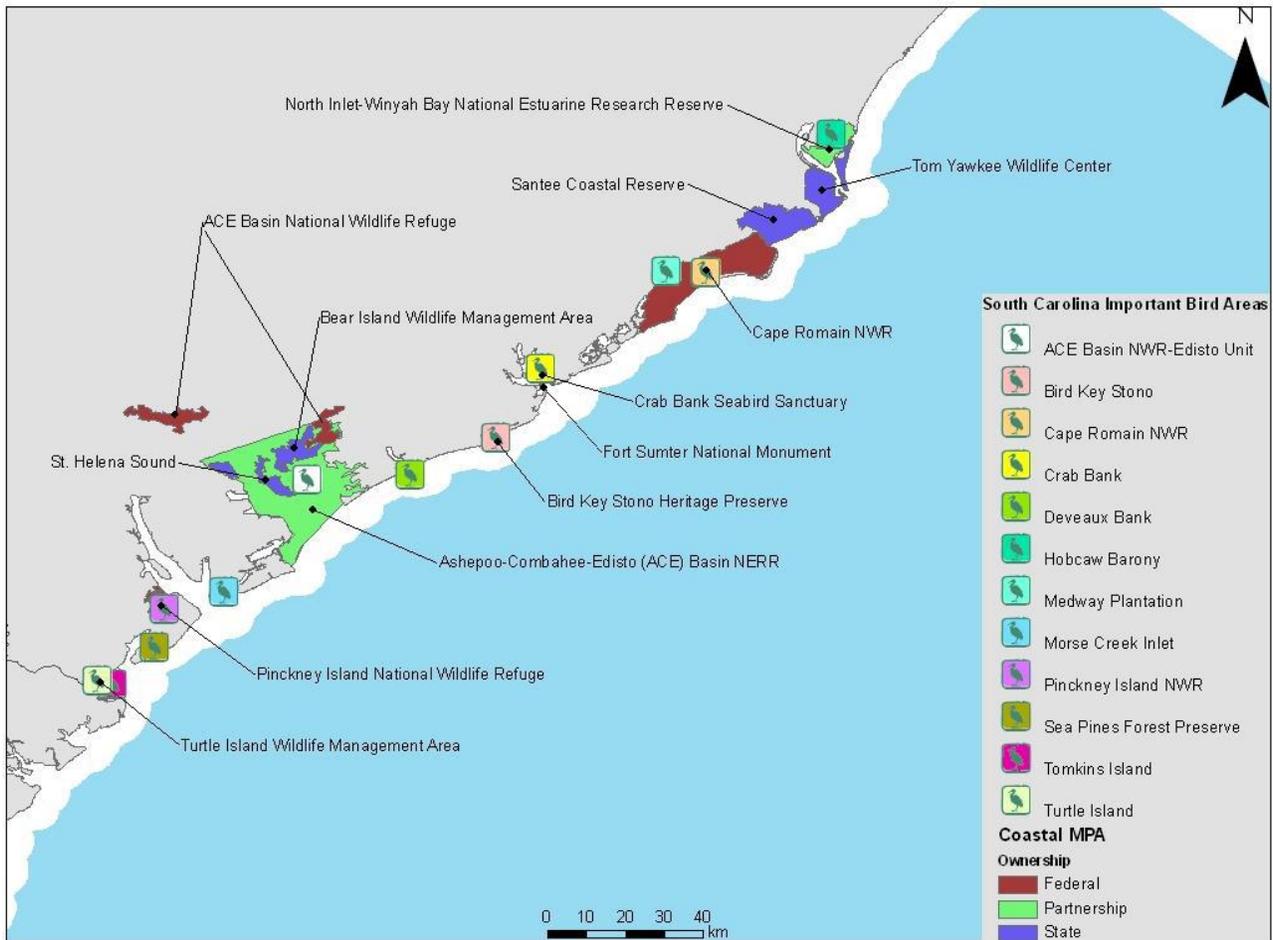


Figure 2. SC Important Bird Areas - Image provided by Dr. Patrick Jodice, Clemson University. SC Living Marine Resources and Habitats Workshop. Charleston, SC. December 2, 2010.

⁹⁷ Jodice, 2010.

⁹⁸ *Id.*

⁹⁹ *Id.*

¹⁰⁰ *Id.*

Living Marine Resources / Marine Habitat Management in South Carolina

Management of South Carolina's living marine resources is led by the SCDNR and the SAFMC.

Resource monitoring programs, described in more detail in Chapter 8, include:

- Fishery dependent data collection;
- Southeast Area Monitoring and Assessment Program (SEAMAP), a program for monitoring resources such as fish and crustaceans, and characterizing bottom habitat types;¹⁰¹
- Marine Resources Monitoring and Assessment Program (MARMAP), a program that conducts reef fish assessments from North Carolina to Florida;¹⁰²
- International Activities and Minerals Resources (INTERMAR), a project that synthesizes sand and habitat resource data;¹⁰³ and
- Turtle surveys and research.¹⁰⁴

Other habitat studies have involved surveys and a nearshore bottom mapping effort by Coastal Carolina University.¹⁰⁵

Marine Artificial Reefs

The majority of the continental shelf off South Carolina is covered with sand. Only a small portion of the ocean bottom consists of the necessary geological structure to allow natural reefs to form.¹⁰⁶ The SCDNR established a Marine Artificial Reef Program in 1973 and continues to manage the program through its Marine Resources Division. Reef construction involves the strategic placement of environmentally safe materials, such as steel or concrete, on the ocean bottom for the purpose of creating additional productive hard bottom substrate that will enhance development of sponges, corals and other forms of natural "live bottom" habitat. The artificial reefs are strategically placed to provide additional recreational fishing and diving opportunities offshore while avoiding potential conflicts with other marine related uses.¹⁰⁷ Over 40 offshore artificial reefs are located in waters along the coast of South Carolina out to 35 nautical miles

¹⁰¹ Chapters 7 & 8 of this report; and <http://www.dnr.sc.gov/marine/mrri/SEAMAP/seamap.html>.

¹⁰² Chapter 7 of this report; and <http://www.dnr.sc.gov/marine/mrri/MARMAP/marmap.html>.

¹⁰³ Chapter 7 of this report; and

http://www.DHEC.gov/environment/ocrm/docs/OPWG/OPWG_Pres/111909/VanDolah_Mapping.pdf.

¹⁰⁴ <http://www.dnr.sc.gov/seaturtle/inwater.htm>.

¹⁰⁵ See Chapter 7 of this report for the SC Coastal Erosion Study and other habitat mapping efforts.

¹⁰⁶ SC Dept. of Natural Resources Marine Resources Division. *Sea Science: Marine Artificial Reefs*. Retrieved January 2011. <http://www.dnr.sc.gov/marine/pub/seascience/artreef.html>.

¹⁰⁷ *Id.*

offshore, and cover areas up to one square mile.¹⁰⁸ SCDNR has mapped the artificial reefs and transit routes to aid fishermen and divers with access to these amenities (Figure 3).¹⁰⁹ The siting of artificial reefs could be considered as an early example of “marine spatial planning” in South Carolina.

Fisheries and Ecosystem Based Management

The SAFMC manages fisheries in federal waters (3-200 nm). Federal regulations can affect how fisheries are managed in state waters where certain habitats or offshore migratory species have been deemed protected under federal law. SCDNR manages state marine fisheries consistent with federal regulations and is a voting member on the SAFMC, affording the state the standing opportunity to provide input on federal

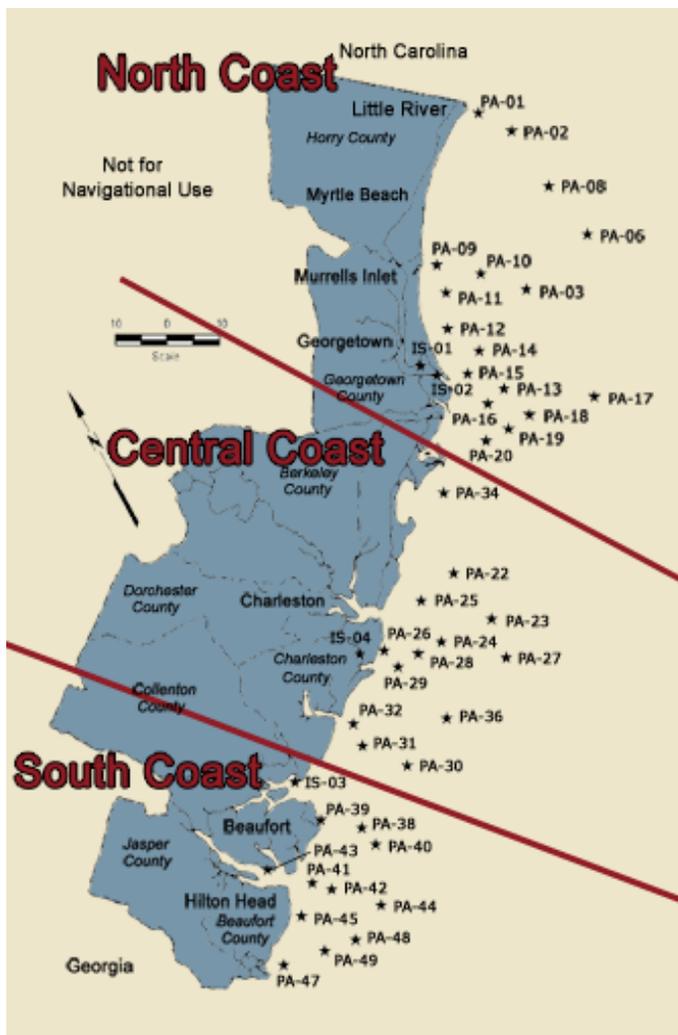


Figure 3. SC Dept. of Natural Resources. Marine Artificial Reefs.
<https://www.dnr.sc.gov/reefguide/artreefgraphic>.

management and planning activities related to offshore fisheries. The Magnuson-Stevens Fishery Conservation and Management Act defined Essential Fish Habitat (EFH) and authorized measures including regulations on gear restrictions, harvest prohibitions, by-catch reductions, and area-based management, which were all established through Fishery Management Plans.¹¹⁰ A Habitat Advisory Panel was convened to develop policies related to marine aquaculture, marine submerged aquatic vegetation, beach dredging and filling, energy exploration,

¹⁰⁸ *Id.*

¹⁰⁹ SC Dept. of Natural Resources Marine Resources Division. *Locations of Artificial Reefs and Wrecks*. Retrieved January 2011. <https://www.dnr.sc.gov/reefguide/artreefgraphic>.

¹¹⁰ Magnuson-Stevens Fishery Conservation and Management Act. Pub. L. No. 94-265 (1996), amended by the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act, Pub. L. No. 109-479 (2007).

development, transportation and hydropower re-licensing, alterations to riverine, estuarine and nearshore flows, and marine and freshwater invasive species.¹¹¹ The final product was the SAFMC's Habitat Plan (1998) which presented a snapshot of the biological, social and economic characteristics of South Atlantic Region ecosystem and served as the basis for the SAFMC's newly developed ecosystem-based management approach.¹¹²

The SAFMC adopted and continues to implement an ecosystem-based approach to fisheries management with the development of a Fishery Ecosystem Plan (FEP) and Comprehensive Ecosystem-Based Amendments.¹¹³ Various elements of the SAFMC's ecosystem-based approach to managing fisheries out to 200 nautical miles include spatial management, ecosystem modeling and fisheries oceanography, and tools developed to support habitat conservation, and spatial management.¹¹⁴ The development process of the FEP consisted of 20 habitat, issue-based, ecosystem model and research workshops, and writing teams who revised the Habitat Plan and developed the FEP in April 2009. The FEP provides a comprehensive view of the biological, social, and economic characteristics of the South Atlantic ecosystem; serves as a source document for Comprehensive Ecosystem-Based Amendments; addresses EFH mandates in the EFH Final Rule highlighting spatial presentations of designated EFH and Habitat Areas of Particular Concern (HAPC); and updates EFH and HAPC information.¹¹⁵ Additional components to the SAFMC's ecosystem-based management approach include spatial management (which include the identification of Coral HAPC, Special Management Zones, Gear and Seasonal Closure areas, Deepwater Marine Protected Areas, and EFH/HAPCs), ecosystem modeling to evaluate the impacts of fishing and non-fishing activities, and habitat assessment tools.¹¹⁶

¹¹¹ Roger Pugliese, South Atlantic Fishery Management Council. *South Atlantic Fishery Ecosystem Plan*. SC Living Marine Resources and Habitats Workshop. Charleston, SC. December 2, 2010.

http://www.DHEC.gov/environment/ocrm/docs/OPWG/OPWG_Pres/120210/Roger120210.pdf.

¹¹² *Id.*

¹¹³ The South Atlantic Fishery Management Council. Ecosystem-Based Management. Retrieved January 2011.

<http://www.safmc.net/Default.aspx?alias=www.safmc.net/ecosystem>.

¹¹⁴ Pugliese, 2010. http://www.DHEC.gov/environment/ocrm/docs/OPWG/OPWG_Pres/120210/Roger120210.pdf.

¹¹⁵ Pugliese 2010.

¹¹⁶ *Id.*

Experiences in Other States

Rhode Island

The Rhode Island Ocean SAMP, introduced in Chapter 1 of this report, is an ecosystem-based approach to ocean management and was led by RI's Coastal Resources Management Council (CRMC).¹¹⁷ Development of the Plan involved mapping existing uses and zones (e.g., transportation corridors, military uses, and essential habitats); communicating and engaging stakeholders from the beginning; drafting regulatory standards for siting and for resource protection; and continuing with data development such as seafloor mapping, bird and marine mammal observations, and fishery data, among others.

In addition to recognizing the natural and living resources that make up the rich and diverse ecosystem of Rhode Island's ocean waters (e.g. fish, birds, marine mammals, and sea turtles), the Ocean SAMP documents how these living resources use and rely upon their rich habitats and how many of the people of Rhode Island use and depend upon all of these state's offshore resources for work, food, and recreation.¹¹⁸ Through the Ocean SAMP, the RI CRMC identifies the important fishing grounds and habitats that must be protected from threatening activities in order to preserve the state's fisheries.¹¹⁹ One example is the SAMP's policy that aquaculture leases be considered if they pose no significant adverse impacts to traditional fisheries.¹²⁰

The Ocean SAMP also established certain areas for protection and/or for the application of specific standards or criteria within "Areas of Particular Concern" or "Areas Designated for Preservation." Certain uses or activities may be prohibited from these areas if the proposed developments "conflict with the intent and purpose of an Area Designated for Preservation."¹²¹

Oregon

Ocean Planning in Oregon has recently involved the evaluation of marine reserves off its coast in response to a 2008 Executive Order and strong community and legislative involvement. Six sites

¹¹⁷ See pages 15, 26, 40, & 80 of this report for discussions about RI's Ocean SAMP; and Rhode Island Coastal Resources Management Council, *Ocean SAMP*. Retrieved January 2011. http://www.crmc.ri.gov/samp_ocean.html.

¹¹⁸ Section 110, RI Ocean SAMP (2010).

¹¹⁹ *Id.*

¹²⁰ *Id.*; and See Chapter 11 of the RI Ocean SAMP, *The Policies of the Ocean*. 2010.

¹²¹ Chapter 11 of the RI Ocean SAMP, *The Policies of the Ocean*. 2010.

are considered for designations.¹²² Although similar types of marine designations are not necessarily under consideration in South Carolina, the planning process that Oregon followed may be useful, especially considering the significant involvement of the fishing community in their ocean planning efforts. The planning process has included the establishment of community teams consisting of representatives from local governments, the recreational fishing industry, commercial fishing industry, non-fishing industry, recreationalists, conservation organizations, coastal watershed councils, and relevant marine and avian scientists.¹²³ In addition, the Oregon Department of Fish and Wildlife (ODFW) is working closely with recreational fishermen who currently fish in the pilot or proposed marine reserve sites in order to understand the economic and social importance of fishing activities in that local community. Communication and education efforts were initiated early on with local fishing communities and ODFW continues to collect this user knowledge information through online surveys, public meetings, and other stakeholder interactions.¹²⁴

In addition to the marine reserve siting, Oregon is actively pursuing ocean mapping activities from a depth of ten meters out to three nautical miles.¹²⁵ Priority mapping themes have included habitat, sediment management, and wave energy.¹²⁶ The state is now engaged in spatial analysis involving bio-geographic assessments.¹²⁷ The resulting maps will cover about 34 percent of Oregon waters and 75 percent of its rocky reef areas.¹²⁸

SC Living Marine Resources and Habitats Workshop Outcomes

The SC Ocean Planning Work Group hosted a public workshop in December 2010 to bring together state and federal agency representatives, researchers, nongovernmental organizations,

¹²² Oregon Ocean Information. Status of the Marine Reserve Process. Retrieved January 2011.

http://www.oregonocean.info/index.php?option=com_content&view=category&layout=blog&id=9&Itemid=2.

¹²³ *Id.*

¹²⁴ Status of Marine Reserve Process. Recreational Fishermen Questionnaire. Retrieved January 2011.

http://www.oregonocean.info/index.php?option=com_content&view=category&layout=blog&id=9&Itemid=9.

¹²⁵ Seafloor Mapping in Oregon. Retrieved January 2011.

http://www.oregonocean.info/index.php?option=com_content&view=category&layout=blog&id=25&Itemid=26.

¹²⁶ http://www.oregonocean.info/index.php?option=com_content&view=article&id=185:priority-mapping-areas&catid=26:sites-for-seafloor-mapping&Itemid=29.

¹²⁷ Klarin, Paul. Marine Affairs Coordinator, Oregon Coastal Mgmt. Program. *Oregon Marine Spatial Planning*. Coastal States Organization Meeting, Monterey, California. Oct. 2010.

¹²⁸ Seafloor Mapping in Oregon. Retrieved January 2011.

http://www.oregonocean.info/index.php?option=com_content&view=category&layout=blog&id=25&Itemid=26

commercial fishermen, local governments, and others. The goals of the workshop were to consider potential conflicts between living marine resources and new or expanding ocean activities, and whether a state ocean plan could guide decisions such as preferred siting or use standards. The workshop consisted of a full day of presentations about offshore marine habitats, status of marine fisheries, marine mammals, sea turtles, and sea and coastal birds. A panel-audience discussion followed. The workshop concluded with recommendations for the SC Ocean Planning Work Group to consider. These related to how to plan for and reduce future use conflicts, how to reduce resource impacts, and how South Carolina should move forward with ocean planning (Appendix 1).

PAGE INTENTIONALLY LEFT BLANK



Ocean Energy Development

Photo credits:
(Top, left) NOAA Office of Ocean Exploration
(Top, right) Dreamstime.com
(Center, right) Federal Energy Regulatory Commission
(Bottom, left) Clemson University
(Bottom, right) DOI Bureau of Ocean Energy Management

Chapter 4. Ocean Energy Development

Many states are currently evaluating the feasibility of energy development within their ocean jurisdictions, as well as working with the relevant federal agencies to evaluate activities in federal waters. In recent years, a national moratorium that banned new offshore oil and gas exploration and drilling was lifted¹²⁹ and federal approval was granted for the first offshore wind farm in the country.¹³⁰ At the same time, the Deep Water Horizon oil spill in the Gulf of Mexico (summer 2010) also caused coastal states and the federal government to closely evaluate energy development plans and to strengthen oil spill preparedness and response efforts. Many coastal states have been studying the feasibility of alternative forms of energy development, including wave, tidal, and wind energy facilities.

In South Carolina, the General Assembly convened study committees to consider both the potential for wind energy development and offshore drilling for natural gas. Both study committees released recommendations in support of offshore energy development. Many nongovernmental organizations and state agencies have been involved in various initiatives to study and promote offshore wind development. Earlier studies indicate that South Carolina holds a significant resource in offshore wind energy (Figure 4).¹³¹ Because of statewide interest in offshore wind development and offshore oil and gas exploration, this chapter focuses on these areas by describing ongoing study initiatives, and the regulatory and planning roles that would be associated with these types of projects. Finally, the chapter summarizes findings from a workshop hosted by the Ocean Planning Work Group and the SC Energy Office on ocean energy development.¹³²

¹²⁹ An executive moratorium banning new offshore oil and gas exploration and drilling on the Outer Continental Shelf was lifted by President George W. Bush. The same year, a similar congressional moratorium, in place since 1982, was allowed to expire. Environmental News Service. September 30, 2008. Retrieved November 2009, <http://www.ens-newswire.com/ens/sep2008/2008-09-30-091.asp>.

¹³⁰ BOEMRE Cape Wind. November 2010. <http://www.boemre.gov/offshore/renewableenergy/CapeWind.htm>.

¹³¹ US Department of Energy Wind and Water Power Program "Wind Powering America." Retrieved October 2010, <http://www1.eere.energy.gov/windandhydro/wind_potential.html>; and

Beacham, Jeffery L., John R. Jensen, and Zhongwu Wang. *A Feasibility Analysis of South Carolina Wind Resources for Electric Power Generation*. University of South Carolina. Retrieved September 2011, <http://www.ipspr.sc.edu/ejournal/ejnov08/Renewable%20Portfolio%20Standard.pdf>.

¹³² SC Energy Office and SC DHEC-OCRM. *Offshore Wind Energy Development and Onshore Implications of Ocean Energy Development Workshop*. Charleston SC. March 24-25, 2010.

Offshore Wind Energy Development

Many coastal states around the country are currently considering offshore wind development as a supplemental source to existing energy production. As of the writing of this report, competitive lease sales are scheduled in 2012 (NJ, MD, VA) and 2013 (NC), and Calls for Information and Nominations (Call) are being prepared or have already been published in the Federal Register (e.g. NJ – 11 nominations have been received).¹³³ In South Carolina, a recently-appointed legislative study committee, the South Carolina Wind Energy Production Farms Feasibility Study Committee, considered the economic impacts of offshore wind energy development in the state and received estimates, based on various studies, on the potential opportunities for economic growth in South Carolina.¹³⁴ In order to achieve 20 percent of total energy production through wind power by 2030, South Carolina would need to provide 3.3 gigawatts (GW) of wind power, which would result in approximately 15,500 temporary jobs and over 3,000 permanent jobs.¹³⁵ A separate study found that a 480 megawatt (MW) wind farm off South Carolina would result in approximately 2,000 temporary jobs for manufacturing and installation, and up to 155 permanent jobs related to operation and maintenance.¹³⁶ Offshore wind development would also increase the state's economic output, annual disposable income, and therefore state income taxes.¹³⁷ After a year of meetings and gathering of information, the Wind Study Committee recommended the establishment of a “clean energy portfolio standard with a target of 40-80 MW for generation capacity from offshore wind by 2013, and 1000 MW by 2018.”¹³⁸

In addition to the Wind Study Committee's work, other research and interagency coordination efforts have been launched to better understand the state's potential to produce offshore wind energy and to promote an improved regulatory framework. In particular, the SC Regulatory Task

¹³³ Bureau of Ocean Energy Management. Sand and Gravel Program. Mid/South Atlantic-Sand Management Working Group Meeting Presentations. August 2011. Retrieved October 2011, <http://www.boemre.gov/sandandgravel/RegionalSandManagementWorkingGroups.htm>.

¹³⁴ SC Wind Energy Production Farms Feasibility Study Committee. 2010. *South Carolina's Role in Offshore Wind Energy Development*. p. 11-14. Retrieved October 2011, <http://www.energy.sc.gov/index.aspx?m=6&t=123>.

¹³⁵ Id. p. 11 citing Flowers.

¹³⁶ Id. p. 11 citing Roger J. Flynn & Robert T. Carey, Clemson University, *The Potential Economic Impact of an Off-Shore Wind Farm to the State of South Carolina*. http://sti.clemson.edu/index.php?option=com_docman&task=cat_view&gid=156&Itemid=310.

¹³⁷ Id.

¹³⁸ The Wind Energy Production Farms Feasibility Study Committee. *South Carolina's Role in Offshore Wind Energy Development*. p. 3 & 25. December 2009.

Force for Coastal Clean Energy has spent several years engaging stakeholders involved in these statewide efforts and outlining the regulatory pathway that would be followed for any proposed offshore wind energy project.

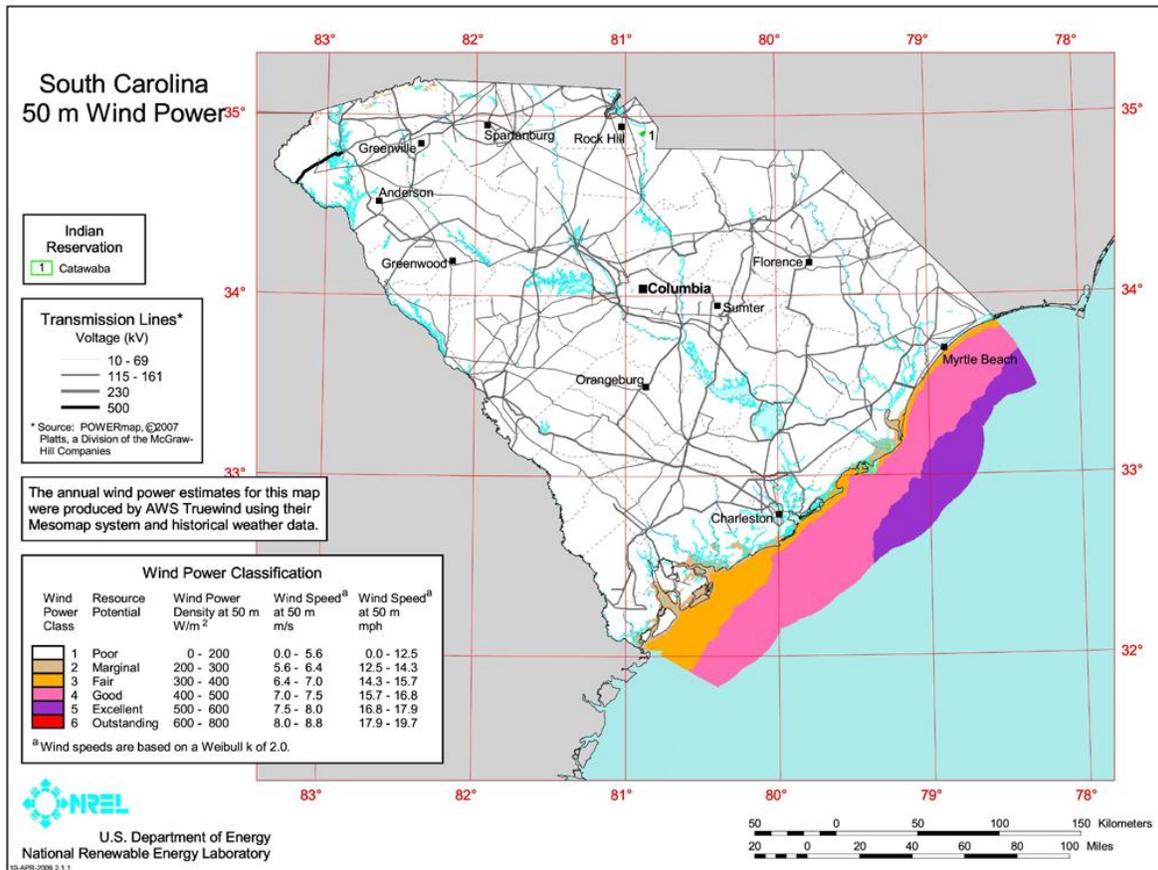


Figure 4. The Department of Energy's Wind Program and the National Renewable Energy Laboratory published a South Carolina wind resource map that shows wind speed estimates at 50 meters elevation.¹³⁹

Renewable Ocean Energy Policy and Research Initiatives in South Carolina

As discussed in Chapters 2 and 9 of this report, a Regulatory Task Force for Coastal Clean Energy (RTF) was established by the SC Energy Office to promote a regulatory environment favorable to alternative energy development in state waters. The RTF developed interim recommendations for the Wind Energy Production Farms Feasibility Study Committee to

¹³⁹ Retrieved March 16, 2011: http://www.windpoweringamerica.gov/maps_template.asp?stateab=sc.

consider during its year-long deliberations on wind production feasibility.¹⁴⁰ The RTF emphasized that its recommendations for the development of a marine spatial plan and a comprehensive leasing framework would help to facilitate and streamline the regulatory process, providing some predictability for the applicant and aiding decision making by resource managers.¹⁴¹

Members of the RTF are also involved with other statewide research efforts related to offshore wind development described in this report (e.g., SC Offshore Wind Transmission Study, Palmetto Wind Project). In addition, the RTF maintains contact with out-of-state agencies and organizations involved with offshore wind development, marine spatial planning, and submerged lands leasing, in an attempt to get a complete understanding of the challenges associated with and benefits gain from a proposed offshore wind energy project. In March 2010, the RTF collaborated with the SC Energy Office, DHEC-OCRM, SCDNR, SC Sea Grant and others, to conduct a two-day workshop to explore energy development issues for South Carolina. The workshop focused on determining potentials for wind energy development in South Carolina and engaged stakeholders in discussing the onshore implications of ocean energy development. Presentations were made by representatives from state agencies, the Clemson University Restoration Institute, the US Department of Defense, and other coastal states. Workshop participants included local, state, and federal agencies, non-profit organizations, industry, academia, military, and the public. Top needs identified for South Carolina included: 1) establishment of a clean energy portfolio standard; 2) development of a marine spatial plan and leasing program; and 3) establishment of a state policy that supports the development of offshore wind.¹⁴²

More recently, the RTF established a sub-group to evaluate a leasing framework for South Carolina ocean waters. The leasing group evaluated the Texas, Maine and federal Bureau of Ocean Energy Management (BOEM) models to consider implications of leasing in South

¹⁴⁰ SC Regulatory Task Force for Coastal Clean Energy. 2009. *Recommendations to the Wind Energy Production Farms Feasibility Study Committee*.

¹⁴¹ *Id.*

¹⁴² Onshore Implications of Ocean Energy Development Workshop. Charleston, SC. March 25, 2010.

Carolina waters and to recommend options to the RTF to take to the state's Wind Study Committee.

As mentioned above, the SC Wind Energy Production Farms Feasibility Study Committee was established to determine whether South Carolina is a suitable place for wind power generation.¹⁴³ The Committee held multiple public meetings, considered the economic and environmental impacts from offshore wind development to the state, and provided recommendations to the General Assembly and Governor.¹⁴⁴ The Committee released 18 recommendations that included the establishment of a clean energy portfolio standard, a state leasing framework for offshore activities, a permit facilitation office, a state-level marine spatial plan, a Wind Working Group to promote education and awareness of offshore wind activities, and a Memorandum of Understanding with neighboring states to collaborate on future projects.¹⁴⁵ In addition, the Wind Study Committee made recommendations related to providing "revenue certainty" for offshore production, expanding and increasing existing renewable energy tax credits, encouraging large-scale commercial projects, and establishing funding opportunities for further wind research and demonstration activities.¹⁴⁶

As of the final publication of this report, a BOEM South Carolina Task Force was created for the purpose of helping BOEM fulfill its mandate to coordinate and consult with the Governor of any state that may be affected by a lease authorizing renewable energy activities offshore in federal waters.¹⁴⁷ Members of the Task Force include federal agencies, tribal governments, and South Carolina state and local agencies that have a role in permitting and regulating resources and activities that may be affected or have an effect on renewable energy development.¹⁴⁸ The Task Force's first meeting was held on March 29, 2012 in Charleston, SC.¹⁴⁹

¹⁴³ South Carolina Act 318 of 2008.

¹⁴⁴ Wind Energy Production Farms Feasibility Study Committee. 2009. *South Carolina's Role in Offshore Wind Energy Development*. <http://www.energy.sc.gov/index.aspx?m=6&t=123>

¹⁴⁵ *Id.* pages 3-5.

¹⁴⁶ *Id.*

¹⁴⁷ Subsection 8(p)(7) of the OCS Lands Act, as amended by the Energy Policy Act of 2005.

¹⁴⁸ Renewable Energy Uses of the Outer Continental Shelf BOEM South Carolina Task Force Charter. March 29, 2012.

¹⁴⁹ <http://www.boem.gov/Renewable-Energy-Program/State-Activities/South-Carolina.aspx>. Retrieved April 2012.

Palmetto Wind Research Project¹⁵⁰

In March 2009, the SC Public Service Authority (Santee Cooper), Coastal Carolina University (working jointly with NC State University), and the SC Energy Office kicked off a joint study on the feasibility of offshore wind energy development.¹⁵¹ The project builds upon previous research and mapping that has indicated the potential for a viable wind resource off of South Carolina's coast.¹⁵² The study was designed to ground-truth previous wind modeling completed for the SC Energy Office and to identify suitable areas for wind power generation.¹⁵³ The project consisted of installing six oceanographic and atmospheric instrumentation buoys along two transects that run perpendicular to Winyah Bay and North Myrtle Beach. The buoys were installed to measure speed, direction, frequency and other parameters up to six miles off the South Carolina coast for at least one year.¹⁵⁴ Funding for this project was provided by Santee Cooper and the US Department of Energy (DOE). DOE funds were administered by the SC Energy Office.

Buoys were deployed during the summer months of 2009, providing data to researchers until the end of 2010. Comparisons between this project and the previous wind modeling study conducted by AWS Truewind indicated that the average wind speed for the first six-month (summer/fall 2009) period was less than the AWS Truewind values at the 1.5 and three mile sites, but greater for the six mile site.¹⁵⁵ Based on these data, wind velocities increase as the distance from the shore increases. The second half of the study involved moving the 1.5 mile buoy at Winyah Bay and North Myrtle Beach to locations 12 miles offshore.¹⁵⁶ Academic researchers analyzed the data collected throughout the year and determined the best location for a proposed offshore

¹⁵⁰ Coastal Carolina University. <http://bccmws.coastal.edu/projects/palmetto-wind-research-project>.

¹⁵¹ Santee Cooper. "Palmetto Wind Research Project." 2009. Retrieved October 2010, https://www.santeecooper.com/portal/page/portal/santeecooper/environment/renewables/green_power_generation/wind_power.

¹⁵² US Department of Energy. "Wind Energy Resource Potential." Retrieved October 2010, http://www1.eere.energy.gov/windandhydro/wind_potential.htm; and AWS Truewind. "Wind Energy Resource Maps of South Carolina." for SC Energy Office. June 10, 2005. Retrieved October 2010, <http://www.energy.sc.gov/index.aspx?m=6&t=85>.

¹⁵³ Gayes, Paul Dr. and Dr. Len Pietrafesa. 2010. "Palmetto Wind Research Project Progress Report" for Santee Cooper, SC Public Services Authority, and SC Energy Office. February 26, 2010. Retrieved Oct. 2010. <<https://bcmw.coastal.edu/projects/palmetto-wind-research-project>>.

¹⁵⁴ *Id.*

¹⁵⁵ *Id.*

¹⁵⁶ *Id.*

anemometer tower to measure upper-level winds is near one of the buoy paths, offshore from Winyah Bay in Georgetown. Construction of the tower is the next step of this project.¹⁵⁷

SC Offshore Wind Transmission Study¹⁵⁸

Recognizing the influence of existing energy infrastructure (electrical power “grid”) on energy development and siting, Santee Cooper initiated an Offshore Wind Transmission Study in 2009 to evaluate the state’s transmission system and its capacity to absorb offshore wind energy.¹⁵⁹ The study consisted of investigating two aspects of the existing transmission infrastructure: power lines back to shore, and the effect of additional energy inputs into the land-side power grid. In addition, the study evaluated options for integrating offshore wind energy into the state’s portfolio of services.¹⁶⁰ The Transmission Study was led by researchers at the Clemson University Electric Power Research Association (CUEPRA), sponsored in part by the SC Energy Office. The analysis for the study was based on Power Flow Base Cases generated by the SC Electric & Gas Company (SCE&G) and Santee Cooper.¹⁶¹ The study consisted of evaluating three levels of power generation to determine issues facing the integration of wind energy into the power system.¹⁶² Three future scenarios were evaluated: a projection of 80 MW into Santee Cooper’s system from wind power in state waters by 2014; an additional one GW (total 1,080 MW) in federal waters by 2020 distributed among four utilities; and an additional two GW (total 3,080 MW) in federal waters by 2030 distributed among five utilities.¹⁶³ Wind has an approximate 35-40 percent capacity factor. When wind speeds diminish, power levels drop and must be picked up immediately by back-up resources (intermittency).¹⁶⁴ Initial results of this study indicated that dynamic scheduling among the utilities must be implemented to accommodate for power drops and share the problem.¹⁶⁵

¹⁵⁷ Santee Cooper. “Palmetto Wind Research Project.” Web. 20 Oct. 2010.

¹⁵⁸ Dr. Girgis, Adly, and Dr. Elham Makram. Clemson University Electric Power Research Association (CUEPRA). *Offshore Wind Transmission Study*. June 2010. Retrieved September 2011.

http://www.energy.sc.gov/publications/CUEPRA_Offshore_Wind_Transmission_Report_%207-10.pdf.

¹⁵⁹ CUEPRA 2010.

¹⁶⁰ *Id.*; and Kress, Elizabeth. Santee Cooper. *Grid Influence on Offshore Wind Energy Siting*. Onshore Implications of Ocean Energy Development Workshop. Charleston, SC. March 25, 2010. Retrieved October 2010.

<http://www.energy.sc.gov/index.aspx?m=6&t=85&h=904>.

¹⁶¹ CUEPRA 2010.

¹⁶² *Id.*, p. 4

¹⁶³ *Id.*; and Kress, 2010.

¹⁶⁴ Kress 2010.

¹⁶⁵ Kress 2010.

Various assumptions were made in this study and are described on the SC Energy Office’s website and in CUEPRA’s final report. Results showed that a robust system exists along the South Carolina coast for the first two scenarios under normal operating conditions.¹⁶⁶ However, the existing network will require some new lines to handle the third scenario.¹⁶⁷ A future study is proposed to include recommendations for redesign or upgrade in the third scenario.¹⁶⁸ In addition, studies are recommended for contingency evaluation for service outages, short circuit analysis, dynamic stability, voltage stability, and transient stability.¹⁶⁹

The North Strand Coastal Wind Team¹⁷⁰

The North Strand Coastal Wind Team was established as a collaborative partnership with North Myrtle Beach Chamber of Commerce, Coastal Carolina University, Savannah River National Lab, Myrtle Beach Regional Economic Development Authority, and the SC Energy Office to encourage and help facilitate the development of wind energy resources for the City of North Myrtle Beach. The City of North Myrtle Beach passed an ordinance allowing installation of rooftop vertical axis turbines for the purpose of “overseeing the permitting of small wind energy systems...”¹⁷¹ While not directly associated with offshore wind turbine siting, the ordinance demonstrates local support for wind energy development in the area.

Clemson University Restoration Institute¹⁷²

The Clemson University Restoration Institute and its partners received a \$45 million grant from the DOE, combined with \$53 million of matching funds, to build and operate a large-scale wind turbine drive train testing facility at the Institute’s research campus in Charleston.¹⁷³ The state-of-the-art facility will have the largest capacity of any wind turbine testing site in the world,

¹⁶⁶ *Id.*; and CUEPRA 2010.

¹⁶⁷ *Id.*

¹⁶⁸ Kress 2010.

¹⁶⁹ *Id.*; and CUEPRA 2010.

¹⁷⁰ <http://northstrandcoastalwindteam.org/mission-statement>

¹⁷¹ City of North Myrtle Beach Zoning Ordinance Section 23-129.4 Small Wind Energy Systems http://library.municode.com/showDocument.aspx?clientID=11359&docID=0#COOR_CH23ZO_ARTVII.1ENST_S23-129.4SMWIENSY

¹⁷² http://www.clemson.edu/restoration/focus_areas/renewable_energy/index.html

¹⁷³ Clemson University Media Relations. *Clemson University Restoration Institute lands \$98 million funding to develop next-generation wind turbines*. November 23, 2009. Retrieved July 2010, http://www.clemson.edu/media-relations/article.php?article_id=2432.

capable of testing advanced drive train technology in the five to fifteen megawatt range.¹⁷⁴

Research conducted on next-generation wind turbines and drive trains will help shape the wind industry and advance energy goals for the nation.

Environmental Effects and Information Needs of Alternative Energy Uses on the OCS

In 2007, Research Planning, Inc. undertook a study, initiated by the Department of Interior to evaluate offshore alternative energy projects, predominantly offshore wind, and to report on environmental impacts and information needs.¹⁷⁵ The study focused on European installations where offshore alternative energy has been ongoing for the past 20-30 years.¹⁷⁶ The study assessed current offshore energy technologies and future trends, public acceptance, and information needs to address data gaps. It also modeled potential direct, indirect, and cumulative environmental effects, and evaluated mitigation measures.¹⁷⁷

The study identified types of impacts and physical characteristics associated with the activities of the alternative energy installations including habitat change, lost use, noise, contaminants, etc. Effects of impacts on natural resources including birds, fish, marine mammals, benthos, and scenic vistas were also investigated.¹⁷⁸ Information needs were identified for ocean mapping to include identification of use conflicts, involving navigation, distribution and abundance of natural resources, commercial and recreational fisheries, cultural resources, cables, and dredge borrow and disposal sites. Additional information gaps identified included physical resources, benthic resources, fishery resources, marine mammals, sea turtles, birds, and socio-economics.¹⁷⁹

¹⁷⁴ Dr. Nicholas C. Rigas, Clemson University Restoration Institute. *Workshop for Offshore Wind Energy Development*. Charleston, SC. March 24, 2010.

<http://www.energy.sc.gov/UserFiles/File/ThePotentialforWindEnergyDevelopment-NRigas.pdf>.

¹⁷⁵ Jacqueline Michel, Research Planning, Inc. *South Carolina Ocean Planning Initiative: Integrated and Prioritized Ocean Mapping Efforts*. Charleston, SC. April 24, 2008. Retrieved April 2008, Presentation:

http://www.DHEC.gov/environment/ocrm/ocean_planning.htm; and Michel, J. et al. 2007. *Worldwide Synthesis and Analysis of Existing Information Regarding Environmental Effects of Alternative Energy Uses on the Outer Continental Shelf*. US Department of the Interior, Minerals Management Service, Herndon, VA, MMS OCS Report 2007-038. 254 pp.

¹⁷⁶ *Id.*

¹⁷⁷ *Id.*

¹⁷⁸ *Id.*

¹⁷⁹ *Id.*

Wind Energy in Other Coastal States

Rhode Island

In 2007, Rhode Island's Governor established a mandate that offshore wind resources provide 15 percent of the state's electrical power by 2019. This was a major driver for the development of the state's recently released Ocean SAMP, which was led by the RI Coastal Resources Management Council in partnership with researchers and others.¹⁸⁰ The SAMP provides comprehensive management for a variety of ocean resources and uses, and will serve as a regulatory tool that provides policies and recommendations for appropriate siting of offshore renewable energy.¹⁸¹ The SAMP development process, along with the establishment of regulations and policies, included significant researcher and stakeholder involvement.¹⁸²

North Carolina

The NC Division of Coastal Management released an Ocean Management Strategy in 2009. Ocean-based alternative energy development was one of five emerging policy issues related to ocean and coastal resources identified.¹⁸³ Recommendations in the report included:

- Enactment of a comprehensive statute and promulgation of rules to address the granting of easements and leases of state-owned submerged lands and the associated water column and air space for alternative energy projects;
- Review and amendment of existing state rules affecting alternative energy facilities sited in state and federal waters;
- Clarification of CRC, Environmental Management Commission, and Utilities Commission roles in the development of rules for the siting of ocean-based alternative energy projects;
- Examination of NC Coastal Management Program policies on non-water dependent structures and their pertinence to alternative energy facilities.

In September 2009, Duke Energy partnered with the University of North Carolina to install three demonstration wind turbines in Pamlico Sound. Due to costs exceeding the benefits that would

¹⁸⁰ Rhode Island Ocean SAMP, 2010. <http://seagrant.gso.uri.edu/oceansamp/>.

¹⁸¹ *Id.*

¹⁸² *Id.*

¹⁸³ NC Ocean Policy Steering Committee. 2009. *Developing a Management Strategy for North Carolina's Coastal Ocean*. Submitted to the NC CRC by NC Coastal Resources Law, & NC DCM. Retrieved February 2012. <http://dcm2.enr.state.nc.us/opscreport.pdf>.

have been derived from the project, Duke Energy ended the project.¹⁸⁴ Before its termination, the project obtained data and analysis on offshore wind energy project design and equipment procurement processes. In addition, avian data were collected for approximately one year, and the USACE had initiated EIS development per NEPA requirements. Although the project did not come to fruition, Duke Energy and North Carolina gained important knowledge about project economics and environmental issues associated with offshore wind power. The primary lesson learned from the project was that “small projects lack economies of scale.”¹⁸⁵ The costs involved would be the same regardless of the size of the project. Other issues identified included problems associated with siting turbines in shallow waters, increased concerns for marine resources, and future uncertainties of costs and public funding.¹⁸⁶

Massachusetts

Massachusetts has been faced with proposals for new offshore uses, including the final federal approval of the Cape Wind project in 2010. As mentioned in Chapter 2 of this report, Massachusetts recently released an Ocean Management Plan (2009) to be incorporated into the existing state Coastal Zone Management Program and enforced through the state’s regulatory and permitting processes, including the Massachusetts Environmental Policy Act (MEPA) and the state’s waterways law. Through an environmental screening process, two “proposed Wind Energy Areas” were identified based on having a suitable wind resource and water depth, and minimum conflicts with other uses or resources.¹⁸⁷

The proposed Cape Wind project involves installing and operating an offshore wind-powered electric generating facility comprising of 130, 3.6 MW offshore wind turbine generators, an Electrical Service Platform, and associated transmission cables and equipment.¹⁸⁸ The location of the project is approximately 4.7 miles from shore, covering approximately 25 square miles. The permitting and NEPA processes took approximately nine years to complete, and a two-year

¹⁸⁴ Presentations by Duke Energy and ARCADIS representatives at the SC RTF Meeting, Charleston SC. November 3, 2010.

¹⁸⁵ *Id.*

¹⁸⁶ Duke Energy Presentation. SC RTF Meeting, Charleston, SC 2010.

¹⁸⁷ Massachusetts Office of Energy and Environmental Affairs. (2009). *Ocean Management Plan*. Appendix 3.

¹⁸⁸ BOEMRE Cape Wind. November 2010. <http://www.boem.gov/Renewable-Energy-Program/studies/Cape-Wind-Background.aspx> .

schedule is proposed for actual construction. Once in operation, it is expected that the facility could produce enough energy to power more than 200,000 homes in Massachusetts.¹⁸⁹

Regulatory Pathways

Activities in State Waters (Figure 5)

In many areas, offshore wind speeds and durations have been shown to be greater beyond three nautical miles in federal waters.¹⁹⁰ However, in South Carolina, there is some interest in siting wind turbines within three nautical miles of the coastline.¹⁹¹ In 2009, Santee Cooper, the SC Energy Office, and Coastal Carolina University began working towards the installation of a wind test tower three nautical miles offshore of South Carolina's coast for one year to measure wind speeds, among other parameters.¹⁹²

The SC Public Service Commission (PSC) is the state agency with regulatory authority over siting large-scale or multiple wind towers within state waters. The PSC grants a certification for construction of any "major utility facility."¹⁹³ The statute defines "major utility facility" as an electric generating plant and associated facilities designed for, or capable of, operation at a capacity of more than 75 megawatts, or an electric transmission line and associated facilities of a designed operating voltage of 125 kilovolts or more.¹⁹⁴ In addition to the PSC's review, permits from the USACE would need to be obtained under Section 404 of the Clean Water Act (CWA); Section 10 of the Rivers and Harbors Act; and the USACE would be the lead federal agency for the NEPA process. DHEC-OCRM would review proposed project(s) for consistency with the SC Coastal Wetlands and Tidelands Act and Critical Area Regulations for alteration of the "critical area." If a proposed project does not meet the "major utility facility" definition, the PSC would

¹⁸⁹ *Id.*

¹⁹⁰ US Department of Energy Wind and Water Power Program "Wind Powering America." Retrieved October 2010, http://www1.eere.energy.gov/windandhydro/wind_potential.html.

¹⁹¹ Santee Cooper. "Palmetto Wind Research Project." 2009. Web. 20 Oct. 2010. <http://www.santeecoopergreen.com/portal/page/portal/SanteeCooper_Green/OurCommitment/GreenPowerGeneration/WindPower>

¹⁹² Gayes, Paul Dr. and Dr. Len Pietrafesa. 2010. "Palmetto Wind Research Project Progress Report" for Santee Cooper, SC Public Services Authority, and SC Energy Office. February 26, 2010. Retrieved October 2010, <https://bcmw.coastal.edu/palmetto-wind-research-project/project-objectives>.

¹⁹³ S.C. Code § 58-33-110 (2010).

¹⁹⁴ S.C. Code § 58-33-20(2) (2010).

not have authority for review; rather a “Critical Area” permit from DHEC-OCRM would be required.¹⁹⁵

Wind towers sited in federal waters will likely have ancillary activities including cable installations and onshore infrastructure that would be located within South Carolina’s coastal jurisdiction, possibly requiring one or more Critical Area permits under the state’s coastal zone management program. As described in Chapter 2, activities beyond state waters would be reviewed for coastal zone federal consistency.¹⁹⁶ Under current law, it does not appear that the State Budget and Control Board has the legal authority to lease submerged lands for renewable energy development, in contrast to specific existing authorities for oil and gas leases.¹⁹⁷ A more detailed discussion on leasing programs is included in Chapter 9.

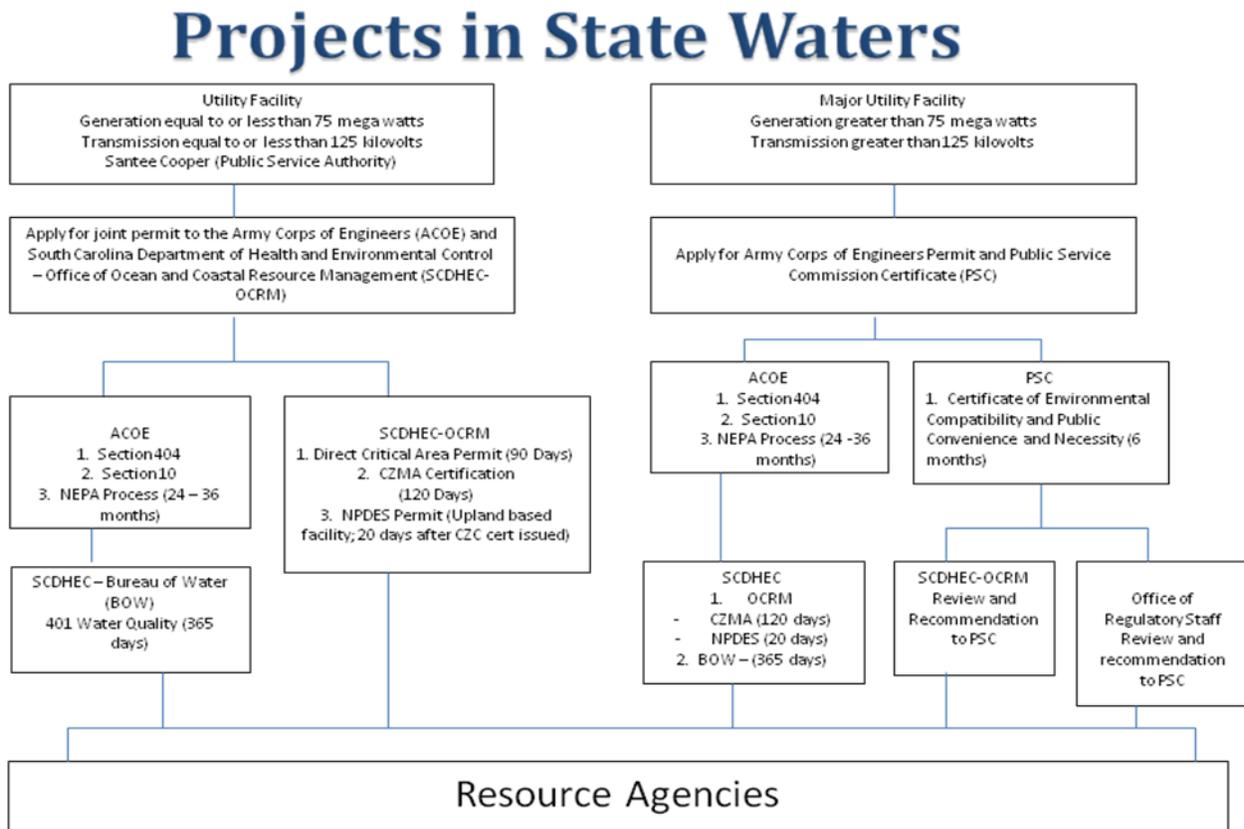


Figure 5. Regulatory Road Map for Offshore Wind Projects. Source: B. Williams, Office of Ocean and Coastal Resource Management, DHEC. September 21, 2009.

¹⁹⁵ S.C. Code § 48-39-50 (2011).

¹⁹⁶ 16 U.S.C. §§ 1451 *et seq* (2010).

¹⁹⁷ S.C. Code § 48-43-390 (2010).

*Activities in Federal Waters*¹⁹⁸

At the federal level, rules governing renewable energy projects in federal waters have only recently been promulgated through a Final Rule Environmental Assessment that was released in 2009.¹⁹⁹ In addition, a memorandum of understanding (MOU) was entered into between DOI and the Federal Energy Regulatory Commission (FERC) to clarify each agency's jurisdiction regarding renewable energy projects on the OCS.²⁰⁰ According to that MOU: 1) DOI Minerals Management Service (now BOEM) has exclusive jurisdiction over the production, transportation, or transmission of energy from non-hydrokinetic renewable energy projects on the OCS including wind and solar energy sources; 2) BOEM has exclusive jurisdiction to issue leases, easements, and rights of way on OCS lands pursuant to Section 8(p) of the OCSLA²⁰¹; and 3) FERC has exclusive jurisdiction to issue licenses pursuant to Part I of the Federal Power Act and exemptions under Sections 405 and 408 of the Public Utility Regulatory Policies Act of 1978²⁰² for hydrokinetic projects on the OCS.²⁰³

Section 388 of the Energy Policy Act of 2005 (EPAct) authorizes DOI to grant leases, easements, or rights of ways on the OCS for activities that produce or support production, transportation, or transmission of energy from sources other than oil or gas.²⁰⁴ This mandate also authorizes DOI to allow for alternative uses of existing facilities on the OCS.²⁰⁵ Under the Final Rule (30 CFR Part 285), two types of leases are available for offshore renewable energy facilities - Commercial or Limited (Figure 6).²⁰⁶ A commercial lease provides full rights to apply for and receive authorizations to assess, test and produce renewable energy on a commercial scale for 30 years, and would include the right to a project easement for cable installation necessary to transmit electricity; and any related ancillary structures on the OCS necessary.²⁰⁷ The project

¹⁹⁸ The Final Rule governing Renewable Energy and Alternative Uses on the OCS is codified in 30 CFR Part 285.

¹⁹⁹ US Department of Interior. Renewable Energy and Alternate Uses of Existing Facilities on the Outer Continental Shelf: Final Rule Environmental Assessment. OCS EIS/EA MMS 2009-026.

²⁰⁰ MOU Between the US Dept. of Interior and the Federal Energy Regulatory Commission, April 9, 2009. Retrieved February 2011, <http://www.ferc.gov/legal/maj-ord-reg/mou.asp>.

²⁰¹ 43 U.S.C. § 1337(p)(2010).

²⁰² 16 U.S.C. §§ 792-823a(2010).

²⁰³ *Id.*, p. 1.

²⁰⁴ 43 U.S.C. §§ 1331 *et seq* (2010).

²⁰⁵ For rules governing proposed alternative uses on the OCS, see 30 CFR Part 285 Subpart J.

²⁰⁶ "Renewable Energy and Alternate Uses of Existing Facilities on the Outer Continental Shelf, Final Rule." *Federal Register* 74 (29 April 2009): 19638-19871 at 19647. Print.

²⁰⁷ *Id.*

easement is issued upon approval of the Construction and Operations Plan (COP) for Commercial Leases or General Activities Plan (GAP) for Limited Leases. A Limited lease conveys access and operational rights for activities on the OCS that support energy production but do not result in energy production for commercial use, distribution, or sale.²⁰⁸ Leases for site assessment or to develop and test new renewable energy technology would fall under a Limited lease framework. Power generated during testing may be sold within the limits of the lease, which allows for recoupment of expenses entailed.²⁰⁹ Limited leases are issued for five years. BOEM also issues approvals for Rights of Use and Easement (RUE) and Rights of Way (ROW) Grants for associated activities not covered in the lease.²¹⁰ BOEM will also issue an Alternate Use RUE for energy or marine related uses of an existing OCS facility not otherwise authorized.²¹¹ For details on these types of approvals, see the 2009 Final Rule and the Final Rule Environmental Assessment.²¹² The following summary provides an overview of the administrative process for a commercial lease.

The EPO Act requires BOEM to award leases, ROW, and RUE grants on a competitive basis unless BOEM finds no competitive interest.²¹³ This is determined after public notice of a proposed lease, easement, or right-of-way is published and BOEM receives no letters of interest from other parties.²¹⁴ BOEM prepares the NEPA and other environmental compliance documents in conjunction with this process, including a Coastal Zone Management Act (CZMA) consistency determination, which would be submitted to DHEC-OCRM for approval. To begin this competitive leasing process, BOEM issues a call for interest, designates the lease or grant area, and publishes all notices and calls relating to the sale in the Federal Register.²¹⁵ BOEM then makes a determination after the call for interest whether a lease or grant is competitive or noncompetitive. Leases are determined to be noncompetitive if no competitive interests in that

²⁰⁸ *Id.*

²⁰⁹ *Id.*

²¹⁰ *Id.*

²¹¹ Final Rule at 19647.

²¹² “Renewable Energy and Alternate Uses of Existing Facilities on the Outer Continental Shelf, Final Rule.” *Federal Register* 74 (29 April 2009): 19638-19871; and US DOI MMS “Renewable Energy and Alternate Uses of Existing Facilities on the Outer Continental Shelf: Final Rule Environmental Assessment.” MMS 2009-026.

²¹³ 43 U.S.C. 1337(p)(3); and Final Rule at 19647.

²¹⁴ Section 388(3)(d) of the Energy Policy Act of 2005.

²¹⁵ Final Rule at 19647.

particular OCS area are received.²¹⁶ Regardless of whether a lease is acquired competitively or non-competitively, it must comply with all BOEM lease stipulations and conditions.²¹⁷ All permitted activities must comply with all relevant federal laws, regulations and statutes.²¹⁸

Before BOEM approves a competitive lease sale, or grant, it must submit a coastal zone consistency determination to the affected state(s) if it is determined that the lease sale is reasonably likely to affect a state's coastal zone.²¹⁹ For a competitive lease sale, the consistency determination will also cover site assessment activities.²²⁰ If effects are foreseeable, the consistency determination must describe the activity in detail, expected effects, and how the proposed activity is consistent with applicable enforceable policies in the State's Coastal Management Program.²²¹ If the affected state(s) agrees with BOEM's determination, BOEM may proceed with the lease sale. If the affected state(s) disagrees, BOEM must follow the procedures as outlined in 15 CFR Part 930, Subpart C, which covers consistency for federal agency activities. In contrast, for noncompetitive leases or grants, Subpart D applies covering activities that require a federal permit. A noncompetitive lease or grant, which is treated as a permit rather than a lease sale, will not be approved by BOEM if consistency has not been "conclusively presumed;" or the state objects to the applicant's consistency certification and the Secretary of Commerce has not found the permitted activities are consistent or otherwise necessary in interest of national security.²²²

²¹⁶ *Id.*

²¹⁷ *Id.*

²¹⁸ See Final Rule at 19647-19651, and Report Supplement for list of relevant federal authorities.

²¹⁹ BOEM must follow procedures outlined in 15 CFR part 930, subparts C, Consistency for Federal Agency Activities (for competitive lease sales) and D, Consistency for Activities Requiring a Federal License or Permit (for noncompetitive lease sales).

²²⁰ Final Rule Environmental Assessment at 9.

²²¹ Final Rule at 19651.

²²² Final Rule and Final Rule Environmental Assessment at 9.

Activity	MMS Process	NEPA Documentation	Lease or Grant Conditions	CZMA
Leases				
Competitive lease sale.	Conduct competitive lease sale and issue leases.	Covers lease sale area.	Stipulations, mitigation, and conditions established in lease contract.	Covers a Federal agency activity and must comply with 15 CFR part 930, subpart C.
Noncompetitive lease.	Negotiate noncompetitive lease and issue decision on the SAP or GAP.	Covers identified noncompetitive lease area and proposed activities in the SAP or GAP.	Stipulations, conditions, mitigation, and monitoring established in the lease and SAP or GAP.	Covers a nonfederal activity that requires a Federal license or permit and must comply with 15 CFR part 930, subpart D.
Grants				
Competitive ROW grants and RUE grants.	Conduct competitive ROW grant or RUE grant sale and issue grants.	Covers ROW grant- and RUE grant-specific sale area.	Stipulations and conditions established in grant award.	Covers a Federal agency activity and must comply with 15 CFR part 930, subpart C.
Noncompetitive ROW grants and RUE grants.	Negotiate noncompetitive ROW grants or RUE grants and evaluate GAP.	Covers identified noncompetitive grant site and proposed activities in the GAP.	Stipulations, conditions, mitigation, and monitoring established in grant award and GAP.	Covers a nonfederal activity that requires a Federal license or permit and must comply with 15 CFR part 930, subpart D.

Figure 6. Table excerpted from “Renewable Energy and Alternate Uses of Existing Facilities on the Outer Continental Shelf, Final Rule.” *Federal Register* 74 (29 April 2009): 19638-19871. Print.

Once the commercial lease is acquired, the lessee must submit plans to BOEM that include site assessment, construction, operations, and decommissioning.²²³ The first plan to be submitted for review and approval is the Site Assessment Plan (SAP) and approval is required before those activities can begin. The SAP would go through the NEPA reviews²²⁴ and must demonstrate how the proposed activities will comply with relevant federal statutes such as the CZMA, CWA, Endangered Species Act, and Marine Mammal Protection Act, among others. The lessee prepares the CZMA consistency determination.²²⁵

²²³ Final Rule at 19652.

²²⁴ The Final Rule allows the SAP NEPA and CZMA reviews to be done in conjunction with the NEPA and CZMA analyses performed for the initial lease sale to reduce the number of NEPA and CZMA reviews for commercial leases from 3 to 2 (Figure 7). This revision was in response to comments received regarding the Proposed Rule. Final Rule at 19685.

²²⁵ Final Rule at 19652.

After site assessment activities have been performed, the lessee must submit for BOEM approval a Construction and Operations Plan (COP) before starting development and production activities.²²⁶ The COP would also undergo NEPA reviews in addition to the SAP, and must comply with relevant federal statutes. During operations, the operator would be required to monitor activities and demonstrate that its performance satisfies specified standards in its approved plans.²²⁷ The operator would also be required to comply with applicable federal and state regulations regarding air quality, safety, maintenance and shutdowns, equipment failure, adverse environmental effects, inspections, facility assessments, and incident reporting.²²⁸

For limited leases, the above process is followed, but instead of a SAP and COP, the lessee submits a General Activities Plan (GAP) that covers all activities including site assessment, development, operations, and decommissioning.²²⁹ Like the other plans, the GAP would be required to go through NEPA reviews and comply with relevant federal statutes.²³⁰

Frequency of NEPA/CZMA reviews based on instrument held.

Instrument Held	MMS Process	NEPA Documentation and CZMA Review
Competitive Commercial Lease	Conduct lease sale and issue decision on plans	1. Lease Sale and SAP activities EIS 2. COP*
Noncompetitive Commercial Lease	Negotiate and issue lease	1. Lease Issuance and SAP 2. COP*
Competitive Limited Lease	Conduct lease sale and issue decision on plan	1. Lease Sale 2. GAP
Noncompetitive Limited Lease	Negotiate and issue lease	1. Lease Issuance and GAP
Competitive ROW, RUE Grant	Conduct ROW, RUE sale and issue decision on plan	1. ROW, RUE Sale 2. GAP
Noncompetitive ROW, RUE Grant	Negotiate and issue ROW, RUE grant	1. ROW, RUE issuance and GAP

*Note: the review times may be reduced if the applicant submits a combined SAP/COP or a combined SAP/FERC license application. For commercial hydrokinetic leases FERC will conduct NEPA and CZMA review for license activities.

Figure 7. MMS (now BOEM) Renewable Energy and Alternate Uses of Existing Facilities on the Outer Continental Shelf; Final Rule. April 29, 2009.

²²⁶ *Id.*, and Final Rule Environmental Assessment at 10.

²²⁷ Final Rule at 19652.

²²⁸ *Id.*

²²⁹ *Id.*

²³⁰ *Id.*

Regarding revenue sharing, the OCSLA requires 27 percent of the revenues received from any projects located wholly or partially within three nautical miles seaward of state submerged lands, referred to as the “8(g) zone,” be paid to that state.²³¹ In addition, when a project extends into the 8(g) zone of at least one state, eligibility for a share of the revenues is extended to states with a coastline located within 15 miles of the geographic center of the project.²³² The amount distributed to each state is based on proximity to the project, as determined by a formula established by the Secretary of Interior.²³³

Offshore Oil and Gas Development

In 2008, the South Carolina Legislature evaluated the feasibility of offshore natural gas development through a legislative study committee.²³⁴ The Ocean Planning Work Group examined the regulatory framework for a proposed offshore natural gas project at both the federal and state levels. This section details the regulatory pathways and considers experiences of other states that are considering offshore oil and gas development.

Recent Policy Initiatives in South Carolina

The South Carolina Natural Gas Exploration Feasibility Study Committee was established by the SC General Assembly pursuant to Act 170 of 2007, and as amended by Act 400 of 2008. The Study Committee was tasked with examining the feasibility of natural gas exploration off of South Carolina’s coast. The Committee sought input from various state and federal agencies along with private industry, nongovernmental organizations, and representatives from other states, including a State Senator from Virginia and a representative from the Louisiana Department of Natural Resources.²³⁵ Considerations by the Committee included potential impacts to tourism, health, and the environment.²³⁶ In 2009, the Study Committee concluded:

²³¹ 43 U.S.C. 1337(p)(2)(B) (2010).

²³² Final Rule at 19652.

²³³ *Id.*

²³⁴ The South Carolina Natural Gas Exploration Feasibility Study Committee established by the General Assembly pursuant to Act 170 of 2007, amended by Act 400 of 2008.

²³⁵ The SC Natural Gas Exploration Feasibility Study Committee. 2009. Report to the South Carolina General Assembly. Online: <http://www.scstatehouse.gov/committeeinfo/NGEFStudyCommittee/NGEF.php>.

²³⁶ The SC Natural Gas Exploration Feasibility Study Committee. 2009. Report to the South Carolina General Assembly. Online: <http://www.scstatehouse.gov/committeeinfo/NGEFStudyCommittee/NGEF.php>.

...it is our opinion that, pending the satisfactory disposition of the following issues:

- *execution of a 5-year plan by MMS that includes natural gas exploration off the SC coast,*
- *protection of natural resources and quality of life issues, including attention to the concerns inherent in hurricane activity and the potential development of the companion industries of oil and gas,*
- *protection of tourism interests,*
- *execution of state energy policy in a manner that maximizes the benefit of the entire portfolio of energy resources,*
- *an acceptable royalty revenue sharing agreement, and*
- *market factors associated with the financial risk of exploration,*

the state of South Carolina should consider the development of an offshore natural gas industry. At the appropriate time, we recommend that the General Assembly pursue any legislation that would be productive of these ends.

Regulatory Pathways

Activities in State Waters

The SC Budget and Control Board (BCB) is the designated authority with the responsibility and power to lease state lands for the purpose of drilling for and producing oil and gas.²³⁷ DHEC is designated as the exclusive agent for the BCB in selecting lands to be leased, administering the competitive bidding for leases, administering the leases, receiving and compiling comments from other state agencies concerning the desirability of leasing the state lands proposed for activities that pertain to oil and gas leases.²³⁸ However, to date no formal leasing program has been established by DHEC under this authority. Still, exploration, drilling and any ancillary activities in South Carolina's jurisdiction would require a permit from DHEC's Land and Waste Management Office.²³⁹ In addition, DHEC-OCRM would review any proposed project(s) for consistency with the SC Coastal Wetlands and Tidelands Act and Policies of the Coastal Zone Management Program.²⁴⁰ Any alteration of the "critical area" would be subject to review under the Critical Area Regulations and Coastal Zone Program Policies. An application for a Critical Area Permit for activities in state waters could be submitted simultaneously with an application

²³⁷ SC Oil and Gas Exploration, Drilling, Transportation, and Production Act. SC Code Ann. § 48-43-390 (2010).

²³⁸ SC Code Ann. § 48-43-390 (2010). However, at present, SC DHEC has not developed a formal oil and gas leasing program to administer this section.

²³⁹ SC Code § 48-43-10 *et. seq.* (2010), and the SC Oil and Gas Exploration, Drilling, Transportation, and Production Regulations § 121 – 8.0 *et. seq.* (2010).

²⁴⁰ SC Code § 48-39-20 *et seq.* (2010).

to the USACE for dredging activity within three nautical miles. A joint public notice would be issued, which would likely trigger a Clean Water Act Section 401 review by DHEC's Bureau of Water. During the DHEC-OCRM permitting process, other resource and regulatory agencies may provide comments, including but not limited to DHEC's Bureau of Air, SCDNR, USFWS, NMFS, and the SC State Historic Preservation Office (SHPO).

Activities in Federal Waters

BOEM is the lead federal agency for granting leases on the OCS from three nautical miles out to 200 nautical miles. As required by Section 18 of the OCSLA, BOEM has established a leasing program that is updated every five years.²⁴¹ "A 5-year program consists of a schedule of oil and gas lease sales (auctions) indicating the size, timing, and location of proposed leasing activity the Secretary determines will best meet national energy needs for the 5-year period following its approval."²⁴² An area must be included in the current 5-year program in order to be offered for leasing." With the lifting of the congressional moratorium in September 2008, BOEM began preparing a lease program for 2010-2015 to consider new areas offshore for oil and gas leasing. However, development of a new 2012-2017 lease program is now underway, and will supersede the 2010-2015 Draft Proposed Program.²⁴³ In 2010, BOEM released a Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS) for the 2012-2017 OCS Oil and Gas Leasing Program under NEPA²⁴⁴ to determine the scope of the EIS and analyze all proposed plan areas, including the South Atlantic region. EIS scoping meetings originally planned for mid-2010 were postponed in light of the Deepwater Horizon explosion and resulting oil spill in the Gulf of Mexico. The agency's efforts were diverted to review safety and environmental issues associated with the OCS program. BOEM has stated that as they develop the 2012-2017 Program EIS, all comments received in response to the 2009 NOI (74 FR 361) and the 2008 Request for Comments on the preparation of the 2010-2015 program EIS (73 FR 45065) will be taken into consideration.²⁴⁵

²⁴¹ Outer Continental Shelf (OCS) is governed by the OCS Lands Act (Act), as amended, 43 U.S.C. § 1331. et. seq. Section 18 of the Act calls for the preparation of an oil and gas leasing program indicating a 5-year schedule of lease sales designed to best meet the nation's energy needs (43 U.S.C. § 1334).

²⁴² Bureau of Ocean Energy Management, Regulation and Enforcement 5-year Program. Retrieved September 2011. <http://www.boemre.gov/5-year/>.

²⁴³ <http://www.boemre.gov/5-year/>

²⁴⁴ 42 U.S.C. §§ 4321-4347 (2010).

²⁴⁵ 75 FR 7580, p.16828-29. <http://www.boemre.gov/5-year/PDFs/2010-2015/NOIandScoping2012-2017.pdf>

According to BOEM, approximately 25 to 30 plan and permit approvals are required for a proposed oil and gas offshore lease in federal waters.²⁴⁶ To bring a lease into production may require the following permits, legal contracts, certifications, and/or plans:

- Oil and Gas Lease
- Geological and Geophysical Exploration Permit
- Exploration Plan
- Coast Guard Compliance review for mobile drilling units
- Oil Spill Response Plan
- Oil Spill Financial Responsibility
- Hydrogen Sulfide Plan (some locations)
- *Coastal Zone Management Consistency Determination (Exploration)
- Army Corps of Engineers Permit (Navigation and National Security)
- EPA National Pollutant Discharge Elimination System Permit
- EPA Air Emissions Permit (some locations)
- Marine Mammals/Endangered Species permits from NOAA or USFWS (some locations)
- Application for Permit to Drill (exploratory wells)
- Application for Permit to Modify (any changes in drilling program)
- Deepwater Operations Plan (some locations)
- Conservation Information Document (some locations)
- Coast Guard Structural Review (floating production systems)
- Certified Verification Agent Review (some locations)
- Development Plan/Dvpmnt. Operations Coordination Document (depending on location)
- Pipeline Right-of-Way
- *Coastal Zone Management Consistency Determination (Development)
- Application for Permit to Drill (development wells)
- Application for Permit to Modify (any changes in development drilling program)
- Application for Permit to Modify (to plug and abandon development wells)
- Platform Removal Application
- Pipeline Decommissioning Application

*At the state level, a federal consistency determination would be required after evaluating any potential impacts to the state's coastal zone.²⁴⁷ Once the five-year lease plan is approved and available lease blocks are identified, the lease sale process follows the process described in Figure 8, and involves an additional federal consistency determination by DHEC-OCRM.

²⁴⁶ South Carolina Natural Gas Exploration Feasibility Study Committee, MMS presentation Oct. 16, 2008.

²⁴⁷ Section 307 of the CZMA (16 USC § 1456). In SC, the coastal program was formed by CTWA in 1977 and its enforceable coastal policies were approved in 1979 for use in state and federal consistency decisions. The program policies relate to Energy and Energy Related Facilities, Wildlife and Fisheries Management, Artificial Reefs, Dredging, Dredged Material Disposal, Navigation, Public Open Space, among others. DHEC-OCRM administers the SC Coastal Program and all federal consistency determinations in the SC coastal zone (coastal counties out to 3 nm).

Request for Information Published	45-day Comment Period	Define Proposed Sale Area	Draft EIS Published	60-day Comment Period	Final EIS Published	30 day Period	Notice of Sale	30-day Period	Sale	Leases Issued
					Proposed Notice of Sale	60 day Period				
					CD to Governors	90 day Period				



Figure 8. Planning for a Specific Lease Sale (Information provided by MMS, Oct. 16, 2008)

Coastal states in the Atlantic Region

There are four BOEM planning areas in the Atlantic OCS region (North Atlantic, Mid-Atlantic, South Atlantic, and Straits of Florida).²⁴⁸ According to the DOI, the North Atlantic planning area is not included in the current 2007-2012 leasing program and will not be proposed for leasing under the new program. The Mid and South Atlantic Planning Areas are being studied for possible seismic exploration and for inclusion in the five-year program for 2012-2017.²⁴⁹ The Florida Straits will continue to be excluded from the leasing programs.²⁵⁰

Interest in offshore oil and gas is mixed among the Atlantic coastal states. Until recently, all were under a moratorium and, except for Virginia, were not included in the current five-year program. A special interest sale was proposed in 2011, 50 miles off of Virginia’s coast; it was canceled by the DOI following the Deepwater Horizon oil spill in the Gulf.²⁵¹ As of 2010, it was reported that the Governor of the Commonwealth of Virginia supported oil and gas leasing, exploration, and production.²⁵² Delaware and North Carolina were interested in knowing what potential resources exist off their states’ shores.²⁵³ New Jersey and Maryland were against offshore oil and gas activities but Maryland commented that it may reconsider in the future.²⁵⁴ Members of the

²⁴⁸ US Department of Interior reports that “there is low state and public support for leasing in the North Atlantic at this time; and the Florida Straits “area has not been included in a 5-year program for 20 years. No activity is expected.” 27 Oct. 2010. http://www.doi.gov/whatwedo/energy/ocs/Atlantic_Region.cfm.

²⁴⁹ US Department of Interior. 27 Oct. 2010. http://www.doi.gov/whatwedo/energy/ocs/Atlantic_Factsheet.cfm.

²⁵⁰ *Id.*

²⁵¹ *Id.* & The New York Times, May 6, 2010. *Interior Suspends Planned Va. Offshore Oil and Gas Lease Sale.* 27 Oct. 2010. www.nytimes.com.

²⁵² *Id.*

²⁵³ *Id.*

²⁵⁴ *Id.*

congressional delegation in Georgia were in support for activities in the Atlantic, and the Governor of South Carolina requested revenue sharing and a 35-mile buffer from the shoreline for any oil and gas activities.²⁵⁵

SC Ocean Energy Workshop Outcomes

The Ocean Planning Work Group hosted a public workshop in March 2010 to bring together state and federal partners, ocean and coastal agency representatives from other states, military, private sector, nongovernmental organizations, and utility companies, among others. The goals of the workshop were to consider onshore planning, and infrastructure needs and grid issues, and to learn from other state experiences.²⁵⁶ Presentations were given and included descriptions about the grid and its influence on ocean wind energy development and siting, infrastructure needs to accommodate offshore energy development (wind and/or natural gas), and potential impacts to onshore and nearshore environments. A panel-audience discussion followed. The workshop concluded with recommendations for the SC Ocean Planning Work Group to consider. The recommendations of the workshop identified what onshore facilities would be needed to accommodate offshore energy development, potential use conflicts and how they might be addressed, and how to engage stakeholders along the way of any future ocean planning activities (Appendix 1).

²⁵⁵ *Id.*

²⁵⁶ The OPWG Workshop was held Day 2 of a two-day workshop. Day 1, held by the SC Energy Office, focused on ocean wind energy development and Day 2 focused on onshore implications from offshore energy development.



Sand Resources

Photo credits:
(Top, left) Town of Hilton Head/Elite and Olsen Associates
(Top, right) DHEC-OCRM
(Bottom, left) DHEC-OCRM
(Bottom, right) DHEC-OCRM

Chapter 5. Sand Resources

A significant portion of South Carolina's economy depends on its ocean and coastal resources. One of the main reasons visitors travel to the coastline is to enjoy the state's wide sandy beaches.²⁵⁷ Coastal erosion is a known, continuous threat to the coast and South Carolina has consistently supported beach nourishment as a way to maintain its valuable beach resource. However, as seen in Table 1, renourishment projects require a long-term financial commitment, and funding is becoming more difficult to obtain at federal, state, and local levels. In addition, South Carolina's sand resources are not infinite, making it extremely important to manage this resource to ensure a sustainable beach and dune system along the coast. While some high resolution seafloor mapping and data collection has been conducted off of South Carolina's northern coast, and along portions of the central coast, significantly more information is needed in order to identify the quantities and locations of beach quality sand along the South Carolina coast.²⁵⁸ Beach communities may eventually have to compete for sand resources and will continue to contract with coastal engineers to search for new borrow areas with sufficient beach quality sand to meet the needs of their next nourishment projects. This tends to be done on a case-by-case basis and is sometimes more reactive to critical erosion problems.²⁵⁹

DHEC-OCRM data (Table 1) shows that at least 24 renourishment projects have been conducted in South Carolina since 1985, with a total of over 27.5 million cubic yards of sand added costing nearly \$225 million (not adjusted for inflation).²⁶⁰ Of this amount, \$22.7 million came from private funds (10%), \$58.8 million from local funds (26%), \$45.3 million from state funds (20%), and \$97.3 million from federal funds (44%).²⁶¹ Local beach communities are faced with

²⁵⁷ A future study worth noting will come from the Bureau of Ocean Energy Management and the Army Corps of Engineers Charleston District. They will be examining the economic impacts of a recently completed nourishment project and the outcomes of the study will include a final report containing analyses of the socioeconomic and beach nourishment data on a local, regional, state, and national level. See Bureau of Ocean Energy Management. Mid/South Atlantic-Sand Management Working Group Meeting. Charleston, SC. August 31, 2011. Presentations Slide #20. Retrieved October 2011,

<http://www.boemre.gov/sandandgravel/PDF/SandManagementWorkingGroup.pdf>.

²⁵⁸ Shoreline Change Advisory Committee (SCAC). *Adapting to Shoreline Change: A Foundation for Improved Management and Planning in South Carolina*. SC DHEC-OCRM. April 2010. Retrieved August 2011,

http://www.DHEC.gov/environment/ocrm/shoreline_change.htm.

²⁵⁹ *Id.*

²⁶⁰ *Id.*

²⁶¹ *Id.*

various challenges including high costs, emergency project proposals, and missed opportunities for the beneficial re-use of dredged materials.²⁶² South Carolina and coastal municipalities need to know where sand resources are located, and whether they include beach quality material, in order to estimate and plan for long-term beach renourishment needs.

One long-term approach to meet these needs is through the development and implementation of a Regional Sediment Management (RSM) Plan.²⁶³ This concept originated with the USACE as they began thinking about managing sand resources at a broader scale rather than the previous project-by-project approach.²⁶⁴ RSM is partially described as “integrated management of littoral, estuarine, and riverine sediments to achieve balanced and sustainable solutions to sediment-related needs.”²⁶⁵ With respect to RSM, “region” does not usually infer two or more states, but rather a subregion of the coastal zone defined at least in part by shared sediment issues and transport pathways. For example, a region may be defined on the basis of coastal watersheds, or could be defined by the sediment transport pathways associated with a specific coastal inlet or river system. A region might also be defined by coastal geography, for example, the area between two capes along a coastline, and could include offshore areas in considering future borrow sites and disposal sites. The components of a RSM plan may include planning for renourishment projects; seafloor mapping, which would also assist with the management of uses in a particular area; beneficial re-use strategies for dredged material; and a process for interagency coordination.

This chapter describes related initiatives in South Carolina which may provide some support for taking the USACE’s model and applying it in South Carolina. The chapter provides an overview of regional sediment management, outlining specific planning and coordination steps that would need to occur in the development of a RSM Plan. It describes North Carolina’s experience, including lessons learned and benefits derived from RSM planning for its coastal regions. It also summarizes the regulatory pathways for extracting sand from both state and federal waters, and

²⁶² SCAC, 2010.

²⁶³ US Army Corps of Engineers. Regional Sediment Management. Retrieved November 2009, <http://projects.rsm.usace.army.mil/> and <http://rsm.sam.usace.army.mil/about/>.

²⁶⁴ <http://projects.rsm.usace.army.mil/>

²⁶⁵ US Army Corps of Engineers. <http://www.wes.army.mil/rsm/pubs/pdfs/rsmprimer.pdf>.

looks at other states and regions that practice regional sediment management. The chapter concludes with outcomes from the OPWG's RSM Workshop.

South Carolina Beach Renourishment Projects, 1985-2008								
Area	Year	Length (miles)	Sand Volume (cubic yards)	Private Cost ¹ (millions \$)	Public Cost (millions \$)			Total Cost (millions \$)
					Local	State ²	Federal	
Myrtle Beach	1986-1987	8.6	854,000		4.5			4.5
Seabrook Island	1990	1.1	700,000	1.5				1.5
Debidue Beach	1990	1	200,000	1				1
Hilton Head Island	1990	6.6	2,000,000		2	8		10
Hunting Island	1991	1.5	800,000			2.9		2.9
Folly Beach	1993	5.3	2,500,000			3.5	11.5	15
Edisto Beach	1995	2	150,000		0.5	1		1.5
Grand Strand ³	1996-1998	26	5,000,000		9	9	36	54
Hilton Head Island	1997	7	2,000,000		11			11
Sullivans Island	1998	0.5	35,000			0.2		0.2
Debidue Beach	1998	1.5	250,000	1.5				1.5
Pawleys Island	1998	2.5	250,000			1.3		1.3
Folly Beach	1998					0.1		0.1
Daufuskie Island	1998	3.5	1,400,000	6				6
Hilton Head Island	1999	0.8	200,000		1.2			1.2
Edisto Beach	2000					0.3		0.3
Folly Beach	2005	5.3	2,300,000		1		11.5	12.5
Edisto Beach	2006	3.5	875,000		3	4.7		7.7
Debidue Beach	2006	1.5	600,000	5.6				5.6
Hunting Island ⁴	2006	3	570,000			8.5		8.5
Hilton Head Island	2007	6	2,700,000		19			19
Folly Beach	2007	1.9	485,000				7.5	7.5
MB/Grand Strand ⁵	2008	25.3	3,000,000		4.8	4.8	30.8	40.4
Isle of Palms	2008	1.8	885,000	7.1	2.8	<1		~10.6
TOTALS:		116.2	27,754,000	22.7	58.8	45.3	97.3	223.8

¹ The private cost values are estimates.

² State money allocated to the SC Beach Restoration and Improvement Trust Fund, which was created in 2001, can be used to fund beach renourishment, improved public access, and beach erosion monitoring.

³ The Grand Strand project includes North Myrtle Beach (renourished in 1996), Myrtle Beach (renourished in 1997 and 1998), and Surfside Beach and Garden City Beach (renourished in 1998).

⁴ The Hunting Island 2006 project includes \$4.5 million for sand renourishment and \$4 million for new groin construction.

⁵ The MB/Grand Strand project includes Garden City/Surfside, Myrtle Beach, and North Myrtle Beach.

Table 1. Table adapted from Shoreline Change Advisory Committee (2010).

Sediment Management in South Carolina

Regional sediment management planning is a subject of increasing interest in South Carolina. In 2010, an external advisory committee recommended that the state develop and implement a RSM Plan to better manage the state's sand resources.²⁶⁶ The SC Coastal Erosion Study and similar efforts provide an initial foundation for the development of state and subregional sediment management plans. Advanced planning could provide various economic and environmental benefits.

SC Coastal Erosion Study

The US Geological Survey, in cooperation with the SC Sea Grant Consortium, conducted a multi-year coastal erosion study in northeastern South Carolina.²⁶⁷ The study developed a geologic framework of the Grand Strand by using high-resolution side-scan sonar, seismic-reflection, sediment cores, grab samples, and other methods to map bathymetry, hard bottom, and sand resources up to 10 km offshore (this study is also described in Chapter 8). This geologic framework influences sediment volumes, rates of sediment transport, and the distribution and character of near-surface geologic strata at the active coast.²⁶⁸ The Coastal Erosion Study has benefitted the USACE, the state, and local communities in the Grand Strand region by 1) providing data that is used to generate annual beach reports and aid with nourishment monitoring issues both on and offshore, 2) supporting both local and federal efforts to secure funding for nourishment, and 3) providing a baseline for expansion of the regional inventory of sand resources on the inner shelf available for future nourishment projects.²⁶⁹

SC Shoreline Change Advisory Committee

In 2007, an external advisory panel, consisting of scientists, agency researchers, municipal officials, and various stakeholders, was established by DHEC-OCRM to reflect on the past 20 years of experiences under the South Carolina Beachfront Management Act and to identify potential research and policy needs for the future of South Carolina's beachfront and estuarine

²⁶⁶ Final Report of the South Carolina Shoreline Change Advisory Committee. 2010.

²⁶⁷ Barnhardt, W.A. (ed.). 2009. *Coastal Change along the Shore of Northeastern South Carolina – The South Carolina Coastal Erosion Study*. US Geological Survey Circular 1339. 77 pp.

²⁶⁸ Barnhardt, 2009; and SCAC, 2010.

²⁶⁹ SCAC, 2010.

shorelines.²⁷⁰ After receiving public input, the Shoreline Change Advisory Committee (SCAC) released its final recommendations in 2010 for consideration by public officials and decision makers, which included a recommendation for South Carolina to develop and implement a Regional Sediment Management Plan.²⁷¹ The SCAC envisioned the RSM Plan to provide estimates about beach nourishment needs based on erosion rates, coastal processes, and sediment budgets. In addition, a RSM Plan should identify sediment sources and quantities, determine characteristics of compatibility, and establish how agencies will coordinate the planning and implementation of an approved RSM plan.²⁷² Benefits recognized include advanced planning for renourishment to avoid emergency situations, improved communication and coordination, cost savings, beneficial re-use of dredged material, potential for reduced impacts to threatened and endangered species, and information that can be included in Local Comprehensive Beach Management Plans.²⁷³ According to the SCAC, planning should include data integration; identification of data gaps and needs; and determination of the best option for collecting and storing data. Further, the South Carolina coast should be divided into sub-regions based on similar needs and standards defined by sub-regional characteristics (e.g., sand grain size, color, composition, texture).²⁷⁴ Lastly, planning should include identification of potential sand sources, including offshore deposits, nearshore bars, and dredged material, and this information should be correlated with the local communities and included in their Local Comprehensive Beach Management Plans.²⁷⁵

SCDNR Historical Data Study on Beach Nourishment Projects

In 2007, DHEC-OCRM contracted with the SCDNR to evaluate the results of beach nourishment environmental impact assessments and other related studies performed in South Carolina and use the analyses to make recommendations to improve management decisions and monitoring programs related to beach nourishment.²⁷⁶ The goals of the project were to centralize data,

²⁷⁰ SC Department of Health and Environmental Control Office of Ocean and Coastal Resource Management. Shoreline Change Advisory Committee. Retrieved November 2010, http://www.DHEC.gov/environment/ocrm/shoreline_change.htm.

²⁷¹ SCAC Final Report, 2010. pp. 76-81.

²⁷² *Id.*

²⁷³ *Id.*

²⁷⁴ *Id.*

²⁷⁵ SCAC Final Report, 2010.

²⁷⁶ Bergquist, Derk C. and Stacie E. Crowe, SCDNR MRRI. 2008. *Using Historical Data and Meta-analyses to Improve Management Policy Related to Beach Nourishment Final Report* Submitted to DHEC-OCRM.

identify consistent physical and biological impacts, develop empirically-defensible permitting conditions, and improve and standardize monitoring protocols.²⁷⁷ SCDNR examined nourishment projects and borrow sites in South Carolina. A database structure was created that consisted of a standardized format that was capable of handling a wide array of data types and project design differences. The predominant use of the data to date has been a meta-analysis of borrow area and beach monitoring data. The study looked at all projects simultaneously and at the overall trend of modified sediment characteristics up to one year post nourishment.²⁷⁸ When looking at one parameter, a consistent response among most dredging projects can be seen, and dredging can change critical sediment characteristics that affect re-use of an area.²⁷⁹ However, the effect is site and project-specific. It is clear from the analysis that the integrity and sustainability of a sediment source is dependent upon borrow site location, excavation method, and related management decisions.

Findings from the study related to impacts to benthic communities in borrow sites for renourishment revealed that there is a long-term change in the benthos. The dredged area is often slow to fill back up and often times the sediment that accumulates in the borrow sites is finer than the sediment that was originally removed.²⁸⁰ The report recommends that multiple smaller sites be dredged and that dredging to shallower depths below grade is preferable. DHEC-OCRM has begun using the results of the study to draft permit conditions for renourishment projects. The permit conditions require standardized monitoring of renourishment projects and offshore borrow sites.

Regional Sediment Management

The US Commission on Ocean Policy called for RSM stating, “A national strategy for managing sediment is needed to reduce harm to natural resources, address ecological and economic needs, and achieve goals such as greater beneficial uses of sediment from navigational dredging.”²⁸¹

The USACE supports RSM and defines it as a “system-based approach” that seeks to solve sediment-related problems by designing solutions that fit within the context of a regional

²⁷⁷ *Id.*

²⁷⁸ *Id.*

²⁷⁹ *Id.*

²⁸⁰ *Id.*

²⁸¹ US Commission on Ocean Policy. 2004. P. 180.

strategy.²⁸² According to the USACE, “RSM includes the entire environment, from the watershed to the sea” and “accounts for the effect of human activities on sediment erosion as well as its transport in streams, lakes, bays, and oceans.”²⁸³ RSM engages many stakeholders and is an effective way to plan for future nourishment needs on a regional scale.²⁸⁴ The NC Department of Environment and Natural Resources, in partnership with the USACE, is beginning to implement a coastal RSM framework (as described in the case study below). The following benefits were cited by the USACE for North Carolina’s RSM program:

- Increased knowledge of regional sediment systems – benefits all projects in a region;
- Reintroduction of sediment into littoral systems – reduce erosion, habitat restoration, marsh creation;
- Cost savings – reduced re-handling of material; extended dredging cycles; equipment sharing between projects;
- Shared regional-scale data management systems – shared accessible information, avoid duplication of data collection; and
- Improved interagency and stakeholder relationships – generate opportunities for leveraging financial and other resources.²⁸⁵

Regulatory Pathways for Offshore Sand Mining

State Pathway

When mining for offshore sand within the coastal zone out to three nautical miles, a Critical Area Permit from DHEC-OCRM is required under the SC Coastal Tidelands and Wetlands Act (CTWA) for alteration of the “critical area.”²⁸⁶ Simultaneously, and pursuant to the US Rivers and Harbors Appropriation Act, the applicant must apply to the USACE for a permit to dredge in navigable waters.²⁸⁷ The USACE will issue a joint public notice and may require a CWA Section 401 review for any activity that may result in a discharge of a pollutant into waters of the United States.²⁸⁸ The notice triggers DHEC-BOW to conduct a CWA Section 401 state certification. A

²⁸² SCAC 2010; and US Army Corps of Engineers. Retrieved November 2009 <http://www.wes.army.mil/rsm/>.

²⁸³ US Army Corps of Engineers. <http://www.wes.army.mil/rsm/>.

²⁸⁴ SCAC, 2010; and Sara Brown, US Army Corps of Engineers. SC Regional Sediment Management Workshop. *Regional Sediment Management (RSM) Overview*. Charleston, SC. November 19, 2009.

²⁸⁵ Gregory L. Williams, Ph.D., P.E. Chief, Coastal, Hydrology & Hydraulics Section, US Army Corps of Engineers. Presentation: *Regional Sediment Management in North Carolina: A State-Federal Partnership*. Wilmington Regional Engineering Center. July 22, 2009.

²⁸⁶ S.C. Code §§ 48-39-10 *et seq* (2010).

²⁸⁷ 33 U.S.C. § 403 (2010).

²⁸⁸ 33 U.S.C. § 1341 (2010).

USACE permit is also required under Section 404 of the CWA for any placement of the dredged material, including sand, into waters of the United States.²⁸⁹ This section of the law would apply to that part of the project consisting of placing renourished sand on the beach. During the CTWA permitting process with DHEC-OCRM, other resource agencies provide comments, including SCDNR, USFWS, NMFS, and SHPO. Comments from resource agencies are provided to DHEC-OCRM. The USACE usually does not make its determination until DHEC-OCRM releases its final decision. South Carolina does not require compensation for the mining of sand so there is no other state permit or approval process that is required when obtaining sand from state waters.

Federal Pathway

The Bureau of Ocean Management (BOEM)²⁹⁰ is the federal agency within the Department of Interior responsible for granting leases for obtaining sand seaward of the three nautical mile line offshore (Public Law 103-426).²⁹¹ BOEM uses two types of lease conveyances for sand and gravel and other non-energy minerals from the OCS.²⁹² The two types are: 1) non-competitive negotiated agreements that can only be used for obtaining sand and gravel for public works projects funded in part or whole by a federal, state, or local government agency (Figure 9); and 2) competitive lease sales in which any qualified person may submit a bid.²⁹³

According to BOEM, preparation of a noncompetitive agreement is a 13-step process that typically takes 10-14 months to complete.²⁹⁴ It involves:

- Technical and environmental review of the request and project (BOEM will determine the type of analysis required under NEPA on a case-by case basis);
- Consultation on endangered species and essential fish habitat;
- Completion of a Memorandum of Agreement (MOA) with any Federal agency participating in the project;

²⁸⁹ 33 U.S.C. § 1344 (2010).

²⁹⁰ BOEMRE Reorganization. Retrieved Sept. 6, 2011. <http://www.boemre.gov/reorganization.htm>.

²⁹¹ Section 8(k) of the Outer Continental Shelf Lands Act.

²⁹² US Department of Interior, BOEM (formerly Minerals Management Service Leasing Division), *Guidelines for Obtaining Sand, Gravel, and Other Non-Energy Mineral Resources From the Federal Outer Continental Shelf*. Herndon VA, August 2008. Retrieved March 2011, <http://www.boemre.gov/sandandgravel/ObtainingMarineMinerals.htm>.

²⁹³ BOEMRE (formerly MMS) Guidelines, 2008.

²⁹⁴ *Id.*

- Review of archaeological surveys, air quality data, and CZMA consistency preparation in an environmental analysis (Environmental Assessment (EA) or Environmental Impact Statement (EIS));
- Signing of the agreement instrument with terms and conditions, and formal notification of congressional committees when the agreement has been signed.

The dredging action associated with sand mining would also trigger a USACE permit.²⁹⁵ The USACE's jurisdiction under Section 10 of the Rivers and Harbors Act has been extended out to the OCS by the OCSLA. The USACE would likely issue its determination after BOEM's review, which includes a state coastal zone consistency determination by DHEC-OCRM.²⁹⁶

Offshore sand mining is usually associated with beach renourishment. Although not included in this regulatory pathway, placing sand on the beach would require a Critical Area Permit from DHEC-OCRM²⁹⁷ and a USACE permit before discharging dredged or fill material into waters of the United States, including wetlands.²⁹⁸

²⁹⁵ 33 U.S.C. § 403 (2010).

²⁹⁶ 16 U.S.C. § 1456 (2010).

²⁹⁷ S.C. Code Ann. § 48-39-50 (2010).

²⁹⁸ 33 U.S.C. § 1344 (2010).

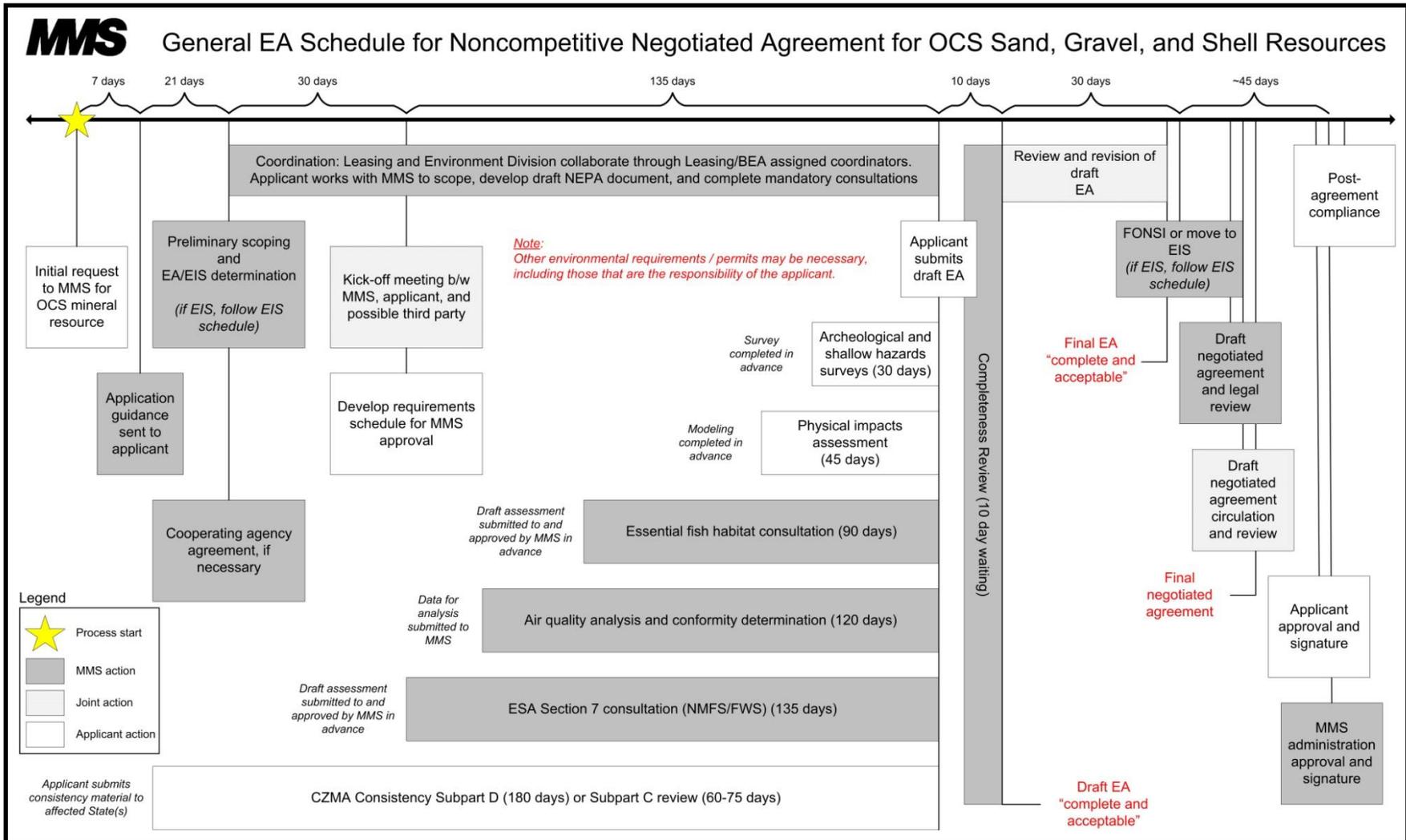


Figure 9. Environmental Review (Excerpted from MMS Presentation by Geoffrey Wikel, Mid-Atlantic OCS Sand Management Working Group Meeting, September 16, 2008, NOAA’s Coastal Services Center).

Regional Sediment Management in Other States

A few coastal states have adopted RSM as a way to manage their shorelines. In the past few years, North Carolina's Division of Water Resources and Division of Coastal Management have worked together in developing a plan to manage the state's beaches and inlets. California established a work group in 2009 to implement regional sediment management with regional plans that apply specifically to different portions of the California coast. Representing multiple coastal states for the Gulf area, the Gulf of Mexico Alliance developed a RSM Plan to manage sediment at a multi-state, regional scale.

North Carolina

The North Carolina Beach and Inlet Management Plan (BIMP) was developed jointly by the state's Department of Environment and Natural Resources (NCDENR) Division of Water Resources (DWR) and Division of Coastal Management (DCM) and is mandated in state law and the Coastal Habitat Protection Plan.²⁹⁹ DWR maintains a six-year plan for water resource development projects in North Carolina, including historical information, current status, and future cost projections for beach and inlet projects.³⁰⁰ DCM maintains a digital database of shorelines that is used to establish beachfront erosion rates and inlet processes. A collaborative effort between DWR and DCM catalogs, archives, and makes available relevant coastal information (*e.g.*, maps, reports, scientific monitoring data) as a resource to facilitate beach and inlet management and development of the BIMP.³⁰¹ The tasks of the BIMP included identifying and acquiring data, defining beach and inlet management regions, developing preliminary beach and inlet management strategies, holding stakeholder meetings, and developing draft and final plans.³⁰²

Preliminary recommendations resulting from North Carolina's evaluation included the establishment of local/regional boards to manage projects, with additional DCM staff assisting with state prioritization, funding, and regional environmental and regulatory issues. It was also

²⁹⁹ Gregory L. Williams, Ph.D., P.E. Chief, Coastal, Hydrology & Hydraulics Section, US Army Corps of Engineers. SC OPWG Meeting: Introduction to RSM. *Regional Sediment Management in NC: A State-Federal Partnership*. Charleston, SC. April 16, 2009.

³⁰⁰ *Id.*

³⁰¹ SCAC, 2010.

³⁰² Williams, 2009.

recommended that a dedicated funding source be allocated by the General Assembly and that future BIMP updates focus on data gaps, sediment resources and budgets, vulnerability and prioritization criteria, and improved estimates of funding requirements and resources.³⁰³

California

California established a Coastal Sediment Management Workgroup to work towards implementing a RSM Plan that “systematically addresses sediment supply and imbalances on a regional basis rather than attempting to resolve sediment problems on a site-specific location or project.”³⁰⁴ The Coastal RSM Plan program implements Sediment Master Plan (SMP) objectives by developing a series of regional plans specific to different portions of the California coast.³⁰⁵ SMP objectives included reducing damage from shoreline erosion and coastal storms, providing sediment for environmental restoration and protection, increasing and restoring natural sediment supply to the coast, restoring and preserving coastal beaches, improving water quality along coastal beaches, and promoting the beneficial use of sediment dredged from ports, harbors, wetlands, and other sources, among others.³⁰⁶ The SMP is meant to be a comprehensive plan for the regional sediment management in coastal California over the next 20 years.³⁰⁷

Gulf of Mexico Region

Through existing partnerships via the Gulf of Mexico Alliance (GOMA), the Gulf States have acknowledged the significance of sediment resources to accomplish many of the GOMA initiatives and objectives including habitat conservation and restoration, and coastal resiliency.³⁰⁸ The Gulf States have recognized the need for a Gulf Regional Sediment Management Master Plan to facilitate and assess the implementation of sediment management to provide effective use of “sediment resources to accomplish environmental restoration, preservation, and conservation while reducing coastal erosion, coastal storm damage and associated costs of sediment management.”³⁰⁹

³⁰³ Williams, 2009.

³⁰⁴ CA Coastal Sediment Management Workgroup (CSMW). Retrieved November 2009, <http://www.dbw.ca.gov/CSMW/default.aspx>.

³⁰⁵ CSMW Sediment Master Plan. Retrieved November 2009, <http://www.dbw.ca.gov/CSMW/smp.aspx>.

³⁰⁶ CSMW, 2009.

³⁰⁷ *Id.*

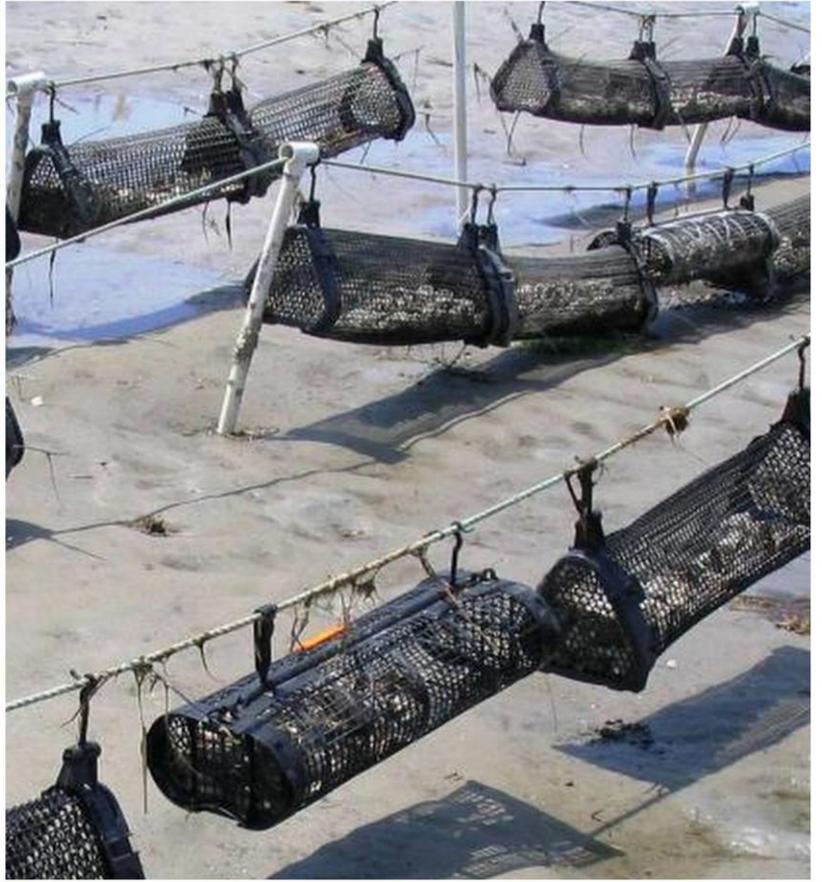
³⁰⁸ Gulf of Mexico Foundation. Gulf Regional Sediment Management Master Plan 2009 GOMA Project. Retrieved March 2011, <http://www.gulfmex.org/goma/01.htm>.

³⁰⁹ *Id.*

SC Regional Sediment Management Workshop Outcomes

The Ocean Planning Work Group hosted a public workshop in November 2009 to bring together stakeholders from the private industry with local, state, federal governments, academia, and nonprofit organizations. The goals of the workshop were to consider the potential for a Regional Sediment Management Plan in South Carolina, data needs, and how the state should proceed. Presentations were held and included background information from the USACE on their federal RSM program, North Carolina's experience in developing a state RSM framework, and the perspectives of private industry and local governments. In addition, the OPWG and workshop participants heard about past data collection and analysis efforts that provide models to consider when developing a state RSM plan. Group discussions followed. The workshop concluded with recommendations for the OPWG to consider. Recommendations identified elements of a RSM plan, the process, data and research needs, capacity, and partnerships (Appendix 1).

PAGE INTENTIONALLY LEFT BLANK



Marine Aquaculture

Photo credits:

(Top, left) Hawaii Oceanic Technology, Inc. "Oceanspheres." <http://www.hioceanictech.com>
(Top, right) NOAA Fisheries Service
(Bottom, left) NOAA Fisheries Service
(Bottom, right) Kim Hughes

Chapter 6. Marine Aquaculture

The South Carolina General Assembly passed the Aquaculture Enabling Act in 1985 declaring that it is in the state's interest to encourage the development of aquaculture.³¹⁰ While aquaculture has always been a part of South Carolina's history, it has become increasingly diversified over the years - from oyster farming to marine shrimp, clams, catfish, hybrid striped bass, and most recently types of marine finfish and game fish.³¹¹ Today, the primary aquaculture industry in South Carolina involves shellfish grown in the state's coastal waters. There are, at present, no marine aquaculture facilities in state ocean waters (from the beachfront out to 3 nm). The SCDNR continues to conduct research efforts to develop environmentally-friendly technologies for seafood production, and to study organisms such as red drum, black sea bass, cobia, and marine shrimp, produced in hatcheries to improve their understanding of natural fish populations.³¹² One of SCDNR's research facilities, the Waddell Mariculture Center, is known nationally for its mariculture research and demonstration work. It was built in the early 1980s to develop techniques for commercial-scale aquaculture for marine and brackish water species of finfish, mollusks, crustaceans and plants.³¹³ The SC Sea Grant Extension Program assists in the development of sustainable aquaculture through its various research efforts and by working with industry and regulatory agencies to develop best management practices.³¹⁴ SC Sea Grant collaborates with resource agencies to address environmental issues such as reducing discharges, and eradicating aquatic nuisance species. SC Sea Grant has also worked to help industry farmers obtain crop insurance when shrimp farms were impacted by spread of disease.³¹⁵

Aquaculture activity in South Carolina has expanded in the last twenty years.³¹⁶ However, seafood production in the state is far below consumer demand with the majority being

³¹⁰ S.C. Code §§ 50-18-210 *et seq* (2010).

³¹¹ Jack Whetstone, SC Sea Grant Extension Program. *History of Aquaculture in South Carolina*. SC Ocean Aquaculture Round Table. August 10, 2011. Charleston, SC.

³¹² SCDNR MRRI Aquaculture Program. Retrieved April 2011. <http://www.dnr.sc.gov/marine/mrri/aquaculture.html>.

³¹³ SC Department of Natural Resources Waddell Mariculture Center. Retrieved August 2011, <http://www.dnr.sc.gov/marine/mrri/waddell/index.html>.

³¹⁴ SC Sea Grant Consortium. Aquaculture. Retrieved October 2011, <http://www.scseagrant.org/Content/?cid=38>.

³¹⁵ *Id.*

³¹⁶ Henry, Mark S., Raymond J. Rhodes, & Daniel Eades, EDA University Center for Economic Development. Clemson University. *The Flow of South Carolina Harvested Seafood Products through South Carolina Markets*. UCED Research Report 09-2008-03. P.8. Retrieved October 2011, <http://cherokee.agecon.clemson.edu/seafood.pdf>.

imported.³¹⁷ There is a potential for a market in marine finfish, as has been shown in other coastal states such as Florida and Hawaii (e.g. use of sinking and floating cages). However, questions remain as to whether these can be permitted and are economically feasible in South Carolina.³¹⁸ Examples from other areas in the United States include the raising of aquatic plants in Hawaii and experimental projects connecting farms to oil rigs in the Gulf of Mexico.³¹⁹ Additional details on experiences in other states are described below.

At the national level, Congress passed the National Aquaculture Act (PL 96-362) in 1980, which declared that aquaculture development is of national interest, required the creation of a national plan, and established new federal agency coordination around aquaculture issues.³²⁰ Over thirty years later, the United States aquaculture industry is now valued at \$1 billion per year, and is dominated by freshwater fish intended for human consumption.³²¹ By comparison, worldwide production totals approximately \$70 billion annually.³²² Twenty percent of current production is marine aquaculture, primarily through shellfish farming but also including some finfish and algae farming in coastal waters and on land.³²³ Currently, the United States imports approximately 84 percent of its seafood, and nearly half of this amount is from aquaculture. As a result, the United States seafood trade deficit is approximately \$9 billion annually.³²⁴

To date, very little in the way of offshore aquaculture has occurred in state or federal ocean waters. In the last 20 to 30 years, only a few small experimental projects have been approved, including a Massachusetts sea scallop project, a seafood/oil venture in the Gulf of Mexico, and demonstration projects in the open ocean off New Hampshire, Hawaii, and Gulf of Mexico.³²⁵

³¹⁷ Henry *et al.* p. 26.

³¹⁸ Whetstone 2011.

³¹⁹ Cicin-Sain *et al.* 2005. P. 6, Table 1.3 – Offshore and Coastal Ocean Aquaculture Projects.

³²⁰ 16 U.S.C. §§ 2801 *et seq* (2010).

³²¹ US Department of Commerce. June 2011. *Aquaculture Policy*. Washington, DC. Retrieved July 7, 2011

http://www.nmfs.noaa.gov/aquaculture/docs/policy/noaa_aquaculture_policy_2011.pdf, and

http://www.nmfs.noaa.gov/aquaculture/docs/policy/doc_aquaculture_policy_2011.pdf.

³²² US Department of Commerce, NOAA Aquaculture Program. Retrieved April 14, 2011.

³²³ US Department of Commerce June 2011.

³²⁴ *Id.*

³²⁵ Cicin-Sain, B. , S. M. Bunsick, M. R. DeVoe, T. Eichenberg, J. Ewart, H. Halvorson, R. W. Knecht, and R. Rheault. 2001. *Development of a policy framework for offshore marine aquaculture in the 3-200 mile U.S. ocean zone*. Technical Report. Gerard J. Mangone Center for Marine Policy, University of Delaware. Retrieved May 2011, <http://dspace.udel.edu:8080/dspace/handle/19716/2504>; and

Aquaculture activities in the United States have historically occurred within state waters, generally less than three nautical miles offshore. Other than the research or pilot projects mentioned above, there are no existing offshore ocean aquaculture operations in United States waters (3-250 nautical miles).³²⁶

Nevertheless, there has been a recent and growing interest in increasing marine aquaculture production in the United States, including operations in offshore waters.³²⁷ In its 2004 report, the US Commission on Ocean Policy recognized the United States trade deficit in the seafood industry, but pointed out that a number of issues must be addressed in order to achieve an “environmentally and economically sustainable marine aquaculture industry.”³²⁸ These issues include threats (or perceived threats) to the environment and other marine life including native fish from the spread of disease, genetic contamination, competition, entanglement, and other impacts.³²⁹ In addition, conflicts with other ocean uses or users, public trust issues, and the lack of a clear regulatory framework pose significant obstacles to effectively managing ocean aquaculture.³³⁰ The Ocean Commission expressed the need for the establishment of a regulatory framework in federal waters, to include a lead federal office that would ensure an “economically and environmentally sound” industry.³³¹

Also in 2004, NOAA launched a plan to revive a federal Aquaculture Program.³³² Program goals included establishing a regulatory program, developing appropriate technologies, educating the

Cicin-Sain, B., S.M. Bunsick, J. Corbin, M. R. DeVoe, T. Eichenberg, J. Ewart, J. Firestone, K. Fletcher, H. Halvorson, T. MacDonald, R. Rayburn, R. Rheault, and B. Thorne-Miller, with the assistance of J. Didden and M. Blaydes. 2005. *Recommendations for an Operational Framework for Offshore Aquaculture in U.S. Federal Waters*. Technical Report. Gerard J. Mangone Center for Marine Policy, University of Delaware. Retrieved July 2011. <http://dspace.udel.edu:8080/dspace/handle/19716/2506>.

³²⁶ United States Government Accountability Office (GAO). (May 2008). *Offshore marine aquaculture: Multiple Administrative and Environmental Issues Need to Be Addressed in Establishing a U.S. Regulatory Framework report to the Chairman, Committee on Natural Resources, House of Representatives* (GAO-08-594). Retrieved June 2011, <http://www.gao.gov/new.items/d08594.pdf>.

³²⁷ Cicin-Sain *et. al.*, (2001). Retrieved May 2011, <http://dspace.udel.edu:8080/dspace/handle/19716/2504>.

³²⁸ US Commission on Ocean Policy. *An Ocean Blueprint for the 21st Century*. Final Report. Washington DC 2004 ISBN#0-9759462-0-X. p. 332.

³²⁹ *Id.*, p. 331.

³³⁰ *Id.*, p. 332-333; Cicin-Sain, *et. al.* (2001), p.3 and Ch. 4; and Cicin-Sain *et. al.* (2005).

³³¹ US Commission on Ocean Policy (2004). P. 330.

³³² US Department of Commerce, NOAA Aquaculture Program. Retrieved April 2011. <http://aquaculture.noaa.gov/us/welcome.html>.

public, and meeting international obligations.³³³ Major barriers identified by NOAA included a lack of consistent regulatory frameworks, the need for improved technology and management practices to ensure protection of marine ecosystems, and the need for improved efficiency and sustainability of systems.³³⁴ In 2005, with support from the Woods Hole Oceanographic Institute and Pew Charitable Trusts, a Marine Aquaculture Task Force was established to evaluate issues related to regulating aquaculture in marine waters.³³⁵ In its final report in 2007, the Task Force indicated that with newer technologies, there is the potential for expansion of aquaculture operations into open ocean waters, and made recommendations relating to standards and practices to protect marine ecosystem health.³³⁶

There is currently no regulatory framework or standards for marine aquaculture in federal waters. In 2010, the National Ocean Policy recognized aquaculture as an emerging ocean activity that should be considered when planning for various ocean uses.³³⁷ In June 2011, the Department of Commerce (DOC) and NOAA each finalized a statement of national policy on ocean aquaculture for the purpose of guiding decision-making and supporting sustainable aquaculture.³³⁸ Both policies seek to achieve an economically and environmentally sustainable industry, the creation of domestic jobs, protection of wild species, support of innovation and technological advances, coordination among federal partners, public education, learning from other countries, and encouraging sustainable practices.³³⁹ Both the DOC and NOAA have laid out implementation strategies for carrying out these declared policies.³⁴⁰

³³³ *Id.*

³³⁴ *Id.*

³³⁵ Woods Hole Oceanographic Institution. Marine Aquaculture Task Force. Retrieved April 2011. <http://www.whoi.edu/sbl/liteSite.do?litesiteid=2790&articleId=4439>.

³³⁶ *Id.*

³³⁷ The White House Council on Environmental Quality. 2010. *Final Recommendations of the Interagency Ocean Policy Task Force*. http://www.whitehouse.gov/files/documents/OPTF_FinalRecs.pdf.

³³⁸ NOAA Aquaculture Program, Retrieved July 2011, <http://aquaculture.noaa.gov/us/welcome.html>.

³³⁹ NOAA Aquaculture Policy and Department of Commerce Aquaculture Policy. June 2011. Retrieved July 2011. <http://aquaculture.noaa.gov/>.

³⁴⁰ *Id.*; and See http://www.noanews.noaa.gov/stories2011/20110609_aquaculture.html.

Marine Aquaculture in South Carolina

Aquaculture activity in South Carolina has expanded from 27 farms in 1998 to 85 in 2005.³⁴¹ The value of seafood production in the state including non-food market products was approximately \$11.250 million in 2007 and the value of seafood landings (unloading of wild caught seafood in South Carolina ports and shellfish permitted areas) in 2007 was about \$15.574 million.³⁴² There is a disparity between production of seafood in South Carolina and seafood demand in the state. It has been estimated that about 80 percent of the seafood demanded by consumers in South Carolina, both residents and tourists, is imported.³⁴³ Fresh and frozen fish and shellfish consumption by state residents is about 53 million pounds of edible meat. There is currently no data for tourist consumption but surveys have indicated that the majority of visitors eat seafood while in South Carolina. Ignoring tourist demand for seafood, South Carolina only has the potential to supply approximately 21 percent of South Carolina resident demand.³⁴⁴

Locally grown food is in higher demand in recent years. Wholesalers are often asked if fish is caught or processed locally during negotiations between seafood buyers and seafood wholesalers.³⁴⁵ Industry experts in South Carolina suggest that local seafood can earn a 20 percent price premium over imports due to the increase in buyer pressure for locally caught products.³⁴⁶ Tighter domestic supplies of species such as snapper and grouper have been driving the need for imports and it is difficult to compete with shrimp imports because they arrive hand peeled, deveined and sell for less than domestic shrimp.³⁴⁷

While marine aquaculture could be an effective way to expand the state's seafood production and create jobs, there are potential concerns that would need to be considered. As mentioned above, many of the environmental issues recognized in the past remain relevant today, including the spread of disease, disruptions to native species and habitats by the accidental introduction of

³⁴¹ Henry, Mark S., Raymond J. Rhodes, & Daniel Eades, EDA University Center for Economic Development. Clemson University. *The Flow of South Carolina Harvested Seafood Products through South Carolina Markets*. UCED Research Report 09-2008-03. P.8. Retrieved October 2011, <http://cherokee.agecon.clemson.edu/seafood.pdf>.

³⁴² Henry *et al.* (2008) p. 8-9.

³⁴³ Henry *et al.* (2008) p.26.

³⁴⁴ Henry *et al.* (2008) P. 29.

³⁴⁵ *Id.*, p.32.

³⁴⁶ *Id.*, p.33.

³⁴⁷ *Id.*

non-native or invasive species, genetic contamination and competition between farmed and native species, and net entanglement by marine mammals.³⁴⁸ Issues related to economics, policy, regulation, and use conflicts among others also need to be considered with any proposed ocean aquaculture activity. Marine aquaculture would be a new use in South Carolina ocean waters. A marine-based facility would require land and freshwater access, and there would be numerous legal and institutional considerations to consider.³⁴⁹ The existing regulatory environment, both at the federal and state levels, can be overwhelming to potential applicants due to the number of authorities that would be involved in the permitting process under existing laws and the lack of coordination among them.³⁵⁰ Currently, what appear to be the major constraints for the emerging marine aquaculture industry in South Carolina include a lack of a specific regulatory framework, economic feasibility, anchoring issues, competing uses, insurance, and hazards/hurricanes.³⁵¹

Past South Carolina policy actions in the 1980s were focused primarily on freshwater aquaculture. While it is possible to obtain state approvals for ocean aquaculture facilities through existing laws and regulations, the process is unclear and in many cases those laws and regulations are not specifically related to ocean aquaculture. The permitting approval process for aquaculture in South Carolina was mapped out in the 1980s (see Figure 10) and, except for changes in the names of some state agencies due to restructuring, has not changed significantly over time. An Aquaculture Permit Assistance Office was created within the SC Department of Agriculture, but has not resulted in a streamlined regulatory process for marine aquaculture. Today, the Assistance Office continues to provide information on legal and regulatory authorities and permits required for aquaculture facilities. In 1989, a state Aquaculture Association was formed to conduct activities benefiting the production and promotion of aquaculture.³⁵² Since then, little government action has occurred to promote the aquaculture industry in South Carolina.

³⁴⁸ US Commission on Ocean Policy (2004), p. 331-332.

³⁴⁹ M. Richard DeVoe. SC Sea Grant. *Regulatory Framework for Ocean Aquaculture in SC*. SC Ocean Aquaculture Round Table. August 10, 2011. Charleston, SC.

³⁵⁰ Whetstone 2011.

³⁵¹ SC Ocean Planning Initiative Ocean Aquaculture Round Table Meeting. August 10, 2011. Charleston, SC.

³⁵² The SC Aquaculture Association. <http://agriculture.sc.gov/content.aspx?contentID=558>.

Regulatory Pathways

Aquaculture in State Waters

The SCDNR is the designated agency with authority to administer the state's Aquaculture Enabling Act. While its purpose was to expand aquaculture opportunities, streamline state agency permitting, and provide protection for the state's aquatic resources, the Act pertains to freshwater aquaculture only.³⁵³ With growing interest in marine aquaculture activity around the country, this is a significant concern for potential offshore aquaculture in South Carolina.³⁵⁴

At present, SCDNR grants licenses for shellfish harvesting and aquaculture activities in estuarine areas. For example, a commercial shellfish harvester must pay a certain amount (\$5/acre) for a culture permit.³⁵⁵ SCDNR manages these activities and administers the licenses.³⁵⁶ However, there are no aquaculture operations or licenses for shellfish harvesting in state ocean waters from the beachfront shoreline to the state's three nautical mile limit.

The SC Coastal Zone Management Program contains policies and regulations related to ocean aquaculture or mariculture activities. The CWTA required that aquaculture be considered in the development of the state's coastal program.³⁵⁷ South Carolina's Coastal Program Policies, which include policies related to aquaculture, apply to any proposed project sited in the state's coastal waters out to three nautical miles.³⁵⁸ Moreover, any federal project or activity receiving a federal permit would need to be consistent with the State's coastal zone policies.³⁵⁹ Critical Area Regulations address mariculture activities in Section 30-12(O) and apply to any proposed activity in the critical area.³⁶⁰

³⁵³ S.C. Code § 50-18-215 (2010).

³⁵⁴ Whetstone (2011).

³⁵⁵ Berrio, Jessica. *Marine Leasing of South Carolina's Coastal Submerged Lands: Options and Considerations for Commercial and Conservation Strategies*. (College of Charleston Masters in Env'tl Science Thesis Paper, 2007) (on file with author).

³⁵⁶ *Id.*

³⁵⁷ S.C. Code § 48-39-80(E) (2010).

³⁵⁸ 1995 Coastal Zone Management Program Refinements, Section F, Ch. III.

³⁵⁹ CZMA § 307. 16 U.S.C. § 1456 (2010); and federal consistency regulations, 15 C.F.R. part 930.

³⁶⁰ S.C. Code of Regulations 30-12(O).

For the most part, South Carolina does not have a framework dedicated to addressing aquaculture issues expressly; rather it incorporates aquaculture into existing frameworks.³⁶¹ In addition, there appears to be no lead agency for ocean aquaculture.³⁶² For any proposed ocean aquaculture activity, multiple permits and environmental reviews would be required. In the past, it was recommended that South Carolina streamline or simplify the permitting process for aquaculture and that zones be designated for aquaculture activities.³⁶³ More recently, it has been recommended that the state develop a comprehensive leasing program for any activity in state waters.³⁶⁴

Based on significant past research, elements that should be incorporated in a policy framework dealing with marine aquaculture include the designation of preferential areas for aquaculture, provisions to address exclusivity of use of common trust resources, property rights, regulatory coordination and streamlining, a risk “safety net,” and a mechanism to address seed and feed stocks, species selection, and disease.³⁶⁵ As discussed in previous chapters, a leasing system may address a number of these issues from the perspective of both the public and the operator.

³⁶¹ Cicin-Sain *et al.* 2001. P. 99.

³⁶² Cicin-Sain *et al.* 2001. P. 88.

³⁶³ *Id.* p. 91.

³⁶⁴ SC Regulatory Task Force for Coastal Clean Energy. 2009. *Recommendations to the Wind Energy Production Farms Feasibility Study Committee*. December 2009; and SC Wind Production Farms Feasibility Study Committee. 2010. *South Carolina’s Role in Offshore Wind Energy Development*. Retrieved September 2010, <http://www.energy.sc.gov/index.aspx?m=6&t=123>.

³⁶⁵ M. Richard DeVoe, SC Sea Grant. *Regulatory Framework for Ocean Aquaculture in SC*. SC Ocean Aquaculture Round Table. August 10, 2011. Charleston, SC.

Permit Structure: The “Critical Area”

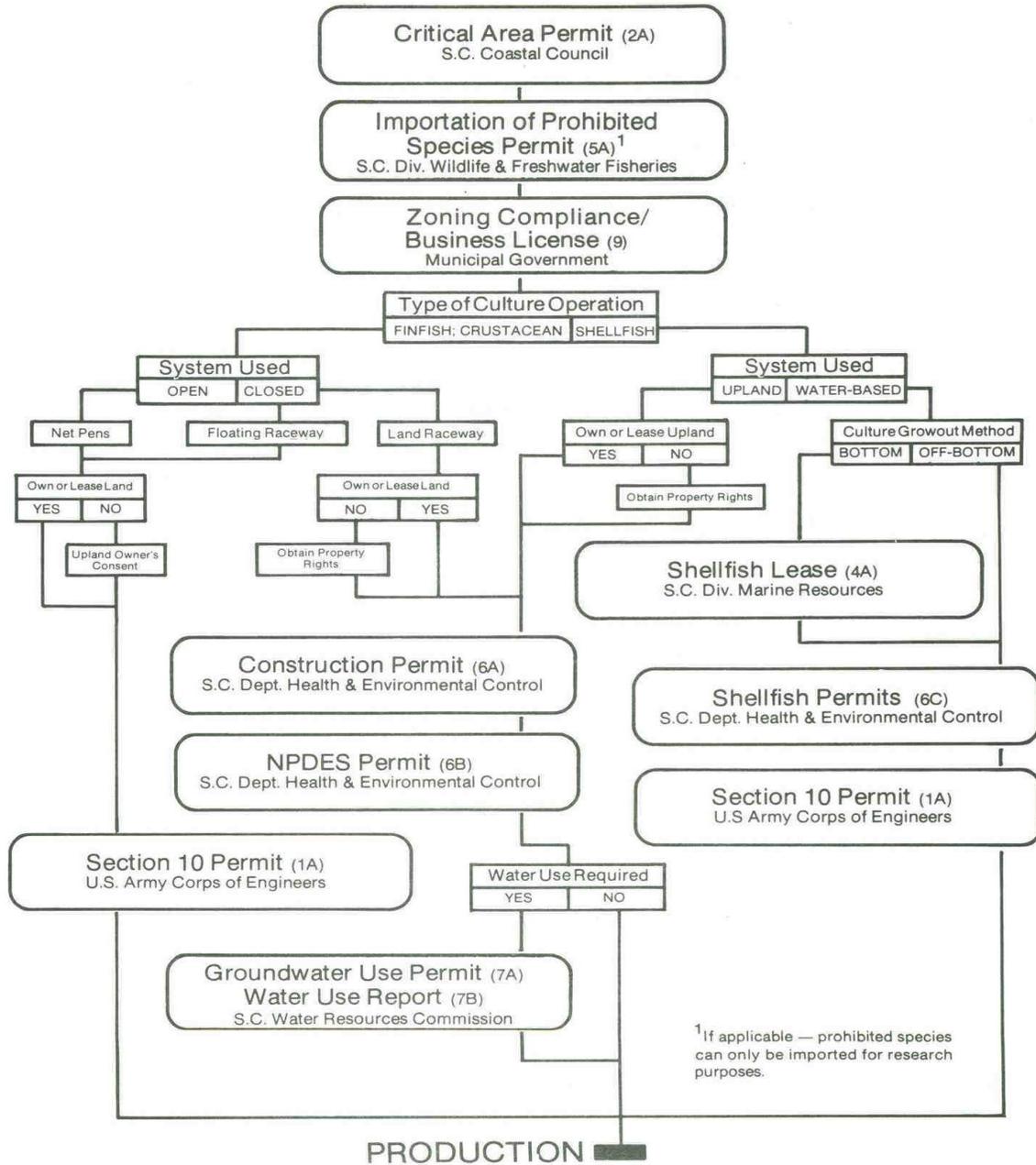


Figure 10. This flow diagram was developed in the 1980s by M. Richard DeVoe and Jack Whetstone of the SC Sea Grant Consortium as part of an Interim Guide to Aquaculture Permitting in South Carolina. While agency names have changed, the pathways are still somewhat similar to today’s processes.

Aquaculture in Federal Waters

Multiple reports have described a lack of a clear regulatory framework for marine aquaculture.³⁶⁶ Federal agencies assert their jurisdiction under existing authorities that were usually developed for purposes other than aquaculture.³⁶⁷ It remains unclear as to which federal agency would make the ultimate decision of whether or not to approve a project for marine aquaculture development in federal waters.

The National Aquaculture Act established a national plan for aquaculture development, required federal coordination of aquaculture activities, and made the US Department of Agriculture responsible for its implementation.³⁶⁸ Under existing mandated duties, several agencies regulate aquaculture. The Environmental Protection Agency (EPA) is responsible for regulating pollutant discharges into the ocean,³⁶⁹ including pesticides.³⁷⁰ The USACE regulates activities that affect navigable waters³⁷¹ and any structures attached to the seabed on the OCS.³⁷² The USACE also requires a permit for the discharge of dredged or fill material in waters of the United States.³⁷³ NOAA's National Marine Fisheries Service is responsible for managing commercial fishing operations and for protecting essential fish habitat in consultation with regional fishery management councils.³⁷⁴ NOAA must also coordinate with regulatory agencies regarding impacts to marine mammals and endangered species from marine aquaculture siting.³⁷⁵ The Coastal Zone Management Act (CZMA), which is administered by NOAA in cooperation with the coastal states, requires federal activities including permits to be consistent with approved state coastal management plans.³⁷⁶ NOAA also has authority under CZMA to assist states in coastal zone management activities relating to aquaculture.³⁷⁷

³⁶⁶ US Commission on Ocean Policy (2004); Cicin-Sain *et al.* (2001 and 2005); US Government Accountability and Office Report to Congress on offshore marine aquaculture (2008).

³⁶⁷ Cicin-Sain *et al.* 2001. p. 21.

³⁶⁸ 16 U.S.C. §§ 2801 *et seq* (2010).

³⁶⁹ Clean Water Act, 33 U.S.C. §§ 1251 *et seq* (2010); and Marine Protection Research and Sanctuaries Act. 33 U.S.C. §§ 1401-1445 (2010).

³⁷⁰ Federal Insecticide, Fungicide and Rodenticide Act, 7 U.S.C. §§ 136 *et seq* (2010).

³⁷¹ Rivers and Harbors Act, 33 U.S.C. §§ 403 (2010).

³⁷² Section 10 of Rivers and Harbors Act.

³⁷³ Clean Water Act. 33 U.S.C. §§ 404 (2010).

³⁷⁴ Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. §§ 1801-1882 (2010).

³⁷⁵ Marine Mammal Protection Act, 16 U.S.C. §§ 1361-1421; and Endangered Species Act, 16 U.S.C. §§ 1531 *et seq* (2010).

³⁷⁶ 16 U.S.C. §§ 1451-1464 (2010).

³⁷⁷ 16 U.S.C. §§ 1452, 1455a, 1456b (2010).

Other agencies that would likely comment on any proposed facility include:

- USFWS - ensures siting does not conflict with endangered species recovery programs;³⁷⁸
- US Coast Guard - ensures safety and navigation, vessel certification, and requires design features (e.g., lighting, signals) for safety purposes;³⁷⁹
- BOEM - ensures siting does not conflict with existing leases for offshore energy exploration and development, and oversees the use of offshore energy facilities for “other authorized marine related purposes;”³⁸⁰ and
- US Department of Agriculture - ensures the safety of shipped seafood,³⁸¹ and controls the spread of communicable diseases.³⁸²

As mentioned previously, it is unclear which federal agency would take the lead in the process of approving an offshore aquaculture facility in federal waters. Multiple agencies have a role and would need to coordinate in order to ensure potential impacts are addressed.

Marine Aquaculture in Other States

Rhode Island

Rhode Island addresses aquaculture in its coastal management plan, and its Ocean SAMP recognizes the importance of marine aquaculture to seafood production while noting potential adverse impacts; for example, the potential introduction of non-native species.³⁸³ A Rhode Island Aquaculture Initiative brought together multiple partners including RI Sea Grant, the Coastal Resources Management Council (CRMC), industry, and other researchers and government officials to administer funds for priority research projects related to aquaculture.³⁸⁴ To address potential user conflicts in state waters, the RI Aquaculture Initiative funded a map server project to provide charts that identify the areas of Rhode Island's waters used for fishing, aquaculture, and other activities.³⁸⁵ This tool helps planners ensure stakeholders are included early in any planning process.

³⁷⁸ 16 U.S.C. §§ 1531 *et seq* (2010).

³⁷⁹ 14 U.S.C. §§ 83 *et seq* (2010); and Merchant Marine Act 46 U.S.C. §§ 12101 *et seq* (2010).

³⁸⁰ Outer Continental Shelf Lands Act, 43 U.S.C. §§ 1331-1356 (2010); and Energy Policy Act of 2005, Pub.L. 109-58.

³⁸¹ Food, Drug, and Cosmetics Act, 21 U.S.C. 301 *et seq* (2010).

³⁸² Public Health Service Act.

³⁸³ Rhode Island Coastal Resources Management Council. 2010. *Rhode Island Ocean Special Area Management Plan*. September 2010. <http://seagrants.gso.uri.edu/oceansamp/>.

³⁸⁴ RI CRMC Aquaculture. Retrieved June 2011. <http://www.crmc.ri.gov/aquaculture.html>.

³⁸⁵ Rhode Island Commercial and Recreational Fisheries. Retrieved June 2011. <http://www.edc.uri.edu/fish/about.html>

The RI CRMC regulates activities in state waters. Aquaculture permitting and leasing are governed by the provisions of Title 20 Chapter 10 of the General Laws of Rhode Island and Section 300.11 of the RI Coastal Resource Management Program (CRMP). The CRMP regulations include requirements for siting of open ocean aquaculture facilities, and allow CRMC to grant activities by permit.³⁸⁶ In addition to size, location, species to be cultivated, and methods, CRMC takes into consideration compatibility with other uses, degree of exclusivity required for the activity (may include submerged lands, the water column, and the water's surface), security, and cumulative impacts.³⁸⁷ The regulations also allow for the state to require removal of a facility in certain instances.³⁸⁸ The recently adopted Ocean SAMP requires that permits ensure that aquaculture leases have no adverse impacts on traditional fisheries, and water quality is maintained and improved.³⁸⁹

Massachusetts

The Massachusetts Office of Coastal Zone Management (OCZM) developed a 5-year strategic plan in 1995 encouraging support of aquaculture activity.³⁹⁰ The Massachusetts Department of Agricultural Resources (MDAR), along with other agencies, works to implement the plan. Cities, conservation commissions, the Department of Fish and Game, Office of Environmental Affairs, OCZM, and various federal agencies conduct permit reviews.³⁹¹ Massachusetts' goal is to streamline its permitting process.³⁹² With that in mind, MDAR has developed a permitting guidance document that identifies relevant jurisdictions and permits required based on discharge, species, structure and siting, and water source.³⁹³ Marine aquaculture activities in Massachusetts have involved predominantly shellfish in coastal waters. According to the Massachusetts OCZM, there are currently no marine fish farms in the state.³⁹⁴ However, a few offshore projects were proposed in federal waters in the 1990s which including a blue mussel farm by Woods Hole

³⁸⁶ Cicin-Sain *et al.* 2001. P. 93-94; and See RICRMP Section 300.11.

³⁸⁷ RICRMP Section 300.11 (2010).

³⁸⁸ *Id.*

³⁸⁹ RI Ocean SAMP (2010) p. 4.

³⁹⁰ MA Office of CZM. Retrieved July 2011. <http://www.mass.gov/czm/spexsum.htm>

³⁹¹ Massachusetts Office of Coastal Zone Management. *Massachusetts Aquaculture White Paper - Legal and Regulatory Issues*. September 1995. Retrieved July 2011. <http://www.mass.gov/czm/wptoc.htm>.

³⁹² MDAR. <http://www.mass.gov/agr/aquaculture/permit.htm>.

³⁹³ Massachusetts Department of Food and Agriculture, Massachusetts Aquaculture Advisory Group *Massachusetts Aquaculture Permits Guidance Document*. April 1, 1998. Retrieved July 2011. <http://www.mass.gov/agr/aquaculture/permit.htm>.

³⁹⁴ Massachusetts Office of Coastal Zone Management. *Massachusetts Aquaculture White Paper - Fish Farms & Other Types of Aquaculture*. Retrieved September 2011. <http://www.mass.gov/czm/wpfishos.htm>.

Oceanographic Institute located 10 miles southeast from Martha's Vineyard, a privately sponsored salmon farm proposed 27 miles east of Cape Ann that was never actually installed, and a scallop farm involving bottom culture and suspended nets located 12 miles southwest of Martha's Vineyard that ceased to operate in 1999 when funding ended.³⁹⁵

Hawaii

Hawaii is recognized as a leader in ocean aquaculture science and technology.³⁹⁶ Hawaii's Ocean Resources Management Plan (ORMP) identifies the state's aquaculture management goal as "plan and develop sustainable commercial aquaculture in coastal areas and ocean waters to diversify and expand Hawaii's economy and provide locally produced sources of seafood."³⁹⁷ Hawaii's ORMP considers ocean aquaculture to be one way to enhance stock of important reef and ocean species.³⁹⁸

The state's Aquaculture Development Program falls under the State's Department of Agriculture and was created to assist aquaculture businesses.³⁹⁹ The State Office of Planning of the Coastal Zone Management Program implements the ORMP. The state has had a marine aquaculture policy and leasing policy in place since the 1980s.⁴⁰⁰ It grants bottom leases, water column leases, and non-exclusive easements.⁴⁰¹ It also requires a public hearing and environmental review for any proposal. If granted, posting of a bond and an annual rental payment is imposed.⁴⁰² The state also considers other uses in the area, and the exclusivity required for the aquaculture business and the public needs.⁴⁰³

In 1998, a demonstration project was conducted offshore and showed that it was feasible to grow Pacific Threadfin (Moi) in ocean depths of 15-30 meters with no adverse environmental impacts

³⁹⁵ Cicin-Sain *et al.* 2005. P. 6, Table 1.3.

³⁹⁶ The Hawaii Office of Planning (OP), Department of Business, Economic Development and Tourism (DBEDT). 2006. *Hawaii's Ocean Resources Management Plan (ORMP)*. Retrieved June 2011. <http://hawaii.gov/dbedt/czm/ormp/ormp.php>

³⁹⁷ HI ORMP. 2006. P. 38.

³⁹⁸ HI ORMP. 2006.

³⁹⁹ *Id.* p. 32.

⁴⁰⁰ Cicin-Sain *et al.* 2001. P. 93.

⁴⁰¹ Cicin-Sain *et al.* 2001. P. 93.

⁴⁰² *Id.*

⁴⁰³ *Id.*

to the water column, sea floor, or nearby reefs.⁴⁰⁴ The main obstacle reported for the project was obtaining the proper permits, even though the project only required experiment permits.⁴⁰⁵ The project continues to be active and is managed by Cates International.⁴⁰⁶

Maine

Maine plays an important role in salmon production in the United States.⁴⁰⁷ The state's Department of Marine Resources (DMR) is the lead agency for aquaculture activities. The state policy within DMR is to coordinate state policy on the culture of all aquatic species; coordinate the Interagency Committee on Aquaculture and staff an advisory committee; collect and maintain and distribute data related to aquaculture activities; develop a proactive program that pulls together resources for aquaculture businesses; and advocate for the State in regional and national aquaculture settings.⁴⁰⁸

Maine has a program that grants leases for the ocean bottom and water column for a period of 10 years (or 2 years for experimental projects). State law includes provisions governing the use of leased areas and imposes limitations on aquaculture activities.⁴⁰⁹ The activity/lease cannot interfere with other uses including public use in certain areas, and must support "ecologically significant flora and fauna."⁴¹⁰ State law provides for exclusivity of the leased area to the extent necessary.⁴¹¹ The permitting process for ocean aquaculture facilities in Maine is streamlined in that the leasing and environmental review are done jointly and includes the application process for the USACE permit.⁴¹² Maine also has an aquaculture monitoring program, which is required by law.⁴¹³

⁴⁰⁴ Helsley, Charles. University of Hawaii, Sea Grant College Program. *Hawaii Open Ocean Aquaculture Demonstration Program*. JNR Technical Report No. 28.

⁴⁰⁵ *Id.*

⁴⁰⁶ Cicin-Sain *et al.* 2005. P. 6, Table 1.3.

⁴⁰⁷ Cicin-Sain *et al.* 2001. p. 85.

⁴⁰⁸ *Id.* P. 97.

⁴⁰⁹ *Id.* P. 95; and 12 M.R.S. § 6072.

⁴¹⁰ *Id.*

⁴¹¹ Cicin-Sain *et al.* 2001. P. 96.

⁴¹² Cicin-Sain *et al.* 2001. P. 97.

⁴¹³ 12 M.R.S. § 6077. See also Cicin-Sain *et al.* 2001. P. 98.

Florida

The Florida Aquaculture Policy Act establishes the state's policy on aquaculture and provides for regulations and leasing of the ocean bottom and water column to the extent required for aquaculture activities.⁴¹⁴ The Act directs the Florida Department of Agriculture and Consumer Services (FDACS) Aquaculture Division to carry out various responsibilities including regulating aquaculture facilities and shellfish processing plants, opening and closing shellfish harvesting waters, managing oyster reef restoration programs, and issuing leases of submerged state lands for aquaculture.⁴¹⁵

The application process under the leasing program requires any proposed aquaculture activity to prepare a business plan to be reviewed by FDACS. Lease approval is granted by the Governor and Cabinet.⁴¹⁶ A county with jurisdiction may object.⁴¹⁷ In addition to lease approval, the project must receive an Aquaculture Certificate from FDACS for the aquaculture activity. "Certification identifies aquacultural products as an agricultural commodity and entitles the aquafarmer to the same benefits bestowed upon other agricultural producers. The certificate also exempts the aquafarmer from certain requirements of wild-harvested species, offers tax advantages and reduces the number of permits required from other regulatory agencies."⁴¹⁸ Certain BMPs must be followed as part of the certification eliminating the need for separate environmental permitting and licensing.⁴¹⁹

SC Ocean Aquaculture Round Table Outcomes

The SC Ocean Planning Work Group hosted a Round Table Discussion in August 2011 to bring together commercial fishermen, state and federal agency representatives, and researchers. The goals of the meeting were to assess the potential for aquaculture development in South Carolina's ocean waters, gain an understanding of potential use conflicts, and identify various concerns associated with ocean aquaculture development. Presentations included descriptions of the new NOAA Aquaculture Policy priorities and initiatives for supporting sustainable

⁴¹⁴ Chapter 597, Florida Aquaculture Policy Act.

⁴¹⁵ FDACS website, Retrieved July 2011, <http://www.floridaaquaculture.com/>.

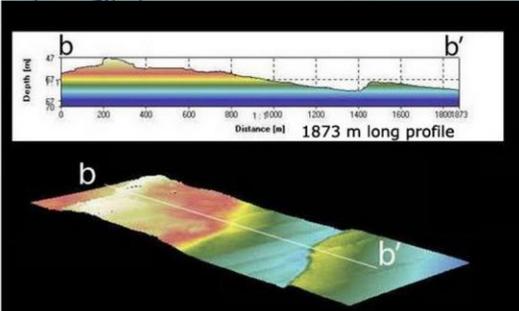
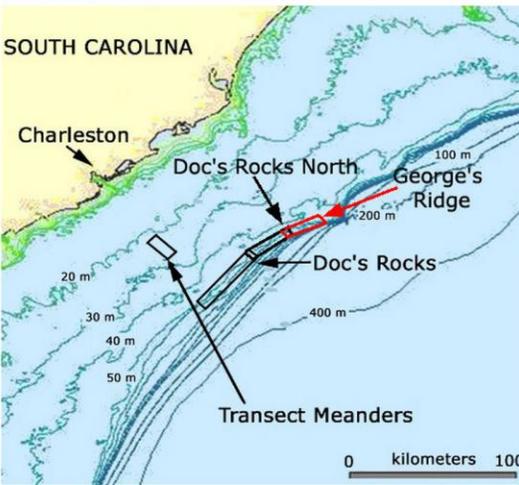
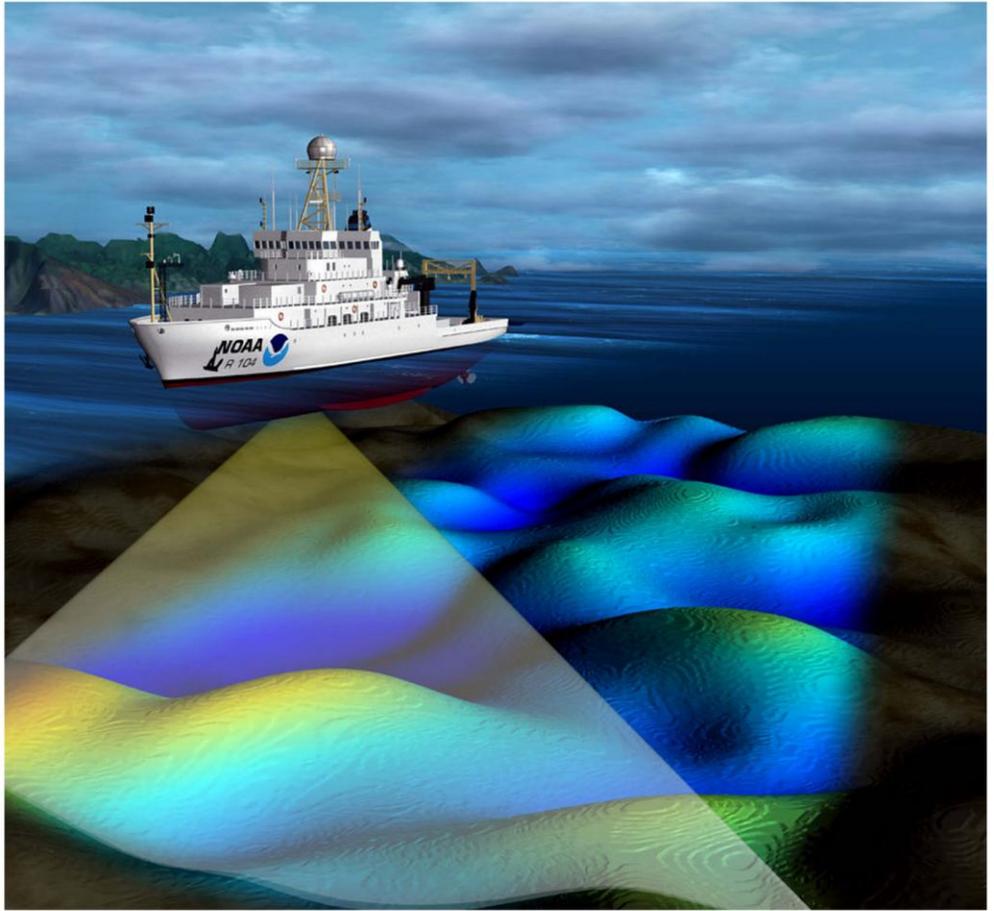
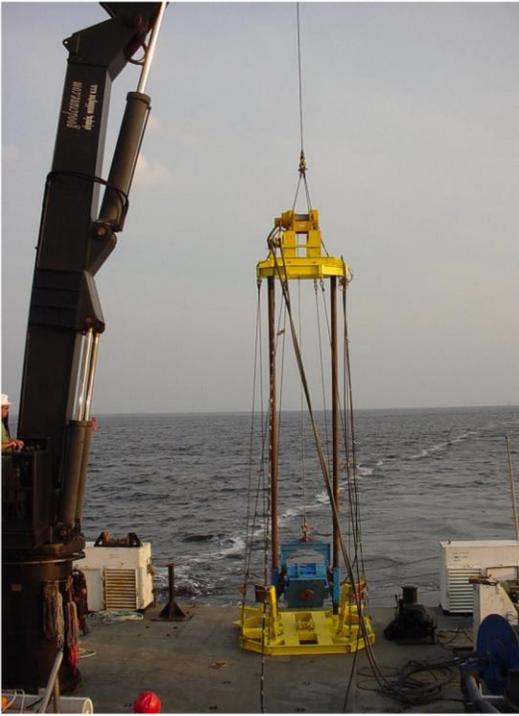
⁴¹⁶ Cicin-Sain *et al.* 2001. P. 94.

⁴¹⁷ *Id.*

⁴¹⁸ FDACS Division of Aquaculture. http://www.floridaaquaculture.com/bad/bad_aquacertify.htm.

⁴¹⁹ Cicin-Sain *et al.* 2001. P. 97.

aquaculture in the United States; the history of aquaculture in South Carolina along with recent status and trends; and the potential concerns and opportunities associated with marine aquaculture development in the state's offshore waters. A round table discussion followed and the meeting concluded with recommendations for the Ocean Planning Work Group to consider. Recommendations identified actions or activities that would need to occur in both related planning and regulatory schemes to promote sustainable coastal and ocean aquaculture development (Appendix 1).



Ocean Mapping in South Carolina

Photo credits:
(Top, left) NOAA Marine Operations
(Top, right) NOAA National Ocean Service
(Bottom, left) College of Charleston, BEAMS Program
(Bottom, right) NOAA Marine Operations

Chapter 7: Ocean Mapping in South Carolina

Expanded mapping along South Carolina's coast would improve understanding of the geology, resources, and natural habitats of the seafloor. These efforts are beneficial in identifying critical fisheries habitat, and appropriate sites for energy and other industry-related infrastructure. Ocean mapping also improves understanding of the complex dynamics of shoreline change and sand movement along South Carolina's coast, and assists in determining the location of sources and quality of sand resources for beach renourishment projects. In its 2004 report, the US Commission on Ocean Policy recommended legislative mandates and funding for ocean mapping, recognizing the utility of maps in ocean monitoring, habitat preservation, and ocean exploration; as well as the need for integration of existing maps.⁴²⁰ Spatial data related to ocean resources and human uses continues to be a priority.⁴²¹

A variety of ocean mapping activities has been undertaken in South Carolina over the past few decades. While each project has been valuable, these efforts represent a relatively small geographic area of South Carolina's submerged lands. High-resolution mapping of nearshore areas has been conducted in the Long Bay region between the North Carolina state line to North Inlet,⁴²² and in segmented portions of the central coast between Bulls Island and Edisto Island.⁴²³ These maps continue to provide valuable information for beach renourishment projects and a better understanding of offshore geology.

The remaining, unmapped seafloor areas of the continental shelf offshore South Carolina present a challenge to resource managers who will make important decisions regarding future impacts

⁴²⁰ US Commission on Ocean Policy. *An Ocean Blueprint for the 21st Century*. Final Report. Washington DC, 2004. ISBN#0-9759462-0-X.

⁴²¹ National Ocean Policy Task Force, 2010. http://www.whitehouse.gov/files/documents/OPTF_FinalRecs.pdf.

⁴²² Barnhardt, W.A. (ed.). 2009. *Coastal Change along the Shore of Northeastern South Carolina – The South Carolina Coastal Erosion Study*. US Geological Survey Circular 1339. 77 pp.

⁴²³ Harris, M. S., P. T. Gayes, J. L. Kindinger, J. G. Flocks, D. E. Krantz, and P. Donovan-Ealy. 2005. *Quaternary Geomorphology and Modern Coastal Development in Response to an Inherent Geologic Framework: An Example from Charleston, South Carolina (USA)*. *Journal of Coastal Research*, 21(1), 49-64; Kindinger, J. L., J. G. Flocks, M. S. Harris, Paul T. Gayes, W. C. Schwab, and M. P. Katuna. 1998. *Quaternary Stratigraphy and Depositional History of the Central South Carolina Coast and Inner Shelf: Implications to Coastal Change, US Geological Survey*. <http://coastal.er.usgs.gov/scerosion/quaternary/> (Accessed 9 January 2012); and Luciano, K. 2010. *Impacts of Underlying Stratigraphy, Inlet Formation, and Geomorphology on Coastal Sediment Dynamics: Capers Inlet Quadrangle, SC (USA)*. College of Charleston, M.S. Thesis.

and resource allocations. This chapter describes previous mapping that provides a foundation for future mapping off South Carolina and summarizes how these efforts compare to other coastal states' ocean mapping activities. The findings of an Ocean Mapping Workshop held in Charleston are included at the end of the chapter.⁴²⁴

Ocean Mapping in South Carolina

Coastal Erosion Program (1994-1999)

In 1994, the US Geological Survey (USGS) and the SC Sea Grant Consortium conducted the first major cooperative mapping program in the Southeast. The study integrated onshore and offshore geological information between the Isle of Palms and Edisto Island to help understand the processes involved in coastal erosion.⁴²⁵ In contrast to the long, linear beaches of Long Bay and the wide Sounds to the South, the central coast is marked by large ebb tidal deltas that add great complexity to the sediment dynamics and regional sediment management issues.⁴²⁶ The overall focus of this six-year study was to identify the causes of erosion by analyzing geological processes and inlet-beach interactions within the region. Outcomes of the study included a detailed geologic framework of the beach/inlet systems;⁴²⁷ a regional inventory of volumes and movement of sediment;⁴²⁸ investigation of sediment transport rates within the system;⁴²⁹ and an inventory of coastal features including an analysis of shoreline change.

⁴²⁴ SC Ocean Planning Initiative, Ocean Mapping in SC Workshop. Charleston SC. April 24, 2008.

http://www.DHEC.gov/environment/ocrm/ocean_planning.htm.

⁴²⁵ Hansen, M. E. 1998. *South Carolina Coastal Erosion Study*, US Geological Survey.

<http://coastal.er.usgs.gov/projects98/7240-33580.html> (Accessed 9 January 2012).

⁴²⁶ Kana, T. W., and D. J. Gaudio. 2008. *Regional Beach Volume Changes at Decadal to Century Time Scales - Central South Carolina USA*, in: Smith J.M. (Ed.), Coastal Engineering, Hamburg, Germany, pp. 2340-2351.

http://eproceedings.worldscinet.com/9789814277426/9789814277426_0193.html.

⁴²⁷ Harris, M. S., P. T. Gayes, J. L. Kindinger, J. G. Flocks, D. E. Krantz, and P. Donovan-Ealy. 2005. *Quaternary Geomorphology and Modern Coastal Development in Response to an Inherent Geologic Framework: An Example from Charleston, South Carolina (USA)*. Journal of Coastal Research, 21(1), 49-64.

⁴²⁸ Hippensteel, S. P., R. E. Martin, and M. S. Harris. 2005. *Records of prehistoric hurricanes on the South Carolina coast based on micropaleontological and sedimentological evidence , with comparison to other Atlantic Coast records: Discussion*. Geological Society of America Bulletin, 117(1/2), 250-256, doi:10.1130/B25535.1.250; and Work, P. A., J. Guan, E. J. Hayter, and S. Elci. 2001. *Mesoscale model for morphologic change at tidal inlets*. Journal of Waterway, 127(5), 282-287.

⁴²⁹ Kana and Gaudio (2008).

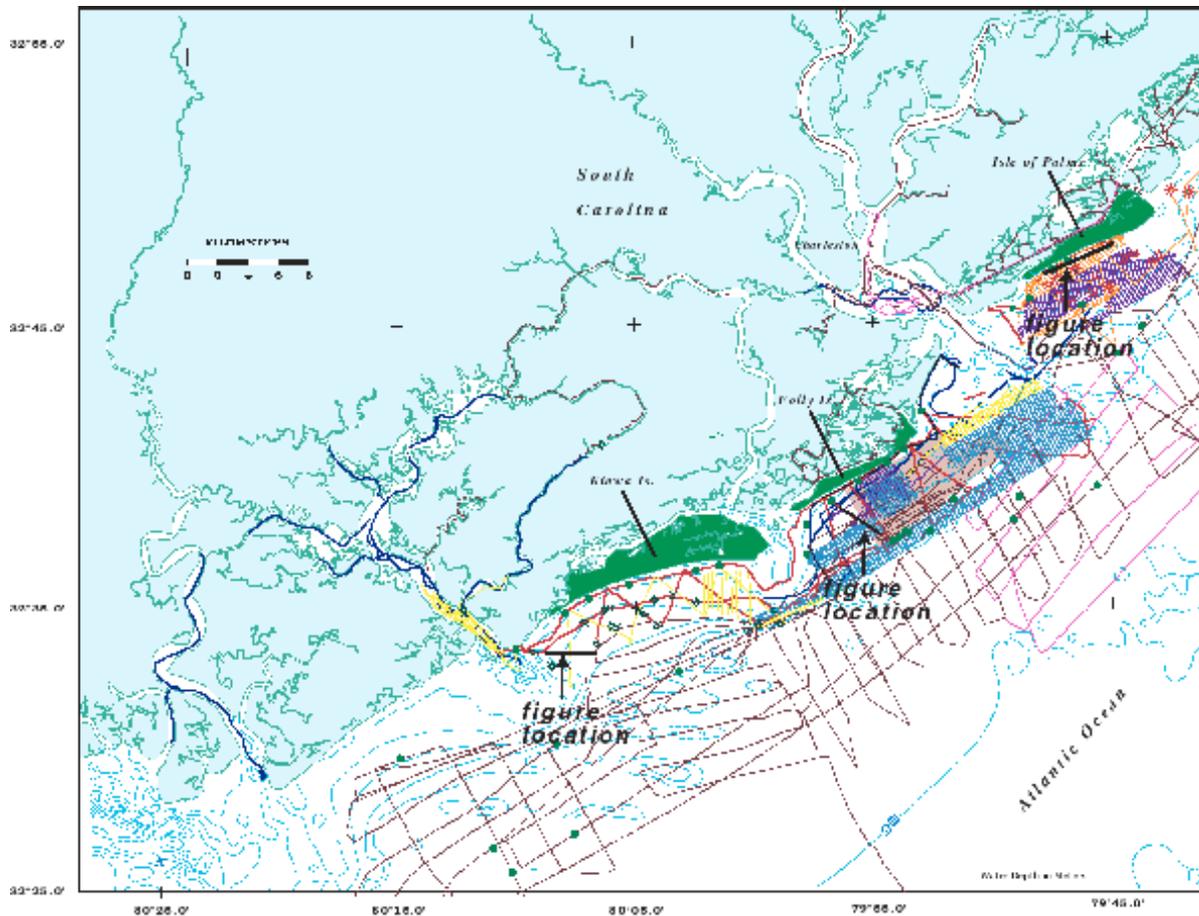


Figure 11. Data location map for the coastal erosion cooperative in the mid-1990's in Central South Carolina.⁴³⁰ The image indicates areas where seismic lines (widely spaced), sidescan sonar mosaics (closely spaced lines), and cores were collected in the area.

South Carolina Coastal Erosion Study

The USGS partnered with SC Sea Grant Consortium to investigate geologic processes affecting shoreline change along the northern South Carolina coast, specifically the Long Bay region (Figure 12).⁴³¹ Long Bay is a sediment-starved embayment that is situated between Cape Fear to the north and the Santee River Delta/Cape Romaine to the south.⁴³² The location of sediment

⁴³⁰ Kindinger, J. L., J. G. Flocks, M. S. Harris, Paul T. Gayes, W. C. Schwab, and M. P. Katuna (1998), Quaternary Stratigraphy and Depositional History of the Central South Carolina Coast and Inner Shelf: Implications to Coastal Change, U.S. Geological Survey. <http://coastal.er.usgs.gov/scerosion/quaternary/> (Accessed 9 January 2012); and Harris, M. S., P. T. Gayes, J. L. Kindinger, J. G. Flocks, D. E. Krantz, and P. Donovan-Ealy (2005), Quaternary Geomorphology and Modern Coastal Development in Response to an Inherent Geologic Framework: An Example from Charleston, South Carolina (USA), *Journal of Coastal Research*, 21(1), 49-64.

⁴³¹ USGS Woods Hole Science Center. SC Coastal Erosion Study. 1999. Retrieved July 2010, <http://woodshole.er.usgs.gov/project-pages/scarolina/html/Intro.htm>.

⁴³² *Id.*

resources is important to understand because of the potential use for renourishment, and the identification of possible navigational hazards. The SC Coastal Erosion Study (CES) examined “how historical and pre-historical geology and present-day physical processes influence coastal erosion patterns and the location of offshore sediment sources.”⁴³³ The goal of the study was to understand factors controlling sediment transport in order to predict coastal change and successfully manage and mitigate coastal resources and hazards.⁴³⁴

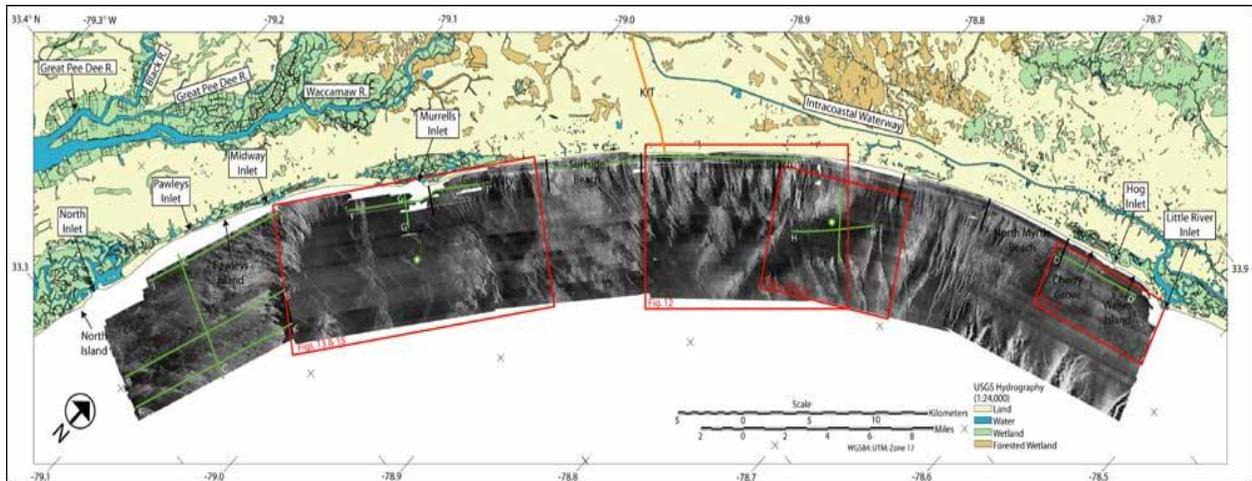


Figure 12. Mosaic image from South Carolina Coastal Erosion Study (1999-2003), for a subregion of Long Bay, SC (offshore of Horry and Georgetown Counties).

Geophysical surveys that defined the Grand Strand geologic framework were conducted between 1999 and 2003.⁴³⁵ The survey area extended from seaward of breaking waves (< 1 kilometer) to approximately 10 kilometers offshore, and covered approximately 700 square kilometers of the inner-shelf and lower shore face.⁴³⁶ High-resolution side-scan sonar, seismic-reflection, cores, samples, and other methods were used to map bathymetry, hard bottom, and sand resources up to

⁴³³ *Id.*

⁴³⁴ Barnhardt, W.A. (ed.). 2009. *Coastal Change along the Shore of Northeastern South Carolina – The South Carolina Coastal Erosion Study*. US Geological Survey Circular 1339. 77 pp; and Denny, J. F., W. E. Baldwin, W. C. Schwab, P. T. Gayes, R. Morton, and N. W. Driscoll. 2007. *Morphology and Texture of Modern Sediments on the Inner Shelf of South Carolina’s Long Bay from Little River Inlet to Winyah Bay*, US Geological Survey Open File Report, 2005(1345). <http://pubs.usgs.gov/of/2005/1345/index.html> (Accessed 9 April 2012).

⁴³⁵ Gayes, 2008.

⁴³⁶ USGS, Retrieved July 2010, http://www.DHEC.gov/environment/ocrm/ocean_planning.htm#042408.

10 kilometers offshore.⁴³⁷ Online maps and data are available at the SC Coastal Erosion Study USGS website.⁴³⁸

The CES has provided important data for South Carolina, including historical shoreline data, and has assisted in the development of the “State of the Beaches” report and the USGS national shoreline change database.⁴³⁹ The CES has helped provide a baseline for expansion of the regional inventory of sand resources available for future nourishment projects.⁴⁴⁰ Other initiatives by SCDNR and the USACE were able to expand upon the CES efforts utilizing equipment and personnel already mobilized, to study impacts of the Ocean Dredged Materials Disposal Site offshore of Charleston. It has helped local communities understand shoreline erosion processes enabling resource managers to better manage and mitigate beach erosion. In addition, the CES has aided SCDNR’s management of living marine resources by providing seafloor mapping of nearshore reef habitats, which also helps characterize areas when considering siting for ocean development activities such as offshore wind energy.

Mapping Activities by the College of Charleston

The College of Charleston works with local, state, federal, and nongovernmental organizations to gather data as part of their Benthic Acoustic Mapping and Survey Program (BEAMS) in Charleston Harbor and along the central South Carolina coast. The program maintains the largest training program for seafloor and coastal mapping in the Southeast, and focuses on data collection of coastal Light Detection and Ranging (LiDAR), sidescan sonar, sub-bottom profiling, and multi-beam bathymetry. Data collected through BEAMS is analyzed by using multivariate statistics to identify areas of critical habitat in state and federal waters.

⁴³⁷ Denny, J. F., W. E. Baldwin, W. C. Schwab, P. T. Gayes, R. Morton, and N. W. Driscoll. 2007. *Morphology and Texture of Modern Sediments on the Inner Shelf of South Carolina’s Long Bay from Little River Inlet to Winyah Bay*, US Geological Survey Open File Report, 2005(1345). <http://pubs.usgs.gov/of/2005/1345/index.html> (Accessed 9 April 2012).

⁴³⁸ woodshole.er.usgs.gov/projects/project_get.php?proj=29210EJ&style=html.

⁴³⁹ The South Carolina Coastal Erosion Study: A Cooperative Program of the US Geological Survey and S.C. Sea Grant Consortium. FY09 Budget Request submitted by S.C. Sea Grant Consortium and Coastal Carolina University. February 29, 2008.

⁴⁴⁰ Harris, M. S., E. E. Wright, L. Fuqua, and T. P. Tinker. 2009. *Comparison of Shoreline Erosion Rates Derived from Multiple Data Types: Data Compilation for Legislated Setback Lines in South Carolina (USA)*. *Journal of Coastal Research*, 2009(56), 1224-1228.

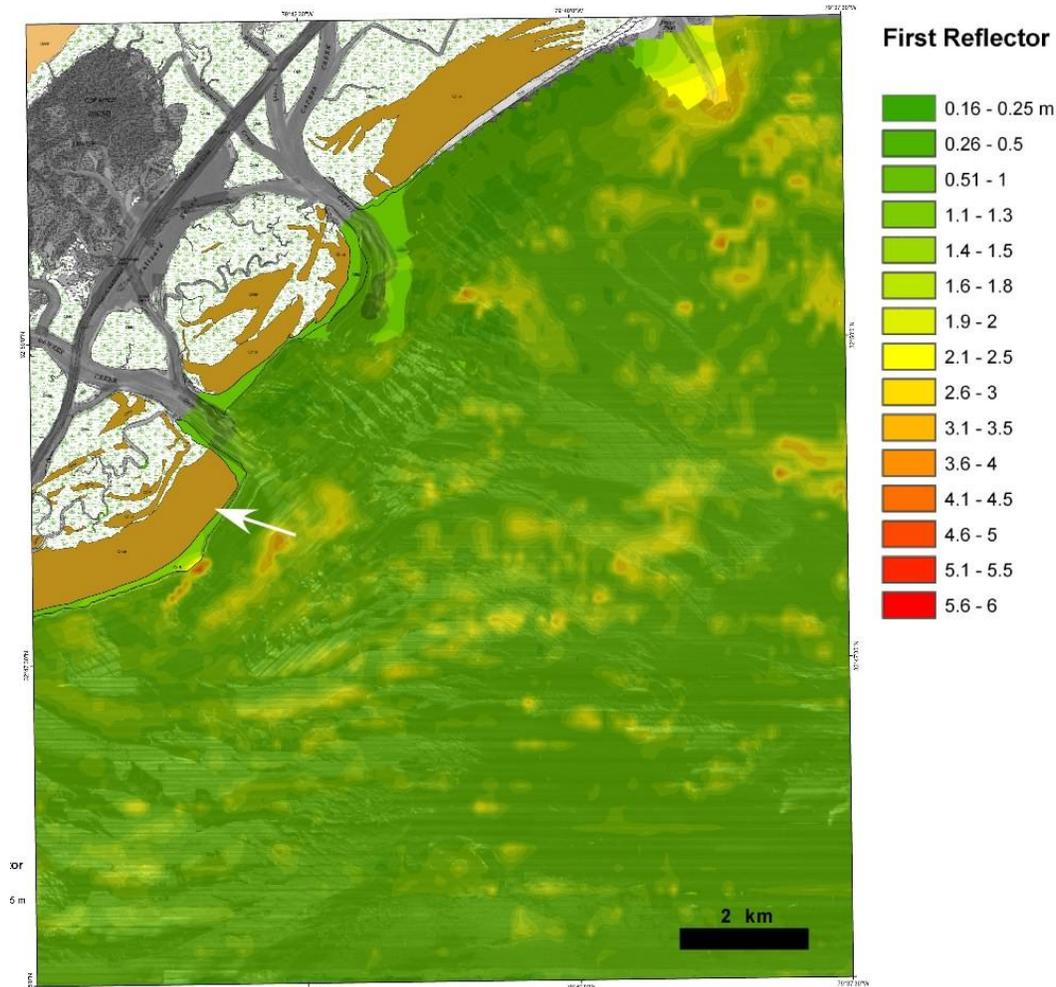


Figure 13. Sediment thickness of recent materials actively moving off Isle of Palms and vicinity.⁴⁴¹

Mapping areas include waterways from Winyah Bay to the Savannah River, and state and federal ocean waters. Recent work has been conducted in the Ashley River, Capers Inlet, Charleston Harbor Entrance, and the waterways around Folly, Kiawah, and Edisto Islands. Repetitive surveys are regularly conducted off the barrier islands, and are cost-effective due to the proximity to the harbor.

Multibeam bathymetric surveys are also conducted by the College of Charleston in conjunction with several Federal agencies including the USACE and NOAA.

⁴⁴¹ Luciano, K. (2010), Impacts of Underlying Stratigraphy, Inlet Formation, and Geomorphology on Coastal Sediment Dynamics: Capers Inlet Quadrangle, SC (USA), College of Charleston, M.S. Thesis.

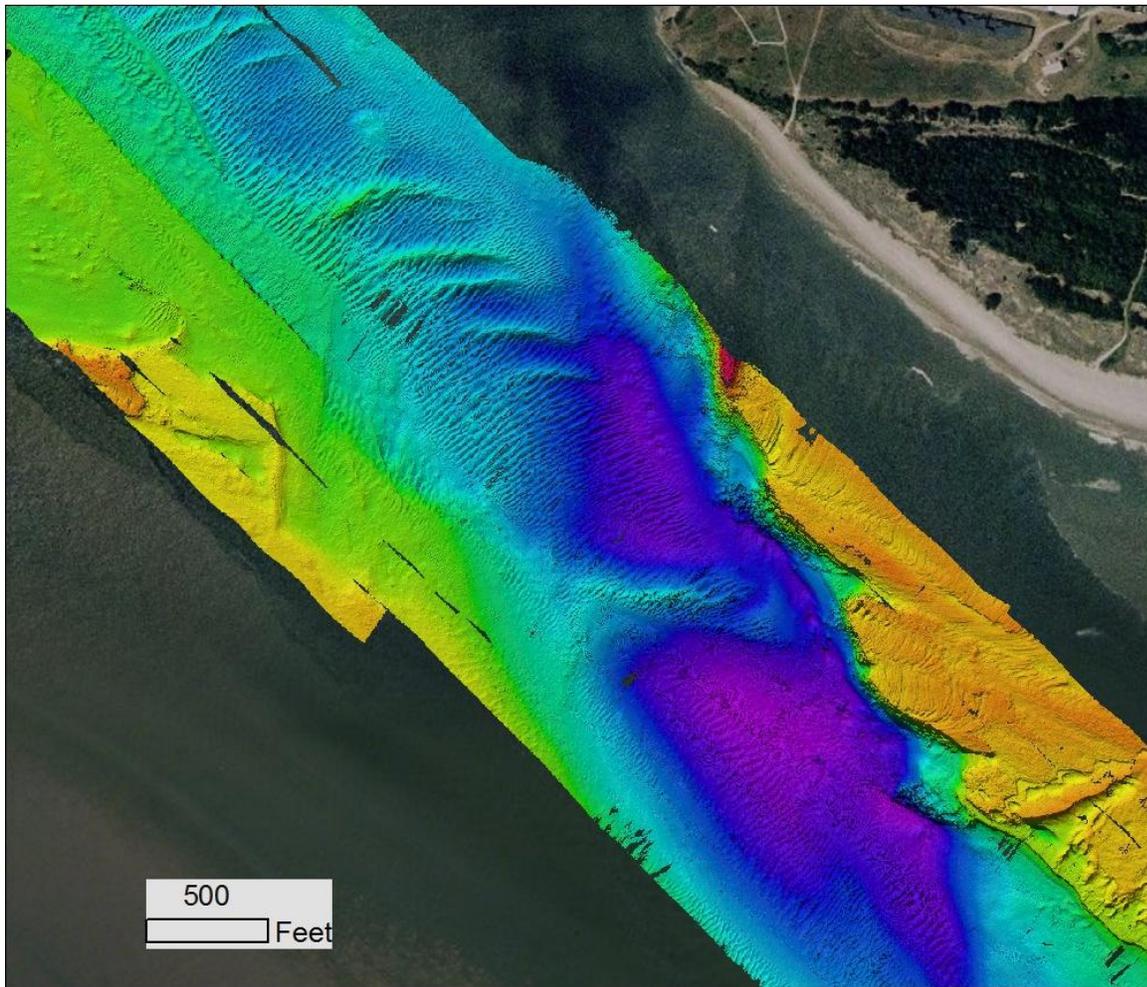


Figure 14. The entrance to Charleston Harbor at the south end of Sullivan's Island. Depths range from -20 feet (reds) to -85 feet (purple). Map created by the College of Charleston as part of their training program (with USACE and QPS, 2012).

Comprehensive Spatial Mapping Effort of South Carolina's Ocean Resources and Activities

More recently, the SC Energy Office contracted with SCDNR's Marine Resources Division to develop a spatial database for ocean resources and activities. The goals of the effort were to provide updated information on the distribution of habitats, biological resources, and human use data in South Carolina's coastal zone from 30 miles inland out to 200 meter bathymetric depth contour.⁴⁴² Results of this effort included 70 data layers that contain information such as

⁴⁴² SC Department of Natural Resources. GIS Data Resources. *Comprehensive Spatial Database on SC's Coastal Resources and Uses*. <http://www.dnr.sc.gov/GIS/gisenergy.html>. Retrieved April 2012.

hydrography, land cover, offshore wind speeds, government protected lands, bird and turtle nesting areas, marine mammal, finfish, and juvenile sea turtle distributions. In addition to habitat and biological data, the database provides information on jurisdictional boundaries, shipping activities, military use areas, commercial fishing distribution, and sand mining and ocean disposal areas.⁴⁴³ The project was initiated to address the need for comprehensive ocean planning in state waters in an effort to evaluate potential wind energy projects that may be proposed off of South Carolina's coast.⁴⁴⁴

Multipurpose Marine Cadastre – SC Renewable Energy Task Force Viewer

Building off of the spatial mapping effort described above and in support of the BOEM Task Force described in Chapter 4, the NOAA Coastal Services Center has incorporated the data from SCDNR's mapping project into a data portal within the already existing Multipurpose Marine Cadastre.⁴⁴⁵ The data is presented at the lease block level of three square nautical miles but is further refined into aliquots equaling 1/16th of a lease block. The data layers for South Carolina are available under the South Carolina Renewable Energy Task Force Viewer.⁴⁴⁶

Mapping Activities by the US Army Corps of Engineers

The USACE Charleston District is responsible for maintaining approximately 300 nautical miles of federal authorized channels within South Carolina. The Charleston District collects multi-beam, single beam and sidescan sonar hydrographic surveys within the federal channels. Hydrographic operations encompass areas of the Charleston Harbor, Georgetown Harbor, the Atlantic Intracoastal Waterway, existing Ocean Dredged Material Disposal Sites (ODMDS) and offshore borrow areas. Hydrographic data is available on the Charleston District website.

⁴⁴³ *Id.*

⁴⁴⁴ Van Dolah, R.F., J.B. Boynton, K.S. Schulte, J.C. Felber. SC Department of Natural Resources Marine Resources Research Institute. 2011. *Final Report: A Comprehensive Spatial Mapping Effort of South Carolina's Coastal Resources and Activities*. Funded by the SC Energy Office through a US Department of Energy grant. <ftp://ftpdata.dnr.sc.gov/gisdata/dnrdata/CRWPFinalReport.pdf>. Retrieved April 2012.

⁴⁴⁵ NOAA and BOEM. Multipurpose Marine Cadastre, <http://www.marinecadastre.gov>. Retrieved April 2012.

⁴⁴⁶ <http://www.arcgis.com/home/item.html?id=a18d32ef45e047b6b11faa5280b07d9f>

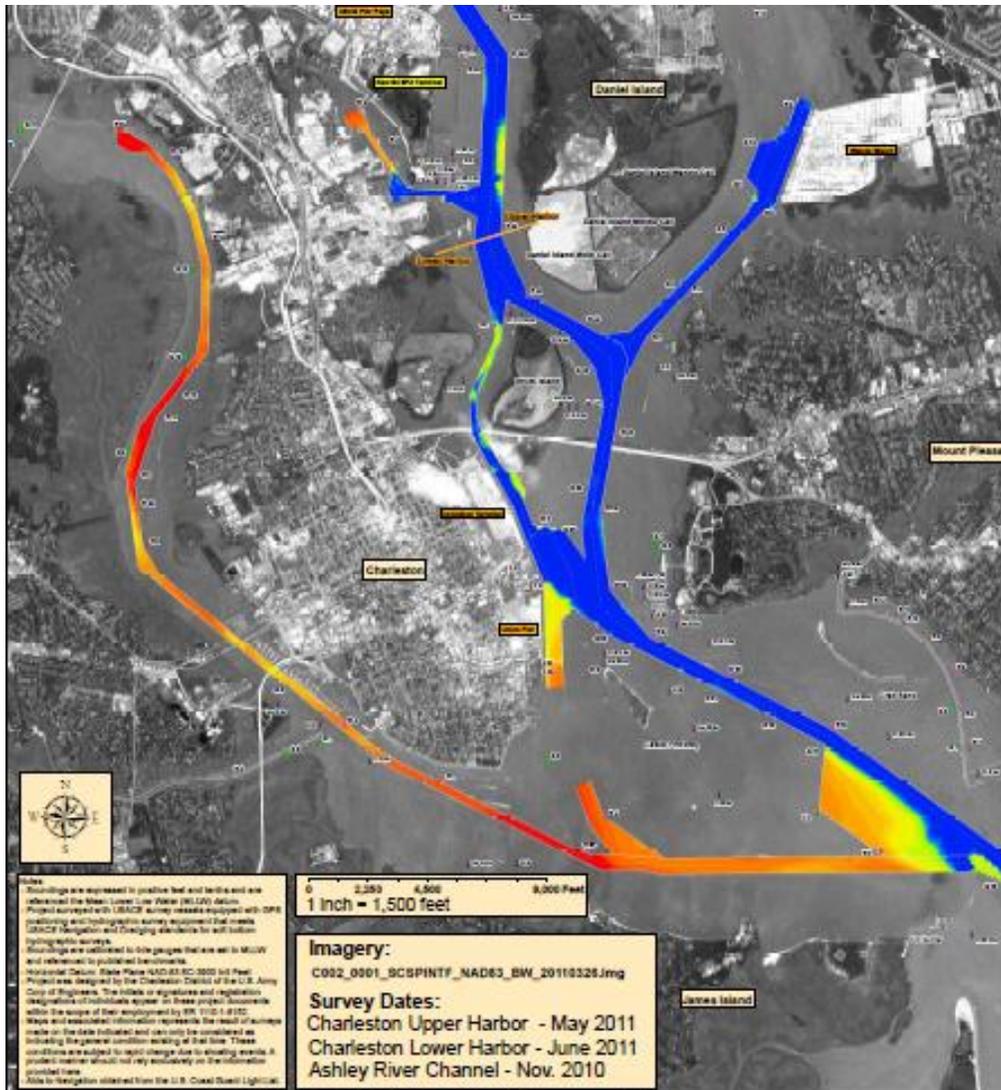


Figure 15. USACE Charleston District. Hydrographic Survey Map, Charleston Harbor. Red and yellow areas indicate shallower depths, blues deeper (range is 8-50 ft).

The Nature Conservancy’s Carolinas Ecoregional Assessment

The Nature Conservancy (TNC) developed an Ecoregional Assessment for a Carolinas marine region to support ecosystem-based management decisions.⁴⁴⁷ The assessment integrates data on the diversity of habitats, species, and marine resource use; informs strategies for protecting

⁴⁴⁷ DeBlieu, J., M. Beck, D. Dorfman, P. Ertel. 2005. Conservation in the Carolinian Ecoregion: An Ecoregional Assessment. The Nature Conservancy, Arlington, VA.

sensitive living resources for multiple uses; and characterizes connectivity, food web dynamics, and GIS data showing resiliency to specific threats.⁴⁴⁸

The Carolinian Assessment included Virginia, North Carolina, South Carolina, Georgia, and Florida, and contains mapped data for 36 conservation targets including Right Whale calving grounds, offshore reef and hard bottom habitat, and Habitat Areas of Particular Concern (HAPC).⁴⁴⁹ The assessment also included mapped data for ten “cost factors” to develop a suitability index including population growth, shipping lanes, dredged channels, and dredge disposal sites (Figure 16).⁴⁵⁰ Marxan, a marine conservation planning software tool that supports design of terrestrial and marine reserves, was used to identify potential conservation areas.⁴⁵¹ A number of gaps and limitations were noted from the Carolinian Assessment, including reliance on regional data that provides lower resolution, and the need for validation of fish habitat areas and ecological linkages with nearshore areas.⁴⁵²

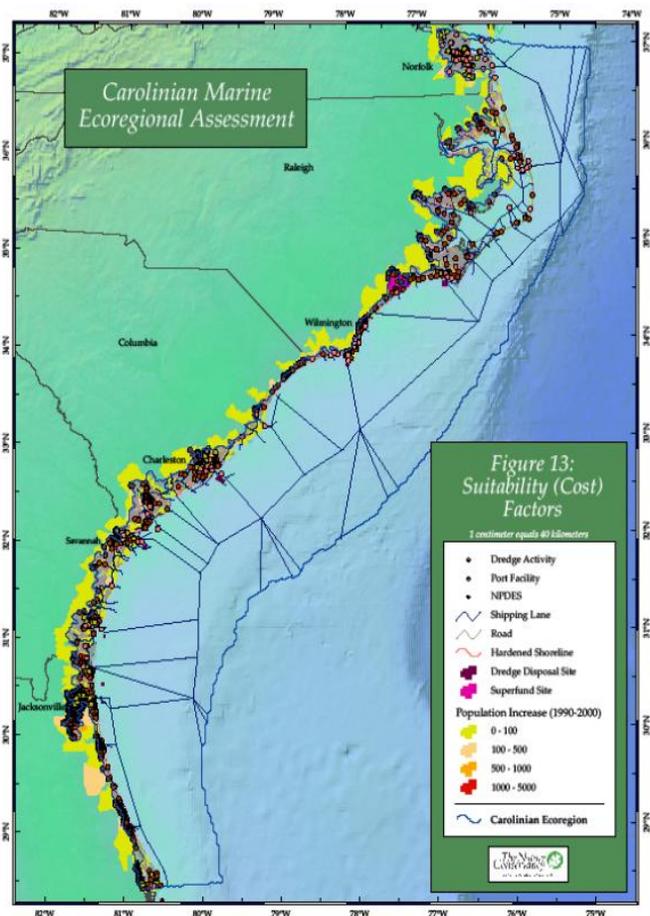


Figure 16. SC Ecoregional Assessment / Marine Mapping Strategies, SC Ocean Mapping Workshop (SC TNC, April 24, 2008).

⁴⁴⁸ Mary Conley, The Nature Conservancy. SC Ocean Mapping Workshop. *SC Ecoregional Assessment and Marine Mapping Activities*. Charleston SC. April 24, 2008. http://www.DHEC.gov/environment/ocrm/ocean_planning.htm.

⁴⁴⁹ Id.

⁴⁵⁰ Id.

⁴⁵¹ Duke University. Marine Geospatial Ecology Lab. MARXAN User's Manual. Retrieved September 2009. <https://mgel.env.duke.edu/proj/mebm/funded-projects/marxan>.

⁴⁵² Conley, 2008.

Benthic Habitat Mapping Projects in South Carolina

SEAMAP

The Southeast Area Monitoring and Assessment Program (SEAMAP) is a cooperative state and federal program for the collection, management, and dissemination of fishery-independent information to enhance knowledge of marine fisheries and their associated ecosystems.⁴⁵³

SEAMAP is utilized by fisheries managers, government agencies, recreational and commercial fishing industries, researchers, and others. SEAMAP's Bottom Mapping Project was initiated in 1985 to develop a database of bottom habitats throughout the South Atlantic Bight. The primary focus of this project was to identify critical essential fish habitat (EFH) for commercially and recreationally important species in the South Atlantic region. Along with the location and characteristics of hard-bottom reef habitats, the project also identified locations of artificial reefs, bottom areas where there was less definitive evidence of reef habitat, and those areas with no evidence of reef habitat.⁴⁵⁴ Data describing bottom habitats from North Carolina to the Florida Keys were obtained by compiling and analyzing existing data sources available from state and federal agencies. This information was assembled into a searchable database and has been used by agencies to define EFH and develop alternative management options for resource protection.⁴⁵⁵

INTERMAR

A second habitat mapping project was initiated through a partnership with the former Minerals Management Service Office of International Activities and Mineral Resources (INTERMAR). Through this partnership, a former South Carolina Task Force on Offshore Resources entered into a multi-year cooperative agreement with the Minerals Management Service (MMS) to compile a comprehensive database of bottom habitat characteristics in South Carolina coastal waters from the shoreline to 200 meters depth.⁴⁵⁶ Specific goals of the project included expanding the SEAMAP database to include sand and mineral information, collecting additional

⁴⁵³ SEAMAP. Retrieved 2009, <http://www.dnr.sc.gov/marine/mrri/SEAMAP/seamap.html>.

⁴⁵⁴ The Atlantic States Marine Fisheries Commission. *SEAMAP Bottom Mapping Project: Distribution of Bottom Habitats on the Continental Shelf from North Carolina through the Florida Keys*. April 2001. P.1. Retrieved March 2011. http://www.asmfc.org/publications/seamapDocs/bottomMapping/seamapHardbottomMappingv1_2%20summary.pdf

⁴⁵⁵ Fishery Ecosystem Plan of the South Atlantic Region, Volume V. Research and Data Needs Retrieved September 2011, www.safmc.net.

⁴⁵⁶ Weinbach, P.R. & R.F. Van Dolah. 2001. Spatial Analysis of Bottom Habitats and Sand Deposits on the Continental Shelf off South Carolina. Final Report to Minerals Management Service, INTERMAR Program. 21 p. + Appendices.

data in the nearshore coastal zone related to hard bottom and potential sand sources. In addition the project conducted several special South Carolina studies including shoreline migration rates and sediment budgets for Seabrook, Kiawah, and Folly Island; evaluated beach renourishment and physical recovery rates of sand borrow sites; and completed spatial analysis of bottom habitats.⁴⁵⁷ The project was initiated in 1992, and the coastal shelf component was completed in 2001.

The final INTERMAR report provides a synthesis of historic and recent data, and provides bottom characteristic information such as hard-bottom reef habitat, percent sand composition, mean grain size and thickness of sand layer over harder substrate or subsurface reflectors.⁴⁵⁸ The report identified and evaluated sand resources suitable for the state's planned beach nourishment projects, and concluded that there are suitable concentrations of nourishment quality sand deposits in reasonable proximity to most of the state's beaches.⁴⁵⁹ However, several geographic regions lack sufficient data, including areas near erosional beaches in need of nourishment.⁴⁶⁰ Based on the data available, it appears that there are dense patches of natural live hard bottom nearshore areas within state waters in Long Bay, which provide critical habitat for various fish species.⁴⁶¹ Although the project compiled the best available data on sand resources and reef habitats at relatively low cost, the data represent one-time estimations of bottom conditions based on a limited number of sampling locations over a large geographic area.⁴⁶²

Ocean Mapping in Other States

California

California's Seafloor Mapping Program (CSMP) was established in 2007 to classify estuarine and marine geologic habitats of California and create high-resolution base maps for all of the state's waters from the shoreline out to three nautical miles.⁴⁶³ The CSMP is a cooperative

⁴⁵⁷ Dr. Robert Van Dolah, SCDNR Marine Resources Research Institute. SC Ocean Mapping Workshop. *SEAMAP Bottom Mapping Project and MMS INTERMAR SC Task Force on Offshore Resources*. Charleston SC. April 24, 2008. http://www.DHEC.gov/environment/ocrm/ocean_planning.htm.

⁴⁵⁸ Weinbach & Van Dolah, 2001.

⁴⁵⁹ Weinbach & Van Dolah, 2001.

⁴⁶⁰ *Id.*

⁴⁶¹ *Id.*

⁴⁶² Van Dolah, Charleston, SC. 2008.

⁴⁶³ US Geologic Survey. California's Seafloor Mapping Program. Retrieved July 2010, <http://walrus.wr.usgs.gov/mapping/csmpl/>.

partnership among state and federal agencies, universities, and industry. Surface models and imagery of the seafloor are being created from data collected through multibeam, sidescan and sub-bottom sonar, video tow sleds, and LiDAR. Final products from the CSMP will include a series of substrate and habitat maps detailing the seafloor and coastal geology of California's ocean. Digital products will be available through an online data repository.⁴⁶⁴

Massachusetts

The USGS, in cooperation with the Massachusetts Office of Coastal Zone Management and NOAA, has been engaged in geologic mapping of Massachusetts' inner continental shelf since 2003.⁴⁶⁵ The cooperative project uses high-resolution geophysical techniques, sediment sampling and seafloor photography to determine the geological makeup of the seafloor within the state's three nautical miles.⁴⁶⁶ The final mapping products developed under this cooperative will provide guidance for activities such as siting of offshore development, including sand mining and renewable energy projects, habitat recovery monitoring, and fisheries research.⁴⁶⁷ Mapping products will also provide an enhanced knowledge of coastal processes to aid in erosion and sea level rise modeling, and will support resource management initiatives like the state's integrated, multi-use, ocean-management plan under the Massachusetts Oceans Act of 2008.⁴⁶⁸

North Carolina

North Carolina is partnering with the USGS and university researchers in a regional coastal erosion study similar to the Coastal Erosion Study in northern South Carolina (Long Bay) as described above.⁴⁶⁹ The collaborators are mapping the geologic framework of the inner shelf of northern North Carolina.⁴⁷⁰ In a recently released report, the NC Ocean Policy Steering

⁴⁶⁴ <http://seafloor.csumb.edu/csmp/csmp.html>.

⁴⁶⁵ US Geologic Survey. 2006. *Mapping the Seafloor Geology Offshore of Massachusetts*. Retrieved July 2010 <http://pubs.usgs.gov/fs/2006/3042/>.

⁴⁶⁶ US Geological Survey Fact Sheet 2006-3042, Mapping the Seafloor Geology Offshore of Massachusetts, http://woodshole.er.usgs.gov/project-pages/coastal_mass/html/current_map.html.

⁴⁶⁷ *Id.*

⁴⁶⁸ *Id.*

⁴⁶⁹ USGS: NC Regional Coastal Erosion Study, Retrieved July 2010, <http://woodshole.er.usgs.gov/project-pages/northcarolina/>.

⁴⁷⁰ *Id.*

Committee emphasized ocean mapping needs and recommended that the state update maps of its ocean resources.⁴⁷¹

Rhode Island

As part of its Ocean SAMP, Rhode Island has mapped existing uses and critical zones including transportation corridors, military use, and essential habitats. A web-based map viewer was developed for users to access data, internet map servers, and static maps.⁴⁷²

Oregon

Oregon State University led a partnership with private companies to create detailed maps of the seafloor within the boundary of Oregon's territorial sea.⁴⁷³ The project, which was jointly funded by the state legislature and NOAA, used technologies to measure water depth and record natural geological features and aquatic life.⁴⁷⁴ The maps produced cover 34 percent of Oregon waters out to three nautical miles and 75 percent of its rocky reef area.⁴⁷⁵ Oregon has also developed Coastal Atlas, a tool for managing the coastal zone.⁴⁷⁶ The Atlas provides "background information for different coastal systems, access to interactive mapping, online geospatial analysis tools, and direct download access to various planning and natural resource data sets relating to coastal zone management."⁴⁷⁷

West Coast Governors Agreement on Ocean Health

In the summer of 2009, the West Coast Governors' Agreement on Ocean Health (WCGA) called for the development of a comprehensive seafloor map of the West Coast out to three nautical miles that includes bathymetry, benthic substrate, relief, geology, and habitat.⁴⁷⁸ The WCGA recognizes that each coastal state is at a different stage of seafloor mapping. According to the

⁴⁷¹ NC Ocean Policy Steering Committee. 2009. *Developing a Management Strategy for North Carolina's Coastal Ocean*. Submitted to the NC CRC by NC Coastal Resources Law, & NC DCM.

⁴⁷² Rhode Island Coastal Resources Management Council. (2010). *Rhode Island Ocean Special Area Management Plan*. Retrieved July 2010, http://www.crmc.ri.gov/samp_ocean.html.

⁴⁷³ Oregon Ocean Planning Information. 2009. *Status of Seafloor Mapping in Oregon*. Retrieved July 2010, <http://www.oregonocean.info/>.

⁴⁷⁴ NOAA News. *NOAA and Oregon State University Map Oregon's Seafloor*. August 12, 2009. Retrieved July 2010, http://www.noaanews.noaa.gov/stories2009/20090812_oregon.html.

⁴⁷⁵ Oregon Ocean Planning Information. 2009. *Status of Seafloor Mapping in Oregon*. Retrieved July 2010, <http://www.oregonocean.info/>.

⁴⁷⁶ Oregon Coastal Atlas. Retrieved July 2010, <http://www.coastalatlus.net/>.

⁴⁷⁷ Oregon Coastal Atlas.

⁴⁷⁸ West Coast Governors' Agreement on Ocean Health. 2009. Final Action Plan. Retrieved September 2010, <http://westcoastoceans.gov/teams/>.

Final Work Plan, the WCGA Seafloor Mapping Action Coordination Team will foster coordination of mapping, improve partnerships, and leverage resources to speed up progress and achieve mapping throughout the region.⁴⁷⁹ The states will aspire to set joint standards, agree on common products, define high priority areas, elevate and coordinate communication on mapping needs, and estimate a timeline for completion.⁴⁸⁰ The regional action plan's goal for completing the seafloor map of West Coast states' waters is by 2020.⁴⁸¹

Gulf of Maine

The Gulf of Maine Mapping Initiative (GoMMI) is a "US-Canadian partnership of government and nongovernmental organizations to conduct comprehensive seafloor imaging, mapping, and biological and geological surveys."⁴⁸² Currently, GoMMI is working to secure funding to map areas in the Gulf of Maine not yet mapped.⁴⁸³ The GoMMI website shows seafloor areas mapped using high resolution bathymetric surveys as of February 2009.

SC Ocean Mapping Workshop Outcomes

The SC Ocean Planning Work Group hosted a public workshop in April 2008 to bring together state, regional, and federal partners including government, universities, and resource agencies, along with representation from private industry and nongovernmental organizations. Goals of the workshop included compiling existing ocean resource maps and identifying future ocean mapping priorities. Presentations provided descriptions about existing ocean mapping efforts both regionally and in state waters. Group discussions followed and the workshop concluded with a list of mapping needs and priorities for the Ocean Planning Work Group to consider. Three overriding priorities for ocean mapping in South Carolina were identified and included the need for seafloor mapping, marine habitat classification and mapping, and characterization of sand resources (Appendix 1).

⁴⁷⁹ West Coast Governors' Agreement on Ocean Health: *Seafloor Mapping Action Coordination Team Final Work Plan*. May 2010.

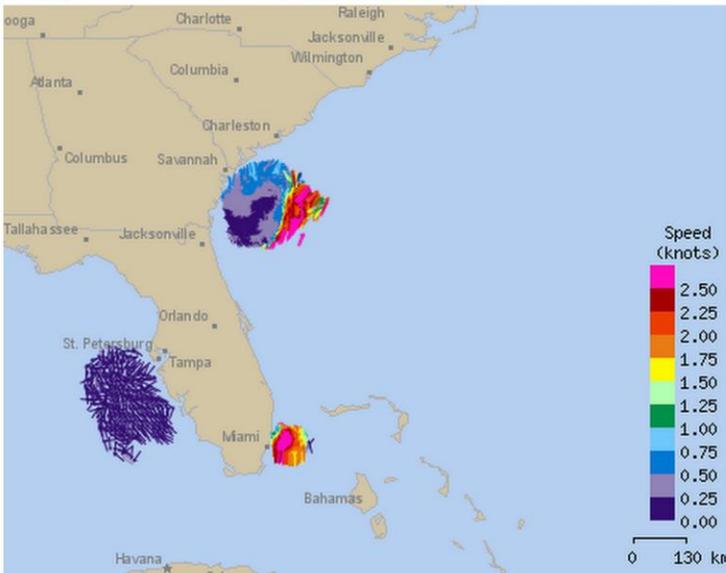
⁴⁸⁰ *Id.*

⁴⁸¹ *Id.*

⁴⁸² GoMMI, Retrieved September 2009, <http://www.gulfofmaine.org/gommi/>.

⁴⁸³ *Id.*

PAGE INTENTIONALLY LEFT BLANK



Ocean Monitoring in South Carolina

Photo credits:
(Top, left) Dwayne Porter, University of South Carolina
(Top, right) NOAA National Ocean Service
(Bottom, left) SECOORA - Surface Currents
(Bottom, center) NOAA National Ocean Service
(Bottom, right) Dwayne Porter, University of South Carolina

Chapter 8. Ocean Monitoring in South Carolina

Ocean monitoring programs involve the routine collection of information related to physical (e.g. temperature, tides, currents), chemical (e.g. salinity, dissolved oxygen, pollutants), and biological (marine mammals, fisheries, sea turtles) conditions at the ocean surface, in the water column, and on the seafloor.⁴⁸⁴ These data collection efforts can be beneficial in different ways, depending on their intended purposes and audiences. For example, programs that monitor invasive species introduction or harmful algal blooms may serve as “early warning systems” for changes in ecosystem conditions or threats to human health. Monitoring can provide important data to help distinguish human from natural influences on ocean conditions like water quality. Programs are also established to estimate trends in resource availability like fish stocks; and can assist in evaluating the effect of ocean regulations or policies on these resources. Finally, comprehensive monitoring programs can be beneficial in improving our general scientific understanding of ocean systems.

Beginning with the California Cooperative Ocean Fisheries (CalCOFI) monitoring program, established in response to the collapse of the California’s sardine fishery in 1949, ocean monitoring in the United States has evolved from a focus on individual species or resources to a broader understanding of ecosystem dynamics and long-term changes.⁴⁸⁵ Over the past decade, ocean monitoring has continued to advance in terms of technological capacities as well as the ability to synthesize data from a wide range of past and ongoing monitoring efforts. In its 2004 report, the US Commission on Ocean Policy identified ocean monitoring as a high priority, and found that monitoring was essential to evaluating the health of ocean and coastal ecosystems and detecting changes over time.⁴⁸⁶ The Commission also noted the growing importance of monitoring in relation to management actions to enable managers to make informed decisions and adapt as necessary.⁴⁸⁷

⁴⁸⁴ Davis, Braxton C. and Emily A. McDonald. Date Unknown. *CSO/SECOORA Meeting the Needs of Southeastern Coastal Resource Managers through Coastal Ocean Observing Systems*. Belle W. Baruch Institute for Marine and Coastal Sciences, University of South Carolina (SCSGC-T-06-001). p.11.

⁴⁸⁵ CalCOFI: California Cooperative Oceanic Fisheries Investigation. <http://www.calcofi.org/>.

⁴⁸⁶ US Commission on Ocean Policy. *An Ocean Blueprint for the 21st Century*. Final Report (See Chapter 15). Washington DC 2004 ISBN#0-9759462-0-X.

⁴⁸⁷ *Id.*

Ocean Monitoring in South Carolina

DHEC's beach water quality monitoring program alerts communities and beachgoers to poor water quality conditions in the surf zone.⁴⁸⁸ This program is among a limited number of examples of long-term ocean monitoring efforts specific to South Carolina. However, over the past decade, South Carolina and the southeast region have begun to make significant efforts to expand and improve ocean monitoring programs. In response to a 2004 "hypoxia" event in South Carolina, where severely reduced oxygen levels affected nearshore fisheries along the Myrtle Beach Grand Strand, a group of coastal managers and researchers came together to conduct studies related to that event, improve coordination of monitoring activities, and evaluate possible causes. And in 2007, the Southeast Coastal Ocean Observing Regional Association was formed to implement the US Integrated Ocean Observing System by building on existing sub-regional ocean observing systems in existence at the time (i.e., the former Carolinas Coastal Ocean Observing and Prediction System and Southeast Atlantic Coastal Ocean Observing System).

While focusing more narrowly on coastal rivers and estuaries, it is also important to consider the SC Estuarine and Coastal Assessment Program (SCECAP). SCECAP has played a key role in providing a picture of the overall health of South Carolina's estuaries and could serve to be an important model for ocean monitoring. Data collection includes measures of biological condition, water quality, and sediment quality at sites throughout the state's coastal zone, and results are integrated into an overall assessment of habitat condition by site.⁴⁸⁹ Habitat types targeted in SCECAP monitoring efforts include tidal creeks and open water areas occurring at the estuarine-coastal interface.⁴⁹⁰ SCECAP produces biannual "State of the Estuary" reports that summarize the overall condition of South Carolina's coastal system.⁴⁹¹

⁴⁸⁸ For Beach Monitoring, <http://www.DHEC.gov/environment/water/ow.htm>; and for Shellfish Monitoring Program, <http://www.DHEC.gov/environment/water/sfmonitoring.htm>.

⁴⁸⁹ SCECAP. Retrieved February 2010, <http://www.dnr.sc.gov/marine/scecap/ProgramSummary.htm>.

⁴⁹⁰ Bergquist, 2009; and SCECAP website.

⁴⁹¹ Id.

Monitoring Water Quality in Long Bay, South Carolina

In July 2004, a low oxygen (hypoxia) event triggered strandings and unusually high catches of flounder off of the Myrtle Beach Grand Strand.⁴⁹² This region receives stormwater discharges from beach and ocean outfalls and from a series of tidal “swashes” that convey much of the urban stormwater runoff from the cities of Myrtle Beach and North Myrtle Beach to nearshore ocean waters. During the event, water quality measurements taken from two piers showed that bottom water dissolved oxygen concentrations were less than 2 milligrams of oxygen per liter (O₂/L) - a point at which most marine organisms are severely stressed. Meteorological records revealed that the event occurred during a period of sustained southwesterly winds that can drive cold bottom waters toward the coastline.⁴⁹³

Following the 2004 event, a Long Bay Working Group was established with representation from various state and federal agencies and universities to investigate the possible causes of the 2004 event. Based on similar events that have occurred elsewhere, the group identified several possible factors.⁴⁹⁴ However, it quickly became clear to the group that there were insufficient data to prove or disprove any of the potential hypotheses. It could not be determined what “normal” oxygen levels were in the area, nor what roles various oceanographic, meteorological, and chemical processes may have played in the event. Over the next few years, several monitoring activities and studies were launched in the region, including real-time, continuous monitoring of water quality conditions from two fishing piers in Myrtle Beach; a physical oceanographic modeling study; a study of surface water inputs and chemical processes in the water column; an Autonomous Underwater Vehicle pilot study; an assessment of groundwater inputs; a flounder study; an analysis of existing data; the development of an interagency sampling response plan and website; and a fishing survey.⁴⁹⁵ These studies revealed that sustained periods of hypoxia did not occur again until the summer of 2009 when nearshore

⁴⁹² Long Bay Near-shore Water Quality Management. *Long Bay Hypoxia Study*.
<http://nautilus.baruch.sc.edu/longbay/index.html>.

⁴⁹³ Sanger, *et al.* 2010.

⁴⁹⁴ *Id.*

⁴⁹⁵ Dr. Denise Sanger, Assistant Director for Research and Planning, S.C. Sea Grant Consortium. SC Ocean Monitoring Workshop. *Long Bay Hypoxia Research*. Charleston, SC. April 27, 2009.
http://www.DHEC.gov/environment/ocrm/ocean_planning.htm.

waters actually lost all oxygen (anoxia) for a sustained period.⁴⁹⁶ Briefer periods of hypoxia were also observed during the summers of 2007, 2008, 2010 and 2011.

Results thus far indicate that physical oceanographic processes, including upwelling and thermal stratification in Long Bay, play a strong role in the development of nearshore hypoxia. The Long Bay Working Group has also suggested that terrestrial stormwater loadings (from swashes, beach discharge pipes, and ocean outfalls) can be trapped by onshore currents and contribute to hypoxic conditions. Once the wind direction changes and upwelling subsides, the water column can remix and restore oxygen concentrations.⁴⁹⁷

Additional clarity on these issues could have significant ramifications for future efforts to treat the region's urban stormwater runoff, since treatment facilities in the area have already required tens of millions of dollars of public financing to build, operate, and maintain. An increase in the occurrences of hypoxia could also have an impact on the tourism and/or recreational fishing industry in the region. It is important to note that the 2004 event might have gone unrecorded if not for a few researchers who happened to be collecting water samples from the local fishing piers at that time. Over the past several years, researchers have attempted to reconstruct the conditions at the time based on limited satellite imagery and water quality sensors that were in place then. The limited data in 2004 raised more questions that led to investments by a number of agencies in the placement of new ocean sensors and even the deployment of automated underwater vehicles (submersibles) in the region to help detect future events and better understand natural versus human-influenced changes in nearshore water quality.

Regional Ocean and Coastal Monitoring

SEAMAP and MARMAP

The Southeast Area Monitoring and Assessment Program - South Atlantic (SEAMAP-SA) and the Marine Resources Monitoring, Assessment, and Prediction (MARMAP) Program are regional fishery-independent monitoring programs funded by the National Marine Fisheries Service and conducted largely by SCDNR. MARMAP provides data on fish populations

⁴⁹⁶ Sanger *et al.* 2010.

⁴⁹⁷ *Id.*

associated with natural hard bottom reef communities, not associated with artificial reefs, through trawl and larval fish surveys throughout the South Atlantic Bight.⁴⁹⁸ The program has been in place since 1972 and data collected are used to determine distribution and abundance of reef fish throughout the region. A long-term database developed through MARMAP has assisted in establishing population trend data that have been useful in development of fishery regulations for sustaining the reef fish resources.⁴⁹⁹



Figure 17. Map from SEAMAP-SA depicting the strata sampled by the SEAMAP-SA Coastal Survey (strata not drawn to scale).

The SEAMAP-SA Shallow Water Trawl Survey collects data concerning marine species abundance, distribution and habitat through nearshore, shallow water trawl surveys, and is the only long-term trawl survey of nearshore habitat in the South Atlantic Bight (Figure 17).⁵⁰⁰ Ongoing data collection has occurred since 1983. Data including life history stages, relative abundance estimates, and spawning information are valuable for management, and recreational and commercial use of the species. SEAMAP and MARMAP support ongoing research efforts including stock assessment, genetics (species and stock identification), mapping of essential fish habitat, systematic disease studies, and toxicology.⁵⁰¹

Additional sampling of living marine resources off South Carolina includes seasonal collection of abundance and maturity data for white shrimp, and in-water, annual trawl sampling to determine size, health, and abundance of loggerhead sea turtles, routine nearshore longline

⁴⁹⁸ SC Department of Natural Resources Marine Resources Research Institute. MARMAP. Retrieved October 2011, <http://www.dnr.sc.gov/marine/mrri/MARMAP/MMhist.html>.

⁴⁹⁹ SC Department of Natural Resources Marine Resources Research Institute Southeast Area Monitoring and Assessment Program (SEAMAP). Retrieved 2009, <http://www.dnr.sc.gov/marine/mrri/SEAMAP/seamap.html>.

⁵⁰⁰ SCDNR MRRI. SEAMAP. Retrieved October 2011, <http://www.dnr.sc.gov/marine/mrri/SEAMAP/seamap.html>.

⁵⁰¹ For details, see <http://www.seamap.org/> and www.dnr.sc.gov/marine/mrri/MARMAP/marmap.html.

sampling for adult red drum and coastal sharks, and routine monitoring of offshore artificial reefs.⁵⁰²

Integrated Ocean Observing System and Southeastern Coastal Ocean Observing Regional Association

SECOORA is one of eleven Regional Associations established nationwide through the US Integrated Ocean Observing System® (IOOS). The IOOS program was developed during the 1990s and became formalized through congressional authorization in 2009.⁵⁰³ Through IOOS, federal agencies, academic partners, and the private sector have established a coordinated network of institutions and technologies to generate continuous data on coastal and ocean conditions.⁵⁰⁴ IOOS-based programs routinely collect real-time data and manage historical information through a network of buoys, ships, satellites, underwater vehicles, data management facilities, and other platforms. The data are intended for many purposes, including the detection and prediction of changes in ocean and coastal waters. Participating member institutions in the southeastern region have long been leaders in ocean data management activities, coastal current radar research, locally run buoy-based research systems, estuarine nutrient enrichment and harmful algal bloom (HAB) research, ocean-atmosphere modeling and wave research, and coastal inundation and flooding models.⁵⁰⁵ The value of IOOS operations in the Gulf of Mexico was recently demonstrated in responding to, tracking, and projecting the movement of oil following the Deep Water Horizon spill.

Ocean Monitoring in Other States

Historically, most ocean monitoring has generally been driven by national programs or funding and implemented at regional scales as described above. More recently, a few states have addressed certain management needs associated with ocean monitoring. For example, Massachusetts has established an Aquatic Invasive Species Program where citizen scientists are

⁵⁰² SCDNR MRRI. SEAMAP. Retrieved October 2011, <http://www.dnr.sc.gov/marine/mrri/SEAMAP/seamap.html>.

⁵⁰³ Integrated Coastal Ocean Observing System (ICOOS) Act of 2009 establishes statutory authority for the development of IOOS and mandates the establishment of a national integrated system of ocean, coastal, and Great Lakes observing systems coordinated at the federal level. Retrieved March 2011, <http://www.ioos.gov/about/governance/welcome.html>.

⁵⁰⁴ The US Integrated Ocean Observing System, <http://www.ioos.gov/>.

⁵⁰⁵ Southeast Coastal Ocean Observing Regional Association, <http://secoora.org/>; and <http://www.ioos.gov/regions/secoora.html>.

provided a protocol to monitor for aquatic invasive species.⁵⁰⁶ This information is entered into the Marine Invader Tracking and Information System, which is a web-based data management resource in development by Massachusetts Coastal Zone Management agency and MIT Sea Grant.⁵⁰⁷ In Florida, a Water Resources Monitoring Council was created in 2006 to advise the FL Department of Environmental Protection (FL DEP) in setting data and monitoring standards and to help integrate existing monitoring programs with expanded coastal and ocean monitoring to form a comprehensive monitoring program.⁵⁰⁸ A Monitoring-Coordination Action Plan was released in December 2008, which provided a strategy to integrate existing programs and guidance for new programs.⁵⁰⁹ FL DEP adopted the Action Plan for implementation in 2009.⁵¹⁰

SC Ocean Monitoring Workshop Outcomes

The SC Ocean Planning Work Group hosted a public workshop in April 2009 to bring together state, regional, and federal partners to discuss the future of ocean monitoring in South Carolina. The goals of the workshop were to foster information exchange, identify gaps and priorities for consideration by the OPWG, explore ways to improve coordination of efforts and data integration, and consider the implications of new technologies. Presentations by guest speakers provided descriptions of existing ocean observing and information management systems; and past and recent marine monitoring programs in South Carolina. Group discussions followed and the workshop concluded with discussion of potential recommendations for the OPWG to consider on this topic. Participant recommendations included expanded ocean monitoring efforts, improved partnerships, and increased and sustained funding (Appendix 1).

⁵⁰⁶ Massachusetts Office of Coastal Zone Management. Aquatic Invasive Species Program. Retrieved March 2011, <http://www.mass.gov/czm/invasives/monitor/mitis.htm>.

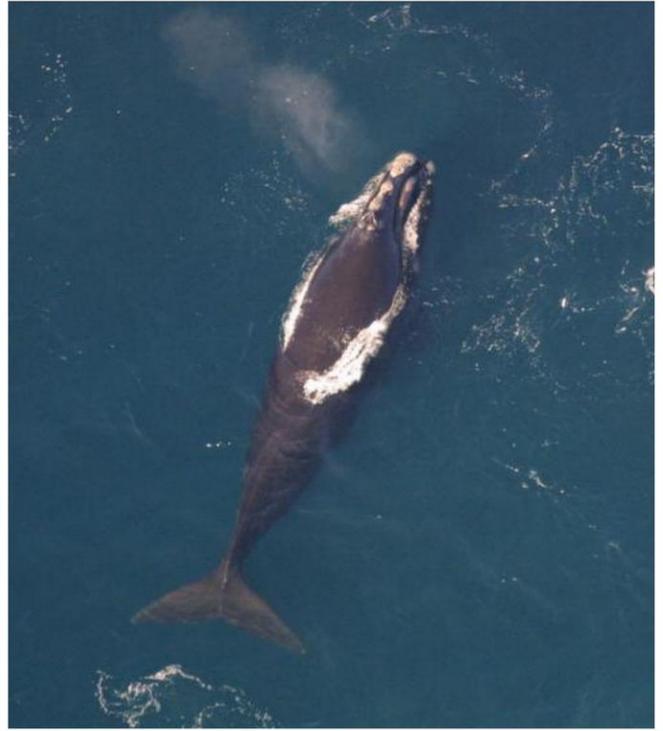
⁵⁰⁷ MIT Sea Grant Coastal Resources. Marine Invader Tracking and Information System. Retrieved March 2011, <http://massbay.mit.edu/mitis/>.

⁵⁰⁸ Florida Department of Environmental Protection. Florida Water Resources Monitoring Council. Retrieved July 2010, <http://www.dep.state.fl.us/coastal/WaterMonitoringCouncil/>.

⁵⁰⁹ Florida Water Resources Monitoring Council. *State of Florida Water Resources Monitoring: Monitoring-Coordination Action Plan*. FL Dept. of Environmental Protection. December 18, 2008. Retrieved July 2010, <http://www.dep.state.fl.us/coastal/WaterMonitoringCouncil/>

⁵¹⁰ Florida Department of Environmental Protection. *Response to Florida Water Resources Monitoring Council Monitoring-Coordination Action Plan*. February 25, 2009. Retrieved July 2010, <http://www.dep.state.fl.us/coastal/WaterMonitoringCouncil/files/DEAR.pdf>.

PAGE INTENTIONALLY LEFT BLANK



Emerging Frameworks for Ocean Management

Photo credits:
(Top, left) Amber Von Harten, SC Sea Grant Extension Program
(Top, right) NOAA Fisheries Service
(Bottom, left) NOAA National Ocean Service
(Center, right) Clemson University
(Bottom, right) DHEC-OCRM

Chapter 9. Emerging Frameworks for Ocean Management

Comprehensive Ocean Planning

At a number of recent interagency meetings and public workshops, an often-repeated recommendation has been the development of a comprehensive geospatial plan for the ocean that examines and sets policies for the siting of fixed facilities, use priorities, and resource protection. South Carolina currently does not have an ocean plan. Recommendations and comments made at the ocean planning workshops identified various components of an ocean plan as critically needed for South Carolina, including high resolution seafloor mapping, habitat classifications and inventory, data integration, public education, and early stakeholder engagement.⁵¹¹ Recent efforts by two different groups further strengthen the recommendations of the workshop participants: the Regulatory Task Force (RTF) for Coastal Clean Energy, which is a large group representing state and federal resource agencies, universities, private industry, and utility companies; and the SC Wind Energy Production Farms Feasibility Study Committee, which was created in response to a directive by the General Assembly to determine whether wind energy production is feasible for South Carolina.⁵¹²

In 2009, a Regulatory Task Force for Coastal Clean Energy was established through a 2008 grant to the South Carolina Energy Office and other state collaborators by the US Department of Energy.⁵¹³ The goal of the grant was to “identify and overcome existing barriers for coastal clean energy development” in South Carolina.⁵¹⁴ The purpose of the RTF was to foster a regulatory environment that is favorable to alternative energy development in state waters (e.g., wind, wave, and tidal energy).⁵¹⁵ In September 2009, the RTF released recommendations to be considered by the Legislative Study Committee for Wind Energy. The RTF recommended that South Carolina develop a “marine spatial plan” for its ocean waters, reasoning that such a comprehensive plan

⁵¹¹ See the SC Ocean Planning Work Group’s meeting notes for highlights and outcomes of ocean planning workshops. http://www.DHEC.gov/environment/ocrm/ocean_planning.htm.

⁵¹² SC Energy Office. Wind Energy Production Farms Feasibility Study Committee. Retrieved October 2011, <http://www.energy.sc.gov/index.aspx?m=6&t=123>.

⁵¹³ SC Energy Office. Regulatory Task Force for Coastal Clean Energy. Retrieved July 2010. <http://www.energy.sc.gov/index.aspx?m=6&t=85&h=904>.

⁵¹⁴ *Id.*

⁵¹⁵ *Id.*

would provide predictability in decision making and aid in the protection of ocean resources and existing ocean uses.⁵¹⁶

The SC Wind Energy Production Farms Feasibility Study Committee was created to develop recommendations regarding the feasibility of wind farms in South Carolina.⁵¹⁷ The study considered siting issues on land and offshore, which included economic and environmental impacts.⁵¹⁸ One of the 18 final recommendations released by the Committee in late 2009 stated:

*South Carolina should develop a marine spatial plan for its offshore coastal ocean waters through the SC Department of Health and Environmental Control to allow predictability in decision making and protection of existing ocean uses. Additionally, DHEC should actively engage in the CEQ Ocean Policy Task Force and solicit input from other relevant state agencies, federal agencies and stakeholders.*⁵¹⁹

The concept of Coastal and Marine Spatial Planning (CMSP) has been gaining support in the United States and has already been implemented in some form by a few northeastern and west coast states. A new framework for CMSP is now being developed at the regional and national levels under the final recommendations of the National Ocean Policy Task Force,⁵²⁰ which described CMSP as a priority objective.⁵²¹ The Task Force described the geographic scope for CMSP to include the Exclusive Economic Zone and Outer Continental Shelf and extending landward to the mean high water line to include inland bays and estuaries.⁵²² CMSP is defined in the National Ocean Policy (NOP) as follows:

CMSP is a comprehensive, adaptive, integrated, ecosystem-based, and transparent spatial planning process, based on sound science, for analyzing current and anticipated uses of ocean, coastal, and Great Lakes areas. CMSP identifies areas most suitable for various types or classes of activities in order to reduce conflicts among uses, reduce

⁵¹⁶ SC Regulatory Task Force for Coastal Clean Energy. 2009. *Recommendations to the Wind Energy Production Farms Feasibility Study Committee*.

⁵¹⁷ South Carolina Act 318 of 2008.

⁵¹⁸ SC Wind Production Farms Feasibility Study Committee. 2010. *South Carolina's Role in Offshore Wind Energy Development*. Retrieved September 2010.
[http://www.energy.sc.gov/publications/Wind%20Energy%20Production%20Farms%20Feasibility%20Study%20Committee%20Final%20Report%2012-09%20\(2\).pdf](http://www.energy.sc.gov/publications/Wind%20Energy%20Production%20Farms%20Feasibility%20Study%20Committee%20Final%20Report%2012-09%20(2).pdf).

⁵¹⁹ *Id.* p. 3 & 25.

⁵²⁰ The White House Council on Environmental Quality. 2010. *Final Recommendations of the Interagency Ocean Policy Task Force*. http://www.whitehouse.gov/files/documents/OPTF_FinalRecs.pdf.

⁵²¹ *Id.* p. 41.

⁵²² *Id.* p. 49.

*environmental impacts, facilitate compatible uses, and preserve critical ecosystem services to meet economic, environmental, security, and social objectives. In practical terms, CMSP provides a public policy process for society to better determine how the ocean, coasts, and Great Lakes are sustainably used and protected - now and for future generations.*⁵²³

The NOP envisions the Plans to be regional in scope, to be developed cooperatively among all levels of government, and to include substantial stakeholder and public input.⁵²⁴ Through this process, it is hoped that CMSP will guide space allocation decisions and allow for reduced use conflicts and cumulative impacts.⁵²⁵

Coastal and Ocean Planning in the South Atlantic Region

Ocean mapping activities have been an important element of past state and regional environmental studies. One example, a habitat-based “eco-regional assessment” led by The Nature Conservancy, resulted in a series of maps outlining targeted conservation areas to represent the region’s biodiversity.⁵²⁶ Details about this “Ecoregional Assessment for the Carolinas” are described in Chapter 7 of this report.

The new Governors South Atlantic Alliance (GSAA) Action Plan (discussed in Chapter 2) also included a recommendation for coastal and marine spatial planning at a regional scale.⁵²⁷ Under its Healthy Ecosystems Priority Issue Area, the GSAA calls for a joint federal and state marine spatial plan that “identifies the location of key coastal and marine resources and activities (e.g., commercial and recreational fishing areas, shipping lanes, military areas, energy development areas, sand resource areas used for beach nourishment) for incorporation into multi-use management decisions.”⁵²⁸

⁵²³ *Id.* p. 41.

⁵²⁴ *Id.* p. 51.

⁵²⁵ *Id.*

⁵²⁶ Mary Conley, The Nature Conservancy. “SC Ecoregional Assessment / Marine Mapping Strategies,” SC Ocean Mapping Workshop. DHEC-Ocean & Coastal Resource Management Agency, NOAA Coastal Services Center. April 24, 2008.

⁵²⁷ Governors’ South Atlantic Alliance Action Plan. 2010. <http://www.southatlanticalliance.org/>.

⁵²⁸ *Id.*

Coastal and Marine Spatial Planning in Other Coastal States

Massachusetts

In 2008, the Massachusetts Oceans Act required that spatially explicit policies and regulatory approaches be applied through its Ocean Management Plan, including regulations for implementation.⁵²⁹ An 18-month process ensued and included the following steps: data mining, collecting public input (18 listening sessions were held around the state), developing a planning framework, developing and refining a work plan, and formal review of that plan.⁵³⁰ Six agency workgroups were formed to acquire and analyze existing data and information regarding habitat, fisheries, transportation, navigation, infrastructure, sediment, recreation and cultural services, and renewable energy.⁵³¹ The state uses the Massachusetts Ocean Resources Information Systems to display spatial data online pertaining to the coastal zone, and is working with the NOAA Coastal Services Center in Charleston, SC to incorporate additional data layers.⁵³²

Rhode Island

A RI Ocean Special Area Management Plan (SAMP) was led by the state's Coastal Resources Management Council (CRMC) and was comprised of a management team, Ocean SAMP subcommittees, science advisory task force, and legal advisory task force.⁵³³ The development of the Ocean SAMP was a two-year process that included scientific research and stakeholder involvement, and will serve as a regulatory, planning, and adaptive management tool for the CRMC when managing the state's ocean resources.⁵³⁴ Specific actions taken in the development of the SAMP included mapping existing uses and critical zones such as transportation corridors, military use, and essential habitats; establishing advisory committees to engage the public; drafting a zoning map and regulatory standards to guide offshore developments (e.g., renewable energy infrastructure) and to protect resources.⁵³⁵ Data development efforts, including seafloor

⁵²⁹ MA Oceans Act of 2008. Retrieved September 2010,

http://www.mass.gov/czm/oceanmanagement/oceans_act/index.htm.

⁵³⁰ Massachusetts Office of Energy and Environmental Affairs. (2009). *Ocean Management Plan*. Retrieved August 2010 <http://www.mass.gov/?pageID=eoeahomepage&L=1&L0=Home&sid=Eoeea>.

⁵³¹ *Id.*

⁵³² MORIS. <http://www.mass.gov/czm/mapping/index.htm>.

⁵³³ Rhode Island Coastal Resources Management Council. *Rhode Island Ocean Special Area Management Plan*. Retrieved September 2010, http://www.crmc.ri.gov/samp_ocean.html.

⁵³⁴ RI Ocean SAMP 2010.

⁵³⁵ NOAA Special Area Management Plans Case Studies. Retrieved December 2010, http://coastalmanagement.noaa.gov/issues/special_casestudies.html; and Rhode Island Ocean SAMP, 2010. http://www.crmc.ri.gov/samp_ocean.html.

mapping, bird and marine mammal observations, and fishery data have been led by the University of Rhode Island.⁵³⁶ In 2011, the Ocean SAMP was adopted into the RI Coastal Program and approved by NOAA.

West Coast

The West Coast Governors' Agreement (WCGA) Action Plan recognized that each of the west coast states was at a different stage of seafloor mapping. Details on mapping efforts are provided in Chapter 7.⁵³⁷ A WCGA Seafloor Mapping Action Coordination Team was created to foster coordination of mapping along the West Coast and to try to leverage resources to accelerate the process of mapping throughout the region.⁵³⁸ The Mapping Coordination Team released its Final Work Plan in May 2010, which outlined essential elements of a regional mapping effort including data collection and processing; data management; product development; and communication, education and outreach.⁵³⁹

Ocean Leasing

The SC Regulatory Task Force (RTF) for Coastal Clean Energy also recommended that South Carolina develop a comprehensive leasing framework for submerged lands.⁵⁴⁰ The RTF asserts that a leasing framework would provide for a more comprehensive project evaluation, minimize use conflicts, reduce risks to the state and to the user, and provide more certainty for the state and investors.⁵⁴¹ In early 2010, the RTF established a subgroup to review ocean leasing options for South Carolina. Details regarding this effort are outlined in Chapter 4 of this report.

In 2009, the SC Wind Energy Production Farms Feasibility Study Committee's final recommendations reinforced the RTF's recommendation for the establishment of a leasing

⁵³⁶ *Id.*

⁵³⁷ West Coast Governors' Agreement on Ocean Health. 2009. Final Action Plan. Retrieved September 2010, <http://westcoastoceans.gov/teams/>.

⁵³⁸ Section 6.3 of the West Coast Governors' Agreement on Ocean Health: Seafloor Mapping Action Coordination Team Final Work Plan. May 2010.

⁵³⁹ *Id.*

⁵⁴⁰ SC Regulatory Task Force for Coastal Clean Energy. 2009. *Recommendations to the Wind Energy Production Farms Feasibility Study Committee*. December 2009.

⁵⁴¹ *Id.*

framework for offshore coastal ocean activities in state waters.⁵⁴² Finding that the current permitting framework has limitations with respect to offshore activities, the Study Committee explained that a comprehensive leasing program would provide a broader review of potential use conflicts and environmental issues; long-term assurance to investors; and compensation back to the state for the use of public resources.⁵⁴³

South Carolina does not currently have a comprehensive leasing program for submerged lands. However, there are leasing-type programs in place related to aquaculture practices, including shellfish harvesting.⁵⁴⁴ The SCDNR issues permits based on the type of shellfish harvesting being practiced (e.g., public grounds, state grounds, and commercial). There are currently no ocean aquaculture facilities off of South Carolina's coast, but interests in offshore facilities beyond state waters may be on the rise.⁵⁴⁵ In addition to shellfish permitting/licensing, state law designates the SC Budget and Control Board (BCB) as the authority for leasing all state lands to persons for the purpose of drilling and producing oil and gas.⁵⁴⁶ The same law designates the SC Department of Health and Environmental Control as the exclusive agent for the BCB in selecting lands to be leased, administering competitive bidding for leases, and administering the leases. However, no formal leasing program has been developed by DHEC to date, and the present authority only applies to leasing for oil and gas-related development activities.

The leasing of submerged lands in federal waters (3-200 nm) is administered by the Department of Interior's Bureau of Ocean Energy Management. The Outer Continental Shelf Lands Act (OCSLA) of 1953, as amended, empowers the Secretary of Interior to grant leases for mineral exploration and development of the outer continental shelf (OCS), including renewable energy leases, easements, and rights-of-way.⁵⁴⁷ The Submerged Lands Act (SLA) returned to the states

⁵⁴² SC Wind Production Farms Feasibility Study Committee. 2010. *South Carolina's Role in Offshore Wind Energy Development*. Retrieved September 2010, <http://www.energy.sc.gov/index.aspx?m=6&t=123>.

⁵⁴³ *Id.*

⁵⁴⁴ See Marine Resources Act, S.C. Code Ann. §§ 50-5-10, *et seq* (2010).

⁵⁴⁵ Center for the Study Marine Policy University of Delaware. 2005. *Development of a Policy Framework for Offshore Marine Aquaculture in the 3-200 Mile U.S. Ocean Zone*.

⁵⁴⁶ S.C. Code Ann. § 48-43-390(A) (2010).

⁵⁴⁷ 43 U.S.C. §§ 1331 – 1356 (2010).

title and ownership of submerged lands and resources out to three nautical miles.⁵⁴⁸ States are responsible for administering any leasing programs for submerged lands in state waters.

Ocean Leasing Frameworks in Other Coastal States

Most Gulf and southeastern states operate some form of submerged lands leasing programs.⁵⁴⁹ Typical activities where leasing applies include marinas (GA, FL, NC, VA), aquaculture (MS, TX, AL, NC), piers and docks (FL, MS, NC) and shellfish harvesting (FL, GA, VA, NC).⁵⁵⁰ The Texas General Land Office leases state land, including submerged lands out to 10.3 miles from shore, for a variety of purposes, including oil and gas production, commercial development, and sustainable energy development.⁵⁵¹

Leasing fee systems vary among states from flat fees to per square foot, and revenues generated depend on use and total area.⁵⁵² Revenue distribution varies by state. For example, Texas directs oil and gas revenues to education funds.⁵⁵³ North Carolina's leasing revenue supports the Division of Coastal Management's submerged lands leasing program.⁵⁵⁴ Virginia's royalties support the Marine Habitat and Waterways Improvement Fund via the state treasury.⁵⁵⁵

The Massachusetts Public Waterfront Act allows for leasing of tidelands and creates a licensing program "to preserve and protect the rights of the public, and to guarantee that private uses of tidelands and waterways serve a proper public purpose."⁵⁵⁶ The corresponding regulations contain provisions for "rent" in the form of occupation fees.⁵⁵⁷ The Massachusetts Oceans Act

⁵⁴⁸ 43 U.S.C. § 1312 (2010).

⁵⁴⁹ Berrio, Jessica. *Marine Leasing of South Carolina's Coastal Submerged Lands: Options and Considerations for Commercial and Conservation Strategies*. (College of Charleston Masters in Env'tl Science Thesis Paper, 2007) (on file with author).

⁵⁵⁰ *Id.*

⁵⁵¹ Texas General Lands Office. Leasing and Easements. Retrieved September 2010, <http://www.glo.texas.gov/what-we-do/state-lands/leasing-and-easements/index.html>.

⁵⁵² Berrio, 2007.

⁵⁵³ Texas General Lands Office, 2010.

⁵⁵⁴ Berrio, 2007.

⁵⁵⁵ Berrio, 2007.

⁵⁵⁶ M.G.L. c. 91.

⁵⁵⁷ B. Carlisle, MA Office of Coastal Zone Management. Offshore Wind Energy Workshop, Charleston SC, March 24, 2010. Retrieved December 2010, http://www.DHEC.gov/environment/ocrm/ocean_planning.htm#032510.

requires an ocean development fee with fifty percent going to “host” communities and an annual payment of a certain percentage of production over the life of a commercial scale lease.⁵⁵⁸

⁵⁵⁸ Carlisle, 2010.

Chapter 10. Conclusions

The following represent the Ocean Planning Work Group's recommendations for consideration by South Carolina's leaders and ocean resource managers. These recommendations are based on the research compiled for this report, public input received through a series of topic-oriented public workshops, and the solicitation of public comments on this report.

Ocean Management

1-1 Develop a South Carolina Ocean Action Plan to ensure the sustainable use of our ocean resources.

A wide range of important economic and national security-related activities occur in South Carolina's ocean waters, including military operations, port and vessel traffic, recreational and commercial fishing, and dredged material disposal. Newly emerging and expanding ocean activities, such as increased interest in wind energy and sand extraction for beach renourishment projects, have the potential to contribute to the state's economic and social well-being in the coming decades.

In order to ensure these activities are conducted in a sustainable, beneficial manner, the Ocean Planning Work Group recommends the development of a South Carolina Ocean Action Plan. This Action Plan will create a long-term vision for the state regarding ocean use and resource management including increased business activities, and provide a focused framework for implementation. By initiating an Ocean Action Plan, the state will be able to identify priorities for ocean resource use in the future; establish goals and objectives; design specific implementation steps with expected outcomes; identify funding opportunities and budget recommendations; and detail partner agency roles for implementation. Finally, the plan should review existing law and regulations and recommend any new legislation or policy amendments necessary to implement objectives of the plan.

Development of the SC Ocean Action Plan should be accomplished through an integrated, transparent approach that involves the public and stakeholders as described in Recommendation 1-2. Recommendations outlined in this report by the Ocean Planning Work Group should be considered for incorporation into the plan.

1-2 Coordinate with stakeholders, elected officials, and the public on ocean management issues to educate and gain input regarding preferred ocean uses.

South Carolina resource agencies and extension programs should engage a broad range of stakeholders and the public in a coordinated approach to inform decisions about how public ocean resources will be used in the future. Groups such as fishermen, recreation and tourism interests, coastal counties and municipalities, environmental organizations, port and commercial industry interests, emergency preparedness officials, Native American tribes, and any other group with interest in ocean resources should have significant involvement in ocean planning activities.

Similarly, federal agency and regional partnerships, such as the South Atlantic Fisheries Management Council and the Governor's South Atlantic Alliance, that are involved in ocean management and sustainability efforts should also be targeted for engagement. These federal and regional partners can provide beneficial collaboration through support for mapping and assessment efforts, streamlining of regulatory processes, consideration of interstate use issues, and shared stakeholder bases.

As new ocean activities emerge and existing ones grow, it will be important to educate South Carolina's residents and visitors on the importance of balancing resource protection with new and expanding ocean industries. Greater involvement by the public in the ocean planning process ensures that a broader range of concerns and issues are evaluated.

Living Marine Resources and Habitats

2-1 Reduce use conflicts and impacts to living marine resources from new and expanding ocean activities.

As South Carolina enters a new era of ocean activity including ocean energy, continued or expanded sand extraction for beach renourishment, marine aquaculture, and new or expanded military operations, the potential for conflicts among different ocean user groups will increase. Management decisions must consider potential impacts to living marine resources and habitats, and impacts on the important tourism industry and recreational and commercial fishers who depend on these resources and contribute significantly to the state's economy.

Expanding upon existing state and regional efforts, South Carolina should identify and map current and potential ocean uses along with existing ocean resources as described in Recommendation 6-1. This information will allow coastal resource managers to adequately evaluate the potential for impact to living resources from new activities and assist, if necessary, in developing specific policies and standards to reduce conflicts. Compatible activities can be targeted for co-location in an effort to share benefits, reduce environmental impacts, and maximize economic gains.

Opportunities to enhance, maintain, or restore traditional working waterfronts and public access for recreational and commercial fishers should be considered a priority.

Ocean Energy

3-1 Facilitate offshore wind energy development in South Carolina.

Many nongovernmental organizations, state agencies, industry, and businesses in South Carolina have been involved in various initiatives to evaluate the feasibility of wind energy development in ocean waters and the potential economic benefits of this activity for the state. Research has shown that a substantial wind energy resource exists off of South Carolina's coast. This new ocean activity can lead to new jobs in manufacturing, installation and operations, as well as increasing the state's economic output, annual disposable income, and tax base.

The Ocean Planning Work Group supports the recent recommendation of the Wind Energy Production Farms Feasibility Study Committee to establish a clean energy portfolio standard for South Carolina with a certain target generation capacity from offshore wind. Agencies and organizations should seek opportunities to educate local and state officials and the public on the economic benefits of offshore wind energy. Agencies and organizations should also continue to collaborate in efforts to identify onshore and offshore infrastructure needs while seeking to minimize potential impacts and use conflicts associated with siting wind energy development infrastructure.

South Carolina should continue to invest in efforts initiated by the Regulatory Task Force for Coastal Clean Energy to streamline regulatory frameworks through guidelines and policies for

siting infrastructure and the integration of policies among agencies. SCDHEC should also identify opportunities through the state's coastal program policies to provide greater influence over federal agency activities and permits in federal waters. In addition, state officials should collaborate with federal agencies responsible for permitting infrastructure in federal waters through a joint task force for energy siting.

3-2 Establish a leasing framework for state ocean waters.

The Ocean Planning Work Group also supports the recent recommendation of the Wind Energy Production Farms Feasibility Study Committee to establish a leasing framework for offshore ocean activities within state waters. A leasing program would streamline the regulatory process for siting infrastructure offshore; reduce costs to industry by providing clarity of the regulatory process; and provide predictability of decision-making. A leasing framework should encourage co-location of compatible activities to minimize the cumulative footprint and provide mutual benefits.

For the public, a lease framework would protect public trust rights by ensuring public access to ocean areas while providing exclusivity for operators of proposed activities. Lease frameworks would also protect the public interest by identifying performance expectations, possibly requiring compensation for the use of public trust lands, and requiring financial assurance to cover removal at decommissioning. For the operator of the proposed facility, a lease framework would provide adequate property rights to protect private investments and would ensure the security of deployed facilities and equipment against criminal activities like trespassing, theft, or vandalism. Operators would benefit from having clarification on the nature of the governmental authorization received by the operator, including ownership, lease rights, or other form of conveyance.

State leaders should consider expanding upon the already established leasing framework under existing authorities pertaining to oil and gas leases granted to SCDHEC by the Budget and Control Board.

Sand Resources

4-1 Develop a Regional Sediment Management Plan for South Carolina.

Coastal erosion is a known ongoing threat to the coast, and South Carolina has consistently supported beach nourishment as a way to maintain its valuable beach resource. South Carolina's sand sources are not infinite, making it extremely important to manage this resource to ensure a lasting dry beach environment. A proactive, regional planning approach is recommended to address long-term beach renourishment needs, as beach communities continue to compete for sand.

State and local resource managers should work together to inventory and characterize sand resources and anticipate the future demands for renourishment. A State Regional Sediment Management (RSM) Plan should identify sediment sources and quantities and map their locations on a statewide or sub-regional basis. Sand resources should be characterized to determine their compatibility for potential beach quality material. A RSM Plan should establish how agencies will coordinate implementation of the plan and develop guidance to ensure the beneficial re-use of dredged material as well as the identification of sand deposits for periodic mining. Opportunities for public/private partnerships should be sought to leverage staff and funding resources to develop and implement a plan. The RSM should also include provisions for monitoring and restoration, as needed, for mined areas.

Marine Aquaculture

5-1 Encourage sustainable coastal and ocean aquaculture development in South Carolina.

Aquaculture activity in South Carolina has expanded in the last twenty years, yet seafood production in the state is far below consumer demand. Ocean aquaculture is a potentially effective way to expand the state's seafood production.

State leaders should consider establishing a state ocean policy that includes support for ocean aquaculture. Ocean aquaculture could bring new jobs to the South Carolina's coast, expand the state's seafood production, and provide opportunities for the revitalization of working waterfronts.

Efforts should be made to coordinate recommended mapping activities described in 6-1 to address concerns over the impacts of potential ocean aquaculture activities on existing uses and to determine appropriate siting of infrastructure. Due to the lack of a regulatory framework for ocean aquaculture, state leaders should consider developing a streamlined process for permitting by utilizing the Aquaculture Permitting Assistance Office within the Department of Agriculture, and/or evaluating existing law (the SC Aquaculture Act), which already instructs state agencies to establish a “one-stop shop” for aquaculture permitting. Finally, the ocean aquaculture industry should be considered in the development of a leasing framework for state ocean waters to assist in streamlining the permitting process, protect public trust issues, and provide rights and security to industry investors.

Ocean Mapping

6-1 Invest in seafloor and ocean use mapping in South Carolina’s state ocean waters.

Mapping along South Carolina’s coast provides valuable understanding of the geology, resources and natural habitats of the seafloor. Unmapped areas and undocumented ocean uses present challenges to resource managers who rely on current information to make important decisions regarding future impacts and resource allocations. State and federal partner agencies should consider investing in ocean mapping to assist with the implementation of many of the recommendations of this report, including identification of existing ocean uses, jurisdictions, important fishing and habitat areas, and sand sources. Seafloor and ocean use maps will play a critical role in decision making regarding potential sites for wind farms, aquaculture operations, and other uses; protecting existing ocean uses like commercial and recreational fisheries; and supporting commerce, transportation, and other ocean ecosystem services valued by South Carolina residents and visitors.

Ocean Monitoring

7-1 Improve ocean monitoring information exchange and investment.

As illustrated by the recent hypoxia events in Myrtle Beach (described in Chapter 8), ocean data collection efforts can be important in establishing “early warning systems” for changes in ecosystem conditions or threats to human health. Such ongoing information is critical to protect

coastal tourism (e.g. consider impacts to tourism in the Gulf following the Deep Water Horizon accident in summer of 2011). Monitoring is important in distinguishing human from natural influences on ocean conditions, estimating trends in resource availability, and evaluating the outcomes of ocean policies and programs. Comprehensive monitoring programs can improve the general scientific understanding of ocean systems.

South Carolina should explore opportunities for partnerships to develop and maintain a web portal for ocean and coastal monitoring data, assets, and archives. Interagency coordination of ongoing monitoring efforts would result in greater efficiencies by improving data collection and integration and by creating opportunities to leverage equipment and staffing resources. Increased or sustained funding for ocean monitoring activities should be sought to maintain existing equipment and expand geographic coverage to address information needs on emerging ocean uses.

PAGE INTENTIONALLY LEFT BLANK

Appendix 1: Ocean Planning Work Group Workshops

Living Marine Resources and Habitats Workshop Outcomes (Chapter 3)

Goals

- Gain understanding of potential conflicts between living marine resources and new / expanding ocean activities.
- Consider how a state ocean plan could guide decisions such as preferred siting or use standards.
- Consider how to incorporate user knowledge to fill data gaps.

Discussion Questions:

1. What are the greatest potentials for future conflicts between SC fisheries and new or expanding ocean activities?
2. What are the greatest potentials for impacts to endangered/ threatened species from new or expanding ocean activities?
3. To what extent should the state attempt to develop an ocean plan to guide decisions related to offshore activities?
4. In creating such a plan, data limitations would be significant. How could the state incorporate “user knowledge” with respect to important fishing activities, habitats, conflicts, and threatened species?

Process:

The workshop brought together 55 state and federal agency representatives, researchers, NGOs, commercial fishermen, local governments, among others. Presentations described the status and management of South Carolina’s living marine resources (e.g., fisheries, seabirds, sea turtles, and mammals); and the potential impacts they may face from emerging and expanding ocean activities. A panel-audience discussion followed, which provided an opportunity for workshop participants to ask questions and offer comments. The panel consisted of representatives from SCDNR; SAFMC; NOAA CCEHBR; and Clemson University.

Partners: SCDHEC-OCRM, SCDNR, and SC Sea Grant.

Recommendations included:

Recommendations to Reduce Future Use Conflicts:

- Regardless of the type of activity, the siting of any fixed structures should take into account not only direct impacts to fishing activities but also vessel transit that may increase transit times for a variety of commercial activities.
- For fixed structures and ancillary seafloor cables, a primary conflict will be with shrimp trawlers, which may be excluded from these areas by default. Shrimp trawling can also be impacted by sand extraction, artificial reefs, etc. There is a need to develop models or “build-out” scenarios for the range of activities that can impact trawling areas, to assist in identifying potential long-term impacts to commercial shrimping and other commercial and recreational interests.
- State goals and policies should encourage recreational and commercial fishing, and otherwise compatible activities and vessel traffic, to be co-located with new offshore facilities – use as opportunity for co-benefits.

- State and local governments should seek opportunities to enhance, maintain, and/or restore waterfront access (“working waterfronts”) as part of any onshore changes related to new offshore activities or developments.

Recommendations to Reduce Resource Impacts:

- Design considerations should include the potential for hurricanes and other natural or manmade hazards impacts, and should consider color, lighting, magnetism, and other potential impacts on marine life, including behavioral impacts;
- The state should map and prioritize “hard bottom” habitats, migratory routes, ecological pathways (in association with life history stages), and other sensitive resource areas for use in siting decisions;
- The state should coordinate, integrate, and make new investments in marine noise-related research, monitoring, and mitigation;
- Significant research is needed for “flying animals” – what is out there, when, where is it, and how is it behaving (including shore birds, sea birds, butterflies, bats, etc.)
- The state should ensure that sand extraction and coastal engineering activities do not negatively impact nearshore habitats or sand resources, including any alterations that might reduce the stability of emergent banks that serve as key nursery and feeding habitats for shore birds; and that dredging activities limit impacts to endangered and threatened species;
- State and local governments should recognize and consider vessel traffic due to increasing shipping, recreational, and cruise ship activities; especially with respect to impacts on marine mammals, fisheries, and water quality concerns and given the potential for significant industrial traffic for any new offshore facilities.

How should SC move forward with ocean planning?

- Sound ocean planning and decisionmaking will require new investments in ocean research, mapping, monitoring, and capacity-building, as is evidenced by the lessons learned in other coastal states like Massachusetts, Rhode Island, California, and Washington; these investments are not overwhelming given the importance of ocean resources in South Carolina, but need to be long-term to allow for adaptive management (e.g. ocean trust fund? or revenue from offshore leasing program?)
- As state and local governments engage in ocean planning, stakeholder engagement should be considered just as carefully as are data frameworks, research, and mapping strategies;
- State and local officials and scientists should leverage user and local knowledge by establishing advisory groups and holding workshops on initial mapping efforts;
- Before engaging in marine spatial planning, a clear state mandate and political support is needed for the intended result. It will be important to engage elected officials early and often, and to learn from other state plans, policies, and standards, as well as from international examples;
- A state-scale marine spatial plan should consider and address regional–scale ecological and social contexts;
- Initially, a state plan should address most immediate, significant issues (energy development and sand extraction), and should evolve into multiple-use planning once foundation is established.

Ocean Energy Workshop Outcomes (Chapter 4)

Goals

- To consider onshore planning, infrastructure needs and electricity grid issues.
- To learn from experiences and perspectives of other states.

Discussion Questions:

1. What existing / new facilities are needed for construction / transport of energy infrastructure?
2. What onshore uses and use conflicts should be identified and addressed?
3. How should state and local planners, businesses, and resource managers engage citizens and stakeholders on these issues?
4. What additional recommendations should be considered by the SC Regulatory Task Force (RTF), Ocean Planning Work Group, MMS Task Force, and other groups?

Process:

The workshop brought together 79 state and federal partners; ocean and coastal agency representatives from other states; military; private sector; NGOs; and utility companies, among others. Presentations were given and included descriptions about the grid and its influence on ocean wind energy development and siting; infrastructure needs to accommodate offshore energy development (wind and/or natural gas); and potential impacts to onshore and nearshore environments. A panel-audience discussion followed with workshop participants. The panel included representatives from RI's CZM Program; SC's Clemson University Restoration Institute; Texas General Lands Office; Santee Cooper; SCANA; and SCDNR.

Partners: SCDHEC-OCRM, SC Energy Office, and SCDNR, SC Sea Grant, and others.

Potential Problems Identified:

- Lack of specific legislative support for ocean planning, leasing, and wind energy development
- No Renewable Portfolio Standard or state goals

Recommendations included:

Key Themes from Panel/Audience Discussion:

Onshore Facilities (existing and new) Needed?

- Port / navigational requirements (e.g. Ability of ports to support construction activity associated with offshore projects)
- Grid / transmission infrastructure
- Manufacturing/Research/Construction facilities
- Operations and Maintenance
- Workforce training but not before demand
- SC at advantage because ocean is accessible; ports accessible
- Construction Vessels (availability, where will they be stored, etc.)
- Skippers needed for cabling (opportunities for fishermen in slower fishing industry)
- Cranes to match size of turbines

Onshore Uses, Use Conflicts and How to Address:

- Need comprehensive geospatial planning

- Impacts on / enhancement of tourism opportunities;
- Onshore / beachfront military operations;
- Residential / resort developments;
- Avoid/mitigate impacts to viewsheds, beaches, wetlands, endangered species, sensitive habitats, protected and conservation properties.

How to engage stakeholders:

- Coastal and Marine Spatial Planning
- Regional forums and public hearings
- Work with closely on environmental concerns
- Engage stakeholders early with clear process
- Educate government and public early
- Viewshed impacts – build public acceptance (e.g., start with a small scale project)
- Create maps, give public something to respond to.

Additional Recommendations:

- Legislation, Policies, Regulations, Incentives?
 - Need state leadership on issue
 - Need State Renewable Portfolio Standard / Goal
 - Need fiscal and regulatory framework; and a state mandate.
 - Learn from other states
- Leasing Framework (transmission corridors)
- Planning and Public participation

Regional Sediment Management Workshop Outcomes (Chapter 5)

Goals

- Gain an understanding of Regional Sediment Management (RSM);
- Consider implications for South Carolina and how the state should proceed; and
- Identify data, information, and planning priorities.

Discussion Questions:

1. What are the appropriate elements of a state-wide RSM plan?
2. What process should be used to develop subregional plans? (models)
3. What are the key data and information gaps?
4. What additional capacities are needed? (Staff? Data? \$\$?)
5. Are there opportunities for public/private/NGO partnerships?

Process:

The workshop brought together 38 stakeholders from the private industry and public (local, state, federal governments, academic, and nonprofits) sectors. Presentations were held in the morning, which included background information from the US Army Corps of Engineers on their federal RSM program; NC's experience in developing a state RSM framework; and the perspectives of private industry and local governments. In addition, the Work Group and workshop participants heard about past data collection and analysis efforts that provide models to consider when

developing a state RSM plan. During the afternoon session, workshop participants divided into groups to consider discussion questions regarding the potential for a Regional Sediment Management Plan in South Carolina, data needs, and how the state should move forward.

Partners:

SCDHEC-OCRM, US Army Corps of Engineers, SCDNR Marine Resources Division

Recommendations included:

Elements of RSM Plan:

- Sand resources and borrow sites identified
- Data collection (& monitoring), coordination, and management protocols and standards; synthesis of existing data
- Analyses that include erosion rates, sea level rise, demand issues; economic studies; sediment budgets; and data
- Defined Sub-Regions
- Preliminary Policy
 - use conflicts, e.g., offshore wind (Identify shared resources);
 - Beneficial Re-Use;
 - Transboundary issues (e.g. NC);
 - Preferred borrow areas (broadly, e.g., beyond 1 mile or CBRA units);
 - Streamlined permitting and EIS (e.g., regional programmatic EIS in NC – do the thinking ahead of time)
- Identification of long-term funding; participation mechanisms, and framework for subregional planning (uniform method and process should be laid out in state plan) – including broader strategies than renourishment.
- Discussion of federal and state coordination

RSM process:

- Local Comprehensive Beach Management Plans (should include preplanning and consideration of future renourishment needs and borrow sites to help local governments think ahead)
- Could SAMPs be used? Voluntary participation with state staff support (mechanism under coastal program)
- Subregional efforts should be state-led, but with close cooperation with Corps and other partners.
- First set up regions, then deal with geo-political issues
- Start with meetings with local governments on framework, and then move into public hearings and stakeholder meetings.
- Lesson learned from NC – regional commissions – look closely at BIMP and NC’s process. Depends on who is leading, state or regions?
- This is likely to be voluntary effort.

Data and Research Needs:

- Baseline seafloor maps in areas not covered – out to 5 nm (and then later think about periodic re-mapping of high priority areas)
- Expanded monitoring of beach profiles and consideration of new technologies
- Economic analysis including costs

- Data synthesis
- Coastal process analyses (with an emphasis on small scale)
- Connection to other issues (MSP) – energy, habitat, fisheries, etc...
- Scheduling of activities and surveys and research to take advantage of time lines

Capacity:

- May need to contract out but with guidelines
- Funding - Investigate MMS, USACE, USGS, state, and other potential sources (local) and take advantage of national (USACE) and regional efforts and opportunities (SECOORA, GSAA)
- Communication pipeline like SC Coastal Information Network
- Engagement - Support regional caucuses, regional forums, coastal caucus, mayors (private industry and NGOs should be partners to be effective)
- Synthesize data sources into E-Coastal or other framework (state should be lead)
- 2 state FTEs – planner and data manager; and/or seed grants; and or academic study (to develop framework and to get all the data into one place)
- Initial investment- state \$ for leveraging...
- Partner w/ local governments for data discovery
- Follow NC's lead!

Partnerships:

Partner on mayor/local government workshops – co-sponsored by these sectors.

Ocean Aquaculture Round Table Outcomes (Chapter 6)

Goals

- Assess the potential for aquaculture development in South Carolina's ocean waters;
- Gain an understanding of potential use conflicts; and
- Identify various concerns associated with ocean aquaculture development in SC (e.g. regulatory hurdles, and environmental, socioeconomic, and technological issues or opportunities).

Discussion Questions:

1. What are the future prospects for open ocean aquaculture in South Carolina? (current interests / future opportunities)
2. What technological and environmental concerns and/or opportunities may be associated with ocean aquaculture in South Carolina?
3. What socioeconomic concerns and/or benefits may be expected (e.g. use conflicts, economics, marketing, work force development)?
4. How could state planning, decision-making, and regulatory frameworks be improved to address these concerns and benefits?

Process:

The Round Table brought together 26 participants consisting of commercial fishermen, state and federal agency representatives, and researchers. Presentations described the new NOAA Aquaculture Policy priorities and initiatives for supporting sustainable aquaculture in the US; the history of aquaculture in South Carolina along with recent status and trends; and the potential

concerns and opportunities associated with marine aquaculture development in the state's offshore waters. A round table discussion followed, which provided an opportunity for participants to ask questions, offer comments, and make recommendations.

Partners: SCDHEC-OCRM, SCDNR, and SC Sea Grant.

Recommendations included:

- Need detailed data offshore to support siting decisions – e.g., mapping of important resources/habitats, existing development and uses (e.g. SCDNR mapping effort and SAFMC)
- Educate state leaders on the importance of marine aquaculture
- Develop a one-stop shop for permitting
 - Utilize the Aquaculture Permit Assistance Office within the Department of Agriculture.
 - Learn from Florida's approach
 - Look at the existing law, which already instructs agencies to establish this process.
- Consider a leasing framework for SC waters (adaptable for multiple uses).
- Need a state ocean policy that includes support for ocean aquaculture
- Tie support for ocean aquaculture into contemporary agriculture initiatives
- Need government support – e.g., cooperative research projects and leverage existing funding sources.
 - Need a single, successful research and development-scale project to evaluate and learn from to determine feasibility.
- Utilize existing research facilities, scientists, and the natural area that exist here in SC, and learn from experiences around the world.
- Start inshore and eventually move further offshore.
- Consider and plan for co-location and synergies with other uses.
- State and local governments should seek opportunities to enhance, maintain, and/or restore waterfront access (“working waterfronts”) as part of any onshore changes related to new offshore activities or developments.

South Carolina Ocean Mapping Workshop Outcomes (Chapter 7)

Goals:

- Compile existing ocean resource maps in SC; and
- Identify future ocean mapping priorities

Process:

The workshop brought together 33 state, regional, and federal partners including: College of Charleston, University of SC, SC Sea Grant Consortium, Coastal Carolina University, SCDNR Marine Resources Research Institute, NOAA-CSC, NOAA-NOS, USACE, EPA, US Coast Guard, along with representation from private industry and NGOs. Presentations were given during the first half of the day and included descriptions about existing ocean mapping efforts both regionally and in state waters. During the second half of the workshop, the Workshop participants were divided into four groups. Each group met at a workstation with maps of a particular theme and discussed the maps – relating to what data is provided, is missing, what are the critical mapping needs.

NOAA's Coastal Services Center in Charleston, SC assisted by drafting thematic maps for workshop participants to review and work from. CSC staff discussed their experiences and lessons learned with the development of the maps. The four themes or topic area maps included: Energy, Political Boundaries / Infrastructure, Sand Resources, and Marine Conservation. Challenges identified included: only one mapping layer for energy; no central location for ocean issue maps in SC; lack of high resolution seafloor data; and differences in scale across maps.

Partners:

SCDHEC-OCRM, SC Sea Grant Consortium, NOAA CSC

Recommendations Included:

Specific Needs Identified:

- Because there are many overlapping issues and potential use conflicts, interactive maps that can be manipulated to address a specific question, issue, or use are preferred over static maps.
- Need to educate state officials on the importance of mapping SC ocean waters.
- Sand demand along coast (based on erosion rates and development)
- Nearshore bathymetry (beachfront out to depth of closure)
- Borrow sites and recovery rates
- Human use maps and ocean socio-economics
- Marine Managed Areas (incl. artificial reefs, CoBRA zones)
- Alternative energy resources (incl. wind (stratified), waves, tidal currents)
- Ocean infrastructure (telecommunication cables, connector points to grid, etc.)
- Mineral resources (oil, gas, clathrate deposits, etc.)
- Navigation/Transportation (Right whale migration routes, shipping lane speed zones, etc.)
- Water quality and chemistry (incl. aquifer discharges, contaminant data, beach closings, stormwater outfall pipe discharges)

South Carolina Mapping Priorities:

The results from the ocean mapping workshop identified three overriding priorities for ocean mapping in SC:

1. Seafloor mapping out to 5 miles;
2. Marine habitat classification, mapping and inventory; and
3. Characterization of sand resources.

Ocean Monitoring Workshop Outcomes (Chapter 8)

Goals

- Foster information exchange among relevant agencies and researchers;
- Identify key gaps and priorities for ocean monitoring;
- Explore opportunities for improved coordination of efforts and data integration across monitoring efforts;
- Consider impacts of new or emerging technologies.

Discussion Questions:

1. Could state public health or marine resource issues be better addressed through improved ocean monitoring programs?
2. What are the key gaps and priorities?
3. What will be the impacts of emerging technologies or methods?
4. Could we improve partnerships and data integration?

Process:

The workshop brought together 45 state, regional, and federal partners including: SECOORA, RCOOS, University of SC, SC Sea Grant Consortium, Coastal Carolina University, SCDNR Marine Resources Research Institute, SCDHEC-Bureau of Water, CCEHBR, NERRS, NOAA, USACE, etc. Presentations were given during the first half of the day and included descriptions about ocean observing and information management systems and their current capacities to collect and manage data; various ongoing marine monitoring programs in SC such as: SCECAP; BOW's surface water monitoring and beach monitoring programs; monitoring of fisheries at state (MARMAP) and regional (SEAMAP) levels; as well as newer programs like the Long Bay Research Program. During the second half of the day, workshop participants divided into groups to consider the questions listed above regarding the priorities and gaps in marine monitoring in South Carolina.

Partners: SCDHEC-OCRM, University of SC, SECOORA, SCDNR

Potential problems identified:

- A disconnect between ongoing monitoring efforts and need for interagency coordination;
- Inconsistent temporal coverage of data collected;
- Lack of resources to support needed maintenance of equipment over time; and
- Lack of broader spatial coverage that includes nearshore and offshore surveys.

Recommendations included:

- Need an inventory of state monitoring efforts, assets, and archives.
- Improve state partnerships for data discovery and integration, as well as pooling resources like ship time and graduate students.
- Utilize regional partnerships – SARPP, SECOORA, GSAA.
- Recognize a key connection to human health and economic linkages – tourism and fisheries.
- Increase and sustain funding for ocean monitoring efforts.

PAGE INTENTIONALLY LEFT BLANK

Appendix 2: Record of Public Comment

The draft of the South Carolina Ocean Report was made available for public comments during the period from March 9, 2012 through April 30, 2012. A total of three comment letters were received and are included in this appendix.

Public Comment Letter 1

M. Scott Harris
College of Charleston
66 George Street
Charleston, SC 29424
April 9, 2012

Melissa Rada
DHEC-OCRM
Suite 400
1362 McMillan Avenue
Charleston, SC 29405
Email: OceanReport@dhec.sc.gov

RE: Comments for South Carolina Ocean Report

Dear Ms. Rada:

Please find attached a copy of comments and additional information for the draft of the South Carolina Ocean Report. I have addressed general comments in the text based on page number and approximate line. Longer comments, paragraphs, and figures I have provided

Sincerely,

--emailed--

M. Scott Harris, Ph.D.
*Department of Geology
and Environmental Geosciences*

Specific Textual Comments:

I have not reviewed the document specifically with regards to references, general grammar, or spelling, except in a few instances.

Chapter 1

No comments

Chapter 2

No comments

Chapter 3

Pg. 35, line 1 reads “As South Carolina enters a new era of proposals for ...” Should these be “proposals” or are these more closely aligned under a title of “applications” or maybe “requests”?

Page 35, paragraph 3: 10,000 square miles (6,400,000 acres) of Continental Shelf covers both South Carolina and Federal waters. On a conservative note, South Carolina out to 3 miles has about 600 square miles (200 miles of coast x 3 miles, or 384,000 acres) and out to 5 has about 1000 square miles (640,000 acres). The 10,000 number provided is inconsistent with State authority for the Continental Shelf.

Chapter 4

What is the influence of North Carolina on South Carolina wind development? Does Duke Energy still see South Carolina waters off Horry County as part of their possible portfolio?

Chapter 5

Footnote 274: should “Stacie Crowe” be hyphenated?

Chapter 6

No comments

Chapter 7

Pg. 108 “SeaMap Program” should be changed to “BEAMS Program” to parallel an internal change made to limit confusion between federal SEAMAP program.

Pg. 109, paragraph 2, sentence 3, would be more accurately put as “High-resolution mapping of the nearshore areas has been completed in Long Bay between the North Carolina State line to North Inlet (Cite Barnhardt reference), and in segmented portions of the central coast between Bulls Island and Edisto Island (Harris et al., 2005; Kindinger et al., 1998; Luciano, 2010).” (SEE ALSO NOTES IN “Larger Additions or Insertions for the Report”).

Pg. 111, sentence 1. A real, reviewed document for this reference is better as the Barnhardt reference where the data exists, or a location of the physical materials using the data (Denny et al., 2007)

Pg. 111, Paragraph 2, Sentence 3. Include a footnote to the reference for South Carolina Shoreline erosion data from (Harris et al., 2009)

Pg. 111 Footnote 428: Better referenced to real product through the (Denny et al., 2007) citation.

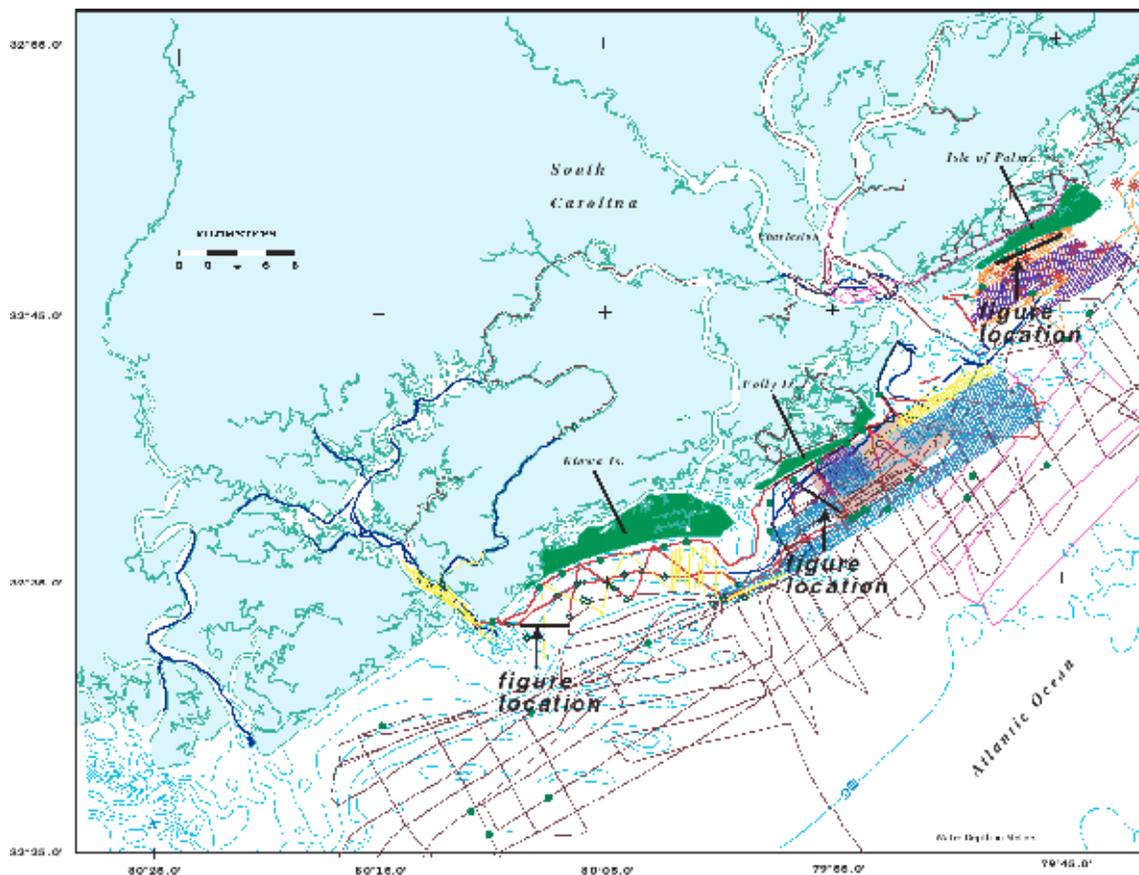
Pg. 111 Footnote 429: The <http://gis.coastal.edu/sccep/data.php> website has been down for about four years and no longer works. The USGS Woods Hole site is suitable.

Larger Additions or Insertions for the Report:

Pg. 111. *The information here is mostly correct (see references needed above), but does not include all Ocean Mapping initiatives or data in the State over the last couple of decades. Two more sections, one before the South Carolina Coastal Erosion Study, and an additional one after, will give the reader a full view of the research conducted in the State, and the resources in the State that have strong programs in marine geology.*

Coastal Erosion Program (1994-1999)

In 1994, the US Geological Survey partnered with the South Carolina Sea Grant Consortium conducted the first major cooperative program in the Southeast (Hansen, 1998), integrating onshore and offshore geology between the Isle of Palms and Edisto Island in Central South Carolina. In contrast to the long, linear beaches of Long Bay and the wide Sounds to the South, the central coast is marked by large ebb tidal deltas that add great complexity to the sediment dynamics and regional sediment management issues (Kana and Gaudiano, 2008). The overall focus of this six-year program included Geologic Framework Studies (Harris et al., 2005), a Sediment Inventory (Hippensteel et al., 2005; Work et al., 2001), Sediment Transport (Kana and Gaudiano, 2008), and Coastal Inventory and Change.



South Carolina Coastal Erosion Study (1999-2007)

The section reads well. See citation information above to clarify details for the reader and to link the reader directly to products.

Mapping Activities by the College of Charleston

The College of Charleston works with local, State, Federal, and NGOs to gather data as part of their BEAMS training and data analysis program on Charleston Harbor in along the central South Carolina

coast (<http://geology.cofc.edu/>). They maintain the largest training program of seafloor and coastal mapping in the Southeast, and focus data collection on coastal LiDAR, sidescan sonar, subbottom profiling, and multibeam bathymetry, with analysis of data using multivariate statistics to identify areas of critical habitat in State and Federal waters. Mapping areas include inland waterways from Winyah Bay to the Savannah River, terrestrial regions, and State and Federal waters to the deep ocean. Recent work has been conducted in the Ashley River, Capers Inlet, Charleston Harbor Entrance, and the waterways around Folly, Kiawah, and Edisto Islands (See Figure 1). Repetitive surveys are regularly conducted off the barrier islands, and are cost-effective due to the proximity to the harbor.

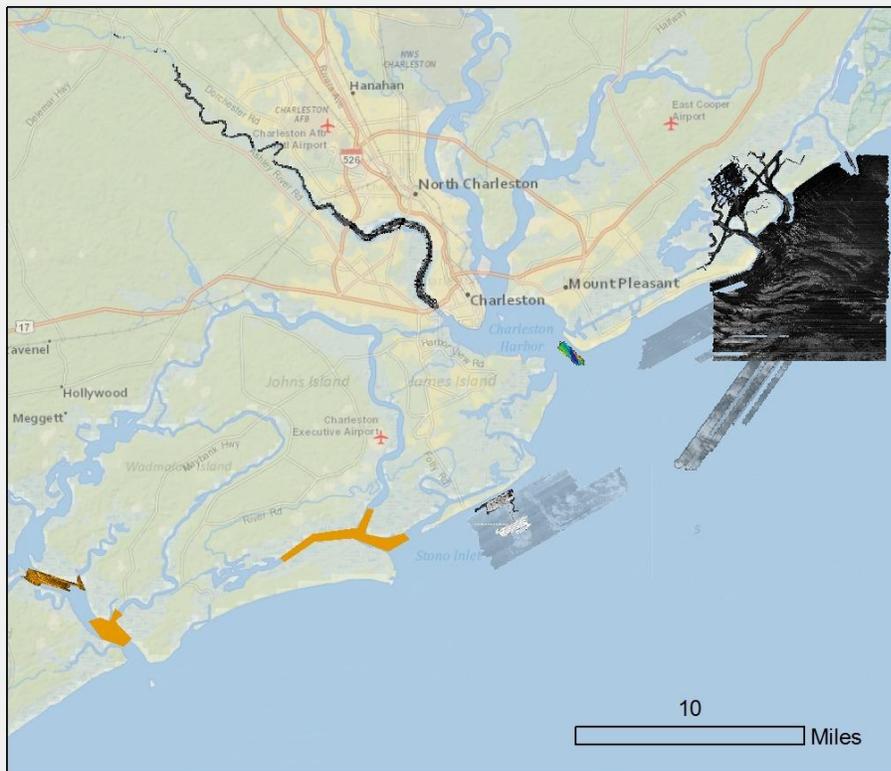
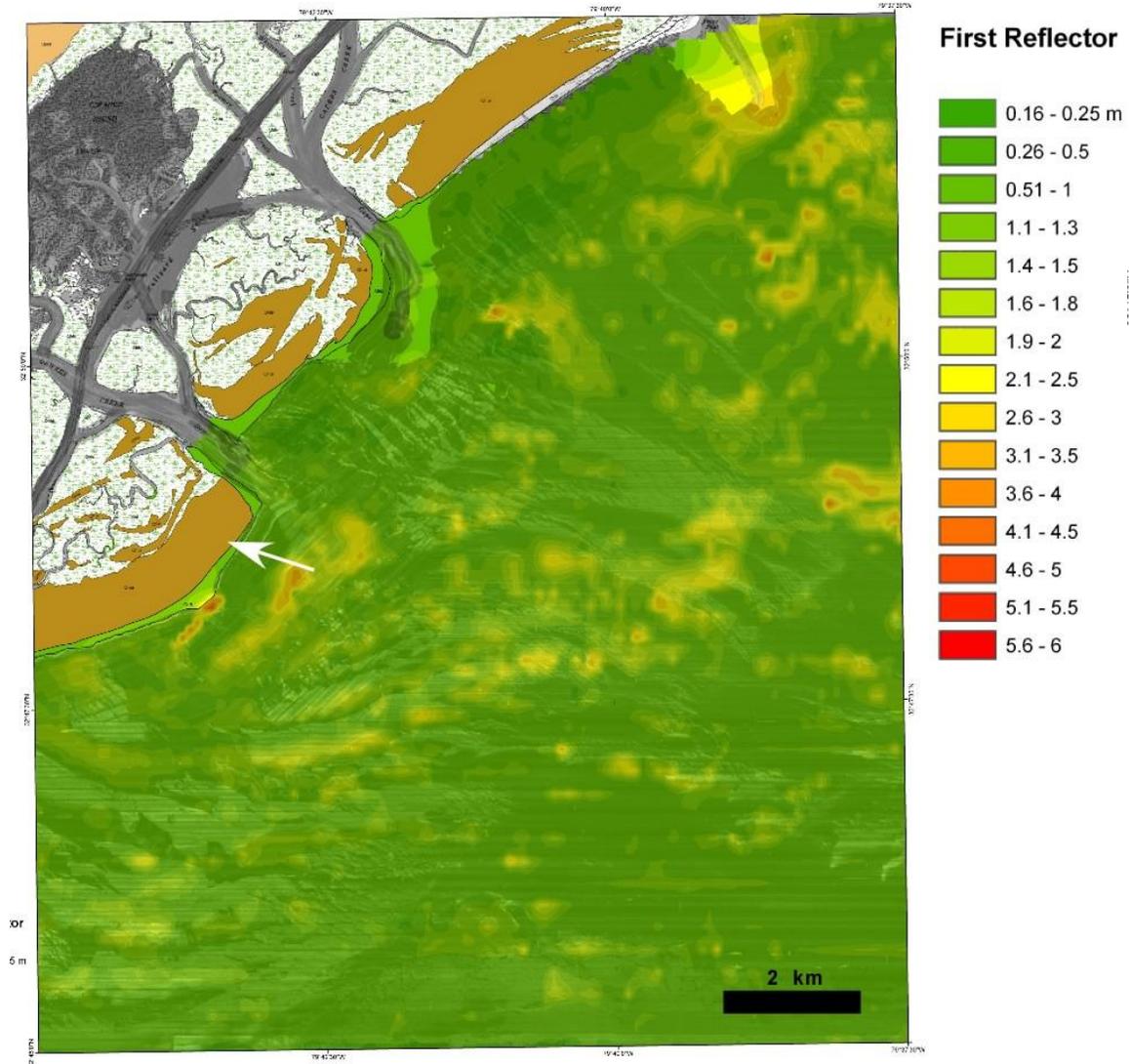


Figure 1. Data collected through the College of Charleston BEAMS program (Dark and colored areas) overlain on older USGS data (grayed).



This maps depicts the thickness of sediments above the first major reflector (recent) with sidescan superimposed in the background. Thicknesses mimic sidescan bedforms.

Figure 2. Sediment thickness of recent materials actively moving off Isle of Palms and vicinity (Luciano, 2010).

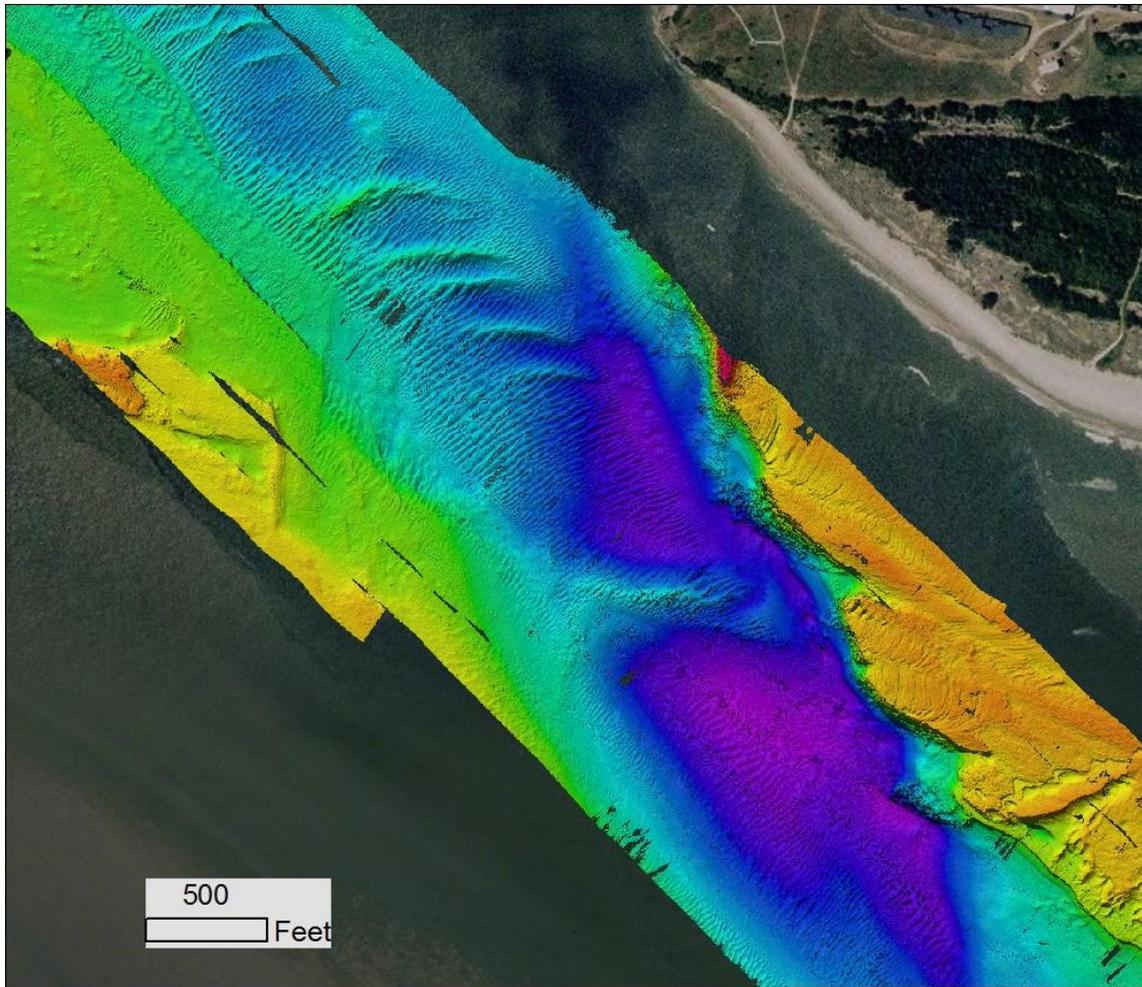


Figure 4. The entrance to Charleston Harbor at the south end of Sullivan's Island. Depths range from -20 feet (reds) to -85 feet (purple). Map created by the College of Charleston as part of their training program (with USACE and QPS, 2012).

Background information: The most recent South Carolina Sea Grant Consortium – USGS cooperative has been very important for the Long Bay area, and focused resources in an organized effort led by the USGS. The first cooperative, however, was in the central portion of the State (original program developed by Rick DeVoe, Margaret Davidson, and Mitchell Colgan), and data collection and focus were coordinated by the PIs of the project (PIs were Hansen and Kindinger at the USGS, and Katuna and Gayes in South Carolina). This first cooperative was very critical to developing a better methodology for the second cooperative, primarily due to the efforts of Bill Schwab (USGS) and the white paper developed in the State by R. DeVoe, L. Sautter, and S. Harris for our Congressional leaders. This white paper and contacts to the legislators provided the pathway for the Congressional lead to support the program.

References Cited

- Denny, J. F., W. E. Baldwin, W. C. Schwab, P. T. Gayes, R. Morton, and N. W. Driscoll (2007), Morphology and Texture of Modern Sediments on the Inner Shelf of South Carolina's Long Bay from Little River Inlet to Winyah Bay, U.S. Geological Survey Open File Report, 2005(1345). [online] Available from: <http://pubs.usgs.gov/of/2005/1345/index.html> (Accessed 9 April 2012)
- Hansen, M. E. (1998), South Carolina Coastal Erosion Study, U.S. Geological Survey. [online] Available from: <http://coastal.er.usgs.gov/projects98/7240-33580.html> (Accessed 9 January 2012)
- Harris, M. S., P. T. Gayes, J. L. Kindinger, J. G. Flocks, D. E. Krantz, and P. Donovan-Ealy (2005), Quaternary Geomorphology and Modern Coastal Development in Response to an Inherent Geologic Framework: An Example from Charleston, South Carolina (USA), *Journal of Coastal Research*, 21(1), 49-64.
- Harris, M. S., E. E. Wright, L. Fuqua, and T. P. Tinker (2009), Comparison of Shoreline Erosion Rates Derived from Multiple Data Types: Data Compilation for Legislated Setback Lines in South Carolina (USA), *Journal of Coastal Research*, 2009(56), 1224-1228.
- Hippensteel, S. P., R. E. Martin, and M. S. Harris (2005), Records of prehistoric hurricanes on the South Carolina coast based on micropaleontological and sedimentological evidence , with comparison to other Atlantic Coast records: Discussion, *Geological Society of America Bulletin*, 117(1/2), 250-256, doi:10.1130/B25535.1.250.
- Kana, T. W., and D. J. Gaudio (2008), Regional Beach Volume Changes at Decadal to Century Time Scales - Central South Carolina USA, in: Smith J.M. (Ed.), *Coastal Engineering*, Hamburg, Germany, pp. 2340-2351. [online] Available from: http://e-proceedings.worldscinet.com/9789814277426/9789814277426_0193.html
- Kindinger, J. L., J. G. Flocks, M. S. Harris, Paul T. Gayes, W. C. Schwab, and M. P. Katuna (1998), Quaternary Stratigraphy and Depositional History of the Central South Carolina Coast and Inner Shelf: Implications to Coastal Change, U.S. Geological Survey. [online] Available from: <http://coastal.er.usgs.gov/scerosion/quaternary/> (Accessed 9 January 2012)
- Luciano, K. (2010), Impacts of Underlying Stratigraphy, Inlet Formation, and Geomorphology on Coastal Sediment Dynamics: Capers Inlet Quadrangle, SC (USA), College of Charleston, M.S. Thesis.
- Work, P. A., J. Guan, E. J. Hayter, and S. Elci (2001), Mesoscale model for morphologic change at tidal inlets, *Journal of Waterway*, 127(5), 282-287.

[OCEAN REPORT EMAIL] sandmining/Melissa Rada at DHEC-OCRM

1 message

jennifer larsen <reneelarse@hotmail.com>
To: oceanreport@dhec.sc.gov

Wed, Apr 25, 2012 at 11:10 AM

I don't believe that we should be sand mining off of our shores it is the main cause of erosion not to mention the effects that it has on sea turtles and other creatures depending on the shore .It destroys our sea life in all actuality its their home not ours ,its where they live and breathe, sleep, eat and reproduce just like us up here on land.Who are we to go destroy it for profit.I believe the ocean has had enough destruction on our part,do't get me started on "plastics".

Sincerley,

jennifer Larsen



**The Nature Conservancy
South Carolina Chapter**
2231 Devine Street
Columbia, SC 29205

Mark Robertson
Executive Director
mrobertson@tnc.org
(803) 254-9049 (Phone)

April 30, 2012

Melissa Rada
SCDHEC-OCRM
1362 McMillan Ave, Suite 400
Charleston, SC 29405

RE: South Carolina Ocean Report: A Foundation for Improved Management and Planning in South Carolina.

Dear Ms. Rada,

Thank you for the opportunity to provide feedback on the *“South Carolina Ocean Report: A Foundation for Improved Management and Planning in South Carolina”*. Given the increasing activity level within South Carolina’s coastal and marine waters, we support SCDHEC-OCRM’s efforts to take a more comprehensive approach to ocean planning. In particular, we appreciate the efforts to engage a broad range of stakeholder interests throughout the process.

The mission of The Nature Conservancy is to conserve the lands and waters on which all life depends. With the support of more than one million members, The Nature Conservancy has protected more than 120 million acres of land and 5,000 river miles around the world. Currently TNC has more than 150 marine conservation projects in 32 countries and in every coastal state within the United States. Working in South Carolina since 1969, we have preserved nearly 287,000 acres and implemented programs for river conservation, prescribed fire, forestry, control of non-native invasive species, nearshore marine conservation, and land use/land management.

After reviewing the South Carolina Ocean Report, we have focused our comments on three primary areas:

- the relationship between coastal and marine ecological resources and socioeconomic conditions;
- the benefit of ocean mapping to support an array of management decisions, and
- increased consideration of multi-objective planning.

Incorporating Ecological Resources into Ocean Planning Efforts

South Carolina’s coastal and marine ecological resources have not only intrinsic significance, but are directly linked to the state’s social and economic values. For example, ensuring the conservation of beaches is inherent to the tourism industry and coastal marshes are critical habitats for a range of commercial and recreation fish species. The document’s summary and introduction highlight the economic importance of the ocean as a reason for developing this report; however, the ecological discussion is minimal. We recommend adding language to these sections that describes South Carolina’s natural resources and relates them to the socioeconomic values. The Nature Conservancy

believes that considering ecological resources alongside economic resources and human uses is critical for any ocean planning efforts.

Development and Use of Spatial Data for Ocean Planning and Management

Visually explicit information on ocean resources and uses can support a variety of ongoing management decisions (e.g. energy siting, sediment management) and is a critical component for future ocean planning efforts. As such, we feel that the recommendations related to mapping (6.1) and monitoring (7.2) should be moved under the ocean management heading, since both serve as key tools for comprehensive ocean planning.

In addition, the Conservancy supports the specific recommendation to invest in the further advancement of seafloor and ocean use mapping data. The Nature Conservancy is a recognized leader in this field and our Carolinian Ecoregional Assessment is identified in the report as a source for spatial data. Efforts are underway to update some of the Assessment's regional resource maps, including seafloor habitats and distributions of significant marine species. We look forward to working with South Carolina resource agency staff on the development and distribution of this information.

Increased Consideration of Multi-Objective Planning

The Ocean Planning Work Group considered a wide array of current and future uses in the development of this framework report. In most cases, the uses were considered in their individual context. One challenge of looking at uses individually is that it limits discussion of overlapping issues that could lead to a greater understanding of multi-objective ocean planning. It is our hope that Recommendation 1.1, which focuses on development of a South Carolina Ocean Action Plan, will increase these connections.

We are also interested in seeing South Carolina agencies move quickly to implement some of the recommendations in the report. Though a comprehensive plan for South Carolina's state waters would be ideal, we urge work group members and their agencies to identify opportunities to incorporate spatial data and stakeholder discussions into ocean management decisions at both a smaller geographic and issue-specific scales.

Thanks again for this opportunity to comment. The Nature Conservancy views SCDHEC-OCRM as a significant partner in the protection and wise management of South Carolina's coastal resources, now and into the future. We look forward to working with you to implement the Advisory Committee's recommendations. Again, thank you for the opportunity to comment.

Sincerely,



Mark Robertson
Executive Director
The Nature Conservancy
South Carolina Field Office