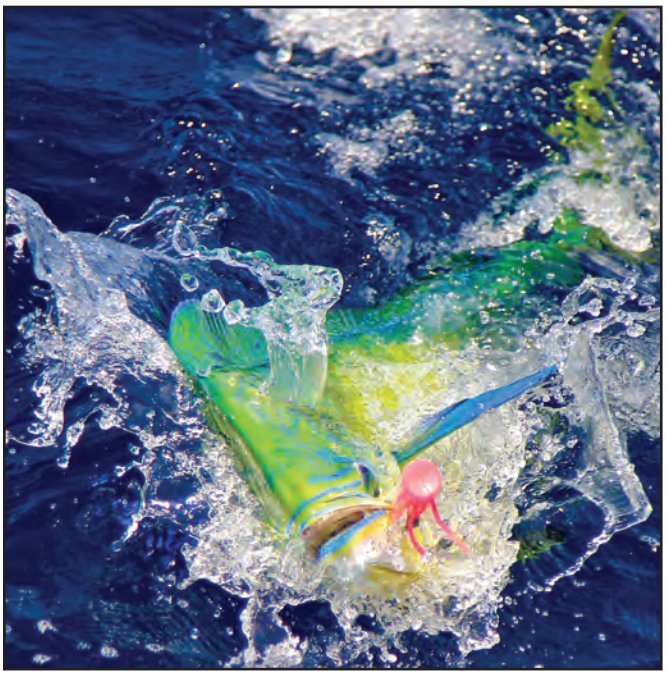
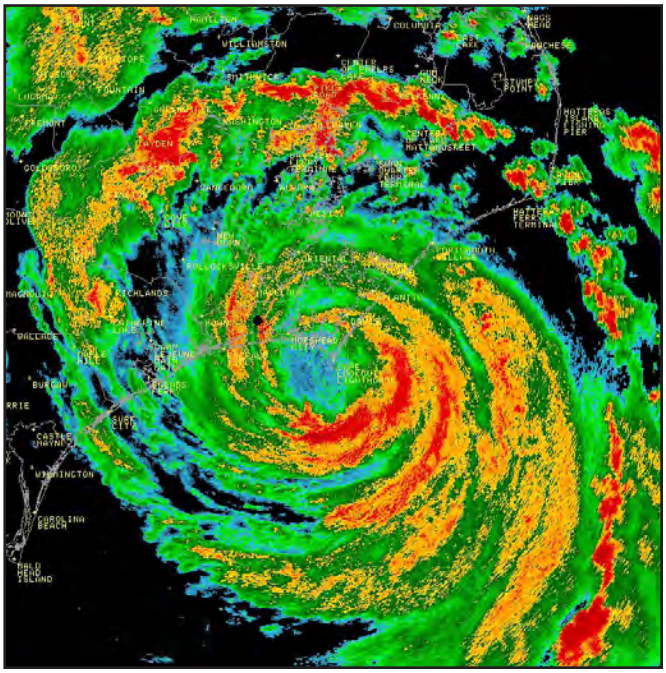
Sea Grant
North Carolina

Federal Site Review

September 16-17, 2014





"Your link to *research* and *resources* for a healthier coast."

Table of Contents

A. PROGRAM MANAGEMENT AND ORGANIZATION **1**
LEADERSHIP *1*
RECRUITING TALENT *7*
B. STAKEHOLDER ENGAGEMENT **12**
C. COLLABORATIVE NETWORKS **15**
D. PROGRAM CHANGES RESULTING FROM PREVIOUS REVIEWS **19**

Appendices

Appendix 1: North Carolina Sea Grant Team Contacts
Appendix 2: North Carolina Sea Grant Advisory Roles
Appendix 3: North Carolina Sea Grant 2014-2017 Strategic Plan
Appendix 4: North Carolina Sea Grant Advisory Board Members 2010-2014
Appendix 5: North Carolina Sea Grant Advisory Board Charter
Appendix 6: Coastal and Marine Research Council of the University of North Carolina
Appendix 7: AAAS Independent Review of UNC System Marine and Coastal Activities
Appendix 8: North Carolina Sea Grant Investments by Strategic Plan Focus Area
Appendix 9: North Carolina Sea Grant Leveraged Funds 2010-2014
Appendix 10: North Carolina Sea Grant Mini-Grants 2010-2014
Appendix 11: North Carolina Sea Grant Fellows 2010-2014
Appendix 12: North Carolina Sea Grant Selected Program Honors 2010-2014
Appendix 13: Key Examples of North Carolina Sea Grant Stakeholders and Partnerships 2010-2014
Appendix 14: North Carolina Sea Grant 2011 Site Review Team Report
Appendix 15: North Carolina Sea Grant Response to 2011 Site Review Team Report

A. PROGRAM MANAGEMENT AND ORGANIZATION

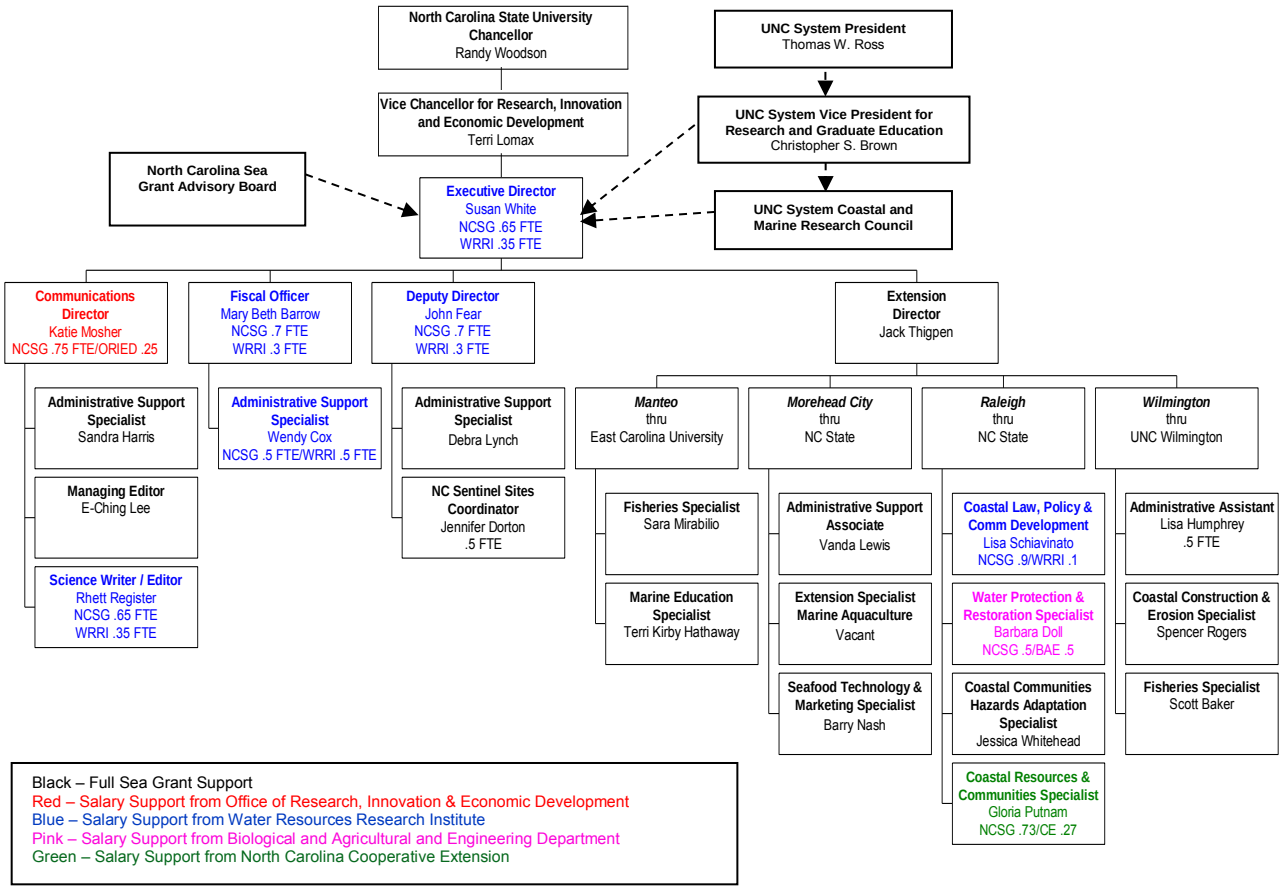
The North Carolina Sea Grant College Program, better known in the state simply as North Carolina Sea Grant, began with an institutional planning and project grant in 1970. The planning effort expanded rapidly in 1972, when the state established the now 16-campus University of North Carolina System. At that time, the NCSG program development effort engaged all major institutions of higher education in North Carolina, including Duke University. In 1976, the program was designated as the nation's 12th Sea Grant College. Now in its fifth decade, North Carolina Sea Grant provides research, demonstrations and leadership on a wide spectrum of coastal and marine topics at the local, state, national and international levels.

LEADERSHIP

Organizational Setting and Structure

NCSG is identified as an interinstitutional center by UNC General Administration, with NCSG programmatic authority sanctioned by the UNC System's Office of the Vice President for Research and Graduate Education. That center designation indicates the highest levels of program integration and engagement across the university system, including shared administrative duties and substantial involvement by multiple campuses in program activities. NCSG is one of only a few such designated programs across the state. Figure 1 reflects the program's overall management, research, extension, communications and fiscal functions.

Figure 1: North Carolina Sea Grant Organizational Chart, 2014



With its interinstitutional status, the NCSG direct administrative oversight was delegated by UNC General Administration and the UNC Board of Governors to NC State University in 2007. NCSG is one of 4 interinstitutional centers based at NC State. NCSG continues to closely work with UNC General Administration with an indirect reporting association. In 2009, administrative responsibilities for NCSG and the Water Resources Research Institute of the UNC System, another NC State-based interinstitutional program, were merged for programmatic efficiencies, both administrative and subject area. There are now 6 positions (noted in blue color in the organizational chart) shared between NCSG and WRRI at various full-time equivalent or FTE levels. Other NCSG positions supported via various NC State partnerships are indicated on the chart. They include the Office of Research, Innovation and Economic Development, the Biological and Agricultural Engineering Department, and N.C. Cooperative Extension.

The NCSG executive director serves at the pleasure of NC State's chancellor, who delegates direct supervision to the vice chancellor for research, innovation, and economic development. On all administrative, fiscal, human resource, program reporting and evaluation matters, the NCSG executive director currently reports directly to NC State Vice Chancellor Terri Lomax, who initiates and performs annual appraisals of the executive director. Additionally, the UNC System president delegates broad oversight of NCSG to UNC Vice President Chris Brown.

Extension and administrative team members are distributed across the state including individuals at NC State in Raleigh. Along the coast, individuals are co-located with East Carolina University and the UNC Coastal Studies Institute in Manteo, NC State's Center for Marine Sciences and Technology in Morehead City, and UNC Wilmington's Center for Marine Science. (Map provided on back cover.) The host institute employs the coastal team members, with programmatic oversight provided by the extension director based at NC State. A sub-contract from NC State provides fiscal support to these institutions. The NCSG coastal law and policy extension specialist is co-director for the N.C. Coastal Resources Law, Planning and Policy Center, a collaborative partnership effort among NCSG and UNC Chapel Hill's School of Law and Department of City and Regional Planning. The NCSG program is one of only 5 formal, state-based programs within the national Sea Grant Legal Network.

Management Team

NCSG has had a long-term commitment to a management team approach, as reflected in the current administrative structure, as well as the program's commitment to engage team members across a broad geography. The management team — those engaged in management and supervision of the program's major components — is composed of the executive director, deputy director, assistant directors for extension and communications, and the lead fiscal officer.

Susan White (.65 FTE) was named executive director in December 2012. Prior to joining NCSG, White was director of the National Oceanic and Atmospheric Administration's Hollings Marine Laboratory in Charleston, S.C. She provided research vision and organizational management, including strategic planning with partner agencies and universities. She previously served as deputy director at the Hollings Laboratory, as well as the national research coordinator for NOAA's Estuarine Reserves Division and National Estuarine Research Reserve System. White earned a doctorate in marine ecology from the University of Georgia, and a bachelor's degree in biology from Duke.

John Fear (.70 FTE) joined the program as deputy director in January 2014. Fear focuses on developing and executing a strong NCSG research portfolio and increasing the links among the research, extension and communication programs. Prior to joining NCSG, Fear was research coordinator for the N.C. Coastal Reserve and N.C. National Estuarine Research Reserve program, within N.C. Division of Coastal Management. In this role, he conducted original research and facilitated studies by partners at the 10 sites of the NCCR-NCNERR and their respective watersheds. Prior to that, he was a postdoctoral fellow at the UNC Chapel Hill

Institute of Marine Sciences. Fear holds degrees from UNC Chapel Hill: a doctorate in environmental sciences and engineering from the School of Public Health, and bachelor's degrees in biology and chemistry.

Jack Thigpen (1.0 FTE) serves as extension director. He was appointed in 2000 after 3 years as an extension specialist in coastal tourism, stationed on the Outer Banks. His background in sociology and ecotourism has been invaluable to a program called upon to address issues relating to sustainable tourism use and development. He previously was at Texas A&M University. Thigpen holds a doctorate in sociology from the University of Kentucky. He also has a master's degree in rural sociology, as well as a bachelor's degree in agricultural business, both from the University of Tennessee, Knoxville.

Kathleen Mosher Patterson (0.75 FTE) serves as communications director. She was appointed in July 2000 after 2 years as communications coordinator. Her background includes experience in newspaper, television and Internet media services and products. In February 2011, she was appointed editor of *Results* magazine from the NC State Office of Research, Innovation and Economic Development, at a 0.25 FTE level. Mosher holds a bachelor's degree in journalism from Kent State University in Ohio and master's degree in liberal studies from NC State.

Mary Elizabeth Barrow (0.70 FTE) has served as the NCSG fiscal officer since September 2009. A certified research administrator, she has a breadth of experience managing financial matters for various units on the NC State campus, including with NCSG as an administrative and fiscal assistant from 2002 to 2005. In December 2010, she was appointed business manager for WRRI, at a 0.30 FTE level. Barrow earned a bachelor's degree in political science and business from East Carolina.

White, Fear, Thigpen, Mosher and Barrow all serve on the NCSG management team. They meet regularly to discuss major program projects, special initiatives, staffing issues and policies. Thus, the management team represents and addresses the various components — research, extension/education, communications, and financial/human resources management — necessary to forge and manage an effective Sea Grant program. Administrative activities at the NCSG program level are accomplished via appropriate processes, procedures and administrative offices at NC State, and, where appropriate, at East Carolina and UNC Wilmington. Project management is handled through appropriate campus channels, working closely and cooperatively with the NC State offices for budget, sponsored programs, and contracts and grants. Technical and fiscal matters are conveyed directly to and through the NCSG office with the concurrence of appropriate campus administrators. NC State has granted departmental status to NCSG to approve administrative and fiscal matters.

In December 2012, NCSG underwent a significant change in leadership when the executive director and associate director retired. Michael Voiland was NCSG executive director from 2006 to December 2012. Steve Rebach was NCSG associate director from 1999 to December 2012, providing program leadership for research administration. Rebach was hired on contract to NCSG for 6 months to facilitate the 2013 research call for proposals. The current team list and contacts information are in Appendix 1.

Advisory Mechanisms

NCSG regularly solicits and receives advice through a range of formal and informal advisory mechanisms. Our team members and funded faculty are continuously involved with a wide variety of state and federal committees, management agencies, commissions, and interest groups, which provide direct and immediate feedback for information needs and establishment of priorities. NCSG team members occupy a number of formal positions on boards and commissions responsible for addressing marine and coastal issues (Appendix 2). All NCSG team members are actively involved on a regular basis with agencies, interest groups and businesses, with those interactions providing continuous short- and long-range planning information. These connections at the program and personal level factored significantly in the program's development of the current 2014-2017 NCSG Strategic Plan, which was released in 2012 (Appendix 3). NCSG has built, and

continues to expand, a large constituency whose input and involvement is vital to the future relevance and effectiveness of Sea Grant programming in North Carolina.

NCSG Advisory Board

The multifaceted mission of the NCSG Advisory Board is to assist the program by identifying priority and emerging needs in research and outreach by assessing, evaluating, and endorsing initiatives and general program progress, and by identifying and developing resources for Sea Grant at the local, state and federal level. Since 2007, NCSG has maintained an overall program advisory board made up of external stakeholders/partners. Prior to 2007, this board only advised on outreach programs. The current board includes individuals who represent interests of communities, businesses and organizations that care about and/or steward the state's coastal resources (Appendix 4).

The board typically meets twice a year for at least a full day of discussions. When schedules allow, at least one meeting per year is "piggy-backed" with a portion of an NCSG team meeting. Board sessions offer updates on NCSG activities and provide opportunities for board members to share input on improving NCSG focus and efforts. As a result of the 2011 National Sea Grant Site Review, the board developed and approved a formal charter to clearly outline roles, responsibilities and procedures (Appendix 5). In addition to its advisory mechanism, the board includes individuals who may assist NCSG to grow and expand in local, state, regional and national relevance. The NCSG executive director has regular contact with individual board members and continues to strengthen board engagement across a range of program priorities.

NCSG is currently seeking to add 5 new advisory board members and has received nominations from a variety of internal and external partners. In coordination with the current advisory board members, these new individuals will bring to the board specific, identified, expertise in the following areas: academia, local government, business/commerce and development. These new members will join the Fall 2014 NCSG Advisory Board meeting in Wilmington.

A new initiative, begun in 2013, established working groups within the board membership. The smaller panels leverage board member expertise and interests, enable the board to work effectively between meetings, and provide guidance to NCSG in critical areas: priority partnerships, priority programs, development, and public affairs. This working group format also encouraged greater engagement of NCSG team members with the inner workings of our advisory board — a very positive programmatic shift that ensures relevant information is shared among board members and our team.

UNC System Engagement

The Office of the UNC Vice President for Research and Graduate Education provides general program guidance and oversight, as does NC State, as previously described. UNC General Administration also convenes various groups and meetings of the system's widespread marine science leadership to generate systemwide focus, policymaking, need assessments, programs, and new or expanded collaborative/interinstitutional efforts. Members of the UNC Coastal and Marine Research Council, known as CMRC, (Appendix 6) historically have provided leadership for these discussions. The NCSG executive director is an ex officio council member. In collaboration with UNC General Administration, NCSG sponsored the Strategic Retreat on Climate Change with the CMRC, including Duke University and other invited guests in November 2009. The purposes of the retreat were to: discuss research-based implications of sea-level rise and climate change in North Carolina; determine the mechanisms for optimal coordination among institutions in addressing research, analysis, and other needed activities; and improve understanding of how the CMRC could impact state- and local-level discussions and policy. As a result of this retreat, participants agreed to: share data sets for coastal observing; coordinate various campuses' climate and coastal/marine science programs with the then-new Cooperative Institute for Climate and Satellites-NC, funded by NOAA through NC State; and plan for data quality and sharing of data sets in the social sciences.

A 2012 request from the UNC Board of Governors and UNC System President Tom Ross initiated a formal review of coastal and marine

science programs systemwide to ensure that these programs operate efficiently and effectively, without unnecessary redundancy. The prestigious American Association for the Advancement of Science (AAAS) conducted the review. UNC campuses included in the review were East Carolina, Elizabeth City State University, NC State, UNC Chapel Hill, UNC Wilmington, and Western Carolina University. Additionally, NCSG and the UNC Coastal Studies Institute were included as both are "interinstitutional" programs working collaboratively across all UNC System campuses with a coastal and marine focus.

The AAAS panel of experts, who visited the state in early 2013, recognized that the UNC coastal and marine enterprise represents a world-class research, education and extension program of significance to the state, nation and international community. The panel offered 14 specific recommendations to facilitate future growth and continued improvement of marine programs in the state. These recommendations were provided to assist the UNC System in working toward greater coordination to engender a more cohesive and collective UNC coastal and marine presence and to improve overall program competitiveness in an increasingly competitive funding environment (Appendix 7).

Several panel recommendations specifically pointed to NCSG program and management expertise and stakeholder engagement across the state:

- UNC System leaders should recognize and fully utilize the well-developed communication and outreach capabilities of NCSG.
- The panel identified a need to conduct economic evaluations of direct and indirect benefits related to the state's coastal environment. At the same time, the panel explicitly recognized the excellent job NCSG is already doing translating science into economic benefit for the people of the state — and that NCSG can be a significant resource in accomplishing recommended economic evaluation.
- NCSG was identified as having the resources and expertise to act as a convener and facilitator of interested parties across the state through workshops, meetings and large events to support targeted collaboration, research and communication needs.
- The panel recognized the excellent job NCSG does in public outreach, noting that NCSG can be an asset in forging and expanding community relationships that may translate into successful economic development efforts.

At the conclusion of the review process, the AAAS panel presented its findings to the UNC Board of Governors. NCSG was invited to the session, along with other UNC coastal leadership, to also present a brief overview of our program's mission, priorities and highlights.

Also at the request of UNC General Administration, an N.C. Coastal and Marine Consortium workgroup was developed to address a primary set of overarching recommendations from the AAAS review. Specifically, the workgroup was to develop a framework for the establishment of a consortium to provide leadership and coordination of UNC System activities, thus creating added value for the state. Any effort to support development and coordination of coastal and marine programs across the state needs to include not only capacities within the UNC System, but also the considerable capabilities embedded within Duke faculty and facilities. As occurred in the NCSG founding in the 1970s, Duke coastal and marine program leaders were included with the UNC System leadership in the new workgroup. The NCSG executive director was requested by UNC General Administration to chair this consortium planning effort. A report, including workgroup recommendations, was delivered to system leaders in April 2014.

Beyond the administrative support and guidance that NCSG regularly receives from fiscal, contracts and grants, and sponsored programs offices at NC State, guidance also is received on marine science and research matters from NC State's Coastal and Marine Sciences Council. This campus council's duties include: collecting information on matters pertaining to coastal and marine issues at NC State from coastal and marine sciences faculty, administrators and other appropriate sources; sharing information on a

timely basis with coastal and marine sciences faculty and administrators at NC State; and making recommendations to the campus administration on policies and procedures affecting coastal and marine-related research, extension and academic programs. The NCSG executive director and deputy director are council members.

Six members of our NCSG team are adjunct faculty across a variety of marine and social science departments within the UNC System, including at UNC Chapel Hill, UNC Wilmington, NC State, and East Carolina. These roles offer yet another direct mechanism of advice and guidance from, to and across the UNC System.

Additional Advice and Feedback

Clearly, a number of additional mechanisms and channels help NCSG gather background information, advise program leaders on complex and/or emerging issues, and guide priority setting. NCSG seeks feedback at local, state, regional, national and international levels to ensure programmatic relevance, effectiveness and efficiency. NCSG continues to be committed to:

- A thorough, group dynamics-driven and forward-looking annual plan-of-work process undertaken by our outreach team members and management team.
- Evaluations of outreach meetings, conferences and workshops.
- Multiple full NCSG team meetings per year, and more regular meetings of extension and communications teams. Separate meetings focus on topical/theme areas such as fisheries, community-based marketing and economic development, or water quality.
- Regularly scheduled monthly discussions with the directors NCDCM and the N.C. Division of Marine Fisheries. Both agencies are within the N.C. Department of Environment and National Resources.
- Regular communications with the director of N.C. Cooperative Extension, as well as on-going NCSG extension interactions, and often project coordination, with local Cooperative Extension agents and statewide specialists.
- Full participation on the NOAA in the Carolinas steering and executive committees. NCSG was a founding member of this grassroots group that includes NOAA line office locations in the state as well as NOAA-funded programs such as NCSG and Coastal Zone Management.
- Regular engagement with the NOAA Southeastern and Caribbean Regional Team, known as SECART, via workgroups and regional Sea Grant representation on the team's advisory board.
- Frequent conference calls or meetings of the South Atlantic and Mid-Atlantic Sea Grant directors.
- Regularly hosting, or co-hosting, workshops, forums, symposiums and conferences, such as Marine Recreational Fisheries Forums, NCSG Research Symposiums, Southeast Tidal Creek Summits, and Stream Ecology and Restoration Conferences.
- Full involvement in South Atlantic and Mid-Atlantic regional research and communication priority setting programs, including the Governor's South Atlantic Alliance, Carolinas' Integrated Science and Assessment program, and various marine fisheries commissions and councils.
- Engagement in relevant international initiatives and training, such as the Sea Partnership Program in Indonesia, which was founded by a former NCSG-funded coastal engineering graduate student based on his experience here. Other international topics include stream restoration in India and seafood marketing in Ireland.

Program Funding

The UNC System has remained committed to NCSG through five decades. NCSG is a true state/federal partnership. Federal funding administered through NOAA is matched by state funds appropriated by the North Carolina General Assembly. Information from PIER (Planning, Implementation and Evaluations Resources system), provided to the Site Review Team separately by the National Sea Grant Office, details NCSG funding from 2010 to 2014, including federal and state matching funds and pass-through amounts.

Also included in the Site Review information from PIER is the distribution of funding by

functional area from 2010 to 2014. These areas generally include fiscal investments in:

- Administration: General operating funds include fiscal and deputy director salaries and related travel, student to work with director and support for advisory board meetings.
- Extension: Project-related costs, such as for extension team, as well as special projects, such as for climate and aquaculture.
- Communications: General operating funds for communications initiatives, including print and electronic products.
- Education: Mostly fellowship support, including Knauss Fellows, graduate student stipend awards associated with core projects, and an ongoing state fisheries fellowship.
- Program Development: Minigrant funding to support seed grants and proof-of-concept grants, as well as sponsorship funds.
- Research: Core grants, post-doc projects, other research grants funded by NOAA.

NCSG is committed to ensuring that resources are applied to critical coastal priority needs. The program's allocation of funding for research and outreach is well distributed across the focus areas described in our strategic plan. (Appendix 8.)

Leveraged Resources

"Managed" and "influenced" funding from sources outside NCSG is included in the PIER information provided by the national office. These projects provide significant contributions to the NCSG research and outreach portfolio and ability to address local, state and regional needs. (See table on page 13 in the PIER report.)

State-appropriated funds provide separate and significant support for NCSG to administer additional marine science-related projects that provide faculty salaries and research relevant at local, state and regional levels. These collaborative research projects often include commercial and recreational fishermen and other community participation. Since the mid-1990s, NCSG received funds from the N.C General Assembly (via NCDENR) to manage and fund the N.C. Fishery Resource Grant Program, known as FRG. Due to state budget difficulties since 2008, FRG funding, which for the previous decade was set at $1 million annually, declined precipitously through 2012. FRG then was eliminated from the state budget that was authorized in 2013. Since 2001, NCSG has received similar university funding to manage and fund the N.C. Blue Crab and Shellfish Research Program. That program has fallen from $500,000 in 2003 to $169,653 currently. Further BCSRP reductions are expected in 2014 as the state budget is finalized by the state legislature and administered by the UNC System. NCSG also expects additional reductions to its state-appropriated matching dollars due to declining UNC System appropriations.

To address constrained federal and state budget realities as well as to gain staffing efficiencies and meet calls for reducing the costs of administering centers and institutes in the UNC System and at NC State, select NCSG positions have assumed duties with other university programs as previously discussed in the management section. Additionally, to help offset inflationary erosion and the continuing decline of federal and state funding, all NCSG team members have been encouraged to seek external support for their programs in recent years, offsetting team salary costs and enabling programmatic growth in mission areas. From 2010 to 2013, $1.7 million in external funds has covered salary costs. Also more than $917,000 has been competitively awarded to NCSG. At this time, NCSG has recorded an additional $314,186 in managed funds in 2014.

NCSG also is extremely proud to note that projects initiated within our program set the groundwork for significant leveraging by researchers and/or partners for follow-up efforts. The Site Review PIER information notes more than $5.7 million in leveraged funding that was influenced by NCSG from 2010 to 2013.

RECRUITING TALENT

NCSG utilizes three main mechanisms to recruit new talent from across the state to participate in our research enterprise. These include our Request For Proposal (RFP) processes, our Minigrant Program, and student fellowships to support NCSG research and outreach. The entire NCSG team supports the recruitment process. Each of these mechanisms will be described in the following sections. You will note that the

varied research programs we offer result in significant numbers of researchers and research FTEs in the PIER information. Higher numbers earlier in the reporting cycle include the FRG program, which was cut by the state in 2013.

NCSG establishes Requests for Proposals, or RFPs within three primary competition areas: our Core Research RFP process, our managed leveraged funds RFPs, and our Minigrant Program. Each utilizes a slightly different process and occurs at different times of the year. However, all maintain exceedingly high levels of scientific rigor and share common design elements aimed at maximizing the return on investment to NCSG, including planning for outreach engagement.

Core Research RFPs

To begin the process resulting in the biennial NCSG omnibus proposal to the National Sea Grant Office, research priorities are reviewed and updated through a combination of methods. The first level of priority guidance is taken from the current National Sea Grant College Program Strategic Plan. This plan gives the general focus areas on which to focus our research dollars. The next level is the current NCSG strategic plan, which mirrors the national strategic plan but tailors the focus areas to highlight North Carolina needs. Both the national and NCSG strategic plans incorporate stakeholder engagement and needs assessments to help shape the focus areas. The final level of guidance for our core research priorities is obtained from ongoing contacts with local stakeholders through formal needs assessments, focus group meetings, and one-on-one conversations to discuss research needs that arise outside the formal strategic planning process. Our stakeholders include federal and state agencies, commercial and recreational fishermen, nonprofit groups, universities, city/county municipalities, our NCSG Advisory Board and local citizens.

Prior to 2014, the associate director drafted priorities for specific RFPs in consultation with the executive director. Since 2014, in light of the new hire and a change in title and responsibilities, the deputy director drafts priorities, which are vetted through the management team prior to the RFP being released. The vetting process ensures the priorities serve not only the needs of research communities but also extension and communication needs. After thorough review by the fiscal officer to ensure compliance with federal and state requirements, the RFP is distributed through various avenues, including websites, listservs, direct news releases, targeted solicitations, blogs and social media, and university-level contacts for sponsored programs.

This review period included cycles for 2010-12, 2012-14 and 2014-16. Core research and other projects funded though these cycles are in Table E in the PIER report. The 2014-16 core projects included funding for teams at NC State, East Carolina, UNC Chapel Hill, UNC Wilmington and a community partner. Co-investigators include researchers at North Carolina Central University and Duke, as well as a consulting firm and a South Carolina state agency. See Table 1 for metrics associated with these three core research cycles.

Table 1: Core Research Cycle Metrics

Category	**2010-2012**	**2012-2014**	**2014-2016**
Pre-proposals submitted	41	46	55
Full proposals submitted	20	23	19
Proposals funded	11	13	12
Institutions with proposals funded	5	5	5
Proposals funded from home institution	4	5	4

The Core Research RFP cycle has distinct stages. Preproposals are requested in the spring of odd-numbered years. The preproposal stage has two main benefits. Applicants can be advised if their idea is a good fit for the current NCSG priorities with a minimal amount of review. NCSG also may quickly cull the proposals down to only ones that are highly relevant. In-state topic experts and NCSG team members review preproposals for relevancy to North Carolina's needs and the priorities as identified in the RFP. NCSG

typically receives 40 to 60 preproposals. Those receiving high ranks from this relevancy review are invited to submit full proposals. Typically around 50 percent of the preproposals are invited for full proposals. Invitees are notified by early May whether they need to prepare a full proposal, due in early July. Uninvited researchers may take in reviewers' comments and prepare a full proposal.

Full proposals are reviewed by 3 to 4 technical reviewers for scientific rigor and innovative hypotheses and method, as well as by NCSG team members. The reviews are collated and proposals ranked. The final step in the selection process is a review panel made up of about 8 nationally recognized experts in subject areas represented in the proposals. Each panel member is the primary reviewer for about 4 proposals, and secondary reviewer for the same number. The lead reviewer presents the proposal to the panel and leads overall discussion, then prepares brief summary of the panel's considerations. Together, the panel examines the proposals and the peer reviewer comments and makes recommendations as to which proposals are fundable. These recommendations are provided to the NCSG executive director, who selects the final proposals in order to provide an overall program to meet NCSG priorities and identified needs in the state.

Starting in 2011, NCSG transitioned the entire core research RFP and progress reporting processes to eSeaGrant. Utilized by several Sea Grant programs, eSeaGrant allows researchers to securely submit proposals electronically. Then reviewers can download proposals and securely submit their comments. The technical panelists can then access the full proposal and reviews. With eSeaGrant, NCSG not only has increased efficiency during the RFP process but also has increased success and response rates for annual progress reporting by researchers. NCSG team members can easily review those projects' progress reports to prepare content for the annual national Sea Grant reporting process.
In 2013, NCSG initiated a research portfolio project to look back over the past 20 years of funded core research projects. The goal was a greater understanding of where NCSG has invested research dollars and to better determine specific and overarching impacts that have resulted. As the NCSG executive director and deputy director of NCSG are relatively new, understanding this history is critical to developing a plan moving forward. Initial results helped shape the 2014 NCSG Research Symposium, which is described in more detail in the networking section of this report.

Leveraged Funds RFPs
During this reporting period, NCSG has administered 4 extramural research programs outside the Omnibus. Those programs are the state-funded BCSRP and FRG programs, the NMFS-funded marine mammals in mid-Atlantic fisheries research program, and joint calls with WRRI. The projects funded out of these programs during this reporting period can be found in Appendix 9. BCSRP RFPs were conducted in 2010, 2011, 2012 and 2013. Although a call in 2014 was not released, funds remain in the BCSRP account and future RFPs from this program are anticipated. FRG RFPs were conducted in 2010, 2011, 2012 and 2013. Unfortunately, this program's funding was eliminated during the 2013 N.C. legislative session. No further calls are expected and once existing projects are completed, this program will be closed out.

NCSG has partnered NOAA's National Marine Fisheries Service since 2004 to administer research programs focused on marine mammal stocks and fishery interactions in the Southeast Atlantic (formally known as Bycatch Reduction of Marine Mammals). NCSG successfully competed nationally in 2012 and 2014 to continue to partner with NMFS to assist with this program. The 2014 NMFS funds, totaling $400,000, will become available in 2015. The marine mammal RFPs occurred in 2010, 2012, and 2014. This program is an important program for NCSG as it gives us a regional impact beyond the state and includes researchers from several states.

Joint RFPs with WRRI were released in 2010, 2012 and 2014. This is important collaboration for NCSG as WRRI has statewide reach.

The RFP process for these leveraged funds programs varies slightly but all are essentially

overseen using the same process. RFPs are released as needed. Priorities are developed in collaboration with RFP partner organizations using the same process as described above for the core research projects in the omnibus process. RFPs are distributed through various outlets including websites, listservs, direct news releases, targeted solicitations, university sponsored-program contacts and blogs. These RFPs utilize a single-stage process, based on a proposal of up to 5 pages. Upon receipt, proposals are reviewed by 3 to 4 topical experts for scientific rigor and an NCSG team member for relevancy. To consider all the reviews, NCSG convenes a selection committee of additional experts along with NCSG team members and the partnering organization. The NCSG executive director considers those recommendations in choosing proposals to be funded.

Minigrant Program RFP

In our 2011 NCSG Federal Site Review, the NCSG Minigrant Program was recognized as a best management practice due to its nimbleness and "always open" status, along with our ability to quickly disseminate results. Since that time, NCSG has continued to improve the program, which we have found provides some of our highest returns on investments. Minigrants have continued to draw strong interest during this evaluation period. Minigrants funded during this evaluation period are noted in Appendix 10. With average budgets of $5,000, many of these projects help develop new partnerships for NCSG research and extension applications. Minigrants often provide a doorway through which new faculty — and other people or organizations not previously funded by NCSG — reach us. We advertise these small grants as providing funds to meet pilot-scale needs, including but not limited to: rapid response; translating research into educational and outreach opportunities; research seed funding for exploration and project development in new or novel areas; and graduate student fellowships. Minigrants continue to provide significant impacts, accomplishments and leveraged funding for NCSG, the research teams and the state.

Over the past year, external requests for support from the NCSG Minigrant Program have increased considerably, resulting in a significant increase in awards. It is not clear why this program has experienced such an increase in interest, however it likely can in part be attributed to a decrease in the availability of other federal and state research funds (such as the state FRG program). We also see growing recognition by junior faculty that we offer a desirable source of seed funding. NCSG also continues its long-standing commitment to graduate research programming, while other national and state programs have decreased these investments. All these factors highlight the great niche that this program fills.

Minigrant forms and instructions are on the NCSG website under Funding Opportunities. The 3-page proposals can be submitted (or invited by NCSG) at any time for applied research, extension projects and outreach activities. Proposals receive reviews by NCSG team members and outside peer reviewers. Processing and awarding of grants often takes less than a month. Non-federal matching dollars are not required, nor are indirect costs applied. Minigrant proposals were submitted to the associate director through 2013 and now go to the deputy director. The executive director may use other means to prompt submission of investigator proposals in priority focus areas by issuing additional formal, widely advertised RFPs that follow a similar process. NCSG works with interested investigators throughout the process to ensure projects are of the highest quality. Successful primary investigators must provide a final report upon completion. They also provide annual progress and follow-up reports through eSeaGrant for our national reporting.

Student Fellowships

NCSG supports a multitude of graduate fellowship opportunities, often in partnership with other organizations. From 2010 to 2014, we recruited for and/or administered the following fellowships: Dean John A. Knauss Marine Policy Fellowship; NMFS-Sea Grant Fellowships in Population Dynamics and Resource Economics; NOAA Coastal Services Center's Coastal Management Fellowship; NCSG/ N.C. Coastal Reserve's Coastal Research Fellowship; NCSG/N.C. Coastal Resources Law, Planning, and Policy Center's Coastal Policy Fellowship, NCSG/East Carolina Maritime Heritage

Fellowship; the NCSG/NCDMF Marine Fisheries Fellowship; and the NCSG Science Communications Fellowship.

In all of these, NCSG has the responsibility for recruiting applicants and interviewing/reviewing applications. The goal of all the fellowships is to provide students with unmatched experience and professional development. The students emerge as highly qualified professionals, ready to assume their first post-graduate professional position or next education step. Similar to the Minigrant Program, NCSG and related fellowships provide an extremely high return on investment, compared to funding/staff time invested. Appendix 11 identifies students that have been funded through these various fellowships during this evaluation period. In the past year, we have started a concerted effort to follow-up with past fellows, starting with our strong cadre of Knauss fellows over the years. This will allow us to better understand the long-term value of the experience, which has led to positions at the White House, in NOAA and major nonprofits.

Although not separate fellowships, NCSG also provides graduate student support to many of our core research projects. These students also receive unmatched training opportunities and degree-completion assistance. We firmly believe that our investment in student training is a best management practice as all parties receive great benefit at very little cost.

Extension Functional Programming

In North Carolina, the Sea Grant extension category includes education. We have an outstanding team of subject-matter specialists who cover topics from across the National Sea Grant Program's spectrum of focus areas. All hold a master's or higher academic degree, have statewide responsibilities, and have at least 50 percent of their time dedicated to NCSG. The specialists also have outstanding administrative support, as is the case throughout the program.

With offices in three coastal locations and a headquarters in the state capital, as explained earlier, specialists gain an intimate knowledge of nuances in the importance of different issues in geographic areas. Thus, outreach programming is fine-tuned for physical and cultural regions of our 300-mile coastline. The specialists are expert partners in geographic and professional communities. They often are approached as go-to individuals on coastal topics because they are respected as honest brokers of information. They quickly identify who in NCSG or a partner agency is the best to handle a particular question. Such respect at the local, state and national level is shown in the honors noted during the current review cycle. Appendix 12 notes awards, such as from national, Mid-Atlantic and South Atlantic Sea Grant extension networks, the N.C. Governor's Conservation Achievement Awards, and the NOAA Walter B. Jones Sr. Awards.

The extension team forms a significant portion of a strong internal NCSG network that is integrated horizontally across regions and topical areas. The team also is integrated vertically, connecting coastal resident and clientele groups and the university research community. Specialists are co-located in research facilities. This encourages NCSG and stakeholder involvement in selection, development and process of research projects. Our specialists collaborate on new avenues of research or improve ongoing projects by identifying emerging issues and changing environmental or community factors, of which a researcher may be unaware. Specialists also have opportunities to share new research-based information with audiences. Our extension specialists are leaders in national Sea Grant networks and quickly consider how concerns and solutions developed here relate to issues near and far. North Carolina is situated at the confluence of two major marine ecosystems, and sits in two geographic regions. Thus extension team and NCSG as a whole regularly collaborate with Sea Grant partners from New York to Florida.

Communications Functional Programming

Truly, the entire NCSG team could be described as outstanding communicators. All are known as good listeners and have the ability to get to the heart of question — from identifying sudden ecosystem degradation to explaining federal grant intricacies or tracking down a decade-old publication. They provide appropriate information or contacts. In National Sea Grant's model, we also have a strong communications team that focuses on developing and distributing varied products that highlight research and

extension impacts, as well as our partnerships at local, state and national levels.

Our flagship publication, *Coastwatch* magazine has a tradition of honors within the Sea Grant network and at the state and national levels, with recent honors noted in Appendix 12. *Coastwatch* is a great example of the integration of our efforts across disciplines, NCSG teams and different media formats. We maintain a printed magazine, but also provide stories online. With the launch of our new website at ncseagrant.org, we have added a *Coastwatch Currents* blog to keep the conversations going between issues. The magazine, with a print run of 4,000 per issue, is shared with subscribers, a complimentary list, and targeted audiences. The magazine provides opportunities to showcase other NCSG products, from videos to reports, books and newsletters.

We cultivate undergraduate and graduate interns, with our NCSG communications network now including professionals in government, corporations or in businesses for themselves. From 2004 to 2012, we offered current or recent graduate students a year-fellowship. Over the years, we have hired two of those fellows and one from another Sea Grant program, and had others work as freelancers. In 2013, we had an opportunity to convert funding for the rotating position to establish a continuing science writer/edit slot shared with WRRI. But we have not abandoned our focus on graduate student and opportunities to learn from them. New strategies include semester or summer positions for graduate students to work in our office, as well as a concerted effort to have funded students write magazine about their research.

B. STAKEHOLDER ENGAGEMENT

As noted earlier, NCSG receives extensive input from stakeholders to ensure that relevant and emerging issues guide the development of our research and outreach programming. Those stakeholders also are partners as we work through tough questions and concerns for coastal communities and ecosystems. Through those partnerships, we have seen growing capacities for individuals, communities, agencies, businesses, and non-governmental organizations. In turn, NCSG provides constant, consistent and unbiased interaction with myriad stakeholders and the general public. This includes NCSG team members and researchers serving as advisors on key panels that consider topics such as sea level rise, local foods marketing, estuarine science and policy, fisheries management, marine sanctuaries and community development. See Appendix 2 for ways that NCSG team members advise agencies, initiatives and community organizations.

Appendix 13 offers examples of the range of stakeholder and partners with whom we work on specific topics. A listing of partners by types or levels also is included in the PIER materials. These strong connections support the Sea Grant network's "honest broker" role. NCSG often serves as an unbiased convener of meetings to bring varied voices to the table. Extension skills and our varied office settings allow us to share not just the results of our research and that within our network, but also other reliable, relevant data, techniques or information portals. We reach and engage audiences through traditional personal contact — such as meetings, workshops, personal visits, telephone contact, committee service— as well as through products and technology, such as newsletters, *Coastwatch* magazine, websites, social media, video and webinars.

Our education programs truly serve all ages. Our K-12 marine education programs "teach the teachers," to multiply the ultimate impacts. NCSG also has key partnerships with informal education settings, including museums, aquariums and the National Park Service. Research and outreach fellowships were noted previously. NCSG extension specialists also teach university level-courses. In addition, they provide content for continuing education workshops for attorneys, architects, engineers, emergency managers, geologists, planners, etc. Such work ensures that agencies and businesses

have professionals who are trained on current topics. Our educational efforts serve industries, such as shrimpers; interest groups, such as the recreational anglers; and consumers through the *Mariner's Menu* blog. Examples of our stakeholder engagements are presented below.

Preparing and Responding to Natural Hazards
Coastal communities are increasingly struggling with changing weather-and climate-related hazards. NCSG team members and researchers partner with NOAA's National Weather Service Forecast Offices and National Hurricane Center colleagues to improve storm surge and other tropical storm forecasting and warnings and communications. Follow-up partnerships from a Core research project included new preparedness materials in Spanish, and an annual hurricane conference that educates and trains NWS forecasters, state and local emergency management officials, and the media. NCSG and NWS also co-sponsor local town-hall meetings after major storms to identify ways to improve warning messages. We also encourage citizen-science reporting of precipitation by providing rain gauges and identifying potential coastal participants in a national weather-monitoring network.

Enhancing Community Resilience
Among the most relevant issues for coastal homeowners and businesses is the threat of major cost increases for flood and wind insurance premiums. NCSG helps coastal property owners, businesses and community officials to understand, anticipate and prepare for possible increases in flood insurance premiums, including those associated with the federal Biggert-Waters Act. Recognized nationally as an expert, our coastal construction specialist works with local, state and federal partners such as N.C. Homebuilders Association, state legislative panels and local government officials. Building code changes and property owners' voluntary adaptations based on NCSG recommendations reduce future wind and water damage, lower insurance costs and provide for more resilient communities. NCSG hosted education and training courses for home inspectors and builders that was designed and implemented with partners from the Institute of Business and Home Safety.

Diversifying Coastal Community Economies
Commercial and for-hire fishing industries have long been an integral part of our coastal communities. As foreign imports and increased operating costs have threatened these businesses, NCSG has worked with fishing families and communities, state officials, seafood processors, distributors and consumers to develop innovative marketing strategies for highly desirable locally landed fish products. These initiatives include N.C. Catch, Carteret Catch, Brunswick Catch, Outer Banks Catch, Ocracoke Fresh — each including fishermen, dealers and market owners, restaurant owner and chefs, local government officials and consumers. A project funded through FRG is credited with first describing the model for Community Supported Fisheries, a concept that has been adopted and adapted far and wide. NCSG also helps businesses develop value-added seafood products that demand a premium price. For example, a struggling crab-processing facility asked for help to transfer a family recipe into a value-added crabcake. The product has kept the business going, and generates about $350,000 in economic impact for the processor and retailers. Coastal communities also are increasingly looking at economic-development strategies based on tourism that highlights environmental and cultural heritage. The grassroots Saltwater Connections network grew directly from one of our social science research projects. Extension specialists are integral partners on the group's ongoing partnerships, including developing and promoting the federally funded Outer Banks Scenic Byway, which *The New York Times* recently highlighted.

Communicating Coastal Science
UNC-TV, the statewide public television network, is a long-time NCSG partner in sharing and explaining marine and coastal policy and science information. Recent efforts include the production and broadcast of *North Carolina's Local Catch*, a documentary highlighting the variety and seasonality of N.C. fisheries. With funding through the FRG program and consultation with NCSG extension and communications specialists and other partners, UNC-TV introduced all aspects of the seafood supply chain, from fishermen working the waters and sharing traditional recipes to a fish house,

market, restaurants and a community supported fishery. NCSG collaborates regularly with UNC-TV for stories on *North Carolina Science Now*, a weekly series within *North Carolina Now*, a weeknight public affairs program. Topics have included shellfish safety, oyster reef responding to climate change and fish tagging. The NCSG executive director serves on the *Science Now* technical advisory board. UNC-TV also is a national partner in QUEST science programming funded by the National Science Foundation. We have been a state collaborator for NC QUEST video stories and online educational materials, including links to *Coastwatch* or NCSG products. In 2014, a UNC-TV proposal regarding drought issues was selected for joint funding from NCSG and WRRI. NCSG works closely with dozens of partners to share our scientific process and results with varied audiences and the public at-large. This includes working relationships with local and national media, the National Association of Science Writers and Science Online Oceans. Partnerships with state and federal agencies result in products that meet critical needs while sharing a staff time and production costs.

Fisheries Outreach in a Modern World

N.C. shrimpers face stiff completion from foreign wild-caught and aquaculture-raised shrimp products. Domestic shrimpers face increasing production costs such as fuel, gear and labor. NCSG collaborated with the Trade Adjustment Assistance program within the U.S. Department of Agriculture, along with Sea Grant partners in Texas, Louisiana, Mississippi/Alabama, Florida, Georgia and South Carolina. TAA required participants to complete intensive training requirements, and ultimately provided more than $2 million to 182 North Carolinians. NCSG recruited participants to learn to develop business plans and adjust business practices to be more effective. Online training included the Shrimp Marketing Opportunities course co-developed by NCSG extension. Meetings/workshops and personal sessions provided other components, such as intensive technical assistance and long-term business adjustment plans.

Fisheries data collection can be very expensive. To identify potential cost-effective and relevant alternatives, Sea Grant evaluates, develops and encourages new ways to electronically and digitally gather data. NCSG received NMFS funding to lead a South Atlantic regional project to examine video monitoring of snapper-grouper fishery vessels. The team, which included SCSG, worked closely with captains and fisheries managers. They determined that simple data loggers provide information similar to that in the videos, yet the loggers would cost fishermen considerably less annually. A previous minigrant initiated discussions in North Carolina and beyond to find ways for anglers to easily submit data themselves, thus augmenting survey techniques and helping managers get clearer pictures of fishery stocks. After successful testing of RecText by charter boat captains using simple cell phones, the project was expanded through a grant from the N.C. Coastal Recreational Fishing License program. In recent years, fisheries managers in Maryland have adapted the protocols. NMFS has tested a variation as well.

Training Future Leaders

NCSG efforts to train future generations of coastal scientists and resource managers are not only multi-faceted but also interconnected. As noted earlier, NCSG funds core research and other projects across the university system, many of which include graduate students. Investigators regularly encourage graduate students to apply for NCSG fellowships, such as the NCSG/N.C. Coastal Reserve fellowship, to expand on those topics. For many graduate students, it may be the first time they are responsible for a proposal, from talking with stakeholders and partners about needs to explaining their goal and developing the project. Fellows cite the NCSG process, in which initial reviews may offer critical improvements, as an outstanding entry point for the world of competitive research. To better understand the "broader impacts" elements required by many funders, a number of NCSG-funded students also participated in REEF: Researchers and Educators Exchange Forum organized by the Centers for Ocean Sciences Education Excellence-Southeast, which was funded by NSF. NCSG was a founding partner of COSEE SE.

The Scientific and Research Education Network has gone well beyond REEF project requirements. The founders, UNC-CH graduate students who have been on NCSG research projects, gathered colleagues from the central

coast to present the first SciREN event. Held at the N.C. Aquarium at Pine Knoll Shores, it drew dozens of researchers, teachers and other educators. The second annual event included researchers from other coastal locations. In November 2014, the first SciREN Triangle event will be at the N.C. Museum of Natural Sciences. NCSG continues as a key sponsor of lesson plan workshops to help scientists develop curricular material that bring real coastal issues, and in some cases near real-time data, into classrooms at elementary, middle and high schools, as well as in informal settings. Those data-driven lessons and programs educate many future scientists, resource managers and community leaders. SciREN events also include scientists and outreach professionals from state and federal agencies.

Identifying STEM Education Initiatives
Educators in North Carolina are tasked with increasing student performance in all subjects without having the benefit of much additional training, particularly in marine science. NCSG offers relevant workshops and curricular materials in marine and ocean sciences. An NCSG research project has provided critical data about middle-schoolers science experience, and now is being expanded in partnership with Project Wet and the N.C. Office of Environmental Education. As classroom and informal educators increase their knowledge, they in turn begin to share ocean literacy lessons that meet North Carolina's Next Generation Science Standards. Elementary educators also seek information and activities related to the marine environment. For the past decade, our marine education specialist has served as the local implementation team leader for DataStreme Ocean, an online graduate oceanography course. She has also assisted numerous agencies and organizations, such at the N.C. Office of Environmental Education, with workshops and is regularly asked to share marine science content and research results at state, regional, and national marine education conferences. The result is that educators have a greater knowledge base of marine/estuarine habitats and current research, as well as a larger repertoire of relevant activities to use with their various audiences. Our PIER tally shows nearly 90,000 students were reached from 2010 to 2013 through direct or indirect programs by NCSG researchers and extension or communications specialists.

C. COLLABORATIVE NETWORKS

NCSG continues to have many activities and projects with NOAA line offices and NOAA-funded programs, as well as with additional networks at local, state and national levels. Examples of our networking and leadership are noted in the team members' roles listed in Appendix 2. Our collaborations also include regional research projects on lionfish in the South Atlantic and flounder response to climate change in the Mid-Atlantic. NCSG long-time extension and communications roles in a national task force on rip current safety led by NOAA and the U.S Lifesaving Association are beneficial for our work at the state and local levels, and visa versa. Rip current partnerships at all levels are among the examples of our work with partners, stakeholders and networks in Appendix 13.

The NCSG team and researchers also convene or participate in overarching discussions to identify needs and set priorities for regional or topical groups. This includes setting research needs and/or goals that have been incorporated into planning by agencies or groups, such as the Governors' South Atlantic Alliance. Other NCSG efforts with GSAA include identifying resiliency needs and establishing the organization's communications plan. We also co-sponsored the group's 2013 meeting in Raleigh. The work with GSAA dovetails well with other regional efforts, such as Sea Grant and NOAA networks.
In recent years, NCSG has added partnerships with the Department of Defense, through the Strategic Environmental Research and Development Program, an environmental science and technology program with the U.S. Department of Energy and the U.S. Environmental Protection Agency. Camp Lejeune and Cherry Point facilities of the U.S. Marine Corps are within the coastal zone, while the Seymour Johnson Air Force Base and Fort Bragg are also within the state. Our

collaborations with the U.S. Department of Homeland Security include collaborations with the Federal Emergency Management Agency on storm damage assessments, and with a hazards center of excellence based at UNC Chapel Hill. Our networks extend across North Carolina, the region and the nation. A sampling of our collaborative networks include:

Building on the Past to Plan for the Future
Initiated by the new executive director in 2013, our research portfolio review not only has provided extensive historical information but also is generating new partnerships. By stepping back to identify patterns within the NCSG research program over the past 20 years and across the UNC System, we gained better understanding of long-term impacts, including data and other information, recommendations for policy, and new tools or techniques. With new NCSG leadership, this review has been a critical step in our planning. The portfolio process also provided fodder for the NCSG Research Summit held in April 2014. The summit steering committee included key leaders from across the UNC system and Duke's marine science programs, as well as state agencies. The event not only allowed us to share NCSG results, but it also celebrated and reinvigorated a wider network. In the breakout groups, local officials and other community leaders joined researchers, NCSG team members and resource managers to identify current challenges and potential solutions. Several new or renewed partnerships will be funded through the 2014 special RFP on topics that emerged at the summit: infrastructure in the coastal zone, long-term datasets, tidal creek systems and research to inform restoration. Our symposium format inspired organizers of an NC State graduate seminar this fall to break with traditional seminar formats.

Investing in Coastal Law and Policy
The N.C. Coastal Law, Planning and Policy Center, described earlier, recently has seen the retirement of its co-director from the law school at UNC Chapel Hill. The new co-director also leads a broader environmental law center, thus expanding the Center's expertise. Annual Shape of the Coast forums draw legal practitioners, policymakers, students and others who care about the coast to discuss current and emerging topics. The sessions provide continuing legal education credits and often include policy updates from the N.C. Coastal Resources Commission. An "Inner Banks" study identified pressing issues that communities and the state will face over the next decade. The final report provided policy recommendations on topics such as wind energy and sewer overflows. On a federal level, the Center co-directors serve on the U.S. Bureau of Ocean Energy Management Renewable Energy Task Force for North Carolina.

Enhancing Stream Restoration and Mitigation Planning
NCSG is a leader in collaborative efforts in a critical mitigation arena. A long-time partnership between NCSG and NC State funds a portion of our water protection and restoration position. That specialist co-leads NC State's Stream Restoration Program, which provides professional training, demonstrations and research initiatives that have influenced restoration techniques throughout the state and beyond. Landscape architects and engineers often earn continuing education credits through the training. The program also has conducted more than 60 grant-funded projects across the state to demonstrate and evaluate stream restoration practices in a variety of watershed conditions. NCSG also is a leader in regional stream conferences held every two years that draw speakers and attendees from around the country and beyond. The NCSG specialist recently earned a doctorate with a study that established a matrix to evaluate stream restoration success.

Helping Coastal Communities Adapt
NCSG has facilitated the creation of a coastal community climate change adaptation network in the state. A workgroup of agency staff and partners doing climate-related work in the state devised an action plan. Workshops provided fact-based information on climate change, as well as specific examples of adaptation efforts in the state. Participants included key individuals in state and federal agencies, non-government organizations, city and county municipalities, and private citizens. University partners were from East Carolina and NC State, and agency partners from NCDENR programs and EPA. Workshop evaluations indicated that participants gained much knowledge.

NCSG provides other leadership on climate, including an extension specialist's long-time membership on the state's Science Panel on Coastal Hazards. Several NCSG-funded researchers also serve on the panel that advises the N.C. Coastal Resources Commission on topics including sea-level rise and inlet hazard areas. NCSG also is a key partner in the Carolinas Integrated Sciences and Assessments, or CISA, program that incorporates climate information into water and coastal management and related decision-making processes. We also network with the Office of the State Climatologist and a variety of regional climate centers, including ones funded by NOAA, USDA and the U.S. Department of Interior.

Expanding Finfish and Shellfish Aquaculture Opportunities

NCSG has long held a reputation as a state, regional and national leader in research and outreach efforts to provide a strong science basis for new or expanding aquaculture operations. This includes leadership with the annual N.C. Aquaculture Development conference that brings together researchers, business leaders, economic developers and individuals interested in starting a business. In this reporting period, NCSG aquaculture focus has included finfish, shellfish and crustaceans. Recent projects are exploring polyculture efforts to grow two species at the same time. NOAA also provided special funding for a statewide team to better understand where new aquaculture leases should be placed and what parameters need to be considered in siting new leases, as well as understanding how best to operate commercial hatcheries. Like other NCSG efforts, the NOAA project includes numerous university scientists, industry experts and aquaculturists. In fact, one of the potential shellfish growers who participated in a project tour then started an oyster aquaculture business that has been featured in *Business North Carolina* and our *Coastwatch* magazines. Throughout this reporting period, NCSG also provided critical research funding for the state's first shellfish research hatchery at UNC Wilmington. Combined research and outreach efforts have put NCSG at the forefront of aquaculture research in the state. We anticipate that will continue with a new extension specialist.

Enhancing Native Oyster Populations

North Carolina's native oyster population has seen continuing decline over the years. Thus, NCSG has offered varied funding aimed at understanding how to restore reefs and the population of this important shellfish. Results from our efforts and collaborations with key partners are beginning to provide new best management practices to be incorporated into restoration activities. To help transfer this knowledge, a NCSG fisheries extension specialist worked with the N.C. Coastal Federation, UNC Chapel Hill, UNC Wilmington, NC State and experts within NCDENR to develop a 2014 workshop to share information from and explore opportunities with varied stakeholders and researchers. The gathering, which included other key partners, offered results of recent research projects, including many funded by NCSG. Researchers also offered important early findings for ongoing projects. Thus, community organizations and government agencies active in restoration efforts were provided the latest science and data. An additional oyster conference that would include state legislators in now in planning stages. The goal for that meeting would be to renew focus on oyster restoration efforts in the state.

Regional Projects

NCSG has been especially active in Sea Grant networks, with current positions on the Sea Grant Association board and as a regional representative to the Sea Grant Extension Assembly, as well as a current nominee for leadership in Sea Grant fiscal network. Extension team members provide leadership within Sea Grant topical networks, including fisheries, climate, law and policy, and sustainable community development. For more than a decade, NCSG was a key partner in COSEE-SE, funded by the National Science Foundation. Several examples of regional projects are highlighted below, including partners from Sea Grant programs and other agencies.

Community Climate Adaptation Initiative

NCSG expertise in facilitating the Vulnerability, Consequences, and Adaptation Planning Scenario process, known as VCAPS made us a critical partner on two successful competitive National Sea Grant Office Coastal Community Climate

Adaptation Initiative awards. Together, NCSG and SCSG conducted VCAPS in Beaufort County, SC. Project funding will allow 3 N.C. community representatives to attend workshops to learn how public input can inform the development of adaptation priorities to update comprehensive planning processes. VCAPS earlier had been a key part in an NCSG project with the Town of Plymouth, NC. In 2014, NCSG also facilitated VCAPS meetings in St. Marys, Ga., and Hyde County, N.C., in partnership with GASG and the Carl Vinson Institute of Government at the University of Georgia. Local county staff and officials, non-governmental organizations' leaders, and private sector professionals explored how rainfall and storm surges may produce periodic or persistent flooding. Such flooding may denigrate ecosystems, threaten cultural livelihoods, damage public infrastructure, reduce property values, and increase demand on government services. They also discussed the need for data and changes to the built environment. The next steps in the St. Marys and Hyde County projects are to use a GIS-based cost/benefit analysis to evaluate tradeoffs among potential actions to mitigate identified hazards in both communities. Our current full-time adaptation specialist previously served as a regional Sea Grant climate extension specialist serving both North and South Carolina. She has presented the VCAPS process to a wide range of professional conferences as well as to other varied groups.

Southeastern Tidal Creek Summits

In 2011, Sea Grant programs from North Carolina, South Carolina and Georgia partnered to organize and sponsor the first regional tidal creek summit in Charleston, S.C. The summit was a success, bringing together 140 scientists, resource managers, local governments and non-profit groups to network and exchange research results, programs and ideas relative to tidal creeks. A follow-up survey indicated that a second summit was critical to further foster collaboration among southeastern states in protecting, managing and restoring tidal creeks. In November 2013, a second summit in Wilmington, N.C. drew 160 participants. Additional partners included Florida Sea Grant. The summits were attended by wide range of stakeholders and researchers. The goals of both summits were to:

- Identify the current state of knowledge regarding tidal creek research and management in the southeast.
- Identify current issues and threats to tidal creek system ecology and function (management needs) and relevant future research efforts (e.g., classification, restoration, monitoring).
- Evaluate the current and potential management and restoration strategies to protect and enhance the ecology and function of tidal creeks (e.g., development setbacks, buffers, impervious cover limits, stormwater best management practices and restoration efforts).
- Identify recent trends in tidal creeks science, management and status.

Breakout groups in Wilmington discussed the important issues facing tidal creeks and identified informational gaps, resulting in a second white paper, which will help inform the research priorities of all participating Sea Grant programs, along with other partners. NCSG has already utilized the preliminary information to develop a research focus area in a special RFP in 2014.

Success in Sea Grant National Competitions

During this evaluation period, NCSG has been highly successful in National and Regional Sea Grant Competitions. These projects include:

- NMFS Bycatch Reduction of Marine Mammals in Mid-Atlantic Fisheries program. NCSG successfully competed for programs in 2012 ($100,000), and in 2014 ($400,000).
- NOAA Sentinel Site Cooperatives. NCSG successfully competed for this call to provide a 0.5 FTE Sea Grant extension specialist to coordinate the N.C. Sentinel Site Cooperative, ($200,000), 2014.
- Enhancing Sea Grant's Ability to Help Coastal Communities Adapt to Climate Change, ($60,000), 2012-2015.
- Developing Tools for the Growth of the North Carolina Shellfish Industry: Site Condition Assessment and Economic Impacts ($288,972), 2010.
- Regional: Preventing Aquatic Invasive Species Through Vector Management: Live

Bait Vector as a Model in the Mid-Atlantic Region ($15,000), 2010.

- Regional: Lionfish in the South Atlantic and Caribbean: Integrated Regional Research and Extension to Support Effective Management of an Invasive Marine Species ($20,032), 2010.

D. PROGRAM CHANGES RESULTING FROM PREVIOUS REVIEWS

The 2011 Site Review Team report noted a single recommendation, three suggestions, and four findings/comments resulting from their review (Appendix 14). NCSG successfully addressed the review team's sole recommendation to develop an official charter for the Advisory Board with a completed charter in November 2012 (as previously discussed, Appendix 5).

The previous NCSG director provided a letter to the National Sea Grant office that specifically addresses the 2011 review team's finding that additional engagement from program extension team members would have been beneficial (Appendix 15). The other actionable finding/comment regarding proactive visioning —specifically related to funding concerns and institutional arrangements — continues to be supported in many ways, including through adjustments of the roles and responsibilities of the NCSG Advisory Board, targeted engagement across our partnerships for leveraging research and extension impacts, and strategic joint team positions and collaborations with other funding sources.

The 2011 SRT report suggestion to periodically review university reporting arrangements has not been necessary over the course of this period given the very positive relationships with both the direct reporting to NC State as well as the program's strong engagement with UNC General Administration. These relationships continue to grow under new NCSG leadership.

NCSG's *Coastwatch* magazine continued to receive significant national and state accolades over this review period. The program has chosen not to use overall sponsorship funding to offset magazine printing costs at this time. Our continued independence supports our role as an "honest broker of information" in the current N.C. political environment. We do offer partners opportunities to buy-in on print runs for issues showcasing particular projects. In 2015, in conjunction with broader NCSG strategic planning and needs assessments, we also will survey current and potential readers of the printed and electronic formats. Our goal will be to better understand perceived benefits of the current publication, as well as readers' current and emerging interests. Such data will help us identify opportunities, challenges and potential partnerships as we strive to provide high-value communications products within limited budgets.

NCSG continues to work closely with N.C. Cooperative Extension at local and state scales, including the shared salary of a NCSG extension specialist with expertise in coastal resources and water quality. We also have long-term engagement with Cooperative Extension on aquaculture activities, and ongoing programs in ecosystem restoration (e.g. invasive species, stream restoration) and community education (e.g. hazard response).

Program Best Management Practices

NCSG continues to reap benefits from the well-established Minigrant Program (as described previously) that was identified in 2011 as a best management practice. Since 2011, NCSG has prioritized developing and supporting a number of progressive management practices to leverage resources further, as well as expand the reach and capacity of the program.

We find that investments in people and research continue to reap benefits through graduate research fellowships jointly hosted with state or federal institutions/agencies, and other joint funding opportunities such as those between NCSG and WRRI. Most often, the fellowships with special RFPs are supported through the program development budget, which includes Minigrant Program and our sponsorship of meetings or events developed by others. We also support and encourage state and national

fellowships, as shown in the strong showing for N.C. graduate students selected for the Knauss fellowship.

The creation of a joint NCSG and WRRI communications position ensures the program's ability to address not only coastal interests but increases the breadth of coverage to a watershed perspective, thus enhancing our program's information dissemination to an increasingly larger audience. This builds upon our earlier synergy on the administrative and fiscal positions for the two programs.

Based on the very positive feedback we received from the first NCSG Research Symposium: Investments and Opportunities, we confirmed this effort is filling a gap in engagement and information transfer for the state. NCSG plans to continue these types of forums as a model for information exchange and to develop new collaborations, such as those we will fund later this year. Topic areas for new proposals include infrastructure in the coastal zone, long-term data sets, tidal creek systems and research to inform restoration. The symposium was outlined previously. From a management perspective, we expect to refine and expand topic areas as funding allows.

Future Areas of Advancement

In looking ahead, NCSG sees significant programmatic value in explicitly strengthening the collaborating and coordinating efforts between NCSG extension and communication teams with NCSG-supported researchers through a defined coordination pilot effort established in 2014 under the leadership of the deputy director and extension director. Selected additional areas of opportunity that NCSG will consider in the near future include:

- Considering new opportunities to develop an expanded fellowship program including graduate and undergraduate students to provide additional partnership opportunities with academic, state government, NGO and community partners.
- Hiring a post-doctoral fellow in early 2015 to develop program capacity in natural resource economics and continue to leverage NC State collaborations to ultimately support a full-time permanent economist, potentially as a joint faculty extension position. This position will address NCSG research and extension needs, as well as recommendations in the AAAS report.
- Hiring the N.C. Sentinel Sites coordinator in Fall 2014 to support additional relevant research, extension and education with a newly developed NOAA initiative.
- Developing stronger relationships with the NCDENR Division of Water Resources while supporting the development of EPA-mandated scientific advisory nutrient criteria for selected impaired waters in the state.

During the Sept. 16-17, 2014 Site Review, NCSG will welcome the review team's questions and discussions on the program's response to any 2011 SRT report items as well as other program changes and advancements since 2011. This briefing book, appendices, agenda and any additional handouts provided during the team's visit will be posted at: http://ncseagrant.ncsu.edu/2014-site-review/.

Appendix 1: North Carolina Sea Grant Team Contacts

North Carolina Sea Grant, North Carolina State University, 1575 Varsity Drive, Varsity Research Building, Module 1, Box 8605, Raleigh, NC 27695-8605
You may reach the Raleigh Sea Grant staff at the main number (919-515-2454) or you may dial their direct line listed below.

Name	Title	Email	Phone
Mary Beth Barrow	Fiscal Officer	marybeth_barrow@ncsu.edu	919-515-9103
Wendy Cox	Administrative Support Specialist	wendy_cox@ncsu.edu	919-515-2456
Barbara Doll	Water Quality Specialist	barbara_doll@ncsu.edu	919-515-5287
John Fear	Deputy Director	jmfear@ncsu.edu	919-515-9104
Sandra Harris	Administrative Support Specialist	sandra_harris@ncsu.edu	919-515-9101
E-Ching Lee	Communicator	eching_lee@ncsu.edu	919-515-9098
Debra Lynch	Administrative Support Specialist	debra_lynch@ncsu.edu	919-515-9102
Katie Mosher Patterson	Communications Director	katie_mosher@ncsu.edu	919-515-9069
Gloria Putnam	Coastal Resources & Communities Specialist	gloria_putnam@ncsu.edu	919-513-0117
Rhett Register	Communicator	hrregist@ncsu.edu	919-515-1092
Lisa Schiavinato	Law, Policy & Community Development Specialist	lisa_schiavinato@ncsu.edu	919-515-1895
Jack Thigpen	Extension Director	jack_thigpen@ncsu.edu	919-515-3012
Susan White	Executive Director	snwhite3@ncsu.edu	919-513-1145
Jessica (Jess) Whitehead	Coastal Community Hazards Adaptation Specialist	jcwhite4@ncsu.edu	919-515-1686

North Carolina Sea Grant, University of North Carolina Coastal Studies Institute
Main number 252-475-3663 — (mailing address) P.O. Box 699, Manteo, NC 27954 (physical address) 850 NC Hwy 345, Wanchese, NC 27981

Name	Title	Email	Phone
Terri Kirby Hathaway	Marine Education Specialist	terrikh@csi.northcarolina.edu	252-475-5486
Sara Mirabilio	Fisheries Specialist	saram@csi.northcarolina.edu	252-475-5488

North Carolina Sea Grant, Center for Marine Sciences and Technology, 303 College Circle, Morehead City, NC 28557

Name	Title	Email	Phone
Vanda Lewis	Administrative Support Associate	vanda_lewis@ncsu.edu	252-222-6307
Barry Nash	Seafood Technology & Marketing Specialist	barry_nash@ncsu.edu	252-222-6337
New hire in process	Marine Aquaculture Extension Specialist	TBD	TBD

North Carolina Sea Grant, UNC-W Center for Marine Science, 5600 Marvin K. Moss Lane, Wilmington, NC 28409

Name	Title	Email	Phone
Scott Baker	Fisheries Specialist	bakers@uncw.edu	910-962-2492
Jennifer Dorton	N.C. Sentinel Sites Coordinator	dortonj@uncw.edu	910-962-2777
Lisa Humphrey	Administrative Support Associate	humphreyl@uncw.edu	910-962-2490
Spencer Rogers	Coastal Construction & Erosion Specialist	rogerssp@uncw.edu	910-962-2491

This page left intentionally blank.

Appendix 2: North Carolina Sea Grant Advisory Roles

Last Name	Title	Panel	Title	Year
Baker	Fisheries Specialist	American Fisheries Society, Tidewater Chapter (NC, VA, MD, DE)	President-Elect	2014-present
Baker	Fisheries Specialist	South Atlantic Fisheries Management Council, Information and Education Advisory Panel	Chair	2014-present
Baker	Fisheries Specialist	NC Sea Grant and Water Resources Research Institute Joint Proposal Selection Panel	Member	2014
Baker	Fisheries Specialist	National Marine Fisheries Service, Southeast Cooperative Research Program, Selection Panel	Member	2014, 2011, 2008
Baker	Fisheries Specialist	North Carolina Catch 3rd Annual Summit Planning Committee	Leader	2013-2014
Baker	Fisheries Specialist	Mid-Atlantic Region Sea Grant Meeting Planning Committee	Member	2013-2014
Baker	Fisheries Specialist	North Carolina Marine Recreational Fisheries Forum	Co-organizer	2012-2013
Baker	Fisheries Specialist	National Marine Fisheries Service Marine Recreational Information Program (MRIP) Observer Team	Member	2012-2013
Baker	Fisheries Specialist	Fisheries Resource Grant Program (FRG) Proposal Selection Panel	Member	2012
Baker	Fisheries Specialist	Massachusetts Recreational Bluefin Tuna (RBLT) Census Reporting MRIP Project	Member	2011-2013
Baker	Fisheries Specialist	Gulf of Mexico Electronic Monitoring Pilot Project for Reef Fish Vessels	Advisor	2011-2012
Baker	Fisheries Specialist	Sea Grant/AFS Symposium Planning Committee for 2010 "Local Catch" Symposium	Member	2010
Baker	Fisheries Specialist	National Sea Grant Catch Shares Advisory Committee	Advisor	2010
Baker	Fisheries Specialist	Trade Adjustment and Assistance Program (TAA) for Shrimp, Commodity Team	Member	2010
Baker	Fisheries Specialist	Trade Adjustment and Assistance Program (TAA) for Shrimp, North Carolina Coordinator	Leader	2009-2012
Baker	Fisheries Specialist	South Atlantic Fisheries Management Council Shrimp Advisory Panel	Advisor	2006-present
Baker	Fisheries Specialist	Blue Crab and Shellfish Research Program Proposal Selection Panel	Member	2004-2011
Baker	Fisheries Specialist	Service as a technical reviewer for 10+ journals and 20+ groups or organizations	Reviewer	2003-present
Baker	Fisheries Specialist	American Fisheries Society	Member	1999-present
Barrow	Fiscal Officer	eSea Grant Implementation Committee	Committee Member	2013-present
Barrow	Fiscal Officer	Business Operations Center Financial Task Force	Steering Committee	2013
Barrow	Fiscal Officer	Certification for Research Administrators (CRA)	Member	2010-present
Doll	Water Protection & Restoration Specialist	Water Education Summit Planning Committee	Committee Member	2014-present

Doll	Water Protection & Restoration Specialist	International Conference on Research in Watersheds Planning Committee	Committee Member	2014-present
Doll	Water Protection & Restoration Specialist	CALS Centennial Campus Sustainability Committee	Member	2010-present
Doll	Water Protection & Restoration Specialist	NC State Campus Environmental Sustainability Team (CEST)	Member	2009-present
Doll	Water Protection & Restoration Specialist	Currituck County Goes Green Initiative	Team Member	2008-present
Doll	Water Protection & Restoration Specialist	Mid-Atlantic Regional Panel for Aquatic Invasive Species	Panel Member	2006-present
Doll	Water Protection & Restoration Specialist	NC State Campus Design Review Panel	Member	2004-2010
Dorton	NC Sentinel Sites Coordinator	NC Sentinel Sites, Water Level Sub-Committee	Member	2013-present
Dorton	NC Sentinel Sites Coordinator	SECOORA Representative for the NC Coastal Atlas	Representative	2013-present
Dorton	NC Sentinel Sites Coordinator	Governor's South Atlantic Alliance (GSAA) Regional Information Management System Team	Member	2011-2014
Dorton	NC Sentinel Sites Coordinator	Southeast Coastal Ocean Observing Regional Association (SECOORA)	Member/PI	2010-present
Dorton	NC Sentinel Sites Coordinator	NOAA in the Carolinas	Coordinator	2008-present
Fear	Deputy Director	NC Division of Marine Fisheries Strategic Habitat Area Region 3 Committee	Committee Member	2013-present
Fear	Deputy Director	NC Sentinel Site Cooperative (NCSSC)	Core Management Team Member	2012-present
Fear	Deputy Director	NC Coastal Reserve/National Estuarine Research Reserve Education Advisory Committee	Committee Member	2008-present
Fear	Deputy Director	Defense Coastal/Estuarine Research Program (DCERP) Regional Coordinating Committee	Committee Member	2006-present
Kirby Hathaway	Marine Education Specialist	Outer Banks Center for Dolphin Research	Advisory Board Member	2013-present
Kirby Hathaway	Marine Education Specialist	National Network for Ocean and Climate Change Interpretation (NNOCCI)	Network/Workshop Participant	2013-present
Kirby Hathaway	Marine Education Specialist	NC Soil and Water Education Sub-Committee on Mobile Soil Trailer	Sub-Committee Member	2013-present
Kirby Hathaway	Marine Education Specialist	National Sea Grant Project: Pharmaceuticals and Personal Care Products	Committee Member	2013-present
Kirby Hathaway	Marine Education Specialist	Southeast Environmental Education Alliance	Proposal Reviewer	2013
Kirby Hathaway	Marine Education Specialist	Louisiana Sea Grant	Proposal Reviewer	2013
Kirby Hathaway	Marine Education Specialist	New Hampshire Sea Grant	Proposal Reviewer	2013
Kirby Hathaway	Marine Education Specialist	Connecticut Sea Grant	Proposal Reviewer	2013
Kirby Hathaway	Marine Education Specialist	Sea Grant Educators Network	Member of Executive Committee	2011-present
Kirby Hathaway	Marine Education Specialist	Blue Heron Bowl (Regional Competition for NOSB)	Moderator	2011-2012

Kirby Hathaway	Marine Education Specialist	Dare Soil and Water Conservation District	Board of Supervisors	2010-present
Kirby Hathaway	Marine Education Specialist	NC Office of Environmental Education and Public Affairs	Facilitator for "Methods of Teaching EE"	2010-present
Kirby Hathaway	Marine Education Specialist	NOAA Office of Education	Proposal Reviewer	2010
Kirby Hathaway	Marine Education Specialist	National Marine Educators Association	By-Laws Committee Co-Chair	2009-present
Kirby Hathaway	Marine Education Specialist	South Carolina Sea Grant Consortium	Proposal Reviewer	2009, 2011
Kirby Hathaway	Marine Education Specialist	Monitor Sanctuary Advisory Council	Education Seat	2007-present
Kirby Hathaway	Marine Education Specialist	American Meteorological Society	Local Implementation Team Leader – DataStreme Ocean	2003-present
Lee	Managing Editor	National Association of Science Writers	Member	2011-present
Lee	Managing Editor	NC Association for Government Information Officers	Member	2010-present
Lee	Managing Editor	Society for Technical Communication	Member	2010
Mirabilio	Fisheries Specialist	Sea Grant National Fisheries Extension Network (FEN) Council	Member	2013-present
Mirabilio	Fisheries Specialist	Albemarle-Pamlico National Estuary Partnership Comprehensive Conservation and Management Plan Implementation Committee Oyster Work Group	Member	2013-present
Mirabilio	Fisheries Specialist	Outer Banks Seafood Festival's Outer Banks Catch Education Tent Subcommittee	Member	2012
Mirabilio	Fisheries Specialist	Saltwater Connections (Core Sound Waterfowl Museum and Heritage Center / NC Rural Center Economic Innovation Grant-Funded Project) Resource Team	Member	2011-present
Mirabilio	Fisheries Specialist	Outer Banks Catch Logo/Website Subcommittee	Member	2010
Mirabilio	Fisheries Specialist	College of the Albemarle – Dare Campus Marine Sciences Advisory Council	Member	2008-present
Mirabilio	Fisheries Specialist	American Fisheries Society Tidewater Chapter (Executive Committee)	Member	2008-2012
Mirabilio	Fisheries Specialist	American Fisheries Society Tidewater Chapter (*Tidewater Press* newsletter)	Editor	2008-2012
Mirabilio	Fisheries Specialist	NC Aquarium on Roanoke Island Advisory Committee	Member	2007-2013
Mirabilio	Fisheries Specialist	NC Coastal Federation Northern Oyster Work Group	Member	2005-present
Mirabilio	Fisheries Specialist	UNC Chapel Hill Institute for the Environment's Albemarle Ecological Field Site Community Advisory Board	Member	2004-2012
Mirabilio	Fisheries Specialist	American Fisheries Society Parent and Tidewater Chapters	Member	2004-present
Mosher Patterson	Communications Director	Governor's South Atlantic Alliance	Communications Advisory Committee	2013-present

Mosher Patterson	Communications Director	NC State Office of Research and Innovation	Communications Team Member and Editor of Results Magazine Chair of 2014 Awards for Excellence Committee	2011-2014
Mosher Patterson	Communications Director	NC Big Sweep	Communications Advisory – Ad Hoc	2010-2012
Mosher Patterson	Communications Director	Science Online, Including First Science Online: Oceans Meeting in 2013	Sponsor and Student Volunteer Contact Science Online Oceans 2013: Everglades Field Trip Organizer; Planning Committee	2009-present
Mosher Patterson	Communications Director	Science Communicators of NC	Member	2008-present
Mosher Patterson	Communications Director	NOAA Rip Current Strategies Team	Sea Grant Network Communications Representative	2002-present
Mosher Patterson	Communications Director	Indonesia Sea Partnership Program	Communications/ Outreach Advisor	2001-present
Mosher Patterson	Communications Director	NC Association of Government Information Officers	Member	2000-present
Mosher Patterson	Communications Director	Science Writers' – Annual Meeting of the National Association of Science Writers and Council for the Advancement of Science Writing	Member of NASW Sponsor Contact and Coastal Field Trip Lead for 2012 Meeting in Raleigh, also Member of Overall Planning Team	1999-present
Mosher Patterson	Communications Director	National Sea Grant Communications Network	Active Member. Served as Chair in Past.	1998-present
Nash	Seafood Technology and Marketing Specialist	Carteret County Food Council	Member	2014-present
Nash	Seafood Technology and Marketing Specialist	Local Food Council of NC	Member	2013-present
Nash	Seafood Technology and Marketing Specialist	Carteret County Cooperative Extension Family and Consumer Sciences Advisory Council	Member	2013-present
Nash	Seafood Technology and Marketing Specialist	NC Seafood Coalition	Member	2010-present
Nash	Seafood Technology and Marketing Specialist	NC Seafood Coalition Subcommittee for Marketing and Education	Chair – Subcommittee on Infrastructure	2010-2011
Nash	Seafood Technology and Marketing Specialist	Southeastern NC Food Systems Program	Member	2010-present
Nash	Seafood Technology and Marketing Specialist	NC Sustainable Local Food Advisory Council	Member	2009-present
Nash	Seafood Technology and Marketing Specialist	NC Sustainable Local Food Advisory Council Subcommittee for Economic Development and Infrastructure	Member	2009-2013

Nash	Seafood Technology and Marketing Specialist	NC Seafood Festival Board of Directors	Member	2007-2012
Nash	Seafood Technology and Marketing Specialist	NC Food Safety and Defense Task Force Subcommittee for Recall Enhancement to Train Businesses in Developing Protocols for Removing Potentially Hazardous Products from Commerce	Member	2006-present
Nash	Seafood Technology and Marketing Specialist	NC Seafood Festival	Organizer – Cooking with the Chefs	2006-2011
Putnam	Coastal Resources & Communities Specialist	Mid-Atlantic Panel on Aquatic Invasive Species	Panel Member	2014
Putnam	Coastal Resources & Communities Specialist	NC Watershed Stewardship Network	Steering Committee Member	2013-present
Putnam	Coastal Resources & Communities Specialist	NC Coastal Atlas	Steering Committee Member	2013-present
Putnam	Coastal Resources & Communities Specialist	U.S. Army Corps of Engineers' Currituck Sound Ecosystem Restoration Feasibility Study Project Delivery Team	Team Member	2010
Putnam	Coastal Resources & Communities Specialist	NC SAV Partnership	Education and Outreach Subcommittee	2009-present
Putnam	Coastal Resources & Communities Specialist	Currituck County Goes Green Initiative	Planning Member/Chair of Training and Development Subcommittee	2008-present
Putnam	Coastal Resources & Communities Specialist	NC Department of Environment and Natural Resources	NCSG Liaison	2007-present
Putnam	Coastal Resources & Communities Specialist	NC Nonpoint Education for Municipal Officials Workgroup	Planning Member	2007-present
Register	Science Writer/Editor	National Association of Science Writers	Member	2013
Rogers	Coastal Construction & Erosion Specialist	Ad Hoc Committee to Review Marine Construction Chapter of the NC Building Code	Member	2013-2014
Rogers	Coastal Construction & Erosion Specialist	NC Beach, Inlet and Waterway Association	Ex-Officio Member Board of Directors	2011-present
Rogers	Coastal Construction & Erosion Specialist	Coastal Zone Management Committee – Coasts, Oceans, Ports and Rivers Institute, American Society of Civil Engineers	Member	2011-present
Rogers	Coastal Construction & Erosion Specialist	Professional Development Committee, NC Association of Floodplain Managers	Member	2011-present
Rogers	Coastal Construction & Erosion Specialist	SE Region Advisory Committee, NC Coastal Federation	Member	2011-present
Rogers	Coastal Construction & Erosion Specialist	NC Science Panel	Member	1999-present

Rogers	Coastal Construction & Erosion Specialist	NC Floodmapping Committee	Member	1999-present
Rogers	Coastal Construction & Erosion Specialist	HAZUS Flood Loss Estimation Model Coastal Storm Surge Committee, National Institute of Building Sciences and FEMA	Member	1998-present
Rogers	Coastal Construction & Erosion Specialist	NC Coastal Resources Advisory Panel	Member	1993-present
Rogers	Coastal Construction & Erosion Specialist	Board of Directors, Applied Technology Council	Member	2006-2013
Rogers	Coastal Construction & Erosion Specialist	Flood Resistant Design and Construction, American Society of Civil Engineers	Standards Development Committee Member	1996-2011
Schiavinato	Coastal Law, Policy and Community Development Specialist	The Coastal Society	President	2014
Schiavinato	Coastal Law, Policy and Community Development Specialist	The Coastal Society	Past-President	2013
Schiavinato	Coastal Law, Policy and Community Development Specialist	The Coastal Society	President	2011-2012
Schiavinato	Coastal Law, Policy and Community Development Specialist	Estuarine Shoreline Steering Committee	Co-Chair	2010-2012
Schiavinato	Coastal Law, Policy and Community Development Specialist	The Coastal Society	President-Elect	2009-2010
Schiavinato	Coastal Law, Policy and Community Development Specialist	Committee of The Coastal Society's 22nd International Conference	Conference Chair	2009-2010
Schiavinato	Coastal Law, Policy and Community Development Specialist	UNC N.C. Wind Working Group	Member	2008-present
Schiavinato	Coastal Law, Policy and Community Development Specialist	Center for Natural Resources Economics and Policy	Member	2006-present
Thigpen	Extension Director	NC Aquaculture Development Conference Planning Committee	Member	2014
Thigpen	Extension Director	Newport/Morehead City National Weather Service Forecast Office Marine Forecast Advisory Committee	Member	2014
Thigpen	Extension Director	NC State Carnegie Engaged University Recertification Committee	Member	2013-2014
Thigpen	Extension Director	UNC General Administration Marine Resources Inventory Workgroup	Member	2013-2014

Thigpen	Extension Director	National Extension Social Science Community of Practice Development Team	Member	2012-2014
Thigpen	Extension Director	NC Climate Adaptation Working Group	Member	2012-2014
Thigpen	Extension Director	South Atlantic Sea Grant Region	Coordinator	2010-2014
Thigpen	Extension Director	NC Paddle Trails Association Advisory Committee	Member	2010-2014
Thigpen	Extension Director	NC Birding Trail Association Advisory Committee	Member	2010-2014
Thigpen	Extension Director	NC Catch Advisory Committee	Member	2010-2014
Thigpen	Extension Director	National Sea Grant Extension Tourism Design Team	Member	2010-2014
Thigpen	Extension Director	Sea Grant National Assembly of Program Leaders	Member	2010-2014
Thigpen	Extension Director	NC State Engagement Partnership Council	Member	2010-2014
Thigpen	Extension Director	National Extension Disaster Education Network Executive Committee	Member	2010-2014
Thigpen	Extension Director	NOAA/SECART Community Resilience Planning Team	Member	2010-2013
Thigpen	Extension Director	Southern Coastal Agromedicine Center Advisory Board	Member	2010-2012
Thigpen	Extension Director	EPA Albemarle-Pamlico National Estuarine Partnership Policy Board	Chair	2010-2011
White	Executive Director	Sea Grant Association Member-at-Large	Pending Fall 2014 Notification	2015-2016
White	Executive Director	NC State Department of Marine and Atmospheric Sciences	Adjunct Faculty	2014-present
White	Executive Director	NOAA National Knauss Fellowship Review Panel	Member	2014
White	Executive Director	CISA Program Review Team	Member	2014
White	Executive Director	Federal Grant Review and/or Federal Hiring Review Panelist (e.g. NOAA, EPA)	Panelist	2013-present
White	Executive Director	NC Water Resources Association	Member	2013-present
White	Executive Director	University Council on Water Resources	Member	2013-present
White	Executive Director	Sea Grant Association Program Mission Committee	Member	2013-present
White	Executive Director	USGS-National Institutes of Water Resources Partnership Committee	Member	2013-present
White	Executive Director	NC Department of Environment and Natural Resources, Division of Water Resources, Outside Involvement Committee	Member	2013-present
White	Executive Director	NOAA in the Carolina's Steering Committee	Member	2013-present
White	Executive Director	NOAA Southeastern and Caribbean Regional Team Resiliency Workgroup	Member	2013-present
White	Executive Director	UNC Coastal and Marine Consortium Workgroup	Chair	2013-present
White	Executive Director	UNC-TV Science Now Advisory Board	Member	2013-present
White	Executive Director	Carolinas Integrated Sciences and Assessment (CISA) Advisory Board	Member	2013-present

White	Executive Director	NC Sedimentation Control Commission	Member	2013-present
White	Executive Director	Advisory Board, Centers for Ocean Sciences Education Excellence – Southeast	Member	2013-2014
White	Executive Director	National Integrated Drought Information System-CISA Drought Early Warning Pilot Workgroup	Member	2013-2014
Whitehead	Coastal Communities Hazards Adaptation Specialist	Central NC Chapter of the American Meteorological Society	Member	2013-present
Whitehead	Coastal Communities Hazards Adaptation Specialist	Science and Technical Advisory Committee of the Albemarle-Pamlico National Estuary Program	Elected Member, Executive Board	2010-present; Executive Board 2014
Whitehead	Coastal Communities Hazards Adaptation Specialist	Sea Grant Climate Network Steering Committee	Member	Co-Chair 2010-2012, Member 2012-present
Whitehead	Regional Climate Extension Specialist	Science and Technical Advisory Committee of the Albemarle-Pamlico National Estuary Program	Elected Member	2010-2011
Whitehead	Regional Climate Extension Specialist	Sea Grant Climate Network Steering Committee	Co-Chair	2010
Whitehead	Coastal Communities Hazards Adaptation Specialist	Sea Grant Climate Network Southeast Regional Group	Chair	2009-present
Whitehead	Regional Climate Extension Specialist	The Nature Conservancy Alligator River NWR Climate Adaptation Project, Science Advisory Panel	Member	2009-present
Whitehead	Coastal Communities Hazards Adaptation Specialist	American Meteorological Society	Member	2008-present

Appendix 3: North Carolina Sea Grant 2014-2017 Strategic Plan

Coastal Science Serving North Carolina

North Carolina Sea Grant Strategic Plan 2014-2017

Susan N. White, Executive Director

NORTH CAROLINA SEA GRANT'S VISION

North Carolina Sea Grant will, in the 21st Century, serve as a leader in addressing the state's urgent and long-term needs in ocean and coastal resource management, and in the successful transition to ecosystem-based approaches through sound science and educational excellence.

NORTH CAROLINA SEA GRANT'S MISSION

Through integrated research and outreach efforts, North Carolina Sea Grant will enhance sustainable use and conservation of ocean and coastal resources to benefit communities, economies and ecosystems.

THE CHALLENGE

Since its inception in 1970, North Carolina Sea Grant has provided leadership in focusing the research capabilities of North Carolina's major universities to address coastal topics, including economic development, ecosystem health and human resources. Census figures place North Carolina among the fastest-growing states. Many coastal and coastal watershed counties had seen unprecedented population growth prior to the economic slowdown. That growth added a variety of stresses — and increases hazard risks — along the state's ocean, inlet and estuarine shorelines and riverine floodplains. The role of Sea Grant as a critical catalyst for, and contributor to, North Carolina's coastal future is increasingly evident.

THE PLAN

This strategic plan will guide North Carolina Sea Grant's efforts to respond effectively to challenges that physically and culturally reshape coastal North Carolina. The plan reaffirms Sea Grant's core values of supporting and promoting:

- The most creative ideas and best research through merit-based peer review of investigator-initiated proposals.
- Integrated multidisciplinary and team approaches to problem solving through combinations of research, outreach and education aimed at priority issues.
- Cutting-edge research and its application by disseminating innovative ideas and new knowledge;
- Excellence in education and development of human resources equipped to address future challenges.
- Strong state and regional partnerships to address emerging coastal issues by sharing the best science to a variety of audiences.

North Carolina Sea Grant will consider proposals for research seeking to improve understanding, utilization and management of marine and coastal resources as related to North Carolina and the adjacent region. Special consideration will be given to proposals that address priority issues; can

support, engage or prompt ongoing outreach programs; and seek to build upon Sea Grant's strong partnerships with industry, government and the general public.

Program direction and priority issues are updated through input from:

- state, regional and federal resource management agencies;
- faculty and staff of North Carolina public and private universities;
- the North Carolina Sea Grant Advisory Board;
- professional, industry and community groups, as well as the public;
- marine science panels convened within the University of North Carolina system;
- the National Sea Grant Strategic Plan that reflects plans developed by the National Oceanic and Atmospheric Administration, and NOAA Office of Oceanic and Atmospheric Research; and
- federal, international, state and private foundation reports on ocean and coastal issues and policy, along with subsequent documents, including NOAA strategy papers on climate, weather and water, coasts, oceans and marine life.

The University of North Carolina system and private universities in the state are home to some of the very best researchers in the world. Sea Grant will use federal core and state-supported resources toward research projects that reflect this plan. The nurturing and maintenance of an excellent human resource base is critical to promoting effective research and outreach. Thus, our research funds provide training of graduate and professional students in coastal disciplines.

Results from Sea Grant research, as well as data available from the scientific community at- large, will be accumulated, assimilated and transferred to user groups by the North Carolina Sea Grant Extension Program. In turn, extension specialists will identify needs of a diverse user community that includes the general public, government institutions, educators, business and industry leaders, and interest groups — and, in turn, will share those needs with the academic communities.

In order to provide cutting-edge information and education to various resource users and the public, Sea Grant communicators will work with researchers and extension professionals to package and disseminate relevant and timely information to a variety of audiences, using a variety of outreach tools, including publications, Web sites and other electronic delivery modes, workshops, and media relations to reach the program's constituents.

North Carolina Sea Grant is a catalyst for partnerships among private and public users, managers of marine and coastal resources, and the academic community, thus generating innovative research and educational products. As director of two aquatically-focused, inter-institutional programs within the University of North Carolina system, the Sea Grant executive director interacts with the office of the system’s vice-president for research, and will serve on system-wide and also North Carolina State University-based marine science councils. Direct reporting is to NC State’s vice chancellor for research and graduate studies. Effective leadership offers a vision for discovery and learning, enabling science to be the basis for addressing emerging coastal and marine issues.

To understand the complex processes and issues that dictate the best use of marine and coastal resources in North Carolina, Sea Grant's efforts need geographic diversity and integrated approaches from the systems level. The complexity of coastal North Carolina includes the interaction of the coastal ocean and estuarine systems, a large semi-lagoonal sound, as well as the contiguous wetlands, tidal creeks, rivermouths and tributaries. These systems respond to acute events, such as storms, as well as long-term changes, including any changes in climate and the impacts of human uses. Many issues facing marine and coastal resource users transcend jurisdictional boundaries. Thus, North Carolina Sea Grant

encourages inter-institutional, multi-disciplinary and regional collaborations to identify complex system characteristics, including policy and legal systems, resulting impacts on resource management, and solutions.

FOCUS AREAS

Sea Grant is concentrating effort in five areas: healthy coastal ecosystems; sustainable coastal development; a safe and sustainable seafood supply; hazard resilience in coastal communities, and environmental literacy and career initiation. These five interrelated focus areas emerged from both a national and state-based strategic planning process as areas of critical importance to the health and vitality of the nation's coastal resources and communities. As such, they reflect issues of major importance to NOAA and North Carolina coastal stakeholders, are consistent with the work of the NOAA coastal program efforts, and are topical areas in which Sea Grant has made substantial contributions in the past and is positioned to make significant contributions in the future. The focus areas also reflect the vision and needs identified by North Carolina Sea Grant, its management, extension and administrative staff, its program advisory board, a web-based invitation to the public to make input, and the findings of several major regional planning and research priority reports pertaining to coastal resources.

In each of the five focus areas, Sea Grant has identified goals to pursue and approaches designed to take advantage of strengths in integrated research, outreach and education, and its established presence in coastal communities. Understanding relationships and synergies across focus areas is vital to achieving the focus area goals. Sea Grant is one of many partners working to address these complex and interrelated issues. Understanding how activities in one area can support and complement other activities, and using partnerships to accomplish shared goals, are approaches inherent to Sea Grant, and will be central to achieving the goals outlined in this plan.

ENVIRONMENTAL LITERACY AND CAREER INITIATION

Managing coastal and ocean resources in ways that will balance human needs with environmental health requires progress in three fundamental areas:

- We need management and decision-making processes that are based on sound information, engage all stakeholders who may benefit from making better resource decisions, and include mechanisms to evaluate trade-offs between human and environmental needs.
- We need better information about how coastal and ocean ecosystems function and how human activities affect these habitats and living resources.
- We need citizens who understand the complexities of coastal environments and the interactions between human use and the health of coastal ecosystems.

To facilitate progress in these areas and to help the nation understand, manage and use its coastal and ocean resources wisely, Sea Grant has identified three central goals in this focus area. These goals reflect the value Sea Grant places on education in all forms, and as an integrated component of all its efforts. They provide the foundation of Sea Grant's work as a scientific and educational organization, and are integral to the success of this plan.

Goal: To generate sound scientific information to advance understanding of the nature and value of our coastal and ocean resources; to identify new ways to conserve and use these resources; and to support evaluation of the environmental impacts and socio-economic trade-offs involved in coastal decision-making.

Short-term economic considerations often influence coastal decision-makers to take action without understanding the long-term social, environmental and economic consequences of their decisions. Ecosystem functioning and values, emerging and future economic opportunities, and the social and economic costs and benefits of various human activities need to be translated into factors understood by the general public in order for sustainable uses of coastal environments to be realized. Sea Grant has a long history of generating cutting-edge research and supporting technological innovations that can lead to informed conservation and use of coastal and ocean resources.

Approaches and Expected Outcomes

Priority research and outreach approaches and outcomes for this goal area include:

- Identify issues and topics for state and regional socio-economic research and outreach that will enhance understanding of human behavioral change at the individual, organizational and policy-decision making scales.
- Identify the needs for and the capacity to develop or adapt, existing businesses, products, tools and technologies that will improve management and development of coastal resources.
- Establish and maintain linkages among university researchers and businesses, government bodies and agencies, non-governmental organizations, coastal communities, and the general public in order to better identify and address pressing coastal resource needs.
- Transfer information to citizens through communications activities, as well as through a variety of networks and partnerships, as means to boost general public understanding of environmental concepts, science, issues and solutions within the coastal context.

Goal: An informed public that not only understands the value and vulnerability of coastal and ocean resources, but demands informed science-based decisions about the conservation, use, and management of these resources, as well as a well-trained workforce that will make this a reality.

Several national, international and private foundational reports of the first decade of the 21st Century emphasized that restoring and sustaining our coastal and ocean environments requires an informed citizenry that understands the value and vulnerability of these resources. Clearly needed are scientists, planners, developers, engineers, and people involved in all water-related enterprises who understand the interactions between human activities and ecosystem health. NOAA has made ocean and aquatic literacy a strategic priority. Sea Grant has been a leader in K-12, undergraduate, graduate, professional and technical education in coastal and ocean-related areas for decades. Sea Grant is committed to playing a leadership role in partnership with the NOAA, its Office of Education, and others to advance coastal and ocean literacy. This can be done by capitalizing on Sea Grant's strong university partnerships, and by using its education and extension capabilities to develop educational programs for schools, professional education, and workforce training.

Approaches and Expected Outcomes

Priority research and outreach approaches and outcomes in this goal area include:

- With an emphasis on informal field-based experiences, support and enhance K-12 STEM teaching achievements via development of methodologies, materials, and social media.
- Identify the current knowledge base of students and educators in order to prioritize development of new materials and media approaches.
- Develop new inquiry-driven curricula and adapting formal, informal and newer information technology-based means for educators to connect students with marine and coastal concepts and to extend relevant research results to students, educators and environmental centers.

- Develop life-long learning experiences that target the needs of the widest spectrum of North Carolina residents, through public lectures, museum and aquarium programs, and presentations to non-governmental and local community organizations.
- Increase the number and diversity of highly qualified graduate and professional students in the marine and coastal professions, and increasing access to fellowships, internships, cooperative programs and field experiences.
- Identify present and future workforce needs that can be met through training by the state's universities and community colleges, and working in partnerships to initiate or expand such programs.
- Continue contributions to — and/or leadership in — regional and national Sea Grant and NOAA efforts.

Goal: Decision-making processes that involve the full-range of coastal interests, that integrate efforts of public and private partners at the federal, regional, state and local levels, and provide mechanisms for establishing common understandings and generating outcomes and public policies that balance multiple interests.

The continued in-migration of people to our state's coastal areas increases the complexity of coastal decision-making and creates greater potential for conflict among users at a time when coastal decision-making frequently can become fragmented and narrowly focused. Sea Grant's long-standing relationships with a wide variety of stakeholders in coastal communities and its reputation as a source of unbiased information enable it to play a leadership role in promoting effective information sharing, consensus building and collaborative integration of efforts in the coastal arena. Sea Grant can enhance its regional effectiveness by working closely with other NOAA coastal programs as well as with programs advanced by other federal and state agencies, regional ocean observation bodies, and non-governmental organizations.

Approaches and Expected Outcomes

Priority research and outreach approaches and outcomes in this goal area include:

- Working with its program Advisory Board and other partners to identify priority topics and prepare research and outreach efforts to meet emerging issues.
- Continue leadership of the North Carolina Coastal Resources Law, Planning and Policy Center.
- Continue Sea Grant extension outreach to state, regional and national policy boards, commissions and review panels.

These three fairly cross-cutting goals within this focus area have been a foundation of North Carolina Sea Grant's work since it was established, and they are fundamental not only within this specific focus area, but also to success in the other focus areas outlined in this plan. The more specific goals and approaches outlined in the other focus areas often build on these same goals, generating the knowledge and creative solutions needed to address challenges and opportunities related to healthy coastal ecosystems, a safe and sustainable seafood supply, sustainable coastal development and hazard resilient communities.

HEALTHY COASTAL ECOSYSTEMS

Healthy coastal ecosystems are the foundation for life along the coast. However, increasingly rapid coastal development, global overfishing and other human activities are leading to water quality degradation, decline of fisheries, wetlands loss, proliferation of invasive species, and a host of other

challenges that need to be understood in order to restore and maintain these ecosystems. Ecosystem functioning does not respect traditional political boundaries, and thus responsible management of ecosystems requires new kinds of thinking and actions.

Sea Grant is a leader in regional approaches to understanding and maintaining healthy ecosystems, with planning efforts underway across the country to identify information gaps, set research priorities, and coordinate information and technology transfer to those who need it. Sea Grant has fostered efforts to address widespread problems and has hired staff, shared among several state programs, to tackle these problems. Sea Grant's regional consortia, nationwide networks and international contacts are particularly well-suited to helping the nation address ecosystem health at the appropriate local, state, regional, national and global levels.

Goal: Sound scientific information to support ecosystem-based approaches to managing the coastal environment.

To realize the full potential of ecosystem-based management approaches, we need research that will lead to better understanding of present day conditions, basic ecosystem processes, the impacts of coastal and upland land uses on the health of coastal and ocean environments, and the importance of healthy ecosystems and their critical and essential habitat to healthy fisheries. We also need to know more about how to transform our new knowledge and understandings into sound management principles and practices. Sea Grant will continue to build the scientific foundation needed by supporting research that provides accurate information related to ecosystem health and by accelerating the transfer of this information to coastal residents, resource managers, businesses and industries.

Approaches and Expected Outcomes

Priority research and outreach approaches and outcomes in this goal area include:

- Develop integrated, multidisciplinary approaches or models to assess the carrying capacity of a wide variety of coastal habitats and environments, including small but highly sensitive tidal creeks.
- Develop techniques and models to determine input rates, fate, effects, and/or residence time of nonpoint sources of nutrients, toxins, pharmaceuticals and other contaminants and their transport and transformation in watersheds. This includes predicting hypoxic/anoxic conditions, determining effects of sedimentation and turbidity on water quality, and determining ecosystem and community responses to these inputs.
- Identify potentially invasive species and their pathways of introduction; and, via sustained outreach efforts, reduce intentional and accidental release of such invaders.

Goal: Widespread use of ecosystem-based approaches to managing land, water and living resources in coastal areas.

Achieving widespread use of ecosystem-based management approaches will require extensive efforts to communicate the effects of ecosystem degradation on natural resources, local economies and human health to a wide range of audiences in ways that motivate them to respond. Sea Grant's strong research and extension capabilities provide scientific information and technical assistance on ecosystem-based management approaches. At the same time, the organization's outreach and education capabilities engage citizens in stewardship activities that promote healthy ecosystems. All these programs can result in regional and other collaborative approaches to address problems that extend beyond traditional geographic or governmental boundaries.

Approaches and Expected Outcomes

Priority research and outreach approaches and outcomes in this goal area include:

- Develop, gather and deliver research-based information that explains to all relevant stakeholders the importance of sustaining critical habitats, biodiversity, ecosystem services and wildlife corridors in both the ecologic and economic contexts.
- Via generation, synthesis, translation and dissemination of relevant science-based information, assist resource managers, regulatory entities, other interests and the general public in understanding the impacts of habitat alteration and loss of ecosystem function, as well as the levels and effects of marine debris and land fertilizers in coastal environments.
- Develop techniques and approaches for determining interactive effects of climatic and human perturbations on ecosystem trophic structure and transfer efficiency, and the fate of primary and secondary production in estuarine and coastal waters.

Goal: Restored function and productivity of degraded ecosystems.

Past activities and events have led to deterioration of nursery areas for wild fish populations, loss of wetlands, closure of beaches and shellfish beds, and proliferation of invasive species. Sea Grant will help reverse these trends by identifying and assessing impaired ecosystems, and supporting the development of new policies, technologies, and processes that promote restoration of ocean and coastal ecosystems in ways that balance the needs of the natural systems with the needs of the humans who inhabit them. Sea Grant will use its nationwide network of extension, education and communication specialists to provide the technical assistance needed, and to share new information and technologies with local, state, regional, national and international partners.

Approaches and Expected Outcomes

Priority research and outreach approaches and outcomes in this goal area include:

- Develop measures, recommendations and protocols for ultimate use as “best management practices” (BMPs) in point source and NPS pollution control, smart growth, and low impact and green development initiatives.
- Develop techniques to be utilized by resource managers and riparian owners to enhance or rehabilitate degraded habitats, such as wetlands, streams, riparian buffers, oyster reefs and submerged aquatic vegetation.
- Quantify the interrelationships among land-use activities, stormwater quality and drainage, habitat and stream condition, hydrologic processes and the ecological response of receiving waters; then share such quantitative findings with coastal resource managers, owners and users.
- Develop techniques to respond to the challenges associated with sewage disposal and with identifying and understanding marine pathogens.
- Determine potential economic and biological impacts of beach nourishment and also the dredging of inlets and waterways; share and explain such impacts to relevant stakeholders.

SUSTAINABLE COASTAL DEVELOPMENT

Coastal communities in America provide vital economic, social and recreational opportunities for millions of Americans, but decades of population migration have transformed our coastal landscapes and intensified demand on finite coastal resources. The increase in population has resulted in new

housing developments and recreation facilities, a new generation of energy development activities, port expansions and other business activities. In addition, the prospect of rising sea levels will need to be examined, and if need be incorporated in new coastal development and investment plans and policies. These changes are placing tremendous pressure on coastal lands, water supplies, and traditional ways of life. To accommodate more people and activity, and to balance growing demands on coastal resources, we must develop new policies, institutional capacities, and management approaches to guide the preservation and use of coastal and ocean resources.

Sea Grant will engage a diverse and growing coastal population in applying the best available scientific knowledge, and use its extension and education capabilities to support the development of healthy coastal communities that are economically and socially inclusive, are supported by diverse and vibrant economies, and function within the carrying capacity of their ecosystems.

Goal: Healthy coastal economies that include working waterfronts, an abundance of recreation and tourism opportunities, and coastal access for all citizens.

Marine resources and coastal amenities sustain local and national economies through fisheries and aquaculture, seafood processing, trade, energy production, tourism, and recreation enterprises. Urban ports and waterways continue to accommodate expanding international trade, staging areas for offshore industries, growth in tourism and recreational boating, and changes in fishing fleets. At the same time, changing development patterns along the coast are threatening to displace traditional water-dependent industries and cut off water and beach access for coastal residents. Vacant industrial buildings and obsolete infrastructure facilities can be recaptured for new marine enterprises, public access, and planned mixed-use developments that bring enjoyment to residents and visitors alike.

Sea Grant's long-standing relationships with coastal communities and industries make it ideally suited to provide information, tools and techniques to support working waterfronts, responsible energy development, the development of accessible recreation and tourism activities, and adoption of sustainable development practices.

Approaches and Expected Outcomes

Priority research and outreach approaches and outcomes in this goal area include:

- Advance community and general public understanding of current and future beach restoration and preservation techniques and approaches as tools to mitigate sea level rise and storm impacts.
- Assist and guide coastal communities, state agencies and/or businesses in identifying and/or modeling the economic and cultural importance, impact and sustainability of recreational and commercial fisheries and their related working waterfronts, and of nature-, heritage- and waterfront-based tourism.
- Explore the advantages, disadvantages, consequences and benefits of alternative sources of energy and water for coastal communities, and share findings with those communities.

Goal: Coastal communities that make efficient use of land, energy and water resources and protect the resources needed to sustain coastal ecosystems and quality of life.

The biggest challenge facing many coastal cities and towns today is how to manage growth in ways that do not diminish the health of the ecosystems these communities depend on. One way this is reflected nationally and internationally is in the high-level of concern about climate change and its associated

effects. To respond to the challenges of growth at a local and regional level, communities are looking for ways to use land and water, generate energy, and dispose of waste that will preserve environmental health and economic vitality.

Determining the amount of the land, water and other natural resources needed to sustain healthy communities is an essential first step in establishing sustainable policies and growth practices. Only when the dimensions of this environmental footprint are identified can coastal communities understand what their carrying capacity is and what will be needed for generations to come. Sea Grant and its university partners are in a unique position to conduct research and develop models and forecasts that will help communities with this process.

Approaches and Expected Outcomes

Priority research and outreach approaches and outcomes in this goal area include:

- Collaborate with federal and state partners to better prepare coastal communities on the potential impacts and adaptation approaches of climate change, sea level rise, and/or storm, drought and flooding events.
- Assist local governments, state agencies and/or coastal community stakeholders in understanding the range and utility of socioeconomic, planning, law and policy approaches so as to enhance, preserve, conserve, and/or increase working waterfronts and other kinds of access to public trust waters.

Goal: Coastal citizens, community leaders and industries that recognize the complex inter-relationships between social, economic and environmental values in coastal areas and work together to balance multiple uses and optimize environmental sustainability.

According to NOAA reports, coastal counties constitute less than one-fifth of the land area of the U.S. (not including Alaska), but account for over half of the population and are among the most rapidly growing areas in the country. The pressures on our oceans, coasts and resources continue to grow. Citizens and decision-makers have an urgent need for tools that will help them evaluate the implications of land-use changes, coastal development pressures, and increased resource use in approaching the policy and management decisions they face. Regional cooperation and coordinated land-use and watershed planning are essential.

Sea Grant's well-established role as a trusted broker among a wide range of interests makes it a key player in providing sound information for decision-makers, convening stakeholders to seek common ground, and facilitating the development and implementation of new coastal policies, plans, management approaches and consensus-building strategies.

Approaches and Expected Outcomes

Priority research and outreach approaches and outcomes in this goal area include:

- Engage and train government officials, non-governmental organizations, business owners, developers, and/or other coastal decision-makers to consider sustainability of coastal ecosystems and economies as they develop land- and water-use plans and water-supply investments.
- Broaden outreach efforts, in partnership with CES as appropriate, on the benefits and costs of rainwater retention, harvest, and diversion in land development and landscaping practices.

- Assess the potential for, and impacts of, sustainable offshore industries, including wind energy and oil and/or gas extraction development.

SAFE AND SUSTAINABLE SEAFOOD SUPPLY

The United States has witnessed the decline of many of its major fisheries while seafood consumption is on the rise, resulting in a seafood trade deficit of $8 billion per year, according to statistics from the U.S. Department of Agriculture's Foreign Agricultural Service. At the same time, Sea Grant, through its research, extension and education activities, and work with partners, has produced important discoveries that have aided the stabilization and recovery of many endangered fisheries.

According to the NOAA Aquaculture Program, U.S. aquaculture is in its infancy, amounting to more than $1 billion of a $70 billion worldwide industry. Aquaculture creates important new opportunities to meet the increased demand for seafood, but a number of questions need to be addressed for its full potential to be realized. Seafood safety is a growing concern as international trade increases and fish diseases and contamination become bigger problems.

Sea Grant has key roles to play in advancing public understanding of the nature of these problems and opportunities. Through the use of its research, extension and education capacities, Sea Grant will support the kind of informed public and private decision-making that will lead to a sustainable supply of safe seafood long into the future.

Goal: A sustainable supply of safe seafood to meet public market and non-market demand.

Ensuring a sustainable supply of safe seafood requires an understanding of the effects of overfishing, past management decisions and climate change on U.S. wild fish populations as well as the role ecosystem-based fisheries management can play. It also requires better understanding of the range of complex issues related to developing the domestic aquaculture industry. Sea Grant will make major contributions by supporting research that provides the knowledge needed to understand the factors stressing fisheries and the complexities of aquaculture development. Sea Grant will also translate and transfer useful research findings through extension and education activities to ensure responsible and productive use of these resources in the future.

Approaches and Expected Outcomes

Priority research and outreach approaches and outcomes in this goal area include:

- For potential use by managers and non-governmental organizations, identify and quantify underlying levels of fishery stock biological and ecological interactions, including the ecological and economic impacts of harvest, threatened species protection, habitat loss, water quality, anthropogenic inputs and climate change.
- Develop information technology-based methods to improve accuracy, credibility and more timely collection of fish harvest data by fishery managers.
- Contribute to the development and application by resource managers of ecosystem-based management strategies/approaches that more fully incorporate human (i.e., economic, cultural and social) factors within the ecosystem.
- Develop tools/procedures to help resource managers/monitors diagnose disease and pathology, and to define fundamental mechanisms of host-pathogen environment interactions.

- So as to serve as the foundations and driving forces for sustaining fishery resources for future use, identify and articulate commonalities (i.e., goals, needs) shared by commercial and recreational fishers.

Goal: A healthy domestic seafood industry that harvests, produces, processes, and markets seafood responsibly and efficiently.

A healthy seafood industry requires harvesting techniques that minimize by-catch and damage to marine habitats. It requires development of value-added products, enhanced quality assurance, and education about how to market under-utilized species. Sea Grant will involve harvesters, recreational fishermen, producers and managers in being responsible stewards as well as successful entrepreneurs. Sea Grant will support development of new technologies and participate in collaborative efforts to increase the range of seafood products produced, enhancing American competitiveness in global markets.

Approaches and Expected Outcomes

Priority research and outreach approaches and outcomes in this goal area include:

- Develop/disseminate information to help fishery users adapt to changes in the resource base (such as harvesting more abundant or underutilized species) and in fishery management strategies/approaches.
- Introduce new technology and gear to the fishing industry to reduce by-catch and mortality in commercial and recreational fisheries, thereby increasing both the efficiency and sustainability of harvest.
- Develop/enhance the commercial culture and production technology, efficiency and competitiveness for existing and new aquaculture species; share culture/production improvements with existing and prospective culturists.
- Optimize seafood-related manufacturing processes, examining functional food ingredients, and developing training programs to facilitate the production of value-added products and/or compliance with rigorous food-safety regulations. This includes improving traceability and truthful marketing to enhance quality and safety of seafood for domestic and global distribution, and converting seafood processing discards, by-products and wastes into value-added items for new markets. Inform seafood processer awareness and adoption or rejection of such new processes.

Goal: Informed consumers who understand the importance of ecosystem health and sustainable harvesting practices to the future of our domestic fisheries, appreciate the health benefits of seafood consumption and understand how to evaluate the safety of the seafood products they buy.

Increased attention to the safety of domestic and international seafood has created an urgent need for rapid assessment techniques, certification programs, and standards for domestic and international seafood products, so consumers will have reliable information to inform their buying decisions. Sea Grant will involve industry representatives in the application of seafood safety standard; train inspectors and wholesalers in how to assess seafood quality; develop educational materials related to seafood safety, quality, and security; and make materials readily available to consumers.

Approaches and Expected Outcomes

Priority research and outreach approaches and outcomes in this goal area include:

- Demonstrate and evaluate strategic and niche marketing approaches, supply chains and business models for potential use in the seafood and fisheries industries, and ultimately for improving consumer understanding of the benefits of identifying and eating fresh, locally caught, and responsibly-managed fishery products.
- Educate consumers about:
    - the characteristics and differences among bioengineered species, farm- raised species and naturally occurring species;
    - the relationship between a healthy ocean ecosystem and both the sustainable harvest of fish and the human health benefits; and
    - the health benefits and risks stemming from consumption of seafood caught in ocean, sound, estuarine and riverine waters.

HAZARD RESILIENCE IN COASTAL COMMUNITIES

Sea-level rise, the increased number and intensity of coastal storms, the ongoing threat of oil spills, and other natural and human hazards are putting more people and property at risk along the nation's coasts, with major implications for human safety and the economic and environmental health of coastal areas. It is essential that residents of coastal communities understand these risks and learn what they can do to reduce their vulnerability and respond quickly and effectively when events occur. Sea Grant will use its integrated research, training and technical assistance capabilities, and its presence in coastal communities to play a major role in helping local citizens, decision-makers, and industries plan for hazardous events and optimize the ability of their communities to respond and rebuild.

Goal: Widespread understanding of the risks associated with living, working, and doing business along the nation's coasts.

Communities and businesses are increasingly vulnerable to hazardous events brought on by climate-related changes, land-use changes and increased economic activity in coastal waters. There is a great need for information and tools to help communities assess the risks they face and identify the options available to them to minimize those risks. Sea Grant will support the work of NOAA's Climate Program Office and its climate impact and adaptation-related activities. Sea Grant will work with other federal, state, and local partners, the banking and insurance industries, and others to develop forecasting and risk assessment tools, economic and environmental impact models, and other mechanisms that will help families, businesses, communities, and regions understand their risks and take them into account in making personal, business, and community-related decisions.

Approaches and Expected Outcomes

Priority research and outreach approaches and outcomes in this goal area include:

- Evaluate the implications of acute weather events and climate variability and change on major coastal initiatives, public facility investments and local economies, and share with interested and concerned parties.
- Through exploration of coastal geological and hydrological processes and dynamics, as well as state-of-the-art engineering applications, develop and/or evaluate prediction methodologies and mitigation strategies that may factor in coastal landform and waterway response to natural hazards, such as storms, floods, rip currents, inlet shifts and dynamics, climate change, sea level rise and long-term erosion; and inform potentially affected, responsible, and interested entities.

Goal: Community capacity to prepare for and respond to hazardous events.

It is not enough for communities and businesses to understand their vulnerabilities, they must act on this knowledge and become more resilient or the human and economic losses will continue to mount. Individuals, businesses and communities need to develop comprehensive emergency preparedness and response plans that increase their resiliency and enable them to respond effectively. Sea Grant will contribute to this by building a sound knowledge base to improve forecasting capabilities, by identifying development and best management practices that reduce the vulnerability of people, buildings and businesses to coastal hazards, and by advancing ways communities can manage and recover from these events when they occur.

Approaches and Expected Outcomes

Priority research and outreach approaches and outcomes in this goal area include:

- Help coastal decision-makers, communities, businesses and key stakeholders to remediate and mitigate against damage exposure through the initiation of pre-event studies and outreach efforts.
- Prepare coastal decision-makers, communities, businesses and key stakeholders for wind, wave, weather and climate events through identification of landform and infrastructural vulnerabilities, opportunities to improve human and community resiliency, preparedness and/or safety, and improved capacity to mobilize post-event recovery efforts.

Goal: Effective response to coastal catastrophes.

Coastal and ocean catastrophes require the nation to mobilize a full-range of public and private partners and resources to mount an effective response. Sea Grant is supporting the development of linked regional, national and international coastal observation networks, thereby improving the availability of information needed to respond to crises as they unfold. Sea Grant's knowledge of local contexts and communities can optimize response effectiveness by facilitating immediate links to local partners and capabilities. Sea Grant has a national network of scientists and outreach workers with broad knowledge and experience, and it will provide multi-disciplinary technical assistance to first responders, helping to minimize damage and promote recovery.

Approaches and Expected Outcomes

Priority research and outreach approaches and outcomes in this goal area include:

- Develop and refine demonstrations and outreach programs that offer retrospective and "lessons learned" from weather and human-induced adverse events.
- Quantify interactions between barrier island/estuarine dynamics and increased coastal development; translate the results into economic and community response models.

THE BENEFITS

Sea Grant has the responsibility to link relevant research results to people who use coastal resources. North Carolina Sea Grant is part of a nationwide network of programs with the mission of delivering science-based information for application in the management and sustained use of coastal and marine resources. The issues and opportunities described in the above focus areas are today's highest priority. We join NOAA Sea Grant and the Sea Grant network in building links between researchers and coastal communities.

Expansion of knowledge for its own sake is not adequate reason for Sea Grant support. Our focus is to increase the public application and benefits stemming from coastal and marine research conducted not only under Sea Grant sponsorship, but also credible research carried out under other public and private support. Sea Grant research proposals will be subjected to a three-tiered review process — peer review, programmatic review and whenever appropriate, user-group review — to ensure that the best science will go forward. No proposed project in research, education or outreach will be considered for funding unless the rationale (programmatic values), methods (project protocols) and prospective user relationships are deemed suitable. Proposed activities should have sufficient intellectual content to make them appropriate university functions.

By addressing high-priority issues through an integrated program of research, outreach and education, North Carolina Sea Grant will advance the following results:

- Effective and sustainable stewardship efforts that utilize and manage coastal and estuarine resources for the use and enjoyment of present and future communities.
- New applications of technology to improve the efficiency of use and the economic return for existing resources.
- Enhanced understanding of the ecological relationships in marine and coastal environments, so that science-based policy can be applied to protect habitats for future generations.
- State and coastal communities' increased resilience to coastal hazards and other changing physical and economic conditions.
- Collaborative solutions to state and regional issues drawing upon the expertise from a wide pool of researchers, industry, government and a host of community interests.
- Increased awareness and knowledge of marine and coastal concepts and issues by producing highly trained graduates, professionals and informed citizens.

The challenges before us are great. The issues are many. But through strong partnerships with all stakeholders — including university researchers, resource managers, coastal communities and their leaders, businesspeople, policy-makers, and individual citizens — North Carolina Sea Grant is poised to bring science-based solutions to the state over the next four years. We will offer relevant research and transferable results on crucial coastal topics.

North Carolina Sea Grant
North Carolina State University
Box 8605
1575 Varsity Drive, Module 1
Varsity Research Building
Raleigh, NC 27695-8605
919/515-2454 * *www.ncseagrant.org*

Susan N. White, Executive Director
Jack Thigpen, Extension Director
Katie Mosher, Communications Director
Mary Beth Barrow, Fiscal Officer

UNC-SG-12-12
Updated February 2013

Appendix 4: North Carolina Sea Grant Advisory Board Members 2010-2014

* Current Members as of 07/09/14
Past Board members are identified with their position at that time.

Liz Baird* (current chair)
Director of Education
NC Museum of Natural Sciences
11 West Jones Street
Raleigh, NC 27601-1029
(P) 919-707-9893
(E) liz.baird@naturalsciences.org

Bob Bryant*
Comercial Fisherman
137 Crab Shell Lane
Sneads Ferry, NC 28460
(P) 910-327-3232
(E) bbbryant@embarqmail.com

Louis Daniel*
Director
North Carolina Division of Marine Fisheries
P.O. Box 769
Morehead City, NC 28557
(P) 252-726-7021
(E) louis.daniel@ncdenr.gov

John Fear
Research Coordinator
NC National Estuarine Research Reserve
101 Pivers Island Road
Beaufort, NC 28516
(P) 252-838-0884
(E) john.fear@ncdenr.gov

Barbara Garrity-Blake*
Cultural Anthropologist
P.O. Box 91
Gloucester, NC 28528
(E) garrityblake@gmail.com

Jason Gray*
Economic and Community Development Policy Consultant
100 Leeward Court
Cary, NC 27511
(P) 919-606-6392
(E) jlgrayling919399@gmail.com

David Griffin*
Director
North Carolina Aquariums
3125 Poplarwood Court, Suite 160
Raleigh, NC 27604
(P) 919-877-5500 ext. 222
(E) david.griffin@ncaquariums.com

Lauren Kolodij
Deputy Director
North Carolina Coastal Federation
3609 Highway 24 (Ocean)
Newport, NC 28570
(P) 252-393-8185
(E) laurenk@nccoast.org

Gretchen Bath Martin*
Fisheries Biologist
P.O. Box 10507
Wilmington, NC 28404
(P) 252-646-5641
(E) martin1639@ec.rr.com

Dave Meyer*
NOAA/National Marine Fisheries Service
Southeast Fisheries Science Center
Beaufort Laboratory
101 Pivers Island Road
Beaufort, NC 28516-9722
(P) 252-728-8743
(E) dave.meyer@noaa.gov

Buddy Milliken
Business Owner
The Milliken Company
529 Sylvan Street
Shallotte, NC 28470
(P) 910-612-6009
(E) themillikencompany@ec.rr.com

Jot Owens*
Charter Boat Captain
2515 Ebb Tide Lane
Wilmington, NC 28409
(C) 910-233-4139
(E) captainjot@yahoo.com

Bill Queen
Retired Director
Institute for Coastal and Marine
Resources – East Carolina University
225 Orton Drive
Greenville, NC 27858
(P) 252-355-8937
(E) queenwh225@yahoo.com

Joe Ramus*
Board Member, NC Coastal Federation
706 Comet Drive
Beaufort, NC 28516
(P) 252-728-7725
(E) jramus@duke.edu

Brian Roth*
Mayor
Town of Plymouth
124 East Water Street
P.O. Box 806
Plymouth, NC 27962
(P) 252-793-9101 ext. 7
(E) plymouthmayor@coastalnet.com

Greg "Rudi" Rudolph
Shore Protection Manager
Carteret County Shore Protection Office
P.O. Box 4297
Emerald Isle, NC 28594
(P) 252-393-2663
(E) rudi@carteretcountygov.org

Appendix 5: North Carolina Sea Grant Advisory Board Charter

Charter Purpose:

The purpose of this charter is to state the mission of the Board, and to detail ways in which the Board will determine its membership and leadership, and will conduct its business and operating procedures.

Mission Statement

The mission of the Advisory Board is to assist North Carolina Sea Grant by identifying priorities in research and outreach, by assessing, evaluating, and endorsing programs and progress, and by identifying and developing resources for Sea Grant at the local, state and federal level.

Membership:

- Number of members: The Board shall consist of no more than 15 members derived from external stakeholders holding interests and/or responsibilities related to coastal resources and their wise use and development.
- Appointment of members: Members will be appointed by the NCSG director, after consultation with and approval given by the Board chair. Appointments may be made at any time.
- Member term lengths and limits: To allow for input of fresh ideas and viewpoints over time, while also maintaining a degree of continuity in understanding on-going board activities and coastal issues, members will serve staggered three (3) year terms. Board members initially appointed under this charter shall, after consultation with the chair and NCSG director, serve for one, two or three more years in order to establish the staggered terms. Members can be appointed to one additional 3-year term, but cannot serve more than two (2) successive terms. Former Board members can be re-appointed to the Board after a two-year break in service.
- Representational Aspects: Deliberate efforts should be made by the NCSG director and Board chair and vice-chair to have the Board membership reflect a wide spectrum of coastal resources use/development/conservation interests as well as wide geographic representation along the entire ocean and estuarine shoreline of the state.
- Attendance, Proxy, and Quorum Policies: Board members are expected to attend Board meetings, be they face-to-face or virtual (electronic) meetings. Two consecutive unexcused absences or three consecutive excused absences may lead to dismissal of a member from the board, as the NCSG director, and Board chair and vice-chair may jointly see fit.

  Representation of Board members by proxy is allowed. A member is expected to inform the chair or the director, in advance, of his/her inability to attend a forthcoming meeting, and whether a proxy will be in attendance. If a proxy is to be sent, the excused member must notify the director or chair of the proxy's name, title, and contact information before the meeting. If represented by proxy, a member is expected to relay upcoming meeting materials to said proxy prior to the meeting.
- Maintenance and Posting of Membership Roster: A current roster of Board members will be kept up-to-date, distributed at each meeting, and posted on the NCSG website.

- Conflicts of Interest: Members shall not use their position on the Board to benefit personally and/or financially, or to create opportunities that may lead to such benefits. Should the member be in private business, NCSG may opt to utilize or purchase that member's products and/or services if it is in the best interest of NCSG programs. Members also can be directly involved in NCSG programs, including research projects and grant awards, but shall not make any efforts to influence the NCSG award decision-making process, and shall recuse themselves from any Board discussions and reviews of proposals for such awards.

Nomination/Election of Chair/Vice-Chair:

- Any member of the Board can serve as chair. The position of chair under this charter will serve a two-year term, not to exceed two consecutive terms. Nomination for chair will be presented to the Board for its vote and approval by the NCSG director.
- Any member of the Board can serve as vice-chair. Nomination for vice-chair will be presented to the Board for its vote and approval by the NCSG director and Board chair.

Duties of Chair and Vice-Chair:

- The chair will, working with the assistance of the NCSG director, develop meeting agendas; preside at Board meetings; chair Board meetings (or delegate such); develop, sign and transmit any official Board correspondence; co-approve membership appointments, and, as available, officially represent the Board at appropriate events, meetings or proceedings (or delegate such).
- The vice-chair will assume any or all of the chair's duties in the chair's absence, or as delegated by the chair.

Meetings:

- The Board shall meet at least twice a year, preferably in spring and fall of the calendar year. Efforts should be made to hold one Board meeting per year coincident with a meeting of the NCSG staff.
- Up to one Board meeting per year may be conducted virtually, via electronic means.
- A quorum of at least half the membership of the Board shall be present for meetings (in-person or virtual) for formal meetings of the Board to take place. For any formal endorsements or votes sought on NCSG plans and actions, the approval by at least 60% of the membership will be required. At the discretion of the chair, votes by the membership can be sought, submitted, and accepted via remote (electronic or postal) means.
- As practicable and needed, Board votes and endorsements shall be carried forth in accordance with Roberts Rule of Order.

Meeting Notes and Annual Reporting:

- Notes that summarize, in brief, Board meeting discussions, presentations, votes and endorsements shall be distributed to all Board members within 90 days following each meeting.
- The NCSG director shall annually make a State of the Program presentation to the Board, to be given at a Board meeting.

Charter Changes:

- Changes to this charter can be made via the following process:
  1. Discussion of proposed charter change at a Board meeting.
  2. Formal charter change proposal communicated to the Board no less than 30 days before a Board meeting.
  3. Board votes on proposed charter change at a Board meeting.

Effective Date:

This charter was unanimously endorsed and adopted by the NCSG Advisory Board on November 13th, 2012.

Appendix 6: Coastal and Marine Research Council of the University of North Carolina

Membership of the Coastal and Marine Research Council, or CMRC, includes seven different entities from within the UNC System, from the Triangle eastward to the coast, as well as Duke University (represented through the Duke University Marine Laboratory in Beaufort). Thus the council collectively represents more than 235 Ph.D. scientists who conduct coastal and marine science research, along with 195 staff and 1,500 students at all university levels.

Dr. Daniel Baden, Director, Center for Marine Science (CMS)
www.uncw.edu/cms
UNC-Wilmington, Wilmington

Dr. Maurice Crawford, Coordinator, Marine Environmental Sciences Program (MESP)
www.ecsu.edu/academics/mathsciencetechnology/biology/index.cfm
Elizabeth City State University, Elizabeth City

Dr. David Eggleston, Director, Center for Marine Sciences and Technology (CMAST)
www.cmast.ncsu.edu
North Carolina State University, Morehead City

Dr. Rick Luettich, Director, Institute of Marine Sciences (IMS)
www.marine.unc.edu/IMS
UNC-Chapel Hill, Morehead City
Representing the UNC-CH Marine Science Program, which is comprised of IMS and the Department of Marine Science on the Chapel Hill campus (marine.unc.edu/Department).

Dr. David Griffith, Interim Director, Institute for Coastal Science and Policy (ICSP)
www.ecu.edu/rgs/ICSP
East Carolina University, Greenville

Dr. Susan White, Executive Director, North Carolina Sea Grant (NCSG)
www.ncseagrant.org
Raleigh

Dr. Nancy White, Director, UNC Coastal Studies Institute (CSI)
http://csi.northcarolina.edu/
Manteo

By invitation:
Dr. Cindy Van Dover, Director, Duke University Marine Laboratory (DUML)
www.nicholas.duke.edu/marinelab
Beaufort
Representing DUML and Duke's Nicholas School of the Environment

Appendix 7: AAAS Independent Review of UNC System Marine and Coastal Activities

Independent Review of the University of North Carolina System Marine and Coastal Activities

A report prepared for
Thomas W. Ross
President

The University of North Carolina

Conducted by the American Association for the Advancement of Science (AAAS)
Research Competitiveness Program

ADVANCING SCIENCE, SERVING SOCIETY

Executive Summary

At the request of the University of North Carolina System General Administration (UNC-GA), the American Association for the Advancement of Science's (AAAS) Research Competitiveness Program undertook a comprehensive review of the marine and coastal programs within the UNC System. This report, based on that review, includes findings and recommendations that are meant to guide the UNC System as it seeks to leverage strengths and maximize impact of its marine-related program assets. In North Carolina, marine-related activities are important to the State's economy, both in traditional sectors like recreation and tourism, fisheries, hazard resilience, and marine heritage, and in emerging areas like wind energy and marine biotechnology. UNC System faculty members are leaders in areas such as marine biotechnology, wind energy, coastal sustainability, marine aquaculture, climate change and marine ecosystem health.

The review comes at a time of significant transition particularly for public institutions of higher education nationwide. This transition is driven to some degree by new technology that has enabled alternative modes and means of information delivery. But it is also driven by tight budget environments and heightened scrutiny aimed at ensuring effective use of resources. Assessing the capacities of programs, and in this case marine-related programs, that have a System-wide footprint, will help to remove barriers to cross-system programmatic synergies. This in turn will help to re-define the North Carolina experience for students.

Perhaps the most significant outcome of this review will be to better position the UNC system to compete in the changing academic landscape[1]. The UNC System's marine-related programs have many forward-looking elements and best practices upon which to build. A system-wide effort to package and market the marine–related activities would enhance the external visibility and accessibility of these assets, which, when considered *in toto,* are formidable.

Comprising much of the breadth of marine and coastal sciences in the UNC System, a total of 26 units, referred to as "UNC Activities," were included as part of this review[2]. These units constitute entities such as departments, centers, institutes, interdisciplinary degree programs, or other programs that the UNC viewed as relevant and significant to coastal and marine sciences in the State. At the start of this review, UNC-GA requested institutional self-studies which resulted in the capture of teaching, research and outreach services that were being conducted by UNC Activities in marine science. The content and depth of each of the self-studies varied, reflecting differences in mission, vision, resources, and capacity for marine science work at the institutions. In total, 8 self-study documents were generated (one from each of the six universities; these each had multiple Activities), the UNC Coastal Studies Institute, and the NC Sea Grant, which were then reviewed by a national panel of marine and coastal sciences experts convened by AAAS. The AAAS panel conducted a week-long site visit to interview faculty and administrators representing each of the UNC Activities and visited three cities along the coast, Wilmington, Morehead City, and Manteo, touring facilities at each

[1] "They never saw it coming." *Science* 339 (2013)

[2] This AAAS report includes a review of programs administered by the following institutions: East Carolina University (**ECU**), Elizabeth City State University (**ECSU**), North Carolina State University (**NC State**), University of North Carolina-Chapel Hill (**UNC-CH**), University of North Carolina – General Administration (**UNC-GA**), University of North Carolina at Wilmington (**UNCW**), and Western Carolina University (**WCU**).

location. In its deliberations, the panel considered the marine-related programs from a system-wide perspective using both the self-study documents and insights gathered from the site visits, presentations made by the units, and in-person interviews.

The AAAS panel soon determined that the UNC System has an extraordinarily rich assemblage of intellectual assets, facilities and capabilities that underlie research, education and outreach related to the coastal North Carolina marine environment, and more broadly to the regional, national and global environment. The word "assemblage" is used deliberately here because it appears that, historically, the planning and support of programs has been largely "siloed" within institutions. The treatment of the programs in a more holistic and coordinated way, while still retaining institutional identity, presents a significant opportunity for North Carolina to amplify the collective impact and increase national recognition of its marine-related programs.

In North Carolina, the marine and coastal programmatic activities are hosted at institutions spanning the spectrum of institutional cultures, missions and Carnegie classifications[3]. Each UNC activity fills a unique niche, consistent with the institution's culture and mission, to serve a distinct set of stakeholders. Most significantly, the AAAS panel did not identify any areas where there was obvious redundancy or overlap in programs. Rather, the various marine activities of the UNC System comprise a rich and diverse assemblage, the potential of which can be fully realized through improved coordination and collaboration.

Grassroots collaborations do exist in several areas of the UNC System. However, these interactions tend to be between individuals or focused on specific project areas. What is lacking is a level of coordinated stewardship with full participation at the unit level that takes advantage of a comprehensive, "big-picture" view and can foster interactions among programs. With this level of coordination, the UNC Activities can function more strategically and work to more systematically develop opportunities that transcend individual programs, projects, and institutions. The benefit will be the System's enhanced competitiveness in the marine-related programs, manifested in a coordinated brand that helps with recognition of system-wide assets, opportunities for enlarging and diversifying the research portfolio and new ways to control costs.

The AAAS panel offers 14 recommendations to improve coordination of UNC Activities that might then translate to better recognition of the strengths of the UNC marine-related activities both internally and externally. These recommendations are intended to be constructive and advisory. The mechanisms to effect changes administratively should be determined by UNC-GA. Four overlapping and complementary topic areas are identified to promote better leverage and efficiency across the UNC system: Statewide Planning and Coordination, Reducing Barriers for Research and Academic Collaborations, Marine Science Activities Planning and

[3] The relative emphasis an institution of higher education places on research and undergraduate and graduate education defines its cultural landscape and is dictated by its mission. Insights into the cultural traditions at institutions of higher education can be gained from the Carnegie Foundation for the Advancement of Teaching's classifications (http://www.carnegiefoundation.org), which attempt to categorize colleges and universities according to their highest or most dominant degree awarded (Associates, Bachelors, Masters, Doctoral) and the level of their research activity (Research Universities with average, high, and very high research productivity). In addition, to these generic labels, institutions have their own special cultural traditions.

Communication, and Other. Each of these recommendations is further detailed in Part I of the report.

Most of the recommendations below will not require great commitments of new fiscal resources, but they will require a common focus, clear leadership, more coordination and a commitment *by all of those involved*. The AAAS panel is convinced that if these recommendations are embraced, North Carolina will be in a leadership role nationally in marine-coastal research, education and service.

STATEWIDE PLANNING AND COORDINATION

RECOMMENDATION 1: The UNC GA should provide greater leadership and coordination of UNC System Activities. As a first step, UNC-GA should build on information in the self-studies as well as other sources to maintain and disseminate an up-to-date inventory of programs and activities. This effort should be complemented by the establishment of milestones and measurement and reporting of outcomes for all participating units.

RECOMMENDATION 2: The UNC System should commission studies on the economic valuation of coastal ecosystem services and natural capital as well as the direct and indirect economic benefits of marine science and technology activities. Such information should be used to communicate the economic value of North Carolina's coastal environment and the role of the UNC System in providing vital understanding, education and outreach to support the wise use and stewardship of natural resources as well as stimulating local, regional and statewide economies through marine science and technology investment.

RECOMMENDATION 3: The UNC System should foster the development of a clear brand or identity for the major marine-related assets and programs, building on the results of Recommendations 1 and 2. For example, with reasonable investment, marine science assets in the Morehead City-Beaufort area could easily be packaged as a national center of excellence. Also, one can imagine the "Marine Research Triangle Partnership" involving UNC-CH's IMS, NC State's CMAST and the Duke University Marine Lab (located in Beaufort), as a natural extension of the Research Triangle Park brand.

REDUCING BARRIERS FOR RESEARCH AND ACADEMIC COLLABORATIONS

RECOMMENDATION 4: The UNC System should foster stronger and more integrative research collaborations and focus more attention to communicating to the public the economic and societal benefit that such research is able to produce.

RECOMMENDATION 5: The UNC System should encourage efforts to remove barriers to academic collaboration.

RECOMMENDATION 6: The UNC System should encourage development of a coordinated online or hybrid course curriculum in marine science to leverage the breadth of activities offered throughout the State. These courses could be a component in a common, shared degree program in marine science (at the Master's or Ph.D. level), and would help maximize the use of teaching resources in the State without requiring duplication in hiring.

RECOMMENDATION 7: The UNC System and individual institutions should foster undergraduate research and encourage efforts to ensure that undergraduate and graduate student mentoring is sufficiently valued and rewarded.

RECOMMENDATION 8: The UNC System should consider building and maintenance of dormitories to foster residential academic programs at the three coastal locations (Wilmington, Morehead City, and Manteo) and to facilitate statewide participation in coastal field studies. More broadly, the UNC system is encouraged to consider a more proactive approach to regular maintenance and upkeep of coastal facilities (including equipment) in conjunction with overall capital improvement schedules.

MARINE SCIENCE ACTIVITIES PLANNING & COMMUNICATION

RECOMMENDATION 9: Leaders of UNC Activities should develop unit-level strategic plans that articulate explicitly with strategic planning by their home institutions and by the UNC System. These plans should include benchmarks and quantitative metrics and use the self-study reports as a starting point. Periodic assessments should be undertaken to monitor progress.

RECOMMENDATION 10: Leaders of UNC Activities should develop and execute a systematic and coordinated communication plan.

RECOMMENDATION 11: Leaders of UNC Activities should recognize and fully utilize the well-developed communication and outreach capabilities of North Carolina Sea Grant and the Coastal Studies Institute.

RECOMMENDATION 12: Leaders of UNC Activities should encourage the use of modern communication and social media technology to improve inter-unit communication and to enhance the curriculum at both the undergraduate and graduate levels.

OTHER

RECOMMENDATION 13: The UNC System should encourage all units to develop fund-raising strategies and plans in coordination with their home institutions, enhance external development programs and to engage external advisory committees and boards.

RECOMMENDATION 14: The UNC System should actively encourage and facilitate coordination of diversity initiatives for students and faculty in marine science.

Many excellent programs, centers and institutes can be found within the UNC System. With appropriate coordination, collaboration, communication, and support, these assets can achieve even more than they already do and provide the state with additional significant return on its investment.

The recommendations in this report are intended to support the UNC GA's ability to facilitate a culture of cross unit coordination and one that leads to a reduction in barriers to the mechanisms that would enhance it. Acting upon the recommendations of this report can result in improvements in both programmatic efficiencies and effectiveness. The panel suggests that

the UNC GA establish and determine the ground rules, but not manage the details. For example, significant program enhancement and efficiencies could be achieved if UNC Chapel Hill and NC State collaborate on operating a shared dormitory facility in Morehead City. The development of a joint master's or doctoral program, and shared coursework at any level, would expand opportunities for students without incurring significant additional personnel and operational costs. A shared system to manage vessels and equipment could both improve efficiencies and expand access of these resources to a wider user base. Shared approaches to public relations, development, and student recruitment could strengthen these activities while at the same time making more efficient use of personnel and operations budgets. The AAAS panel is convinced that if these recommendations are embraced and fulfilled at all levels, North Carolina can be in a leadership role nationally in marine-related research, education and service.

Table of Contents

Executive Summary 2

Section I: AAAS Panel's Major Findings and Recommendations

Introduction and Context 9
North Carolina's Culture for Marine Science 11
Strategic Thinking and Opportunities for the UNC System 13
Conclusions 21

Section II: An Environmental Scan of UNC Coastal and Marine Activities

Major Strengths or Unique Capabilities Supported by the UNC Activities 23
Major Challenges Limiting the Impact of UNC Activities 28
The Degree to Which UNC Activities Coordinate 32
The Degree to Which UNC Marine Activities Overlap 34
Appendix: UNC Activities Included in This Review 35
Appendix: AAAS Panel Member Biographies 37
Appendix: Charge to the AAAS Review Panel 40
Appendix: Site Visit Agenda 42

Section I:
AAAS Panel's Major Findings and Recommendations

Introduction and Context

The University of North Carolina (UNC) System has marine-related[4] programs located throughout the State, from the western mountains to the coastal plain. To understand better the breadth and depth of these activities and to explore their possible synergies, the UNC General Administration (UNC-GA) commissioned the American Association for the Advancement of Science's (AAAS) Research Competitiveness Program to undertake a comprehensive review of the marine-related programs within the UNC System. The AAAS panel focused on developing recommendations that are meant to guide the UNC System as it seeks to leverage strengths and maximize the impact of its marine-related program assets. In total, 26 units, referred to as "UNC Activities," were included as part of this review, illustrating the breadth of marine and coastal sciences in the UNC System. These units constitute entities such as departments, centers, institutes, interdisciplinary degree programs, or other programs that the UNC viewed as relevant and significant to coastal and marine sciences in the State[5].

The review comes at a time of significant transition particularly for public institutions of higher education nationwide. This transition is driven to some degree by new technology that has enabled alternative modes and means of information delivery. But it is also driven by tight budget environments and heightened scrutiny aimed at ensuring effective use of resources. Assessing the capacities of programs, and in this case marine-related programs, that have a System-wide footprint, will help to eliminate redundancies and remove barriers to cross-system programmatic synergies. This in turn will help to re-define the North Carolina experience for students. However, perhaps the most significant outcome of this review will be to better position the UNC system to compete in the changing academic landscape[6]. The UNC System's marine-related programs have many forward-looking elements and best practices upon which to build. A system-wide effort to package and market the marine–related activities would enhance the external visibility and accessibility of these assets, which, when considered *in toto,* are formidable.

The ocean is important whether you live on the coast or in the heartland. It covers 71% of the Earth's surface and contains 97% of the planet's water. The ocean drives our weather and climate through the global transfer of heat and water. The organisms in it generate much of the oxygen we breathe. And, nationally, more than 90,000 miles of shoreline support a $60 billion recreation and tourism industry. In addition, the ocean supports a $60 billion annual seafood industry and a $20 billion recreational fishery and contains approximately $8 trillion in oil and gas reserves as well as extensive capacity for offshore wind energy. Ninety five percent of the nation's commerce travels through U.S. ports[7]. In North Carolina, marine-related

---

[4] The word "marine" is used throughout this report, but in reality, the AAAS panel is referring to a much broader purview that includes, coastal, estuarine, and related systems. It also covers diverse areas from the environmental sciences, to veterinary medicine, to social sciences and beyond. A comprehensive list of the activities in the review is provided in the Appendix.

[5] This AAAS report includes a review of programs administered by the following institutions: East Carolina University (**ECU**), Elizabeth City State University (**ECSU**), North Carolina State University (**NC State**), University of North Carolina-Chapel Hill (**UNC-CH**), University of North Carolina – General Administration (**UNC-GA**), University of North Carolina at Wilmington (**UNCW**), and Western Carolina University (**WCU**).

[6] "They never saw it coming." *Science* 339 (2013)

[7] http://www.oceanleadership.org/ocean-policy-legislation/ocean-leadership-policy-priorities/

activities are important to the State's economy, both in traditional sectors like recreation and tourism, fisheries, hazard resilience, and marine heritage, and in emerging areas like wind energy and marine biotechnology. UNC System faculty members are leaders in areas such as marine biotechnology, wind energy, coastal sustainability, marine aquaculture, climate change and marine ecosystem health.

At the start of this review, the UNC-GA requested institutional self-studies which resulted in the capture of teaching, research and outreach services that were being conducted by 26 distinct UNC Activities in marine science. The content and depth of each of the self-studies varied, reflecting differences in mission, vision, resources, and capacity for marine-related work at the institutions. The self-studies were then reviewed by a national panel of marine and coastal sciences experts convened by AAAS. The members of the review panel are listed below (bios are included in the Appendix):

- Christopher F. D'Elia, Dean and Professor, School of the Coast and Environment, Louisiana State University
- Jacqueline Dixon, Dean and Professor, College of Marine Science, University of South Florida
- Steven E. Lohrenz, Dean and Professor, School for Marine Science and Technology University of Massachusetts-Dartmouth
- Nancy Targett, (Chair) Dean and Professor, College of Earth, Ocean, and Environment, University of Delaware

For this task, AAAS, together with the UNC-GA, developed a charge that focused on opportunities and leveraging across the UNC System (see Appendix). The AAAS panel conducted a preliminary assessment of each of the UNC Activity's capabilities and gaps, based on the questions from the AAAS charge. These preliminary findings laid out a foundation for the AAAS panel to conduct a week-long site visit to interview faculty and administrators representing each of the UNC Activities. The team visited three cities along the coast, Wilmington, Morehead City, and Manteo, touring on-site facilities at each location. In its deliberations, the panel considered the marine-related programs from a system-wide perspective using both the self-study documents and insights gathered from the site visits, presentations made by the units, and in-person interviews. At the end of the site visit, the AAAS panel briefed the UNC-GA VPR with its preliminary findings and recommendations. This report reflects a further discussion and refinement of those views.

This section of the report includes high-level findings and recommendations that emphasize opportunities for coordination across the UNC System (Question 3 of the AAAS Charge, see Appendix). Part II of this report includes further review of the UNC Activities, reflecting the panel's impression of how the units contribute to the totality of marine and coastal sciences in the State and where there are gaps (Questions 1 & 2 of the AAAS Charge).

North Carolina's Culture for Marine Science

In North Carolina, the marine and coastal programmatic activities are hosted at institutions spanning the spectrum of institutional cultures, missions and Carnegie classifications[8]. Each UNC activity fills a unique niche, consistent with the institution's culture and mission, to serve a distinct set of stakeholders. Marine programs at research-intensive universities such as UNC-CH and NC State contribute to our understanding of coastal hazards and resilience, marine ecosystem health, climate change, marine applications of food science and veterinary medicine. Benefits from these efforts accrue to the UNC System as a result of the national visibility of the work (publications in journals like *Science*, *Nature*, and *PNAS* for example; research dollars to the University) and the local impact of having nationally-acclaimed experts that are available to consult with State resource managers, legislators, or businesses. The research also translates into unique learning opportunities for students.

Marine and coastal programs at teaching-intensive institutions serve to educate the next generation of citizens to think broadly about environmental issues. UNCW, in particular, has embraced marine science as the signature theme for the entire university, and is explicitly reflected in traditional disciplinary areas (e.g., Departments of Physics & Physical Oceanography, Biology & Marine Biology, and Chemistry & Biochemistry). UNCW engages students, particularly at the undergraduate and master's level (and at the Ph.D. level in Marine Biology), in a significant experiential-learning process that builds on faculty research and innovative partnerships (e.g., Marine Biotechnology). Other teaching-intensive units also incorporate hands-on student experiences into their marine-related programs. ECU seeks to be an instrument of regional transformation and its marine-related emphases are in areas that are particularly important for the coastal state of North Carolina, including coastal science and policy, coastal resource management (including a Ph.D. program in this area), sustainable tourism and maritime heritage. At WCU the marine-related emphasis is concentrated in the study of developed shorelines. This program has national visibility and extramural funding in addition to strong undergraduate engagement in the analysis of data and production of data products such as the storm surge viewer or the beach nourishment viewer. ECSU's program, while small, collaborates successfully with other institutions both inside and outside of North Carolina to enhance opportunities for its students. As a historically-black college, ESCU offers the added dimension of serving under-represented groups and a pool of students interested in the field.

Marine-related programs like North Carolina Sea Grant and the UNC Coastal Studies Institute (CSI) fall outside of the Carnegie classification because they are not academic entities per se, but they serve a valuable role in translating science to the benefit of North Carolina stakeholders. NC Sea Grant and UNC CSI have a cross-state presence and perspective.

---

[8] The relative emphasis an institution of higher education places on research and undergraduate and graduate education defines its cultural landscape and is dictated by its mission. Insights into the cultural traditions at institutions of higher education can be gained from the Carnegie Foundation for the Advancement of Teaching's classifications (http://www.carnegiefoundation.org), which attempt to categorize colleges and universities according to their highest or most dominant degree awarded (Associates, Bachelors, Masters, Doctoral) and the level of their research activity (Research Universities with average, high, and very high research productivity). In addition, to these generic labels, institutions have their own special cultural traditions.

It was apparent to the AAAS review panel that the marine-related programs within the state have self-selected into niches that largely complement each other rather than compete. More effective coordination of these already strong and diverse cross-state efforts could significantly strengthen them all and enhance the UNC System's competitiveness in this area; truly a "win-win-win" opportunity for the programs, the home institutions, and the system.

Strategic Thinking and Opportunities for the UNC System

Overview

The UNC System has an extraordinarily rich assemblage of intellectual assets, facilities and capabilities that underlie research, education and outreach related to the coastal North Carolina marine environment, and more broadly to the regional, national and global environment. The word "assemblage" is used deliberately here, because it appears that historically, the planning and support of programs has been largely "siloed" within institutions. The treatment of the programs in a more holistic and coordinated way, while still retaining institutional identity, presents a significant opportunity for North Carolina to amplify the collective impact and broaden recognition of its marine-related programs. Such a situation often exists in state university systems because they are large complex organizations composed of individual campuses with multiple and typically competitive leaders.

The coordination has already started organically in several areas of the UNC System. Grassroots collaborations do exist. Interactions do occur among the institutions, programs and laboratories at various levels including research and shared facilities (see Part II). However, these interactions tend to be between individuals or focused on specific project areas. What is lacking is a level of coordinated stewardship that has full participation at the unit level and also takes advantage of a comprehensive, "big-picture" view that can foster interactions among programs. This coordination need not be onerous, but it does require buy-in.

In undertaking this assessment, the UNC System has taken a critical step toward adapting to the changing academic landscape. Effecting change requires strong and committed leadership at all levels. The benefit will be the System's enhanced competitiveness in the marine-related programs, manifested in a coordinated brand that helps with recognition of system-wide assets and opportunities for enlarging and diversifying the research portfolio. It should also help North Carolina's competitiveness in vying for large federal center grants. This is really an opportunity for win-win solutions from which everyone can benefit.

The AAAS panel did not identify any areas where there was obvious redundancy or overlap in programs (see section titled *The Degree to Which UNC Marine Activities Overlap*, p. 33). Rather, the various marine activities of the UNC System comprise a rich and diverse assemblage, the potential of which can be fully realized through improved coordination and collaboration.

This section of the report outlines steps to improve coordination of UNC activities that might then translate to better recognition of the strengths of the UNC marine-related activities both internally and externally.

In summary, four overlapping and complementary topic areas are identified to promote better leverage and efficiency across the UNC system: Statewide Planning and Coordination, Reducing Barriers for Research and Academic Collaborations, Marine Science Activities Planning and Communication, and Other. Each topic area is linked to a set of recommendations.

State-wide Planning and Coordination

• Building on Self Studies

RECOMMENDATION 1: UNC GA should provide greater leadership and coordination of UNC System Activities. As a first step, UNC-GA should build on information in the self-studies as well as other sources to maintain and disseminate an up-to-date inventory of programs and activities. This effort should be complemented by the establishment of milestones and measurement and reporting of outcomes for all participating units.

The self-studies are an important first step in understanding the breadth and depth of UNC System-wide assets. Next, the UNC System should develop a better understanding of the potential system-wide synergies by mapping the inventoried assets in a comprehensive way. This will highlight strengths and identify gaps and facilitate decisions to ensure that desired outcomes are being met and that programmatic impacts are being measured in a comprehensive way. With a better understanding of the breadth of the assets one can enhance system-wide competitiveness and impact.

• Economic Value of North Carolina's Coast

RECOMMENDATION 2: The UNC System should commission studies on the economic valuation of coastal ecosystem services and natural capital as well as the direct and indirect economic benefits of marine science and technology activities. Such information should be used to communicate the economic value of North Carolina's coastal environment and the role of North Carolina's system of higher education in providing vital understanding, education and outreach to support the wise use and stewardship of natural resources as well as stimulating local, regional and statewide economies through marine science and technology investment.

Programs within the UNC System provide vital understanding, education and outreach to support the wise use and stewardship of important coastal resources. Development of an economic valuation of the coast using traditional "neoclassical" market-based economics and also "biophysical" economics based on the valuation of ecosystem services and natural capital would put the UNC System in a much stronger position to demonstrate how its marine-related programs are of strategic importance to the people of North Carolina and beyond. Studies in other states have demonstrated that attracting a workforce with required skills is essential to commercialization and the development of new products derived from the marine sector[9]. Clear linkages to economic and educational impacts are essential to gain needed support in the business community and of other stakeholders. North Carolina Sea Grant is already doing a superb job translating science into economic benefit for the people of North Carolina and could be a significant resource in accomplishing this task (see below).

• Branding

RECOMMENDATION 3: The UNC System should foster the development of a clear brand or identity for the key marine-related programs, building on the results of Recommendations 1 and 2. For example, with reasonable investment, marine science assets in the Morehead City-Beaufort area could easily be packaged as a national center of excellence. Also, one can

[9] Barrow, Clyde; Loveland, Rebecca; and Terkla, David, "Sailing into a Strong Future: The Massachusetts Marine Science and Technology Industry" (2005). MassBenchmarks. Vol. 7, No. 4, pp. 15-21: http://scholarworks.umb.edu/econ_faculty_pubs/24

imagine the "Marine Research Triangle Partnership" (MRTP) involving UNC-CH's IMS, NC State's CMAST and the Duke University Marine Lab (located in Beaufort), as a natural extension of the Research Triangle Park brand. The founding documents of the Research Triangle Park indicate that it is to be an engine for prosperity for the entire state, and MRTP could be a natural extension benefitting all.

The AAAS review panel was extremely impressed with the expertise and capabilities of North Carolina's marine-related activities. Excellent facilities are available for them. However, when someone in the public thinks about ocean sciences, he or she inevitably identifies leading institutions such as Woods Hole, Scripps, and perhaps a few others. Few professionals, even those in the marine sciences, would identify Morehead City as a national center of excellence, except perhaps for the researchers located there. The UNC System has a wonderful prospect to develop a better identity for key marine resources. For example, Morehead City is truly an exceptional and important center of marine and coastal research at the national scale. The AAAS review panel visited the campuses of NC State's Center for Marine Sciences and Technology (CMAST) and UNC's Institute of Marine Sciences (IMS). Despite the close physical proximity of these two units and also Carteret Community College (CCC), and clear evidence that they cooperate in many ways, to the person driving down Arendell St. (US 70), they seem to be unrelated and distinctly independent entities. Why not try to give it a visual identity for what it really is: *a national powerhouse in marine science, research, education and outreach*? With some master planning and relatively little landscape architectural work and signage, a clear visual identity could be given to this significant campus as an integrated unit. This alone would make a powerful statement that would be very positively received by the local community in particular.

In addition, the coastal laboratory facility assets of the UNC System aggregate into three geographic clusters: Wilmington, Morehead City-Beaufort, and Manteo. The UNC System could create a virtual presence for its marine-related assets by aggregating and integrating them on a web site. The foundation for such a web portal appears to already exist in the form of a website focused on Coastal and Marine Sciences in North Carolina (http://ncmarinescience.com/). This portal could provide easy, comprehensive access to individuals trying to find a particular expertise, looking for specific projects, or trying to find course offerings in marine and coastal science.

Reducing Barriers for Research and Academic Collaborations

The AAAS review panel felt that the assemblage of UNC marine Activities, while encompassing impressive depth and breadth in marine-related research and education, lacked clear coordination and a statewide strategic vision for its marine and coastal endeavors. This apparent lack of coordination is an impediment to the ability of marine programs to advocate and communicate not only with higher levels within the administration of higher education and political leadership, but also to the general public.

• Research Collaborations

RECOMMENDATION 4: The UNC System should foster stronger and more integrative research collaborations and focus more attention to communicating to the public the economic and societal benefit that such research is able to produce.

The AAAS review panel heard about a number of ongoing research collaborations between the institutions and this is an area that should be encouraged to expand. The broad range of expertise across the UNC system presents an opportunity for developing highly competitive partnerships. Apparently, under President Bowles, the system office solicited responses previously for inter-campus collaborative research activities with the expectation of funding, but a lack of resources prevented this program from being realized. This unfortunately has resulted in skepticism about such efforts. The fact that the current external review was commissioned without an expectation of new resources is actually helpful. This should cause institutions to focus on stewardship of critical core capabilities instead of just worrying about jostling for new ones. Certainly system-wide collaboration could be framed around resources, the maintenance of current resource levels as well as attempts to secure new resources from the State of North Carolina or from other sources external to North Carolina.

Collaborative research efforts could also lead to increased efficiencies and support within the research enterprise for grant writing, patents and licensing, technology commercialization, and shared computational facilities.

• Academic Collaborations

RECOMMENDATION 5: The UNC System should encourage efforts to remove barriers to academic collaboration. For example, the UNC System could facilitate academic interaction by removing barriers that currently inhibit student and faculty exchange across institutions. Steps could include:

- selected course offerings across the system that might be targeted or designated as system-wide courses,
- common degree programs (Master's or Ph.D. level) with one or more degree-granting lead institution(s) but participation by other institutions (the Maryland MEES Program is an example).

All of these would help to facilitate articulation within the UNC System.

RECOMMENDATION 6: The UNC System should encourage development of a coordinated online or hybrid course curriculum in marine science to leverage the breadth of activities offered throughout the State. These courses could be a component in common, shared graduate degree programs in marine science, and would help maximize the use of teaching resources in the State without requiring duplication in hiring.

The AAAS review panel saw an opportunity for sharing the wealth of marine science expertise in the State through online courses and the use of technology in the curriculum. One opportunity would be to offer hybrid courses, with the bulk of the content offered online combined with a field component offered at the coastal marine stations.

• Enhanced graduate and undergraduate experiential learning and field studies

RECOMMENDATION 7: The UNC System and individual institutions should foster undergraduate research and encourage efforts to ensure that undergraduate and graduate student mentoring is sufficiently valued and rewarded.

For all the programs, it is clear that marine science activities provide enhanced hands-on learning and research experiences for undergraduates. The UNC System needs to assess the importance of experiential learning within the context of its strategic plan and then foster it as appropriate, encouraging recognition and compensation for faculty involved in it.

RECOMMENDATION 8: The UNC System should consider building and maintenance of dormitories to foster residential academic programs at the three coastal locations (Wilmington, Morehead City, and Manteo) and to facilitate statewide participation in coastal field studies. More broadly, the UNC system is encouraged to consider a more proactive approach to regular maintenance and upkeep of coastal facilities (including equipment) in conjunction with overall capital improvement schedules.

The coastal marine science activities offer unique facilities for focused research experiences (summer classes, semester-on-the-coast, etc.). Investment in dormitories at each coastal marine science region (UNCW-CMS in Wilmington, UNCCH IMS and NC State's CMAST in Morehead City, and UNC CSI in Manteo) has been suggested as a way to increase short course enrollments and provide living quarters for guest investigators. Institutions in the same region (e.g., CMAST and IMS in Morehead City) should be encouraged to coordinate or share dormitory facilities. And, while this does demand additional resources, it would significantly enhance these signature programs for North Carolina.

Marine Science Activities Planning and Communication

• Strategic Planning

RECOMMENDATION 9: Leaders of UNC Activities should develop unit-level strategic plans that articulate explicitly with strategic planning by their home institutions and by the UNC System. These plans should include benchmarks and quantitative metrics and use the self-study documents as a starting point. Periodic assessments should be undertaken to monitor progress.

All marine-related units should have strategic plans that clearly articulate their mission, vision, and values. Such plans should be developed with the involvement of external advisory boards, committees and councils. These plans should aggregate up to support the strategic plan of the units' home institution as well as the System's overall strategic plan. Outcomes should be directly related to these plans. Benchmarks and milestones, supported by quantitative metrics, will help to measure progress.

As a neutral broker, the System can facilitate the success of the unit strategic plans by encouraging inter-unit coordination and communication occur. Each unit should designate an individual charged with "administrative outreach" to other units, and identify an internal communication team with the responsibility to marshal resources and work with the System and other units. These efforts can complement and enhance existing assessment activities now

undertaken as part of the accreditation process required by the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC).

• Strengthening Internal and External Communication

RECOMMENDATION 10: Leaders of UNC Activities should develop and execute a systematic and coordinated communication plan.

There is a need for these leaders to see that a system-wide synergy does not need to compromise a unit's fidelity to its home institution. Cultivating such system-wide synergies ensures future competitiveness and North Carolina is better prepared than many to meet that challenge. However, this will require a critical assessment of the current structures, sun-setting those that are not achieving meaningful outcomes and initiating new joint efforts that have bottom up and system buy-in (see additional discussion in Section II: The Degree to Which UNC Activities Coordinate). This may need to be facilitated by someone without institutional affiliation (for example, someone at the system level who is perceived as a neutral broker). The value of clear, coherent, and integrated picture of marine science in North Carolina to both internal and external audiences cannot be overstated (see section titled *The Degree to Which UNC Activities Coordinate*, p. 31).

To facilitate system-wide oversight, enhanced communication is essential at all levels: within institutions, among institutions and between individual institutions and the System Office. A coordinated communication plan needs to be developed and executed to achieve better internal and external recognition of marine related assets within the UNC System. Relevant parties should come together to determine a course of action to accomplish this in a way that does not interfere unnecessarily with unit autonomy or prevent a healthy level of measured inter-unit competition. Regular system-wide meetings to continue coordination and communication should be undertaken in the future. The AAAS review panel sensed that there was general, although not universal, willingness or even eagerness throughout the System to enhance communication and interaction, so now the time is right to do this.

Coordination of efforts related to public outreach could have system-wide benefits. Understandably, each institution has invested most of its efforts in its own public relations activities and must focus on its own priorities. Some programs were doing a commendable job in external communications, while others were less effective in that area. A signature brand that transcended institutions and drew people to a single portal to investigate the wide range of UNC System assets would clearly advantage all. The traditional modes of entry into UNC System assets would still operate but, the portal would provide the System-wide overview. The website http://ncmarinescience.com/ provides a conceptual example for this type of portal. The adage that "a rising tide raises all boats" is applicable in that enhancing the visibility of marine programs, and developing a vision of a coordinated network of interrelated efforts would be a powerful message.

• Utilization of North Carolina Sea Grant and the Coastal Studies Institute (CSI)

RECOMMENDATION 11: Leaders of UNC Activities should recognize and fully utilize the well-developed communication and outreach capabilities of North Carolina Sea Grant and the Coastal Studies Institute.

Two units within the purview of the AAAS review seem to be underutilized for the capabilities they offer to the entire system. The first is North Carolina Sea Grant, which has a formal communications program and also has resources to bring faculty, students and staff together for workshops, meetings and large events. Sea Grant might be engaged to coordinate a biennial "all-hands" meeting. UNC CSI has remarkable facilities for video production and editing. In some ways, this new unit is searching for a broader identity beyond the obvious goal of serving a regional field-going facility need. Partnering with Sea Grant on communicating coastal issues and UNC System solutions may be one such mission element, and the visible and strong presence of Sea Grant at UNC CSI suggest that that might occur.

• Communication Technology

RECOMMENDATION 12: Leaders of UNC Activities should encourage the use of modern communication and social media technology to improve inter-unit communication and to enhance the curriculum at both the undergraduate and graduate levels.

More use could be made of currently available technological resources to foster meetings via interactive video, web hosted technology, Skype, etc. Social media are critical for communicating with younger audiences. A communication strategy should be developed for marine-related programs within the UNC System. Such efforts are especially critical given the geographic separation of facilities within and across institutions.

Other

• Development

RECOMMENDATION 13: The UNC System should encourage all units to develop fundraising strategies and plans in coordination with their home institutions' development office to enhance external development programs and to engage external advisory committees and boards.

Many public universities have begun the transition to a more private university budget model. Partnerships with local industries and organizations are critical. The AAAS panel recognized that most UNC Activities could enhance their external fundraising through gifts. Enhancement of the fundraising enterprise goes hand-in-hand with outreach to the local communities. The AAAS panel recognized the excellent job North Carolina Sea Grant was doing with respect to public outreach. Sea Grant can be an asset in development of community relationships that may translate into successful development efforts.

• Diversity Initiatives

RECOMMENDATION 14: The UNC System should facilitate coordination of diversity initiatives for students and faculty in marine science.

With better coordination, the marine science activity at Elizabeth City State University has the potential to provide a pool of underrepresented minority students to the research-intensive programs in the State. Other additional efforts to involve minority students should be undertaken.

A lack of diversity of faculty and students is also a challenge faced by the majority of the UNC marine programs as well as for geosciences across the country. As noted in a recent report by

the American Geophysical Union[10], "the geosciences continue to lag far behind other sciences in recruiting and retaining diverse populations." Many of the programs lacked any well-defined plans for enhancing the diversity of their students, staff and faculty. This is a glaring omission and should be clearly articulated in future strategic planning efforts.

[10] Velasco and Velasco (2010) EOS Transactions of the American Geophysical Union Vol. 91. pages 289-296

Conclusions

The State of North Carolina is fortunate to have the intellectual capital of the UNC System to address its marine-coastal concerns and prospects. UNC System capabilities are formidable, both in terms of human resources and facilities. The UNC System has world-class institutions of higher education that participate in marine-related research from local and regional to global scales; strong State-based programs that excel in education and outreach; and non-academic programs that connect the institutions to stakeholders. In addition, the UNC System has the advantage of broad geographic presence throughout the State of North Carolina.

Many excellent programs, centers and institutes can be found within the UNC System. With appropriate coordination, collaboration, communication, and support, these assets can achieve even more than they already do and provide the state with additional significant return on its investment. The AAAS panel has offered fourteen recommendations that might be considered to help implement a more impactful and cohesive system-wide effort in the marine-coastal topic area. Most of these recommendations will not require great commitments of new fiscal resources, but they will require a common focus, clear leadership, more coordination and a commitment *by all of those involved*. The AAAS panel is convinced that if these recommendations are embraced and fulfilled at all levels, North Carolina will be in a leadership role nationally in marine-related research, education and service.

Section II:
An environmental scan of University of North Carolina Coastal and Marine Activities

Major Strengths or Unique Capabilities Supported by the UNC Activities

The AAAS panel expected to find significant strengths and capabilities supported by the campus activities throughout the UNC System, and it did. The following section offers highlights of unit strengths and their impacts.

The collective impacts of UNC coastal and marine activities extends from the transformative experiential student learning catalyzed by marine-related research at all institutions regardless of size and mission, to the research and faculty expertise that is a resource for national and state stakeholders (resource managers, business leaders, etc.), to specific positive economic outcomes, both fully realized (e.g., RecText, Surge Viewer, Surf Viewer, hybrid striped bass aquaculture), and potential (e.g., MARBIONIC, offshore wind energy, flounder aquaculture). Looking at the impacts and outcomes from marine-related activities as a whole, it is readily apparent that there is a strong case to be made for the importance of UNC-System research and education to the state and nation. A quantification of the economic value of North Carolina's coastal ocean to the State (e.g., fisheries, ecosystem services that enhance hazard resilience, tourism, etc.) would help to put the value of these efforts into context for the State.

Marine-related assets are found throughout the State of North Carolina. Along the coast there are three primary locations with ready access to the sea and where substantial laboratory and field research teams exist: Wilmington, Morehead City-Beaufort, and Manteo.

- Wilmington. UNCW labels itself North Carolina's Coastal University. In addition to the marine focus of the Center for Marine Science, coastal and marine themes are woven through the natural sciences, as well as through humanities, arts, and social sciences. It has a strong emphasis on experiential learning (primarily at the undergraduate and Master's level and also a Ph.D. in marine biology) that is facilitated by its proximity to dedicated research sites and to state-of-the-art laboratories and equipment. There is a rich cross-university curriculum that also includes inter-institutional partnerships such as the environmental science/environmental engineering 3+2 options with North Carolina State, articulation agreements with several North Carolina community colleges, international agreements with academic institutions, and internship opportunities with non-academic entities (e.g., state agencies, aquaria). Faculty members are dedicated and the leadership is forward looking. UNCW is looking to build capacity through additional innovative programming at levels that begin with K-12 (e.g., Marine Quest) and extend to partnerships between the MARBIONIC program and the Cameron School of Business (joint MBA postdoctoral fellowship) and to potential joint Ph.D. programs. Their focus is strategic with well-developed goals. The development of the Campus for Research Entrepreneurship, Service, and Teaching (CREST) is a potential game changer and has already resulted in significant uptick in grant support. UNCW has proposed the North Carolina Alliance in Marine Science (NC AiMS). In concept, this is the kind of collaborative partnership that would help to leverage the UNC-System's significant marine-related institutional assets in a coordinated and synergistic way.

- Morehead City-Beaufort. This area of the coast is home to the coastal lab facilities for UNC-CH and NC State and proximate to the Duke University Marine Laboratory. The central location along the coast provides convenient access to a large portion of state

waters and habitats. In addition, this area of the coast is home to several marine-related government labs.

- UNC-CH Institute for Marine Sciences (IMS). Located in Morehead City, IMS has 11 residential faculty (9 tenure track, 2 non-tenure track), who have stellar records of research (funding and publications) and service (federal, state, and local initiatives). The faculty members are engaged in research around questions that address three of the great societal challenges: the ability of people to live at the coast (hazards, sea-level rise), quality and safety of our water supply (ecosystem health and function, human health), marine resource development and sustainability (living and non-living resources, science-guided policy and protections). They are well-integrated into UNC-CH marine-related research activities, with most holding joint appointments in the Department of Marine Science on the main campus. In addition, the IMS-based faculty members have strong collaborations with other North Carolina institutions and marine-related activities. IMS faculty members actively participate in graduate education. Since IMS is not a degree granting entity, students matriculate through departments on the UNC-CH campus. IMS faculty are also active in other aspects of education, contributing to field, classroom, independent research, and capstone activities for UNC-CH students and more broadly for undergraduates from other institutions who participate in the NSF REU (Research Experience for Undergraduates) program in marine science that is based at IMS. The on-site seawater facilities are a significant plus and add to the breadth of research that can be conducted at the lab. These are shared with researchers at NC State-CMAST (located less than a mile away). IMS is also home to a state-of-the-art North Carolina Biotechnology Center-funded molecular training facility to train water quality professionals in molecular techniques. IMS has dormitories to serve visitors (faculty/students), although they need to be refurbished.

- North Carolina State University (NC State)-Center for Marine Science and Technology (CMAST). CMAST has a beautiful facility in relatively close proximity to Carteret Community College, North Carolina State Government Labs, and IMS. They have resident faculty from three colleges (Agriculture and Life Sciences, Physical and Mathematical Sciences, and Veterinary Medicine) spanning 6 departments as well as individuals from North Carolina Sea Grant and North Carolina Extension. The group is diverse and yet well-integrated with evidence of innovative partnerships on display throughout the building (the NCMSEP posters were particularly effective at presenting topical synergies). The leadership is forward looking with plans for growth that were well articulated and coincident with the NC State overall strategic goals. The focus at CMAST is on Ocean Health and Sustainability (One Health: healthy environment, healthy animals, healthy people). The presence of a marine animal veterinary science program and a food safety program make this site unique in the UNC System.

  CMAST is coordinating NC State's plans to add several new faculty in coastal and marine sciences through the university's program in faculty excellence and to develop a semester-at-the-coast program that will further enhance student

engagement via hands-on learning. To support the latter, CMAST has developed plans to add a dormitory/guest house.

- Manteo. The UNC Coastal Studies Institute (UNC-CSI) is a multi-campus research, education and outreach partnership that provides institutional context and operational capability for collaborative research and programming in northeast North Carolina with marine-related activities housed throughout the State. It is located in a brand new building that includes state-of-the-art facilities. UNC-CSI can offer place-based, experiential learning and research opportunities in a unique coastal environment that are coordinated for inter-institutional programming that can augment traditional campus-based experiences. UNC-CSI is still undergoing some growing pains as it develops a business plan to sustain itself into the future.

In addition to the coastal sites, North Carolina is home to five institutions with marine-related activities and one, North Carolina Sea Grant that spans the State from the coasts to the Research Triangle.

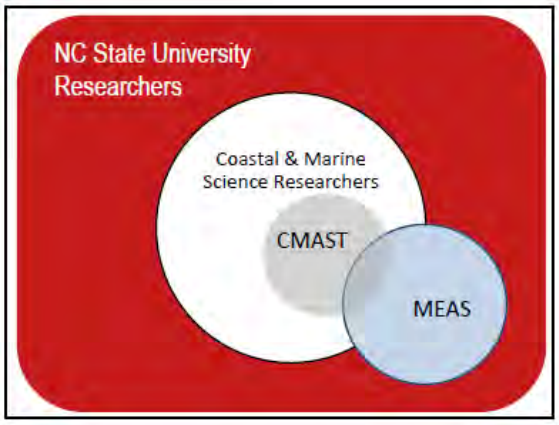
- East Carolina University (ECU). The focus at East Carolina is largely regional in keeping with their goal of being a "*national model of regional transformation.*" The Institute for Coastal Science and Policy (ICSP) aggregates together faculty shared with the Departments of Anthropology, Biology, Economics, Engineering, Geography, Geological Sciences, Sociology, and Recreation and Leisure Studies to bring a multidisciplinary perspective (natural sciences and social sciences) to marine-related issues. Marine-related education at ECU is focused primarily on coastal resource management, sustainable tourism, natural hazards, and maritime heritage/archaeology. All of these programs have strong partnerships internal and external to ECU and there is good placement of students. There is also a Coastal-Maritime Council within ICSP that coordinates the 50+ ECU faculty members and administrators who have interests in coastal science and policy, and provides overall advice to the Institute.

- Elizabeth City State University (ECSU). ECSU is a Historically Black College and University (HBCU) and offers degrees at the baccalaureate and masters level to a diverse student body. This is the only HBCU in the State to offer an undergraduate marine science program and it could provide a pool of qualified under-represented students to the other State marine activities. Marine-related activities at ECSU have three components: 1. the marine environmental science program itself; 2. undergraduate research experiences in ocean, marine, and polar science; and, 3. the Center for Remote Sensing of Ice Sheets (CReSIS). Much of the responsibility for the program is shouldered by Dr. Maurice Crawford, who is carrying a 4/4 teaching load, supervising undergraduate research projects, writing proposals, and trying to carry out a limited research program. ECSU has been very effective at establishing partnerships with other institutions (examples include CReSIS and DREAMS-Diversity in Research and Environmental and Marine Sciences-activities). Interestingly, most of the partnerships are external to North Carolina leaving significant scope for growth within North Carolina.

- NC State University (NC State). NC State Vice Chancellor for Research, Innovation and Economic Development Dr. Terri Lomax provided an excellent representation of how the marine programs were positioned within NC State. There is an opportunity to use

this type of visualization at other institutions and to then aggregate them to give a clearer and more comprehensive picture of marine-related activities in the North Carolina System.

Marine-related activities at NC State occur on the coast at CMAST but also in the Department of Marine Earth and Atmospheric Sciences (36 faculty) as well as in other departments across the university that are broadly categorized as Coastal and Marine Researchers (faculty from 14 units crossing 7 colleges). MEAS has a program that is well integrated across the geosciences from earth to atmospheric systems. It has significant depth and breadth in the area of predictive computational modeling of marine systems, alone or coupled to other components of the Earth System. The non-MEAS marine related activities are significant. Notable assets include the NC State Center for Applied Aquatic Ecology (CAAE) under the direction of Dr. JoAnn Burkholder that provides water quality research information to policy makers and the Program for Sustainable Coastal Engineering (SCE) and Ocean Energy (OE) which is based in at UNC-CSI in Manteo.



The relationship of marine science researchers at NC State. (Figure provided by Dr. Terri Lomax, NC State Vice Chancellor for Research, Innovation, and Economic Development)

- UNC-Chapel Hill (UNC-CH). There are three marine-related units within UNC-CH: The Department of Marine and Atmospheric Science (MASC), Institute of Marine Science at the coast, and the Marine Sciences Program (MSP). All have faculty that function at a research-intensive level. The 13 tenure track and 3 research faculty in MASC are located in state-of-the-art space in the new UNC Science Complex (Venable Murray Hall). There is a strong and ongoing relationship with IMS faculty facilitated via video technology which links IMS with the main campus and via shared students and research. MASC clearly aligns with the primary elements of the UNC-CH strategic plan, touching on 4 of the 6. Marine-related faculty members at UNC-CH extend beyond MASC (including Departments of Biology, Geology, Environmental Sciences and Engineering, and Mathematics; the Institute for the Environment and the Renaissance Computing Institute). They have established collaborative relationships with each other and with other NC academic institutions. These include shared institutional appointments and cooperative academic programs (e.g., Ph.D. with UNCW). Shared state-of-the-art facilities at UNC-CH include the Joint Fluids Lab, the Aquarium Research Center, the Trace Metal Clean Room and the ICP-MS with laser ablation. In addition to partnerships

within and between North Carolina academic institutions, UNC-CH marine related faculty also partner with non-academic entities such as federal and State government agencies and the private sector. This enhances their impact.

- Western Carolina University (WCU). Marine science activity at WCU is focused on the Program for the Study of Developed Shorelines (PSDS) run by Dr. Rob Young and Dr. Andy Coburn. This strongly-branded, widely-recognized program, transferred from Duke to WCU in 2006. It is focused on coastal processes, particularly the science underlying coastal processes, and on how to develop and communicate science-based management recommendations to resource managers and to the public. The program is externally funded with excellent partnerships and produces data products widely sourced by the media and other public entities. The program leaders include undergraduates in their research programs and in the development of data product and publication outputs (e.g., sea level rise adaptation plans for the National Park Service and NOAA, coastal impact plans for dam removal in the Elwha River Dam, and maintenance of multiple large data bases for coastal processes such as the storm surge viewer and the beach nourishment viewer). PSDS program leaders are also engaged in significant service to federal, state, and local communities on issues related to coastal processes. At WCU, the PSDS has also expanded into areas beyond simply coastal processes, but related to its geological foundation. It is a tremendous resource for students at WCU and at Duke and it would be beneficial if it was promoted more conspicuously as an opportunity for students throughout the system.

- North Carolina Sea Grant (NCSG). NCSG is a federal, state, university partnership that engages North Carolina institutions through research, education, and extension projects to foster science-based decisions about the use and conservation of marine resources. Its administrative base is at NC State in Raleigh but it has staff located at UNCW, CMAST, and UNC-CSI, thereby functioning as a bridge that links many of the UNC System's marine-related activities. It facilitates inter-institutional engagement, acts as an "honest broker" to translate research to application, and has a rapid funding mechanism that can be used to address critical issues that arise. In addition, it supports a North Carolina Coastal Resources Law, Planning, and Policy Center on the NC State and UNC-CH campuses. NCSG is nationally recognized for its excellence, consistently ranking at or near the top of the 32 SG College Programs by NOAA Sea Grant National Office reviews. The program provides North Carolina with identifiable impacts and offering significant return on dollars invested. It has strong partnerships across North Carolina in academic and non-academic sectors.

Major Challenges Limiting the Impact of UNC Activities

The AAAS panel recognized that the UNC marine-related activities were facing challenges common to many other programs across the country, in addition to some that were unique to the specific circumstances of individual institutions. The changing face of higher education across the country as well as looming budget challenges are felt by all higher education institutions, and are particularly acute for marine-related programs that depend so heavily on external funding to support research and graduate education. Many state-funded universities are recognizing that they are morphing into state-located universities as their percentage of state funding drops. Public universities can either recognize the changing fiscal environment or face prolonged financial stress, deteriorating quality, and eventual decline ("death by a thousand cuts"). Adapting to the changing landscape requires strong leadership and strategy to replace state revenues with alternate sources of funding, as well as efforts to control costs in innovative and unprecedented ways.

The marine-related activities within the UNC system have tremendous potential to be able to not only weather this difficult period, but position themselves strategically to adapt and evolve to new ways of doing business and serving research, educational and societal missions. Perhaps one the greatest obstacles to achieving this goal for the UNC marine programs is the lack of clear coordination and a statewide strategic vision for marine science. This has implications for the visibility and branding of marine science in North Carolina that is necessary for effective advocacy and communication within the UNC system, but also for communication with political and public sectors. The lack of leadership and coordination is also an impediment to effectively leveraging the depth and breadth of expertise and facilities across the UNC system to enhance capabilities to secure external funding and attract investment. In the remainder of this section, the AAAS panel considers challenges associated in the areas of people, equipment and facilities (as per the AAAS charge) as well as other areas identified by the panel.

People (teams, PIs, students, post docs). As noted under *Strengths* in the previous section, the researchers that the AAAS panel met were committed and dedicated. The various programs possess a broad range of individual talent, experience, and expertise and the faculty are true assets. Having said this, not all programs were "equal" in the sense that some programs such as WCU and ECSU have only a small number of faculty members in marine or environmental science programs serving a relatively large number of students. The UNC System may wish to examine whether strategic additions in faculty to these programs could yield benefits for broadening participation and enhancing diversity in marine science programs as well as Science, Technology, Engineering, Mathematics (STEM) education in general. Such programs may also have value as "feeder" schools for graduate programs elsewhere in the State. In addition to WCU and ECSU, UNCW also noted concerns about the number of faculty required to meet the teaching demands for their degree programs. Based on national trends, attrition due to faculty retirement is likely to be a challenge for all programs and something each program should consider in developing strategic plans for hiring new faculty at the institutional level as well as across the UNC system as a whole.

Finally, there were recurring themes in the self-studies about the challenges of recruiting and funding graduate students. Unlike some other professional programs, marine science programs traditionally provide support for their students, who are routinely expected to work on ongoing research projects. The ability to offer financial support is a major benefit to efforts to recruit

and retain high-caliber students. As funding becomes more constrained, so too will support for graduate students and institutions will have to expand and diversify the sources and strategies for funding students. This must necessarily involve efforts to secure funding for students through competitive educational grants, involvement of students in undergraduate teaching as teaching assistants, cooperative programs with private or public sector entities, and part-time students in employment situations that permit them to devote the necessary time to be successful in a degree program. Programs that explore alternative course delivery options (on-line, night and weekend course delivery, etc.) that are more accessible to the part-time or professional student should also be encouraged.

With regard to recruitment, the AAAS panel was provided with insufficient information to comment much about activities either at the institutional or system levels. Yet recruitment is a growing challenge as programs find themselves increasingly in competition not only with other marine programs, but with other fields as well. This is another example of how leadership at the UNC system level could benefit the entire UNC marine science effort through coordinated recruiting and branding of the marine science activities statewide.

Equipment. As was already noted, the nature of marine science research necessitates the use of expensive and highly-specialized equipment and analytical instruments. The various UNC coastal sites as well as their parent marine programs at the home institutions have an impressive inventory of state-of-the-art equipment and instruments. An emerging challenge faced by marine institutions in general is how to acquire and maintain such items and achieve an optimal level of use. The AAAS panel found very different strategies for dealing with expensive equipment used in marine-related research in the UNC system. On one end of the spectrum, UNCW openly shares its equipment with other users in the UNC System in return for reimbursement for supplies. Maintenance of the equipment is supported through return on indirect funds. Other institutions such as IMS operate their equipment as cost centers. Clearly, this is another area where inter-institutional coordination to facilitate shared use of expensive and highly-specialized equipment may be beneficial. Obviously, there are challenges to these types of arrangements, and different business models (e.g., UNCW or IMS) may be more or less appropriate to specific situations. However, UNC leadership might want to consider identifying centers of excellence for certain types of analytical capabilities that can serve multiple institutions where feasible. Strategies for coordinated asset development and usage will make UNC more competitive especially in an uncertain science funding climate. For example, as funding for start-up packages and major research instrumentation becomes more difficult to obtain, innovative thinking around partnerships will be necessary for universities across the nation.

Research Support Facilities. Facilities, especially research facilities, are expensive to operate and maintain and such costs are being scrutinized heavily as university budgets face rising costs and declining revenues. Additionally, while some facilities are relatively new and in excellent conditions (e.g., new buildings on UNCW campus, UNC CSI), other sites such as the IMS facilities are showing signs of age. Moreover, it was communicated to the AAAS panel that maintenance of the IMS facilities and possibly other sites are not part of system-wide or university capital improvement plans, leaving the burden of maintenance to fall on the individual laboratory. This is an unsustainable situation and the UNC system is encouraged to consider a more proactive approach to regular maintenance and upkeep of coastal facilities in conjunction with overall capital improvement schedules.

Two areas for which there was strong interest from UNC Activities were a functional coastal vessel and for dormitory space at coastal facilities. The retirement of the R/V *Cape Hatteras* was an external decision on the part of the National Science Foundation, which withdrew its support due to declining usage of vessels in the R/V Cape Hatteras class as well as considerations of its age and capability[11] [12]. This loss hampers the ability of UNC marine programs to provide both faculty and students readily available at-sea experience. An alternative that seemed to have considerable support was to acquire a smaller and more versatile moderate size catamaran vessel that could still maintain the needs of both research and educational activities. The AAAS panel encourages the UNC System to examine whether the operation of such a vessel could be financially sustainable given the multiple potential users within and outside the system of such a vessel within North Carolina as well as the external user community.

The need for dormitory space at coastal facilities was another area of common interest. Such facilities seem justifiable given the growing need to engage undergraduates in marine science as well as providing housing for graduate students, faculty and visitors conducting research at coastal sites. Summer experiences for undergraduates are perhaps one of the most effective ways to enhance the visibility of the marine programs across the State and garnish public awareness and support for these activities.

Other. The UNC system has various academic programs at the Bachelor's, Master's and Ph.D. levels. While a detailed assessment of each goes beyond the scope of the AAAS charge, it is recognized that academic programs are a critical aspect of the UNC marine programs. Despite their importance to the core mission of the various institutions, barriers to academic collaboration present a challenge for realization of the true potential for the UNC system to deliver a superior marine science curriculum. Various approaches to break down these barriers have already been suggested including system-wide courses, system-wide degree programs at the Master's or Ph.D. level, and distance learning and on-line delivery. Such activities may also help to overcome the challenges inherent in the geographic separation between the institutions as has been noted previously.

Even with these changes, an even greater challenge may be a reluctance on the part of some institutions to embrace such initiatives. The AAAS panel found that some individuals were reluctant to change the way their programs operate. In contrast, others were enthusiastic about this.

Another challenge seen by the AAAS panel was the lack of a system-wide communication strategy and clear branding for UNC marine science activities. For example, it was previously suggested that a branding of the UNC marine science activities as the "Marine Triangle

---

[11] Declining fiscal resources and increasing operational costs plague UNOLS (the University-National Oceanographic Laboratory System – www.unols.org) which operates our nation's research vessels. The loss of the vessel in North Carolina reflects an increasing challenge to maintain seagoing activities nationally. This situation is expected to get only worse in the future, as discretionary budgets get squeezed even further and as the cost of fuel continues to rise.

[12] "A Sea Change for U.S. Oceanography." *Science* 339 (2013)

Partnership" analogous to the Research Triangle in Raleigh/Durham might be advantageous. Communicating the unique qualities of each institution and the breadth and depth of facilities, infrastructure and expertise would be a powerful message.

The Degree to Which UNC Activities Coordinate

Substantive research collaborations already exist among institutions at the principal investigator level. Opportunities for coordination at the inter-institutional level have been discussed and include academic activities (system-wide courses, degree programs, on-line courses and distance learning) as well as messaging and public relations, and facilities and infrastructure.

The AAAS panel notes that attempts to develop coordinating councils in the past were apparently hampered by "turf" issues or lack of engagement. Over the years, a number of advisory boards, task forces and working groups have formed. In general, faculty impressions were that these entities had limited impact and some faculty expressed skepticism about these past efforts and their effectiveness. The North Carolina Alliance in Marine Science (NC AiMS) has been proposed by the Chancellor of UNCW to align marine programs in North Carolina, but whether other campuses buy-in to this is unclear.

The Marine Science and Education Partnership includes UNC-CH-IMS, NCState CMAST, Duke University Marine Laboratory, East Carolina University, NOAA, North Carolina Sea Grant and various community colleges, public school systems and other state and county agencies. This program appears to have merit, but excludes some programs and there was little information provided about it or its accomplishments.

One area of promising coordination was the relationship between the Marine Biotechnology in North Carolina (MARBIONC) and the Marine Bio-Technologies Center of Innovation (MBCOI) both at UNCW. These entities bring together researchers with private sector entities to support business incubator and economic development efforts around marine biotechnology initiatives. Another positive example of coordination was the Duke-UNC Oceanographic Consortium (DUNCOC), which was a multi-institutional consortium with the mission of operating the research vessel *Cape Hatteras*. The R/V *Cape Hatteras* has since been retired, and the fate of DUNCOC is uncertain. Thus, while some examples of coordination exist, the scope of these entities appears to be limited to specific thematic areas and none of them has a comprehensive mission.

Areas where coordination may be particularly advantageous include shared use of facilities. Some sharing of facilities is already occurring in specific situations, but much more can be achieved. Doing so, will not only achieve economies and leverage funding, but it will also increase impact. UNC Chapel Hill IMS houses space for North Carolina State CMAST in their seawater lab facility. A new coastal vessel would serve multiple users within the UNC system. This is especially important given the recent retirement of the R/V *Cape Hatteras*.

As was previously noted, the expansion of dormitory facilities that could house students from the main campuses at the coastal sites was a common theme across all the institutions. Summer programs at IMS and CMAST are constrained by dormitory space. In addition, educational programs at UNC CSI would also benefit from summer housing. This seems to be an obvious area where coordination and shared use of facilities would be beneficial.

While all institutions were engaged in outreach activities to some extent, some programs stood out. UNCW had various interactions with other institutions including student internships at state, federal and non-profit agencies. The Marine Quest program at UNCW is a receipt-

supported activity providing experiential learning opportunities for graduate, undergraduate and K-12 students. UNCW CMS was proactive in integrating marine science into various programs on the main campus. The summer programs at IMS, CMAST, and CSI could all be expanded. Another strong program was the Program for the Study of Developed Shorelines at WCU.

A major obstacle in coordination will be leadership. If any one institution appears to be taking the lead, other institutions may see this as a threat to their independence and stature related to marine science. Accordingly, leadership will be a challenge and a clear vision must be communicated as to what is the goal of this effort, what are the benefits, and how governance will be shared among the various institutions. Some agreement on how leadership for specific areas will be allocated among the institutions may be one approach for gaining acceptance of this concept. Limits to fiscal resources will always exist, and may even get worse. All entities must strive to work together to minimize costs and maximize benefits.

The Degree to Which UNC Marine Activities Overlap

The AAAS panel saw in each of the institutions a unique set of strengths and capabilities. Overlap in the expertise and research foci were minimal based on the self-studies and interviews with the UNC partners. While it could be argued that having three different coastal sites is duplicative, the case has been made that each of these coastal facilities is located in distinct geographic regions of the State and also serve different purposes. For example, the oyster research being done at UNCW and IMS involved differences in research priorities and each of these activities served a regional need to support the oyster fishery.

As already discussed, many of the marine institutions shared in the operation of the R/V *Cape Hatteras* prior to its retirement. Rather than overlap, this vessel provided a common platform that accommodated multiple and different uses specific to not only the UNC institutions, but to external users from across the country as well. All the marine programs would benefit from having a shared coastal vessel for example, and this would be consistent with the model used to operate the R/V *Cape Hatteras* by a consortium. Thus, such a model for vessel operation would increase efficiency and provide a more effective use of the vessel.

Dormitory facilities on the coast could also potentially be expanded and shared among institutions. This seems most logical in the case of CMAST and IMS, which are neighbors and both have need of student and faculty housing. These organizations already share seawater facilities so the shared operation of a dormitory is a logical extension.

The AAAS panel found that the academic programs exhibited unique strengths and curricular emphases. The panel still encourages the UNC System to examine the feasibility of a system-wide Ph.D. as other forms of academic collaboration and coordination. This would serve to ensure minimal overlap in the future as well as provide access to students to a wider range of options.

In summary, the AAAS panel did not identify any areas where there was obvious redundancy or overlap in programs. Rather, the various marine activities of the UNC System comprise a rich and diverse assemblage, the potential of which can be fully realized through improved coordination and collaboration.

Appendix: UNC Activities Included in This Review

Universities and Activities

The following institutions and Activities submitted self-studies for inclusion in the AAAS review.

East Carolina University

- Institute for Coastal Science and Policy
- PhD Program in Coastal Resources Management
- Program in Maritime Studies
- Other Centers and Programs
    - PhD in Economics
    - RENCI@ECU
    - Center for Sustainable Tourism
- Departments with Significant Coastal Components
    - Geological Sciences
    - Biology
    - Geography
    - Other: COAS minor

Elizabeth City State University

- The Marine Environmental Science Program
- Undergraduate Research Experience in Ocean, Marine, and Polar Science
- Center for Remote Sensing of Ice Sheets

North Carolina State University

- Department of Marine, Earth, and Atmospheric Science
- Center for Marine Science and Technology
- Coastal and Marine Science Faculty

University of North Carolina at Chapel Hill

- Department of Marine Sciences
- Institute of Marine Sciences

University of North Carolina General Administration

- University of North Carolina Coastal Studies Institute*
- North Carolina Sea Grant College Program*
- Water Resource Research Institute*

University of North Carolina at Wilmington

- Center for Marine Science
- MARBIONC (Marine Biotechnology in North Carolina)
- Department of Biology and Marine Biology
- Department of Chemistry and Biochemistry
- Department of Environmental Studies
- Department of Geography and Geology
- Department of Physics and Physical Oceanography
- Department of Public and International Affairs
- Watson College of Education

Western Carolina University

- Program for the Study of Developed Shorelines

* Inter-institutional Institutes/Programs of the UNC System

Appendix: AAAS Panel Member Biographies

Review Panel Members

Dr. Christopher F. D'Elia earned his A.B. in Biology from Middlebury College, his Ph.D. in Zoology from the University of Georgia, and did postdoctoral work at UCLA and at the Woods Hole Oceanographic Institution. Prior to joining Louisiana State University in July 2009 as Professor and Dean of the School of the Coast and Environment, he was Associate Vice Chancellor for Academic Affairs for Research and Graduate Studies and Professor of Environmental Science & Policy and Marine Science at the University of South Florida St. Petersburg. There he also directed the International Ocean Institute-USA and the Center for Science and Policy Applications for the Coastal Environment and served from 2007- 2008 as Interim Vice Chancellor for Academic Affairs. He has also held professorships in Biological Science and Public Administration and Policy and was Vice President for Research & SUNY Research Foundation Operations Manager at the University at Albany, SUNY. From 1977-1999, he was a Professor at the Chesapeake Biological Laboratory, University of Maryland Center for Environmental Science. He served as Director of the Maryland Sea Grant College Program of the University System of Maryland from 1989-1999. He has held appointments as the Ruth Patrick Distinguished Scholar in Aquatic Science at the Academy of Natural Sciences (Philadelphia), as the Director of the Biological Oceanography Program at the National Science Foundation in Washington, D.C. and as Provost and Vice President for Academic Affairs at the University of Maryland Biotechnology Institute. Dr. D'Elia has held numerous research grants and has authored or coauthored over sixty scientific publications on the nutrient dynamics of estuaries and coral reefs, and on science policy. He is a Fellow of the American Association for the Advancement of Science and has served on numerous advisory panels to the National Science Foundation and other federal, state and private funding agencies. He was elected to membership in the Cosmos Club, Washington, DC, in 1994. Dr. D'Elia is a former President of the Estuarine Research Federation and former Chair of the Board of Directors of the Council of Scientific Society Presidents. He has chaired the Mid-Atlantic Regional Marine Research Board and the Public Affairs Committees of the Ecological Society of America and of the American Society of Limnology and Oceanography. He has served twice as President, and as Co-Chair of the External Relations Committee, of the Sea Grant Association. He has been a member of the Scientific and Technical Advisory Committee to the Chesapeake Bay Program and has been Co-Chair of the Legislative Committee of the Commission on Food, Environment and Renewable Resources and Co-Chair of the Board on Oceans and Atmosphere of the National Association of State Universities and Land Grant Colleges (NASULGC), and a member of the Executive Committee of the NASULGC Council on Research Policy and Graduate Education. He has been a member of the Board of Directors of the Hudson River Foundation since 1998 and also served as Chairman of the Executive Board of the Science Center of Pinellas County until from 2007 - 2009. He is serving a second 3-year term as a member of the U.S. National Committee for the Intergovernmental Oceanographic Commission of UNESCO representing the Coastal and Estuarine Research Federation. He is also a board member and Chair of the Southeastern Universities Research Association's (SURA) Coastal and Environmental Research Committee, a member of the Board of Directors for the Baton Rouge Symphony Orchestra, a principal and former chair of the Gulf of Mexico University Research Collaborative and the Louisiana University Gulf Research Collaborative, and serves as Principal Investigator of the LSU component of the USDI South Central Climate Science Center.

Dr. Jacqueline Dixon is Dean of the College of Marine Science at the University of South Florida. She obtained her B.S. and M.S. degrees in geology from Stanford University in 1981 and 1983 and her Ph.D. in geochemistry from Caltech in 1992. Her academic career began as an Assistant Professor in Marine Geology and Geophysics at the University of Miami's Rosenstiel School of Marine and Atmospheric Science in 1992. She is an internationally recognized leader in her field of igneous geochemistry with 36 published articles in top-ranked journals, including *Nature*. Her research specialties are mantle geochemistry and submarine volcanism. Specifically, her research focuses on the role of volatiles, mainly H_2O and CO_2, in the generation and evolution of mantle melts. She received an Early Career award in 1997 for excellence in research and education. In 2007, a premier journal in her field (EPSL)

acknowledged one of her papers as one of their top-50 most cited articles. Prior to her arrival at the University of South Florida in 2011, she served one year as Interim Dean of the College of Arts and Sciences at the University of Miami, three years as Senior Associate Dean for the Life and Physical Sciences in the College of Arts and Sciences, and five years as Director of the undergraduate program in Ecosystem Science and Policy. She was recently elected as a Trustee of the Consortium for Ocean Leadership. She is a member of the American Geophysical Union, the Geochemical Society, the International Association of Volcanology and the Earth's Interior, and the American Association for the Advancement of Science.

Dr. Steven E. Lohrenz is Dean and Professor of the School for Marine Science and Technology (SMAST) at the University of Massachusetts Dartmouth. Prior to becoming Dean of SMAST, Steve served as Chair of The University of Southern Mississippi (USM) Department of Marine Science, located at the NASA John C. Stennis Space Center. He received a B.A. in biology and chemistry from the University of Oregon (1978) and a Ph.D. in biological oceanography (1985) from the Massachusetts Institute of Technology-Woods Hole Oceanographic Institution Joint Program, and was a National Research Council post-doctoral fellow at the Naval Ocean Research and Development Activity (now part of the Naval Research Laboratory). His research extends across various themes of biological oceanography including phytoplankton physiology, community structure, ecology, primary production, biogeochemical cycling, and terrestrial-ocean interactions. His current work also includes applications of optics and remote sensing in the study of biological and biogeochemical patterns and processes in aquatic environments. He has authored or co-authored more than 60 papers in refereed literature and participated in more than 50 research cruises. He is a Contributing Editor for Marine Ecology Progress Series. He currently serves on the Board of Directors of the Northeast Regional Association Coastal Ocean Observing System and is Councillor-at-large of the Oceanography Society. He is a Trustee for the Consortium for Ocean Leadership, and is chair of the Consortium's Ocean Observing Subcommittee. He was formerly co-chair of the Board on Oceans and Atmosphere of the National Association of State Universities and Land Grant Colleges (now the Association of Public and Land Grant Universities). He has served on numerous other advisory groups including the Carbon Cycle Science Working Group (2009-2011) and the Ocean Carbon and Biogeochemistry Steering Committee (2006-2011), and the NASA Geostationary Coastal and Air Pollution Events (GEO-CAPE) Satellite Mission Science Working Group (2011-present). He is a member of the American Geophysical Union, the American Society of Limnology and Oceanography, the American Association for the Advancement of Science, the Optical Society of America, and the Oceanography Society.

Dr. Nancy Targett (Chair) is Dean of the College of Earth, Ocean, and Environment (CEOE) at the University of Delaware and Director of the Delaware Sea Grant College Program. During her tenure as Dean she has broadened the focus of her college to include Geological Sciences, Geography, Environmental Science and Environmental Studies in addition to the Marine Science and Policy Programs that were always the core of the college. The college turned 40 in June 2010 and what began as the Graduate College of Marine Studies, now, 40 years later, has both an undergraduate and graduate presence and is well-integrated into the fabric of the University. In 2008 she chaired a task force that developed a curriculum that would ensure that students received a truly multidisciplinary exposure to the issues in environmental science, while still getting the depth of disciplinary content necessary to be successful. The result was a cross-college multidisciplinary program established in September 2009 that is training tomorrow's environmentally-focused leaders. To model environmental sustainability and provide a platform for research efforts aimed at catalyzing the offshore wind sector, she built a utility-scale (2 MW) wind turbine at the Lewes campus. The turbine provides enough green energy to cover all of the campus' electrical needs. CEOE has a world-wide footprint with research programs that extend across the globe from the upper atmosphere to the land to the bottom of the ocean. Four years ago, Nancy initiated collaboration with Xiamen University and their College of Marine and Environmental Science. That effort now includes a dual Ph.D. degree program in Oceanography and has catalyzed interactions with XMU beyond CEOE such as the recently established Confucius Institute located at UD.

Nancy just completed her term (2010-2013) as chair of the Board of Trustees for the Washington D.C.-based Consortium for Ocean Leadership, a 96 member group of academic institutions, industry and NGOs with a focus on ocean issues. She is also an Aldo Leopold Leadership Fellow. A past officer of the International Society of Chemical Ecology, she has served on numerous editorial boards and been appointed to various national and regional scientific councils and committees. She has served on the National Academy's Ocean Studies Board and chaired or been a member of several of its study committees. She has also served on the Mid-Atlantic Fisheries Management Council and chaired the science and statistics committee and several species committees. Nancy is a past officer of the Sea Grant Association and currently serves as its treasurer. She lives in Sussex County. There she was a founding board member of the Jefferson School, an independent day school located in Georgetown, Delaware, and of the Sussex Academy of Arts and Sciences, a charter middle school also located in Georgetown, Delaware. She served terms as chair for both boards. She also served as a member of the board of St. Thomas More Academy High School in Magnolia. Currently she is a member of the boards for the Greater Lewes Foundation and for Cadbury Continuing Care.

AAAS Staff

Dr. Rieko Yajima is a Project Director with the AAAS Research Competitiveness Program (RCP), where she has led over 35 projects providing clients with technical assistance for improved research, development, and innovation strategies. Her expertise is in evaluating the outcomes and impacts of scientific research, as well as planning and implementing programs for strengthening research capacity and competitiveness. She recently led a comprehensive evaluation of the Marine Microbiology Initiative: a 10-year, $145-million effort to answer fundamental questions about the immense diversity of marine microorganisms and their roles in ocean health, funded by the Gordon and Betty Moore Foundation in Palo Alto. Rieko has organized symposia on emerging interdisciplinary topics for the AAAS annual meeting on research collaborations between artists and scientists, as well as the science behind delicious food. Trained as a biochemist, Rieko received awards for her Ph.D. research on RNA enzymes and has published over 10 research and review articles on the molecular structure and function of protein and RNA enzymes. Prior to AAAS, she was also a Science Policy Fellow at the National Academy of Sciences in Washington, D.C..

Appendix: Charge to the AAAS Review Panel

Charge for the AAAS Review

of the University of North Carolina Coastal and Marine Science Activities

(FINAL)

1. Understand the impacts of UNC coastal and marine science Activities.
    a. What are the most significant impacts in the following areas?
        i. Teaching and Instruction
        ii. Public Service, Outreach and Community Engagement
        iii. Professional Service
        iv. Research
        v. Economic Development
    b. How does the quality of the Activities compare to similar Activities elsewhere?
    c. To what extent have impacts been realized locally, regionally, nationally, and/or internationally?

2. Identify opportunities for coordination, leverage, and avoidance of unnecessary duplication of effort or resources.
    a. What major strengths or unique capabilities are supported by the Activities?
        i. People (teams, PIs, students, post docs)
        ii. Specialized equipment
        iii. Research support facilities
        iv. Connections to key stakeholders or resources
        v. Other
    b. What major challenges or gaps limit the impact of the Activities?
        i. People (teams, PIs, students, post docs)
        ii. Specialized equipment
        iii. Research support facilities
        iv. Connections to key stakeholders or resources
        v. Other
    c. To what degree do the Activities currently coordinate with each other?
        i. Is the level of coordination appropriate?
        ii. What mechanisms are used for coordination?
        iii. What could be done (institutionally or system-level) to enhance coordination?
    d. To what degree do the Activities overlap with each other?
        i. What is basis of overlap (e.g., research area, resource allocation, student recruitment, etc)?

ii. Is the level of overlap appropriate?
iii. Are there un-necessary redundancies?
iv. What could be done (institutionally or system-level) to minimize un-necessary redundancies?

3. What must be done, institutionally or at the system level, to maximize the impact North Carolina's coastal and marine science Activities?
    a. In the next 5 years, what are the most significant opportunities that could be pursued by the Activities, either individually or collectively?
        i. What key success factors are needed (financial resources, infrastructure, people, collaboration, etc.)?
        ii. What barriers or gaps of knowledge would need to be overcome?

Appendix: Site Visit Agenda

UNC Marine Science Activities Review & Site Visits
Master Schedule
Sunday January 27 – February 1, 2013

Sunday, January 27

6:00 pm – Dinner in Wilmington, Overview/Welcome with Dr. Chris Brown, UNC GA

Venue:

Manna
123 Street
Wimington, N.C 28401Tel 910 763-5252
http://mannaavenue.com/

Attendees:

Dr. Christopher F. D'Elia
Louisiana State University

Dr. Jacqueline Dixon
University of South Florida

Dr. Steven Lohrenz
University of Massachusetts

Dr. Nancy Targett
University of Delaware

Dr. Rieko Yajima
AAAS, Washington, DC

Center for Marine Science (CMS)
Marvin K. Moss Lane
Wilmington, NC

Monday, January 28, 2013

8:15-8:30 a.m.	Chancellor Miller, Provost Battles	Welcome remarks
8:30-10:00 a.m.	*Presenters* Chris Finelli, Lynn Leonard, Sue Kesios, Jack Hall Academic I: Intro. Marine Quest, BS Oceanography, BS Marine Biology, applied learning, undergraduate research and scholarship, future	
10:00-11:30 a.m.	*Presenters* Chris Finelli, Joan Willey, Mark Imperial Academic II: MS Marine Science, MPA Coastal Ocean Policy, MS Marine Biology, PhD Marine Biology, graduate research and scholarship, future	
11:30-12:30p.m.	*Presenters* Dan Baden, Jeff Wright, Becky Porterfield MARBIONC: Marine biotechnology, millennium campus model, MBA Business of Marine Biotechnology, future	
12:30-1:30 p.m.	LUNCH	
1:30-2:30 p.m.	*Presenters* Dan Baden, John Morrison CMS: core facilities, enabling activities, mariculture operations, marine alliance, ship, future.	
2:30-4:00 p.m.	Western Carolina	
4:00-5:00 p.m.	Tour	

Point of Contact:

Daniel G. Baden, Ph.D.
William R. Kenan Distinguished Professor of Marine Science, and
Director UNCW Center for Marine Science
5600 Marvin K. Moss Lane
Wilmington NC 28409

--Drive to Morehead City--

Institute of Marine Sciences
3431 Arendell Street
Morehead City, NC 28557-3301

Tuesday, January 29, 2013

8:00 a.m.	MS Review Committee Arrive @ IMS
8:00 – 8:30 a.m.	Greeting by IMS Director, Rick Luettich & brief IMS Tour
8:30 – 10:30 a.m.	UNC IMS
10:40-12:40 p.m.	UNC Department Marine Science
12:45- 1:30 p.m.	Lunch
1:30 - 3:00 p.m.	ECSU
3:10 - 5:10 p.m.	NC Sea Grant

IMS Points of Contact

*Deanna Napier	Receptionist / Admin Assistant	252-726-6841 x120	mdgood@email.unc.edu
Melynie Conner	Admin Assistant	252-726-6841 x 121	connorma@email.unc.edu
Jean Stack	Admin Lead	252-726-6841 x123	cstack@email.unc.edu
Rick Luettich	Director	252-726-6841 x137	rick_luettich@unc.edu

*In charge of logistics on 1/29/2013

Point of contact:
Rick Luettich
UNC Chapel Hill Institute of Marine Sciences
Mobile (252) 342-6437
rick_luettich@unc.edu

Center for Marine Sciences and Technology (CMAST)
303 College Circle
Morehead City, NC 28557

Wednesday, January 30

Location:
Center for Marine Sciences and Technology (CMAST)
303 College Circle
Morehead City, NC 28557
Tel. 252 222-6302

Program:

I. CMAST Review & Discussion (0830—1010)

A. Overview by Dr. David Eggleston (Professor & CMAST Director) (12 mins)

B. CMAST Faculty Roundtable introductions (18 mins)

(i) College of Veterinary Medicine (Drs. Craig Harms, Suzanne Kennedy-Stoskopf, Michael Stoskopf)

(ii) College of Agricultural & Life Sciences (Drs. Jeff Buckel, David Green, Pat McClellan-Green)

C. QA with AAAS Review Team (30 mins)

D. Break (20 mins)

E. AAAS Review Team Discussion (closed) (20 mins)

II. Department of Marine, Earth and Atmospheric Sciences (MEAS) (1020-1150)

A. Overview by Dr. Walt Robinson (Professor & Department Head) (10 mins)

B. MEAS Faculty Presentations (20 mins)

(i) Dr. Roy He, Physical Oceanographer

(ii) Dr. Nicholas Meskhidze, Atmospheric Chemist

C. QA with AAAS Review Team (30 mins)

D. Break (20 mins)

E. AAAS Review team Discussion (closed) (20 mins)

III. Lunch 1200-1300 (second floor foyer)

IV. NC State University (non-CMAST & non-MEAS) (1300-1440)

A. Overview by Dr. Dave DeMaster (Professor & Chair of Marine Science Faculty) (10 mins)

B. NCSU Faculty Presentations (20 mins)

(i) Dr. Margery Overton, Civil Engineer

(ii) Dr. Joanne Burkholder, Marine Ecologist

C. QA with AAAS Review Team (30 mins)

D. Break (20 mins)

V. Summary & Synthesis of NCSU Activities (1450-1600)

A. Overview by Dr. Terri Lomax (Vice Chancellor for Research, Innovation & Entrepreneurship) (15 mins)

B. QA with AAAS Review Team (25 mins)

C. AAAS Review team Discussion (closed) (20 mins)

Meeting Ends at 1600

Point of contact:

David B. Eggleston
Director, Center for Marine Sciences and Technology
North Carolina State University
303 College Circle
Morehead City, NC 28557
Mobile 919-632-1720
(252) 222-6301 (o)
eggleston@ncsu.edu

--Drive to Manteo—

UNC Coastal Studies Institute (UNC CSI)
850 NC Highway 345, Wanchese, NC 27981

January 31, 2013

Research Building Room 262

Room 250 reserved for panel discussion sessions

8:00 Arrival	
8:15 - 8:30	Welcome UNC CSI Chair of Board of Directors, Michael Kelly
8:30 – 10:00	UNC CSI First session (1.5 hrs)
10:00 - 11:15	Break and Tour of UNC CSI Facilities
11:15 -12:45	UNC CSI Second session (1.5 hrs) Three hours total as prescribed in the advisory
12:45 – 1:15	Lunch
1:15 - 3:15	ECU Block 1 (2 hrs) Ditto
3:15 - 3:30	Break
3:30 – 5:30	ECU Block 2 (2 hrs) Ditto
5:30 - 6:00	Break and Conference Time for Panelists

Point of contact:

Nancy White, UNC CSI Executive Director

Direct Line: 252-475-5408
Cell: 252-414-7757

UNC Coastal Studies Institute (UNC CSI)
850 NC Highway 345, Wanchese, NC 27981

February 1, 2013

Research Building Room 262
Room 250 reserved for panel discussion sessions

8:00 a.m. Panel Meeting

11:00 a.m. Lunch

12-noon Departure

Point of contact:
Nancy White, UNC CSI Executive Director

Direct Line: 252-475-5408
Cell: 252-414-7757

Appendix 8: North Carolina Sea Grant Investments by Strategic Plan Focus Area

2010-2013 Overall Budget

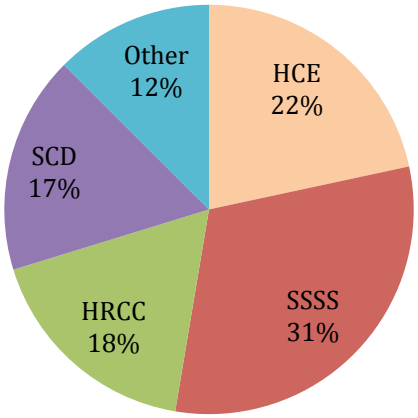


Figure 1

2010-2013 Research

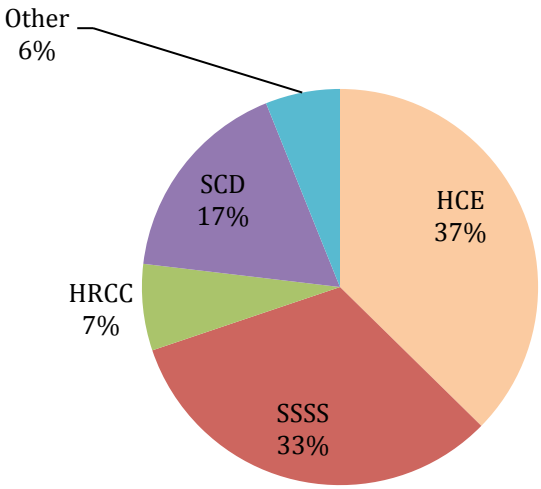


Figure 2

HCE – Healthy Coastal Ecosystems
HRCC – Hazard Resilient Coastal Community
SCD – Sustainable Coastal Development
SSSS – Safe and Sustainable Seafood Supply
Other – Education

Appendix 9: North Carolina Sea Grant Leveraged Funds 2010-2014

Funded Marine Mammal Projects				
2014				
Project Number	**Principal Investigator**	**Affiliation**	**Title**	**Award Amount**
14-DMM-01	Kim Urian	Duke	Enhancing Knowledge of Stock Structure of Bottlenose Dolphins in the Mid-Atlantic Region	$30,000
14-DMM-02	Robert Young	Coastal Carolina University	Stock Structure, Distribution, and Abundance of Coastal and Estuarine Bottlenose Dolphins (*Tursiops truncatus*) in Northern South Carolina and Southern North Carolina	$40,700
2012				
12-DMM-01	Andrew Read	Duke	A Field Test of Interactive Dolphin Dissuasive Devices in the North Carolina Pelagic Longline Fishery	$39,855
12-DMM-02	Kim Urian	Duke	Stock Identity of Stranded Bottlenose Dolphins with Evidence of Fisheries Interaction in Virginia, North Carolina and South Carolina	$16,250
2010				
10-DMM-01	Andrew Read	Duke	Stock Discrimination of Bottlenose Dolphins Along the Outer Banks of North Carolina: Implications for the Risk of Entanglement in Coastal Gill Net Fisheries	$39,939
10-DMM-03	David Kerstetter	NSU Oceanographic Center	Probability-Based Analysis of Pilot Whale-Pelagic Longline Interactions	$43,524

Fisheries Resource Grant Projects					
2013					
Project Number	**Principal Investigator(s)**	**Co-Principal Investigator(s)**	**Other Participant(s)**	**Title**	**Award Amount**
13-AM-02	Troy Alphin (UNC-W)	Martin Posey (UNC-W) Ronald Sheffield (Wilmington)	James Hargrove (UNC-W)	Development of Shellfish Polyculture Techniques in North Carolina	$17,330
13-AM-03	Christopher Finelli (UNC-W)		John Carroll (UNC-W) Henry Jay Styron (Cedar Island)	Predicting and Controlling Recruitment of the Shell-Boring Sponge, *Cliona celata*	$19,920

13-EP-02	Fred Scharf (UNC-W)	Stephen Poland (UNC-W) Rebecka Brasso (UNC-W)	Rick Croson (Wilmington)	Seasonal and Size-Specific Variation of Total Mercury Content in Pelagic Fishes Off North Carolina	$9,200
13-EP-04	Niels Lindquist (UNC-CH)	Adam Tyler (Smyrna) David Cessna (Smyrna)		Testing Salinity-Based Predictions of Oyster Shell Cultch Planting Success	$14,996
13-FEG-01	Tom Burgess (Sneads Ferry)		Paul Rudershausen (NCSU)	Determining Optimal Trap Mesh Sizes for New Black Sea Bass Minimum Size Limits	$19,575
13-FEG-03	Kenneth Seigler (Hubert)		James Morley (NCSU)	Lampara Seine, Alternative Fishing Opportunities	$14,592
13-FEG-04	John Broome (Wilmington)		Julian Anderson (Rocky Point) Donna Anderson (Rocky Point)	By-Catch Volume Reduction Through Addition of a By-Catch Deflector Device (BDD)	$18,763
13-FEG-08	Eric Diaddorio (Greenville)	Anthony Overton (ECU)	Shelton Cuthrell (Aurora) Roger Harris (Atlantic)	Evaluation of Flounder Traps as an Alternative to the Gillnet Fishery	$19,998
13-ST-02	John Burke (Smyrna)		Elizabeth Wall (Lenoir) Barry Nash (NCSU) Tim Coyne (Morehead City) Lianne Won (Tusk)	Market Development for Cultured North Carolina Sturgeon Meat	$9,327
2012					
12-AM-03	Wade Watanabe (UNC-W)	Robert Farnell (Hubert)		Integrated Multi-Trophic Aquaculture of Marine Finfish and Salt-Tolerant Plants (Salicornia) for Biomitigation of Effluent Discharge from Recirculating Aquaculture Systems	$19,848
12-EP-02	Roger Rulifson (ECU)		Tom Roller (Beaufort) Charles Bangley (ECU) Philip Skip	Gastric Evacuation and Daily Ration of Atlantic Spiny Dogfish (Squalus acanthias)	$18,105

			Kemp Jr. (CCC-Morehead City)		
12-EP-03	Roger Rulifson (ECU)		Aaron Kelly (Kill Devil Hills) Coley Hughes (ECU)	What Determines High Strontium Levels in the Primordium of Some Striped Bass Otoliths?	$19,890
12-FEG-01	Dale Britt (Morehead City)		Jeff Buckel (NCSU) Randy Gregory (NCDMF)	Estimating the Rate of Discard Mortality for Dolphinfish (Coryphaena hippurus) Caught by Hook and Line	$19,985
12-FEG-02	Amanda Southwood Williard (UNC-W)		Jeff Wolfe (Wilmington) Wendy Cluse (Pine Knoll Shores) Leigh Anne Harden (UNC-W)	Assessment of Diamondback Terrapin Presence and Abundance in Bogue Sound, North Carolina	$21,882
12-ST-01	Willy Phillips (Columbia)		Barry Nash (NCSU)	Value Added Technology: Developing a Smoked Soft-Crab	$15,600
2011					
11-AM-01	Nelson Paul (Raleigh) Tom Losordo (NCSU)	Dennis DeLong (Raleigh)	Nick Reynolds (NCSU)	Spawning Activity of Mud Minnows (Fundulus heteroclitus) in Tank-Based Systems for the Production of Baitfish	$18,100 Paul $6,130 Losordo $11,970
11-AM-02	Harry Daniels (NCSU)	Russell Borski (NCSU)	I.J. Won (Marshallberg) Archie Cooke (Pinetown)	Year-Round Indoor Production of Hybrid Striped Bass Fingerlings	$93,608
11-AM-03	Wade Watanabe (UNC-W)	Md. Shah Alam (UNC-W) Shawn Longfellow (Wilmington)		Salt Incorporated Diets for Enhancing Growth Performance During Intensive Cultivation of Black Sea Bass in North Carolina Using Low Salinity Brackish Water	$42,000
11-AM-07	Stephen Locke (Aurora) Craig Sullivan (NCSU)		Nancy Sugg (Aurora) Ronald Hodson (Apex)	Domesticated Broodstock for Hybrid Striped Bass Farming: Pioneering Industry Implementation	$88,345 Locke $68,398 Sullivan

					$19,947
11-EP-06	Niels Lindquist (UNC-CH)	Adam Tyler (Smyrna) David Eggleston (NCSU)	Craig Hardy (NCDMF) NCSU Masters Student UNC/IMS Research Tech	Identifying Sustainable Substrates for Oyster Restoration and Artificial Reefs	$120,000
11-EP-08	Joel Fodrie (UNC-CH)		Adam Tyler (Smyrna) David Cessna Sr. (Smyrna)	Turning Negatives into Positives: Recycling Derelict Crab Pots as Substrate for Shallow-Water Oyster Reef Production	$51,251
11-EP-09	Roger Rulifson (ECU)	Chris Hickman (Hatteras)	Andrea Dell'Apa (Greenville) Jennifer Cudney-Burch (Winterville)	Identification of Juvenile Spiny Dogfish Habitats in North Carolina Coastal Waters	$106,683
11-FEG-01	Buck Cuthrell (Aurora)		NCDMF (Washington)	Exploratory Sampling of Older Striped Bass in the Pamlico River	$17,000
11-FEG-02	Thomas Schultz (Duke)	Dan Rittschof (Duke)		Genetic Contributions to Body Size in Blue Crabs	$16,924
11-FEG-03	Alan Doughtie (Newport)		Paul Rudershausen (NCSU) Ernest Small (Newport)	Testing Rectangular Gillnet Mesh in a Tidally Driven North Carolina Estuary	$25,470
11-FEG-04	Tom Burgess (Sneads Ferry)		Jeff Buckel (NCSU)	Accounting for the Effects of Pressure Trauma in Estimating Rates of Discard Mortality of Black Sea Bass (Centropristis striata) in the Deepwater North Carolina Reef Fishery	$30,225
2010					
10-AM-01	Bob King (Cary)	Keith Bolick (Cary) George Moore (Cary)	Nancy Sugg (Aurora) Harry Daniels (NCSU)	Efficient Water Oxygenation and Purification for Aquaculture	$21,808
10-AM-02	Wade Watanabe (UNC-W)	Md. Shah Alam (UNC-W)	Ted Davis (Wilmington) Shawn Longfellow	Pilot Commercial Scale Testing of Promising Diets for Intensive Cultivation of Southern	$45.361

			(Wilmington) Keith Hairr (Wallace)	Flounder and Black Sea Bass in North Carolina Using an Alternative Protein Source	
10-AM-03	Thomas Losordo (NCSU) Tom Burgess (Sneads Ferry)			Development of a Holding System for the Sale of Live Black Sea Bass	$16,151 Burgess $10,625 Losordo $5,526
10-EP-03	Eugene Ballance (Ocracoke)		Barry Cullens (Elizabeth City)	A GIS Assessment of NCDMF Oyster Enhancement from 1981 to 2009	$37,653
10-EP-04	Roger Rulifson (ECU)	Willy Phillips (Columbia)	Chris Hickman (Hatteras Village) Edward Newman (Engelhard) Dewey Hickman (Wanchese) Terry Pratt (Merry Hill) Valton Gage Williams (Gatesville) Charles Van Salisbury (Engelhard) Claudia Cahoon (Swan Quarter)	Identification of River Herring Spawning and Juvenile Habitat in Albemarle Sound Inferred from Otolith Microchemistry	$70,429
10-EP-05	Anthony Overton (ECU)	Terry Pratt (Merry Hill)		Can Spawning Habitat Be Characterized and Prioritized Based on the Presence of Early Life Stages of River Herring?	$57,726
10-EP-07	Dan Rittschof (Duke)		Amy Freitag (Duke) Josh Stoll (Duke) Mark Hooper (Smyrna) Dell Newman (Swan Quarter) Willy Phillips	Is North Carolina Seafood Wholesome? Mercury and Polychlorinated Biphenyl Levels in North Carolina Seafood	$50,640

			(Columbia)		
10-EP-10	Niels Lindquist (UNC-CH)	David Gaskill (Morehead City)	Raymond Graham Jr. (Newport)	Quantifying Boring Sponge Abundance and Biomass in North Carolina Oyster Reefs	$46,576
10-FEG-03	John Broome (Wilmington)		Julian Anderson (Rocky Point) Donna Anderson (Rocky Point)	By-Catch Volume Reduction Through Turtle Excluder Device (TED) Reduced Grid Spacing	$19,859
10-FEG-06	Dale Britt (Morehead City)		Pete Zook (Morehead City) Jeff Buckel (NCSU) Randy Gregory (NCDMF)	Comparing Circle Hook and J Hook Performance in the Yellowfin Tuna Bluewater Troll Fishery, North Carolina	$11,400
10-FEG-07	Charles Renda, Jr. (Beaufort)		Paul Rudershausen (NCSU) Richard Knowles (Harkers Island)	Gear Modifications for Fishing Octopus on Live-Bottom and Adjacent Flat Bottom Habitats in Onslow Bay, North Carolina	$41,125
10-FEG-08	Teresa Thorpe (UNC-W)	David Beresoff (Bolivia)		Delineation of Essential Shark Habitat in North Carolina Coastal Waters	$52,983
10-FEG-10	Fred Scharf (UNC-W)	J. Christopher Taylor (Wilmington)	Jeff Wolfe Cecil Simons Troy Outland	Updating Size and Age at Maturity Schedules for Southern Flounder Through Examination of Reproductive Tissue and Otolith Microchemistry	$47,221
10-FEG-18	Edward Lee Morris (Plymouth)		Leslie Perry (Plymouth) Randy Jett (Plymouth)	Flounder Hoops	$17,498
10-FEG-20	Lena Carawan (ECU)	Joseph Williams (Scranton)	Paul Kauffmann (ECU) Mike Behm (ECU)	Adapting European Trawl Doors to North Carolina Shrimp Fishery in Pamlico Sound	$28,931
10-ST-02	Derek Aday (NCSU)	Chris Conklin (Morehead City) Dale Britt (Morehead City)	Sally Petre (NCSU) Dana Sackett (NCSU)	Consumption Risk from Locally Harvested Fish: A Survey of Mercury in Economically Important Fishes Commonly Landed Off the Coast of North	$18.043

				Carolina	
10-ST-05	Lee Ann Jaykus (NCSU)	Jim Swartzenberg (Jacksonville)	Steve Murphey (Morehead City) Green's Oyster Co. (Sunset Beach) T&A Oyster Co. (Supply) David Green (NCSU) Greg Bolton (NCSU)	Validation of a Post Harvest Process (PHP) to Reduce Vibrio vulnificus in Oysters	$35,700
10-ST-06	Cathy Dobbins (Research Triangle Park)		Brunswick Catch (Supply) William Small (Elizabeth City) Barry Nash (NCSU) Scott Baker (UNC-W)	Raising Consumer Awareness and Interest in North Carolina Seafood	$38,724
10-ST-07	David Green (NCSU)	K.P. Sandeep (NCSU)	Ronnie Wrenn (Gastonia) Greg Bolton (NCSU) Barry Nash (NCSU)	Validation of Microwave Cooking Instructions for Not-Ready-to-Eat (NRTE) Seafood	$23,500

NC Blue Crab and Shellfish Research Program					
2014					
Project Number	**Principal Investigator(s)**	**Co-Principal Investigator(s)**	**Other Participant(s)**	**Title**	**Award Amount**
13-HD-01	Ami Wilbur (UNC-W)		Ryan Carnegie (VIMS) James Morris (Beaufort)	The Distribution and Impact of the Oyster Parasite *Bonamia exitiosa* on the Eastern Oyster, *Crassostrea virginica*, in North Carolina	$49,932
13-MARI-02	Martin Posey (UNC-W)	Troy Alphin (UNC-W)	James Hargrove (UNC-W)	Identification of Potential Interactions Between Rack and Cage Shellfish Culture and Adjacent Critical Habitat	$35,343
13-SR-01	Troy Alphin (UNC-W)	Martin Posey (UNC-W)	Marc Turano (NCSU)	Enhancement of the North Carolina Statewide Oyster Spat Monitoring Program	$17,797
13-SR-02	Ladd Bayliss (NCCF)		Robby Midgett (Stumpy Point) NCDMF	Community-Based Marine Debris Removal in Pamlico Sound	$18,721

			(Morehead City) NCWRC (Raleigh) The Nature Conservancy (Kill Devil Hills) Kirk Havens (VIMS)		
13-SR-06	Niels Lindquist (UNC-CH)		Craig Hardy (NCDMF)	Reproductive Timing, Larval Output, and Dispersal Potential of Oyster-Shell Eroding Sponges in North Carolina Estuaries and Sounds	$49,603
2012					
12-BCSF-01	Ami Wilbur (UNC-W)			The Production and Field Testing of North Carolina Sourced Aquaculture Lines of the Eastern Oyster, Crassostrea virginica	$64,308
12-BCSF-02	Ami Wilbur (UNC-W)			Validation of a Quantitative PCR TaqMan Assay for the Molecular Detection and Qualification of the Parasite Bonamia exitiosa in the Eastern Oyster Crassostrea	$5,000
2011					
11-BCSF-01	Mike Mixon (Powells Point)			Bait Pocket Modifications to Extend the Life of a Commercial Crab Pot	$8,350
11-BCSF-02	Phil Smith (Carolina Beach)			Evaluating a New Filter Design, An Upflow Kaldnes Media Filter for Recirculating Shedding Operations	$6,000
11-BCSF-03	Henry Jay Styron III (Wilmington)			Design and Development of an Articulated Jig for Increased Efficiency for Build Out of Floating Oyster Growout Bags	$975
11-BCSF-04	Philip Skip Kemp Jr. (Carteret Community		Randy Hanford (Morehead City) Terri Hanford (Morehead City)	Assessment of Operational and Economic Factors of Value Added to Clams in a Wet Storage Facility	$19,750

	College)		Thomas Hosley (Carteret Community College)		
11-BCSF-06	Charles Peterson (UNC-CH)		Stephen Fegley (Carteret County) Joey Frost (Salter Path) Henry Frost (Salter Path)	Does the Bay Scallop Spring Spawn Matter? Quantifying Demographic Information to Improve the Fisheries Management Plan (FMP)	$63,924
2010					
10-BIOL-01	Heather Koopman (UNC-W)		Martin Posey (UNC-W) Troy Alphin (UNC-W) Andrew Westgate (Wilmington)	Linking Variation in Egg Quality to Hatching Success and Larval Survival in Blue Crabs	$18,935
10-ECON-03	Jason Hassell (Washington)		Heather Stoker (Wilmington)	Crab Catch Comparison Between Two Pots Fished on One Buoy and One Pot Fished on One Buoy in the Pamlico River	$12,393
10-HD-01	Henry Jay Styron III (Wilmington)			Evaluation of Novel Technique to Reduce Fouling and Overspat in Oyster Growout Operations	$9,960
10-MARI-01	Mark Hooper (Smyrna)			Feasibility of Increasing Initial Mesh Size for Hard Clam (Mercenaria mercenaria) Growout	$6,000
10-MARI-02	James Morris Jr. (Beaufort)			Comparison of Oyster Seed Stock Performance in Floating Bag Culture Systems	$18,325
10-SR-02	Joel Fodrie (UNC-CH)		Jeremy Braddy (Newport) Paul Dunn Robert Dunn Captain Chris Elliot John Fear Nathan Hall Jess Hawkins (NCDMF)	Restoration Revisited: Assessing the Long-Term Primary and Secondary Production Value of Decade-Old, Man-Made Oyster Reefs	$39,762

			Chris Yeomans		
10-STOK-01	Paul Rudershausen (NCSU)		Jimmy Nobles (Greenville)	Working Towards Reducing the Rate of Discards and Bycatch in the North Carolina Blue Crab Trap Fishery: Testing a Device to Exclude Southern Flounder	$14,050

2010-2014 North Carolina Sea Grant – Water Resources Research Institute Projects				
2014				
Project Number	**Principal Investigator**	**Affiliation**	**Title**	**Award Amount**
R/14-NCSG-03 14-07-W	Harry Daniels	NCSU	Land Application of Aquaculture Effluents to Prevent Surface Water Eutrophication and Promote Groundwater Re-Infiltration in Coastal North Carolina	$26,219 $13,500
R/14-NCSG-01 14-08-W	Lucy Laffitte	UNC-TV	Drought Resilience: An Interactive Project	$14,279 $25,721
R/14-NCSG-02 14-09-W	Alex Manda	ECU	Coastal Groundwater Watch	$14,208 $25,721
2012				
R/MG-1215 12-11-W	Michael Burchell II	NCSU	Predicting Water Quality Impacts of Rerouting Drainage Water from the Pamlico Sound to Restored Wetlands	$12,500 $7,314

Appendix 10: North Carolina Sea Grant Mini-Grants 2010-2014

Funded Minigrants				
2014				
Project Number	**Principal Investigator**	**Affiliation**	**Title**	**Award Amount**
R/MG-1401	Henry J. Styron III	Carolina Mariculture Company	Durability Testing of Multiple Mainline Components in a Floating Bag System	$1,200
R/MG-1402	Joel Fodrie	UNC-CH	Can Stable Isotope Analyses Be Used to Elucidate Trophic Flows Between Interconnected Saltmarsh and Seagrass Ecosystems?	$4,960
R/MG-1403	Marcelo Ardon-Sayao	ECU	Novel Biogeochemical Regimes in Sentinel Coastal Ecosystems: Saltwater Intrusion Meets Fertilizer Legacies	$5,000
R/MG-1404	Roger Rulifson	ECU	Gastric Evacuation and Daily Ration of Spiny Dogfish (*Squalus acanthias*)	$1,735
R/MG-1405	David Kimmel	ECU	Evaluating Land Use Effects on the Stinging Sea Nettle, *Chrysaora quinquecirrha*: Are Shoreline Hardening Structures Providing Habitat for a Nuisance Species?	$4,900
R/MG-1406	Janelle Fleming	Eastern Carolina Artificial Reef Association (ECARA)	Assessing Harvest Efficiencies and Consumer Demand for North Carolina Lionfish	$8,960
R/MG-1407	Joel Fodrie	UNC-CH	Linking Nursery Habitat to the Adult Stock Dynamics of Black Sea Bass (*Centropristis striata*)	$5,000
R/MG-1408	Amanda Southwood Williard	UNC-W	Blood Biochemistry of Sea Turtles Incidentally Captured in the Recreational Hook-and-Line Fishery	$4,800
R/MG-1409	Chris Kepley	Kepley Biosystems Inc.	A New Sustainable Crustacean Bait	$4,900
R/MG-1410	Astrid Schnetzer	NCSU	*Pseudo-nitzschia* Blooms in Bogue Sound: Examining Bloom Patterns and Risk of Domoic Acid Exposure	$5,000
R/MG-1411	Benjamin Reading	NCSU	Volitional Tank Spawning of Domesticated Striped Bass Without Recourse to Traditional Hormonal Treatment	$5,000
R/MG-1412	Lisa Schiavinato	NCSU	Building Equitable Resilience in Virginia and North Carolina: Building the Legal	$16,103

			Tools to Incorporate Social Vulnerability Indices into Adaptation Planning	
R/MG-1413	Wilson Freshwater	UNC-W	Abundance and Northward Range Shifts of Tropical Macroalgae and Associated Ciguatera-Causing Dinoflagellates (*Gambierdiscus* spp.) on the North Carolina Shelf	$4,950
R/MG-1414	Shubhasini Oza	UNC-Charlotte	Duckweed Cultivation to Uptake Nutrients from Ash Pond Leachate and for Production of Biofuel	$5,000
R/MG-1414	Lisa Campbell	Duke	Sense of Place and Rural Response in the Context of Amenity Migration on the North Carolina Coast	$4,995
2013				
R/MG-1301	Philip Berke	UNC-CH	Motivation of Sea Level Rise Planning	$5,000
R/MG-1302	Gloria Putnam	NCSU	Derelict Fishing Gear Removal: Policy Analysis and Program Design	$6,498
R/MG-1303	Roger Rulifson	ECU	Do Striped Bass and Atlantic Sturgeon Stay in North Carolina Coastal Waters During the Overwintering Period?	$4,999
R/MG-1304	Robert Roer	UNC-W	Possible Use of Eyestalk Annuli for Age Determination in the Blue Crab, *Callinectes sapidus*	$4,400
R/MG-1305	Erin Seekamp	NCSU	Facilitating NCBT Birder-Friendly Business Program Through Benefit Identification, Decision Criteria Evaluation, and Program Redevelopment	$3,302
R/MG-1306	Dan Rittschof	Duke	A Digital Guide for Invertebrates of North Carolina	$4,911
R/MG-1307	Jennifer Dorton	UNC-W	Improving Regional Coordination of NOAA Programs and Activities in the Carolinas	$3,000
R/MG-1308	Lisa Schiavinato	NCSU	Summer 2013 Research Law Fellow	$1,864
R/MG-1309	John Barry King	Contractor	Can Dyneema Lanyards Provide Strong and Abrasive Resistant Tethers for Oyster Flipbags?	$4,829
R/MG-1310	Patrick Halpin	Duke	Habitat Characterization for Large Sharks Caught in the Longline Fisheries in North Carolina	$4,948
R/MG-1311	William Smith	Wake Forest	The Impact of Saltwater Incursion and Bald Cypress (*Taxodium distichum*) in a Coastal Freshwater Wetland	$5,000
R/MG-	Spencer	UNC-W	Rip Current Drifters	$5,000

1312	Rogers			
R/MG-1313	Barry Nash	NCSU	Adding Value to North Carolina Wild-Caught Shrimp	$2,929
R/MG-1314	David Eggleston	NCSU	Estuarine Soundscapes: Spatiotemporal Patterns of Biological and Anthropogenic Sounds in a North Carolina Reserve and Implications for Conservation	$9,999
R/MG-1315	Antonio Rodriguez	UNC-CH	Landscape Connectivity Influence Growth and Accretion in Temperature Biogenetic Reefs and Adjacent Salt Marshes	$9,999
R/MG-1316	Andy Read	Duke	Protecting Beaches and Turtles: An Economic and Ecological Analysis of Beach Nourishment on Sea Turtle Nesting in New Hanover and Carteret Counties and the Role of Sea Level Rise	$5,000
R/MG-1317	Andrew Fox	NCSU	Partnership, Engagement, and Resilience: A Multi-Disciplinary Agenda for Developing and Sustaining the Role of Designers in Coastal North Carolina	$5,000
2012				
R/MG-1201	Duarte Morais	NCSU	Inventorying Non-Consumptive Utilitarian Uses of Coastal Resources	$5,000
R/MG-1202	Barbara Doll	NCSU	Continuation of Water Quality Treatment Assessment of Enhanced Stormwater Ponds at the NC Cooperative Extension Services Center in Currituck County	$7,300
R/MG-1203	Fred Scharf	UNC-W	Evaluation of an Accurate and Non-Lethal Tool to Assess Maturity of North Carolina Southern Flounder	$4,700
R/MG-1204	Lisa Schiavinato	NCSU	Management Strategies for North Carolina's Estuarine Shoreline	$5,000
R/MG-1205	Roger Rulifson	ECU	Identifying Nursery Habitats for Coastal Sharks Within Pamlico Sound, North Carolina	$4,451
R/MG-1206	Anthony Kennedy	ECU	Species Identification Using Infrared Spectroscopy	$4,375
R/MG-1207	Sarah Watkins-Kenney	NC Underwater Archaeology Conservation Lab	Developing a Corrosion Model at the *QAR* Site to Enhance the Management of Submerged Archaeological Remains	$5,600
R/MG-1208	Nathan Richards	ECU	Deterring Seasonal Rates of Corrosion in Ferrous-Hulled Shipwrecks: A Case Study of USS Huron (1875)	$2,250
R/MG-	Bradley	ECU	Artifact Analysis of the Corolla Wreck in	$2,250

1209	Rodgers		North Carolina	
R/MG-1210	Sara Mirabilio	ECU	Day at the Docks 2012	$2,800
R/MG-1211	Jennifer Dorton	UNC-W	Improving Regional Coordination of NOAA Programs and Activities in the Carolinas	$2,800
R/MG-1212	Susanne Brander	UNC-W	Developing an Approach to Monitoring Potential Endocrine Disruption in *Callinectes sapidus*	$5,000
R/MG-1213	Theresa Ann O'Meara	UNC-CH	Changes in Denitrification Rate from the Maritime Forest to the Shallow Sub-Tidal in Natural and Restored Systems	$5,000
R/MG-1214	Scott Hippensteel	UNC-Charlotte	Influence of Freshwater Inputs on Foraminiferal Distributions in Coastal Environments from Southeastern North Carolina	$3,950
R/MG-1215	Michael Burchell	NCSU	Predicting Water Quality Impacts of Rerouting Drainage Water from the Pamlico Sound to Restored Wetlands	$12,500
R/MG-1216	Thomas Allen	ECU	Synthesis of High and Low Marsh Habitat Mapping, Vulnerability and Responses to Sea-Level Rise in the Rachel Carson Reserve	$5,000
R/MG-1217	Barbara Garrity-Blake	Contractor	Laying the Groundwork for Maritime Heritage Development Program for Outer Banks Scenic Byway Communities and Associated Ports	$3,564
R/MG-1218	Astrid Schnetzer	NCSU	Plankton Assemblages as Sentinels for Ecosystem Change Within Food Webs	$5,000
2011				
R/MG-1101	Charles Hopkinson	GA Sea Grant	Georgia Sea Grant - Sapelo Island National Estuarine Research Reserve Grant 2011 Coastal Research Fellowship for Graduate Students	$7,500
R/MG-1102	Rick DeVoe	SC Sea Grant	South Carolina National Estuarine Research Reserve - South Carolina Sea Grant Consortium 2011 Coastal Research Fellowship Program - Comparative Impact of the Invasive Parasitic Species, *Anguillicoloides crassus*, on the American Eel Populations Between the ACE Basin and North Inlet NERRs and the Cooper River	$7,500
R/MG-1103	Michelle Brodeur	UNC-CH	Managing Intertidal Oyster Reefs in a Changing Climate: How Macroalgal	$10,000

			Cover Affects Reef Dynamics Within the Rachel Carson Reserve	
R/MG-1104	Susan Andreatta	UNC-Greensboro	Examining the Impact of Social Marketing Programs on the Public Accessing Local Seafood	$5,370
R/MG-1105	Nathan Richards	ECU	Ship Ashore! The Role of Risk in the Development of the United States Life Saving Service and Wrecking Patterns Along the North Carolina Coast	$3,000
R/MG-1106	Donna Kain	ECU	Risk Communication and Perception of Climate Change and Adaptation in Northeastern North Carolina	$5,500
R/MG-1107	David Kimbro	FSU	An Investigation of the Spatial Extent and Cause(s) of an Oyster Reef Die-Off in Guana Tolomato Matanzas National Estuarine Research Reserve	$7,500
R/MG-1108	Francois Birgand	NCSU	Quantification of Nutrient and Organic Matter Fluxes in a Restored Tidal Marsh	$9.500
R/MG-1109 Old MG Funds	Spencer Rogers	UNC-W	GIS Analysis Hurricane Ike Mini-Grant Proposal	$1,000
R/MG-1110	Ryan Emanuel	NCSU	Assessing Swamp Forest Die-Off at Goose Creek State Park	$5,375
R/MG-1111	Jack Thigpen (Susan West)	NCSU	Hatteras Connection Seafood Marketing Youth Team (Cape Hatteras Secondary School for Coastal Studies)	$4,400
R/MG-1112	Barry Nash	NCSU	Inventory of Fish Houses Along Coastal North Carolina: An Update	$5,004
R/MG-1113	Thomas Schultz	Duke	Hybridization of Lionfish Species (*Pterois volitans* and *P. miles*) in North Carolina	$5,011
R/MG-1114	J. Wilson White	UNC-W	Spatial Approaches to Managing Ontogenetically Migrating Fishes	$8,994
R/MG-1115	Larry Cahoon	UNC-W	Evaluating the Invasive Seaweed, *Gracilaria vermiculophylla*, as a Source of Plant Growth Promoter Compounds	$5,060
2010				
R/MG-1001	Michelle Standinger	UNC-W	Foraging Ecology of Large Pelagic Predators Off North Carolina	$5,000
R/MG-1002	Calvin Mires	ECU	The Value of Maritime Archaeological Heritage: Understanding the Cultural Capital of Shipwrecks in the Graveyard of the Atlantic	$3,000
R/MG-1003	Sean Lema	UNC-W	Identifying Endocrine Pathways for Reproduction in Blue Crab (*Callinectes*	$3,721

			sapidus)	
R/MG-1004	Brant Touchette	Elon University	Coastal Maritime Swamp Restoration: Evaluating the Importance of Hydrology and Plant-Water Relations	$8,000
R/MG-1005-A	Barbara Doll	NCSU	Assessment of Water Quality Treatment of Enhanced Stormwater Ponds at the NC Cooperative Extension Services Center in Currituck County	$3,311
R/MG-1005-B	Robert McClendon	ECU	Assessment of Water Quality Treatment of Enhanced Stormwater Ponds at the NC Cooperative Extension Services Center in Currituck County	$4,048
R/MG-1006	Michael Voiland	NCSU	Potential Conveyance, Arrival and Forms of Gulf of Mexico Spilled Oil in North Carolina Waters: Using Perspectives of Experts to Inform Key State Leaders and Resource Managers	No Fixed Budget
R/MG-1007	Ruoying He	NCSU	Modeling the Vertical and Horizontal Distributions of the Oil Plumes Arising from the Deepwater Horizon Spill in Southeast U.S. Waters	$7,000
R/MG-1008	Larry Cahoon	UNC-W	Response to BP Oil Spill: Baseline Beach Sampling for North Carolina	$6,000
R/MG-1009	Dana Newton	College of Albemarle	Marine Science Job Fair and Networking Opportunity: College of the Albemarle	$4,359
R/MG-1010	Lynn Leonard	UNC-W	Analysis of Geomorphologic Evolution of Masonboro Island, North Carolina (1857-Present)	$4,000
R/MG-1011	Huili Hao	ECU	Employers' and Managers' Perception of Drilled Oil Risks for Coastal North Carolina's Tourism-Impacted Businesses and Organizations	$4,931
R/MG-1012	Amanda Southwood Williard	UNC-W	Using Postcard Surveys to Investigate Potential Interactions Between Blue Crab Fisheries and Diamondback Terrapins in Coastal North Carolina	$800
R/MG-1014	Constance Rogers Lowery	Catawba College	Effects of Ocean Acidification on a Sentinel Species of Hydroid Found in the Sounds of North Carolina	$4,770
R/MG-1016	JoAnn Burkholder	NCSU	Harnessing Novel Saltwater Microalgae as a Renewable Biofuel Source: Identifying "Best Strains" for Maximal Lipid Production Under Salinity Stress	$8,000
R/MG-1017	Chris Dumas	UNC-W	North Carolina Coastal Homeowner Perceptions and Attitudes About Climate Change and Sea Level Rise	$8,000

R/MG-1018	David Kimmel	ECU	Hydrocarbon Signatures in Coastal North Carolina Water and Mesozooplankton Tissue	$4,953
R/MG-1019	Craig Sullivan	NCSU	Egg Quality in Striped Bass: Profiling Ovarian Gene Expression by Microarray and RNA-Seq Methodologies	$7,500

Appendix 11: North Carolina Sea Grant Fellows 2010-2014

Dean John A. Knauss Marine Policy Fellowship			
Fellow Last Name	**Fellow First Name**	**School**	**Fellowship Years**
Dean	Jennie	Duke University	2010
Laura	Anna-Marie	Duke University	2010
Erickson	Ashley	UNC Chapel Hill	2010
Durham	Christina	NC State	2010
Lettrich	Matthew	UNC Wilmington	2011
Cudney	Jennifer	East Carolina University	2011
Stoll	Josh	Duke University	2011
Vuxton	Emily	Duke University	2012
Jabanoski	Kristen	UNC Wilmington	2012
Chesnin	Noah	Duke University	2013
Piniak	Wendy	Duke University	2013
Andrea Dell'apa	Andrea Dell'apa	East Carolina University	2014
Htun	Emma	Duke University	2014
Jones	Hunter	Duke University	2014
Ritter	Jessie	Duke University	2014
NMFS-Sea Grant Fellowships in Population Dynamics			
Fellow Last Name	**Fellow First Name**	**School**	**Fellowship Years**
Dunphy-Daly	Meagan	Duke University	2012
Kroll	Ian	UNC-Chapel Hill	2013
NOAA Coastal Services Center's Coastal Management Fellowship			
Fellow Last Name	**Fellow First Name**	**School**	**Fellowship Years**

Bowie	Patricia	Duke University	2008-2010
Hirschfield	Daniella	Duke University	2008-2010
Carlozo	Nicole	Duke University	2012-2014
Ducklow	Kelsey	Duke University	2013-2015
Santoni	Amanda	Duke University	2014-2016
Hernandez	Kimberly	Duke University	2014-2016
North Carolina Sea Grant and N.C. Coastal Reserve's Coastal Research Fellowship			
Fellow Last Name	**Fellow First Name**	**School**	**Fellowship Years**
Hall	Kristin	UNC Wilmington	2010
Brodeur	Michelle	UNC Chapel Hill	2011
O'Meara	Teri	UNC Chapel Hill	2012
Garner	Margaret	East Carolina University	2013
Ridge	Justin	UNC Chapel Hill	2014
Brown	Shannon	NC State	2014
North Carolina Sea Grant and N.C. Coastal Resources Law, Planning, and Policy Center's Coastal Policy Fellowship			
Fellow Last Name	**Fellow First Name**	**School**	**Fellowship Years**
Woodruff	Sierra	UNC Chapel Hill	2013
Hernandez	Kimberly	Duke University	2014
Goralnik	Michael	NC State	2014
North Carolina Coastal Resources Law, Planning, and Policy Center's Research Law Fellowship			
Fellow Last Name	**Fellow First Name**	**School**	**Fellowship Years**
Cummings	Layla	UNC School of Law	2010
Ritchie	Meredith	UNC School of Law	2010
Swain	Deanna	East Carolina University	2010-12

Lynskey	Lindsey	UNC School of Law	2011
Millan	Sarah	UNC School of Law	2011
Rothecker	Sarah	UNC School of Law	2011-12
McAlarney	Ashley	UNC School of Law	2012
Willet	Brian	UNC School of Law	2012
Burgess	Tyler	UNC School of Law	2012
Sajadi	Safa	UNC School of Law	2012-13
Lyman	Jack	UNC School of Law	2013
Manolagas	Amalia	UNC School of Law	2013
Anderson	Kelly	UNC School of Law	2013-14
Walker	Samantha	UNC School of Law	2014
North Carolina Sea Grant/East Carolina University Maritime Heritage Fellowship			
Fellow Last Name	**Fellow First Name**	**School**	**Fellowship Years**
Mires	Calvin	East Carolina University	2010
Marano	Joshua	East Carolina University	2011
Horn	Tom	East Carolina University	2012
Brown	Dan	East Carolina University	2012
North Carolina Sea Grant/N.C. Division of Marine Fisheries Marine Fisheries Fellowship			
Fellow Last Name	**Fellow First Name**	**School**	**Fellowship Years**
Weaver	Jennifer	Duke University	2009-10
Calihan	Jody	Louisiana State University	2011-13
Hain	Ernie	NC State	2013-14
North Carolina Sea Grant Communications Fellowship			
Landis	Benjamin Young	Duke University	2010

Latham	Arthur	New Mexico State University NC State University	2011
Settlage	Sharon Brown	NC State	2012
Banerji	Devika	NC State	Summer 2013
Banerji	Devika	NC State	Summer 2014

Appendix 12: North Carolina Sea Grant Selected Program Honors 2010-2014

2014

Gloria Putnam, NCSG coastal resources and communities specialist and **Barbara Doll**, NCSG water protection and restoration specialist, earned the Mid-Atlantic Sea Grant Outstanding Achievement Award for their leadership roles in the Currituck Goes Green initiative.

Communications team, NCSG, received 2014 APEX Awards for Publication Excellence in two categories for *Coastwatch* magazine: Green Magazines, Journals & Tabloids for the Winter 2014 issue, and Magazine, Journal & Tabloid Writing for the Holiday 2013 issue. The team consists of Katie Mosher, E-Ching Lee, Rhett Register, Sandra Harris and Pam Smith. **Lee** also received the APEX Green Writing award for the Winter 2014 issue.

Terri Kirby Hathaway, NCSG marine education specialist, was profiled by the National Marine Educators Association for 29 years of active membership.

Spencer Rogers, NCSG coastal construction and erosion specialist, was featured by the National Sea Grant College Program during Rip Current Awareness Week.

2013

Michael P. Voiland, retired NCSG executive director, received the William Q. Wick Award for Visionary Career Leadership through Administration, a top award from the National Sea Grant Extension Assembly.

Communications team, NCSG, received 2013 APEX Awards for Publication Excellence in the Magazine & Journal Writing Category for the Summer 2012 issue of *Coastwatch* magazine. The team consists of Katie Mosher, E-Ching Lee, Rhett Register and Sandra Harris. **Gloria Putnam**, NCSG coastal resources and communities specialist; **Jack Thigpen**, NCSG extension director; and **Jessica Whitehead**, NCSG coastal communities hazards adaptation specialist, received the Award for Excellence in the Green Materials category for the report titled "Facing the Future in Plymouth, NC: Preparing for Increased Flood Risks."

Communications team, NCSG, won the 2013 Excellence in Communications Competition in the Print Publication category for the Summer 2013 issue of *Coastwatch* magazine. The contest was held by the N.C. Association of Government Information Officers. The team consists of Katie Mosher, E-Ching Lee, Rhett Register and Sandra Harris.

Katie Mosher, NCSG communications director, received the North Carolina State University Office of Research, Innovation and Economic Development’s 2013 Award for Excellence.

2012

Michael P. Voiland, then-NCSG executive director, took honors in the EPA category at the North Carolina State University Office of Research, Innovation and Economic Development's 2012 Award for

Excellence. **E-Ching Lee**, NCSG communications, took honors in the SPA category at the North Carolina State University Office of Research, Innovation and Economic Development's 2012 Award for Excellence. **E-Ching Lee**, NCSG communications writer, won first place in featuring writing for her *Coastwatch* article, "Hunting for Quicksilver: Testing Local Seafood for Mercury." The contest was held by the N.C. Association of Government Information Officers. **Sharon Settlage**, NCSG communications writer, received third place in feature writing for her *Coastwatch* article on dune grass research titled "Advancing Sea Oat Biology: Advancing Dunes." Settlage also won honorable mentions for her two *Coastwatch* stories, "The Pamlico Sound: Fishing Gem of North Carolina," which told of the Coastal Habitat Protection Plan in the Pamlico Sound region, and "The Multitalented Oyster," an article about the environmental benefits of oyster reefs.

NCSG-funded students **Michelle Brodeur**, **Michelle Covi**, **Jennifer Cudney-Burch** and **Timothy Ellis**, received the 2012 Walter B. Jones Sr. Memorial Award for Excellence in Coastal and Marine Graduate Study, issued by NOAA.

The Town of Plymouth, nominated by NCSG, received the 2012 Walter B. Jones Sr. Memorial Award for Coastal and Ocean Resource Management, issued by NOAA.

Scott Baker, NCSG fisheries specialist, received the 2012 South Atlantic Sea Grant Regional Outreach Award.

Sara Mirabilio, NCSG fisheries specialist, was selected for the 2011 N.C. Natural Resources Scientist of the Year Award at the Governor's Conservation Achievement Awards program, administered by the N.C. Wildlife Federation.

Pam Smith, NCSG contributing writer for *Coastwatch* magazine, received 2012 APEX Award for Publication Excellence in feature writing for her article, "Citizen Science Bolsters Oyster Restoration Efforts" in the Spring 2011 issue.

Terri Kirby Hathaway, NCSG marine education specialist, received 2012 Outstanding Practitioner by the Environmental Educators of North Carolina Award.

2011

Mary Beth Barrow, NCSG fiscal officer, received North Carolina State University Office of Research, Innovation and Economic Development's 2011 Award for Excellence.

Lisa Shiavinato, NCSG law, policy and community development specialist, was appointed to two-year term as president of The Coastal Society, or TCS. Schiavinato also was recently named by **Gov. Beverly Perdue** to the federal Bureau of Ocean Energy Management, Regulation and Enforcement's (BOEMRE) North Carolina Task Force on Offshore Renewable Energy.

Rocky Branch Stream Restoration and Greenway Project, led by **Barbara Doll**, NCSG water protection and restoration specialist, was a co-winner in the Natural Resource Conservation category at the City of Raleigh Environmental Awards Program.

Communications team, NCSG, won the 2011 APEX Excellence in Communications Competition in two categories for *Coastwatch* magazine: Magazines & Journals – Print and Green Materials. The team

consists of Katie Mosher, E-Ching Lee, Art Latham, Sandra Harris, Cheyenne Autry, Zach Byrd, and Ryan Shalley. Gloria Putnam, NCSG water quality planning specialist, and Lee were recognized for developing the "Trees & Plants" fact sheets, part of the *Sustainability Series*.

2010

Robin Worrell Wienke, NCSG communications, received NOAA's Walter B. Jones Sr. Memorial Award for Excellence in Coastal and Marine Graduate Studies. **Ben Young Landis**, then-NCSG communications science writer, received the Walter B. Jones Sr. Memorial Award for Excellence in Coastal and Marine Graduate Studies as well.

Michael P. Voiland, then-NCSG executive director and chair of the SGA External Relations Committee, earned Sea Grant Association (SGA) honors for his role in articulating, at the national level, not only the broad positive impacts of Sea Grant, but also the ongoing funding needs of the national network of 32 programs to continue its mission.

Jack Thigpen, NCSG extension director, was honored by the Assembly of Sea Grant Extension Program Leaders not only for his role as past chairman of the assembly, but also for his leadership of the SGA Networks Advisory Council.

Jessica Whitehead, NCSG/SCSG climate extension specialist, was honored by the Assembly of Sea Grant Extension Program Leaders for leadership to increase collaboration in climate science and outreach efforts across coastal and Great Lakes states.

North Carolina Sea Grant's Local Catch efforts were selected by the Sea Grant Association to represent the South Atlantic region for "superior outreach programming." Current North Carolina Sea Grant team members participating in Local Catch efforts include fisheries specialists **Scott Baker** in Wilmington and **Sara Mirabilio** in Manteo; seafood specialist **Barry Nash** and enterprise specialist **Brian Efland**, both in Morehead City; and communications director **Katie Mosher** and writer/editor **E-Ching Lee**, both in Raleigh. Previous communicators **Kathleen Angione** and **Ben Landis** also participated in the projects. Nash serves on a state legislative advisory panel focusing on local foods.

J. Christopher Taylor, former NCSG-funded graduate student and an ecologist for NOAA based in Beaufort, was among 85 scientists who received the 2009 Presidential Early Career Award for Scientists and Engineers.

Lisa Schiavinato, NCSG law, policy and community development specialist, was recognized as the Natural Resources Scientist of the Year for the 47th Annual Governor's Conservation Achievement Awards presented by the N.C. Wildlife Federation.

Lisa Schiavinato, NCSG law, policy and community development specialist, was selected as the Natural Resources Scientist of the Year in the 2009 N.C. Governor's Conservation Achievement Awards program.

Mary Beth Barrow, NCSG fiscal officer, earned the title of Certified Research Administrator, or CRA, from the Research Administrators Certification Council.

Appendix 13: Key Examples of North Carolina Sea Grant Stakeholders and Partnerships 2010-2014

Beach Safety: Current Research and Outreach

NOAA
- National Weather Service: Forecast Offices serving coastal NC
- Marine Program Office
- Other coastal Forecast Offices in US
- Sea Grant Programs: i.e.: DE, SC, MI, NJ, National Office
- National Ocean Service, Center for Operational Oceanographic Products & Services

30 NC beach communities
- Ocean Rescue Squads
- Local governments
- Beach rental companies
- Chambers of Commerce
- Surf schools and shops
- Surfing associations

8 NC oceanfront counties
- Emergency managers
- School systems, i.e.: New Hanover County

U.S. Lifesaving Association

International Lifesaving Association

Media: local, state and national; print, broadcast, online

Naval Postgraduate School

National Park Service, Outer Banks Group

U.S. Army Corps of Engineers, Duck Research Facility

U.S. Coast Guard

UNC Wilmington

UNC Chapel Hill

University of New South Wales, Sydney, Australia, Science of the Surf

Water Quality: Creeks, Streams and Estuaries

NOAA
- N.C. National Estuarine Research Reserve
- Sea Grant programs: SC, GA, FL
- Hollings Laboratory

Albemarle-Pamlico National Estuary Partnership

Currituck County
- Commissioners
- Planning staff
- Cooperative Extension
- Master Gardeners

Chowan County & Town of Edenton
- Chowan Edenton Environmental Group

N.C. Department of Environment and Natural Resources
- N.C. Division of Water Resources
- N.C. Clean Water Management Trust Fund

N.C. Coastal Federation

Governors' South Atlantic Alliance

NC State University: Stream Restoration; Bio & Ag Engineering, Cooperative Extension, Crop Science, Natural Resources Leadership Institute

UNC Wilmington

UNC Chapel Hill

UNC Coastal Studies Institute

East Carolina University

Water Resources Research Institute of UNC System

Engineering industry, i.e.: Moffatt & Nichol, Stantec, GPI

SC Department of Natural Resources

Tampa Bay National Estuary Program

Local Seafood: Community and Economic Development

NOAA
- National Marine Fisheries Service
- Sea Grant Programs, i.e.: CA, VA

U.S. Department of Agriculture, TAA program

N.C. Catch, Carteret Catch, Brunswick Catch, Outer Banks Catch, Ocracoke Fresh; members include fishermen, dealers and market owners, restaurant owner and chefs; local government officials; consumers

Community Supported Fisheries, i.e.: Walking Fish, Core Sound Seafood, Locals Seafood

Saltwater Connections

Day at the Docks

Down East Community News

N.C. Seafood Festival
Outer Banks Seafood Festival
N.C. Fisheries Association
N.C. Watermen United
N.C. Aquaculture Development Conference
UNC Press
University of North Carolina Chapel Hill
N.C. State University: Seafood Laboratory; Center for Environmental Farming Systems
East Carolina University
University of North Carolina Greensboro
Carteret Community College
Virginia Tech
Major groceries, i.e.: Lowe's Foods, Whole Foods, Harris Teeter
Media: i.e.: The News and Observer (Raleigh), Edible Piedmont
N.C. Rural Center
U.S. Department of Agriculture
N.C. Department of Agriculture and Consumer Services
N.C. Division of Marine Fisheries
N.C. Aquariums

Shellfish: Restoration and Aquaculture

Albemarle-Pamlico National Estuary Partnership
Atlantic States Marine Fisheries Commission
Governors' South Atlantic Alliance
Hooper Family Seafood
Mid-Atlantic Fisheries Management Council
National Science Foundation
N.C. Aquaculture Development Conference
N.C. Coastal Federation
N.C. Department of Environment and Natural Resources
- N.C. Coastal Habitat Protection Plan Committee
- N.C. Division of Marine Fisheries
- N.C. Marine Fisheries Commission
- N.C. Shellfish Sanitation

N.C. Shellfish Growers Association
Shellfish Gardeners of North Carolina
South Atlantic Fishery Management Council
The Nature Conservancy
NOAA
- National Estuarine Research Reserves: North Carolina, Ace Basin, Guana Tolomato Matanzas, North Inlet-Winyah Bay
- Sea Grant Programs: FL, GA, LA, SC
- National Marine Fisheries Service

NC State University: Center for Marine Sciences and Technology
Duke University: Marine Laboratory
East Carolina University
Florida State University
North Carolina Central University
Northeastern University
University of Georgia Marine Extension Service
UNC Chapel Hill: Institute of Marine Sciences
UNC System
UNC Wilmington Center for Marine Science
UNC Charlotte
UNC Coastal Studies Institute
Virginia Commonwealth University
Virginia Institute of Marine Sciences
U.S. Army Corps of Engineers
Various commercial fishers

Hazards: Adaptation to Changing Coastal Environment

Albemarle-Pamlico National Estuary Partnership
All 20 CAMA counties in NC
- Building inspectors
- Emergency managers

American Society of Civil Engineers (ASCE)
Association of Mexicans in North Carolina
Federal Emergency Management Agency
Institute of Business and Home Safety
Moffatt and Nichol Engineering
N.C. Building Code Council
N.C. Coastal Atlas
N.C. Division of Emergency Management
N.C. Department of Insurance
N.C. Division of Coastal Management
N.C. Emergency Management Association
N.C. Floodplain Mapping Program
N.C. General Assembly
N.C. Office of State Climatologists
N.C. State Emergency Response Team
N.C. Homebuilders Association

N.C. Legislative Study Commission on Emergency Preparedness and Building Codes
Property insurance policy-holders in coastal NC
NOAA
- Climate Program Office
- CoCoRaHS
- N.C. National Estuarine Research Reserve
- National Hurricane Center
- National Weather Service, Marine Forecast
- National Weather Service: Forecast Offices in coastal and central NC
- Sea Grant Programs: FL, GA, LA, OR, SC, TX
- Southeast River Forecast Center
- NOAA in the Carolinas

Town of Plymouth
East Carolina University: Center for Natural Hazards Research
North Carolina State University
Social and Environmental Research Institute
Texas A&M University
UNC Chapel Hill
UNC Chapel Hill: Institute of Marine Sciences
UNC Wilmington: Center for Marine Science
University of Florida
University of Oklahoma
University of South Carolina: Carolinas Integrated Sciences & Assessments
U.S. Army Corps of Engineers
U.S. Geological Survey
U.S Marine Corps Base Camp Lejeune

Sustainable Fisheries: Biology and Management

American Fisheries Society
Atlantic States Marine Fisheries Commission
Carolina Feeds
Gulf Coast Marine Life Center
Mid-Atlantic Fisheries Management Council
N.C. Coastal Federation
N.C. Coastal Habitat Protection Plan
N.C. Coastal Reserve & National Estuarine Research Reserve
N.C. Coastal Resources Division
N.C. Cooperative Extension
N.C. Department of Agriculture and Consumer Services, Seafood Marketing Division
N.C. Department of Environment and Natural Resources
N.C. Division of Coastal Management
N.C. Division of Marine Fisheries
N.C. Marine Fisheries Commission
N.C. Shellfish Growers Association
N.C. Shellfish Sanitation Section DENR
N.C. Waterman United
N.C. Wildlife Resources Commission
National Science Foundation
S.C. Department of Natural Resources
Striped Bass Growers Association
NOAA
- Beaufort Science Center
- Highly Migratory Species Division
- National Marine Fisheries Service
- NOAA Research
- Office of Protected Resources
- Southeast Fisheries Science Center

Appalachian State University
Duke University
Duke University Marine Laboratory
East Carolina University
East Carolina University, Institute for Coastal Science and Policy
NC State
NC State: Center for Marine Sciences and Technology
UNC Chapel Hill: Institute for Marine Sciences
UNC Wilmington: Center for Marine Science
UNC Coastal Studies Institute
Virginia Institute of Marine Science
Various commercial fisheries
Virginia Aquarium and Marine Science Center
U.S. Geological Survey

Trainings Future Leaders: Classrooms, Fellowships and Professional Development

Albemarle Resource Conservation & Development Council
American Meteorological Society
Blog Together/Science Online
California Coastal Commission
Centers for Ocean Sciences Education Excellence, Southeast
Delaware Coastal Management Program
Environmental Educators of North Carolina
Governors' South Atlantic Alliance

Maryland Chesapeake and Coastal Service
N.C. Aquaculture Development Conference
N.C. Coastal Federation
N.C. Division of Environmental and Natural Resources Coastal Habitat Protection Plan Steeping Committee
N.C. Coastal Reserve
N.C. Department of Agriculture and Consumer Services
N.C. Division of Emergency Management
N.C. Wildlife Resources Commission
N.C. Emergency Management Association
N.C. Environmental Health State of Practice Committee
N.C. Department of Environment and Natural Resources
- N.C. Division of Coastal Management
- N.C. Division of Marine Fisheries
- N.C. Division of Water Resources
- N.C. Office of Environmental Education
- Shellfish Sanitation Section

National Marine Educators Association
National Science Foundation
North American Association for Environmental Education
U.S. Army Corps of Engineers, Duck Field Research Facility
NOAA
- Atlantic States Marine Fisheries Commission
- Climate Program Office
- Coastal Services Center: Coastal Management Fellowship
- NERRS: North Carolina, Ace Basin, Guana Tolomato Matanzas, North Inlet-Winyah Bay
- NMFS Office of Protected Resources
- NMFS/Sea Grant: Fisheries Population Dynamics and Economics Fellowships
- Office of Education
- Office of Legislative Affairs
- Sea Grant: Knauss Marine Policy Fellowship
- Sea Grant programs: FL, GA, SC, AK, ME, NH

U.S. Navy
Appalachian State University
Camden County Schools
College of the Albemarle
Dare County Schools
Duke University
East Carolina University
Elizabeth City State University
Elon University
Hyde County Schools
N.C. Central University
NC State University
UNC Chapel Hill
UNC Charlotte
UNC Coastal Studies Institute
UNC Wilmington
UNC-TV
University of Georgia Press
University of North Carolina System
U.S. Congress

Communicating Coastal Science

APEX Awards
Albemarle-Pamlico National Estuary Partnership
Associated Press
Blog Together/Science Online
Coastal Reserve and National Estuarine Research Reserve
N.C. Division Environmental and Natural Resources
The News and Observer (Raleigh)
N.C. Association of Government Information Officers
N.C. Coastal Federation
NC State Office of Research Innovation and Economic Development
NC State Center for Marine Sciences and Technology
NOAA
- National Weather Service
- National Sea Grant Office
- Coastal Services Center
- Walter B. Jones Jr. Awards

Public Affairs and Office of Environmental Education
UNC Chapel Hill: Institute of Marine Sciences
UNC Press
UNC-TV
UNC Wilmington Center for Marine Science

Appendix 14: North Carolina Sea Grant 2011 Site Review Team Report

Review of the
North Carolina Sea Grant College Program

June 28-29, 2011

8/11/2011

Chair, Federal Program Officer — Date

G. Ross Heath — 8/3/2011

Co-Chair, National Sea Grant Advisory Board Member — Date

INTRODUCTION

This is a report from the Site Review Team (SRT) visit to the North Carolina Sea Grant (NCSG) Program on June 28 and June 29, 2011.

The North Carolina SRT members were

Terry Smith *Chair* NMFS/National Sea Grant Office Silver Spring, MD	**Ross Heath** *Co-Chair* University of Washington Seattle, WA
Stephen Brandt Oregon Sea Grant Corvallis, OR	**Dale Baker** Cornell University Ithaca, NY
Bill Hogarth Florida Institute of Oceanography St. Petersburg, FL	

Prior to the site review visit, in conformance with National Sea Grant Office and College Program guidelines, North Carolina Sea Grant issued a public notice of the upcoming SRT visit by inviting interested parties to send written comments to the SRT Chair. The public notice was distributed on the program website and via press release. The Chair received one letter and one note in response. Both were complementary to the program, highlighting the relevance of outreach and research products to end users and the positive impression gained from personal experience working with the program.

The review took place in Raleigh at three locations on the North Carolina State campus.

During the review, the SRT met with program management staff, university administrators, members of the advisory board and some program collaborators. Representing the program was the Director, Mike Voiland, the Associate/Research Director, Steve Rebach, the Extension Director, Jack Thigpen, the Communications Director, Katie Mosher Patterson, and the fiscal officer, Mary Beth Barrow.

Also in attendance, at the introductory part of the meeting and the closeout discussion, were Terri Lomax, Vice Chancellor for Research and Innovation, North Carolina State University and Courtney Thornton, Research Director, University of North Carolina. Jessica Whitehead, an extension specialist in coastal climatology, was present for parts of Tuesday's and Wednesday's discussion. A list of other individuals that participated in the meeting can be found in Appendix II, 'Guest Presenters.'

The review followed the guidelines of the Site Review Team Procedures Manual and this report uses the organizational structure outlined there. The SRT reviewed and discussed broad issues related to the North Carolina Sea Grant Program's: 1) Organization and Management of the Program; 2) Stakeholder Engagement; and 3) Collaborative Network Activities. The report is organized by these areas. The final section contains summary findings, suggestions and recommendations.

ORGANIZING AND MANAGING THE PROGRAM

The Sea Grant director reports to the Vice Chancellor for Research and Innovation at North Carolina State. This seems to work well and is enhanced by an additional formal connection to the Research Director of the University of North Carolina. In part, this arrangement benefits from the constructive relationships of the people currently holding these positions.

The additional role of the Sea Grant Director as the director of the University of North Carolina's Water Resources Research Institute (WRRI) provides good opportunities for effective collaboration between Sea Grant and WRR although future federal support for WRRI is uncertain.

We applaud the development and creation of the program's Advisory Board and formally recommend that the Board have an official charter including rules of order and explicit lengths of appointment for members (see *Recommendations*).

The strong financial support of the state/university with state matching dollars is critical to the continued success of this program and, of course, relevant in this time of declining state budgets.

Comments
The clear presentation of the Sea Grant Budget given by Mary Beth Barrow, the financial officer, was effective and appreciated by the panel.

The program has a long history of recruiting successful fellows. The large number of Knauss fellows from North Carolina over the lifetime of the national program is particularly noteworthy.

STAKEHOLDER ENGAGEMENT

North Carolina Sea Grant has historically had a very strong extension program. Their outreach capabilities are well respected in the Southeast and throughout the nation. It was obvious from this review that the Extension and Communications Programs continue to be exceedingly strong ─ among the best in the Sea Grant network.

North Carolina Sea Grant is providing national leadership in outreach. Their efforts in the areas of Climate Extension, Coastal Hazards, Water Quality and Seafood Technology are cutting-edge. There has been, and continues to be, a strong commitment by the Program to maintain funding for their extension efforts, in what are becoming difficult fiscal times. The program has been able to attract external funding to pay a portion of many Extension Specialist salaries and has secured additional outside funding for the outreach program.

COLLABORATIVE NETWORK/NOAA ACTIVITIES

North Carolina Sea Grant is clearly a very active program at the local and state level. Equally important, the program is also active regionally and nationally.

As an example, the director serves on several national Sea Grant committees including the Sea Grant Association's External Relations Committee chair and as treasurer.

Additionally, North Carolina Sea Grant is one of the few programs that has retained a law and policy program thrust where, through a specialized extension program, the program interacts with and contributes to National Sea Grant Law Center activities.

Examples
North Carolina Sea Grant initiated the South Atlantic Regional Sea Grant National Estuarine Research Reserve System fellowship program involving the four South Atlantic states. This program is an excellent model for other Sea Grant programs or even for a national initiative.

Another unique and important program is the Coastal and Inland Flood Observation and Warning system or CI-FLOW. Here North Carolina Sea Grant works with NOAA's National Severe Storm Laboratory (Norman OK), National Weather Service offices, national Sea Grant and South Carolina and Texas Sea Grant to research and evaluate new technology and approaches to production of accurate and timely identification of inland, coastal and flash floods. CI-FLOW currently focuses on the Tar-Pamlico and Neuse River basins, but the approach can be generalized and adopted in other areas.

The program's long history and focus on fisheries is noteworthy and includes a strong seafood technology/safety/marketing program. Since 1977 North Carolina Sea Grant is responsible for more than 700 staff members from seafood processors and dealers receiving certificates from the national Hazard Analysis and Critical Control Point (HACCP) program.

Through NC Sea Grant efforts, the term "local catch" to describe direct promotion, branding and marketing has become nationally known and has encouraged similar programs and community-supported fisheries (CSF) efforts around the country.

Under a partnership between North and South Carolina Sea Grant a "Carolinas Coastal Climate Outreach Initiative" was created to educate coastal decision makers on the implications of climate variability and change for water-level rise, erosion, land-use changes, saltwater intrusion and related impacts on coastal communities.

North Carolina Sea Grant has been a national leader on working waterfronts and waterfront access, benefiting from the director's experience as chair of the North Carolina Waterfront Access Study Committee.

Leveraged-funds Programs
North Carolina Sea Grant has three special leveraged-funds programs in fisheries that are important to both the state and region and serve as good examples of potential arrangements between Sea Grant programs and state or national entities.

In all three North Carolina Sea Grant occupies a management/oversight position. That is, North Carolina Sea Grant acts as a facilitator and administrator for other entities – the state of North Carolina or NOAA's National Marine Fisheries Service in the projects described below.

One program is called the 'Fishery Resource Grant Research Program.' North Carolina Sea Grant drafts a call for proposals, facilitates the review of the proposals by a technical review panel and manages the subsequent research grants. The program is funded by the North Carolina General Assembly and has, in the last four years, conducted 65 research projects with total funding of about $884K. Importantly, these are cooperative research projects, which means that one or more of the principal investigators are commercial fishermen.

The Blue Crab and Shellfish Research Program is funded by the University of North Carolina. This is also a cooperative research program and, in the last four years, North Carolina Sea Grant has overseen 33 research projects with total funding of around $400K. Most of the work is associated with blue crab or its fisheries but there is also research on other crab species, oysters and diamondback terrapin.

Under the Marine Mammal Protection Act, the National Marine Fisheries Service (NMFS) and others have responsibility to reduce mortality for endangered and threatened marine mammals and sea turtles. In this context, NMFS' southeast region (North Carolina – Texas) operates a number of 'Take Reduction Teams,' formal technical bodies that review, discuss and recommend actions to reduce mortality on individual or small groups of such species. NMFS's take reduction teams for bottlenose dolphin, pilot whale and Risso's dolphin are assisted by North Carolina Sea Grant. As in the two previously mentioned cases, North Carolina Sea Grant calls for proposals, facilitates review and manages the resulting grant awards. In the last six years they've managed 9 such projects with slightly more than $400K expended.

FINDINGS, RECOMMENDATIONS and SUGGESTIONS

Findings/Comments

- The organizational structure of North Carolina Sea Grant is effective and consistent with the organization of other Sea Grant Programs. The NCSG management group functions well as a team, particularly in the operational sense. However, given the somewhat uncertain future of federal funding and state institutional arrangements, more emphasis on thinking proactively and in future visioning would benefit the program.

- The research program is strong. Proposal review and selection follow the rigorous standard national protocols of Sea Grant. The proactive use of mini-grants to seed new ideas and launch new faculty is an effective use of discretionary funds and is highlighted below as a Best Management Practice.

- Although the SRT received an excellent overview of the extension program by the management team and heard good things about the programming the Extension Specialists carry out, the SRT would have benefited from direct contact/presentations from at least some of the agents during the review.

- Under the leadership of the current director, NCSG is a very diversified collaborative program that serves local, state, regional and federal stakeholders very effectively.

Suggestions

- Official Sea Grant/university reporting arrangements at the director/chancellor/vice president level could be periodically reviewed to see that NC Sea Grant is best serving the needs of North Carolina, its coastal residents, and the nation.

- The communication products include "Coastwatch" a Sea Grant newsletter/magazine published five times a year and a recipient of several national awards. Such large full-color publications are expensive. Given Coastwatch's reputation and value, the program could examine ongoing cooperative funding or sponsorship of particular issues by interested outside organizations.

- North Carolina Sea Grant does not have a formal relationship with USDA's Cooperative Extension. The SRT suspects that there are opportunities for enhanced collaborations and partnerships with this organization, especially in the areas of fisheries and youth education. Opportunities for such partnerships or a formal agreement for such cooperation could be useful.

Recommendations

- We applaud the development and creation of the program's Advisory Board and recommend that the Board have an official charter including rules of order and explicit lengths of appointment for members.

BEST MANAGEMENT PRACTICES

- *Mini-grants*

All Sea Grant programs use Program Development (PD) funds to conduct projects of a smaller or less formal nature than multi-year research projects. Such sub-projects traditionally emerge during the discussion/decision on parts and details of a new multi-year program. North Carolina Sea Grant has taken the general model further and formalized a special mini-grant process which is explicitly designed for outreach and research of immediate need. The mini-grant program is quite formalized, well publicized, and does not involve federal match or indirect costs. Significantly, this special granting mode is always available.

Other Sea Grant programs use approaches like this in dealing with the dynamic nature of a 2-4 year research cycle but the quite specialized and rapid-reacting mini-grant program of North Carolina Sea Grant is noteworthy as the program is able to conduct important research and produce and disseminate results very quickly. Thus the panel strongly supports the current model and endorses expansion of the mini-grant program should funding for larger projects decline.

Appendix I

Agenda

North Carolina Sea Grant College Program
Federal Site Visit/Review

June 28-29, 2011
Raleigh, NC

Tuesday, June 28, 2011

Introduction

8:30 a.m. Opening remarks: overview/purpose of the site review
- Terry Smith, NCGO and SRT Leader

8:45 a.m. Welcome to the SRT and Introductions
- Mike Voiland, Executive Director
- Terri Lomax, Vice Chancellor for Research and Innovation, NC State
- Courtney Thornton, Research Director, UNC General Administration

Program Management and Organization

9:15 a.m. A Brief History of the NCSG College Program of the UNC system
NCSG's Institutional Setting
How NCSG is organized
- Management team and structure
- Staffing: roles and responsibilities
- Recent actions to share administrative roles

Getting Input: how the program is advised

10:00 a.m. Research processes
- Core (federal omnibus-supported) research process and decision-making
- Fishery Resource Grant Program (state-funded)
- Blue Crab and Shellfish Research Program (state/university-funded)

10:20 a.m. Break

10:45 a.m. Research processes (cont.)
- By-Catch of Marine Mammal Research (NOAA Fisheries-funded)
- Minigrants (federal omnibus-supported)
- Invited (needs identified by NCSG)
- Requested (needs identified by investigator)
- Joint NCSG-WRRI projects

11:10 a.m. Outreach programs
- Extension Overview
- Communications Overview

11:35 a.m. Catching Our Collective Breath (questions/clarifications from the presentations)

Stakeholder Engagement

12:40 p.m. How NCSG engages its stakeholders
Case Studies in Engagement:

- Down East and Hatteras Connections
- Currituck Goes Green
- Waterfront Access & Working Waterfronts

2:10 p.m. Break

2:30 p.m. Case Studies in Engagement (cont.):
- Oyster Reef Restoration
- Coastal Hazards
- Community-Climate Initiative

4:00 p.m. Catching Our Breath (questions/clarifications from the presentations)

4:30 p.m. Adjourn for the day

Wednesday, June 29, 2011

Collaborative Networking/NOAA Activities

8:30 a.m. Overview of NCSG's Sea Grant Community and SGA Network Contributions

8:45 a.m. Local Catch Marketing and Branding: An Example in Leading And Networking

9:00 a.m. Vignettes in Leadership and/or Engagement in NOAA Regional Efforts
- *NOAA in the Carolinas*
- CI-FLOW
- Climate Extension Initiative

9:40 a.m. NCSG and NCNERR Collaboration

10:00 a.m. Amping Things Up Regionally in the South Atlantic
- Regional Sea Grant-NERRS Fellowships
- Governors' South Atlantic Alliance
- GoM Oil Spill Preparedness
- Aquatic Invasives NSI
- Interactions with SECART and COSEE-SE

10:40 a.m. Break

11:00 a.m. Program Changes from Previous Review

11:30 a.m. Final questions/clarifications

12:30 p.m. Lunch, with closed SRT work session beginning thereafter.

3:00 p.m.(est.) SRT meets with and debriefs NCSG Management Team and University Officials

4:00 p.m. Adjourn

Appendix II

North Carolina Sea Grant College Program
Federal Site Visit/Review

Guest presenters, June 28-29, 2011

Tuesday Morning

Terri L. Lomax, Vice Chancellor for Research and Innovation, NC State
www.ncsu.edu/ori

Courtney Thornton, Research Director, UNC General Administration
www.northcarolina.edu

Tuesday afternoon

Susan West, Hatteras Connection and Saltwater Connections (on phone)
Hatteras Blog: http://swconnections1.wordpress.com/2011/06/08/hatteras-island-asset-map-available-online/
Hatteras Teens on Facebook: http://www.facebook.com/#!/pages/Hatteras-Connection-Seafood-Marketing-Team/119124268163729

Gordon Myers, NC Wildlife Resources Commission, past member of NC Waterfront Access Study Commission
www.ncwildlife.org

Harry Simmons, Mayor of Caswell Beach and member of NC Coastal Resources Advisory Council, leader of NCBIWA and ASBPA
http://www.ncbiwa.org/
http://www.asbpa.org/

Brian Roth, Mayor of Plymouth and member of the NC Sea Grant Advisory Board, participant in the
http://www.visitplymouthnc.com

Wednesday morning

Gretchen Bath Martin, NOAA Fisheries Beaufort Lab, participant in Carteret Catch, member of NC Sea Grant Advisory Committee
http://www.sefsc.noaa.gov/labs/beaufort/staff/gretchenmartin.htm
www.carteretcatch.org

Kevin Kelleher, NOAA National Severe Storms Lab, and participant in CI-FLOW (on phone)
http://www.nssl.noaa.gov/ciflow/

Darin Figurskey, National Weather Service, Raleigh, member of NOAA in the Carolinas
http://www.erh.noaa.gov/er/rah/
http://www.carolinas.noaa.gov/

Rebecca Ellin, Director, NC Coastal Reserves and NC Estuarine Research Reserves and NOAA in the Carolinas

John Fear, Research Director, NC Coastal Reserves and NC Estuarine Research Reserves and member of the NC Sea Grant Advisory Board.
http://www.nccoastalreserve.net/

Appendix 15: North Carolina Sea Grant Response to 2011 Site Review Team Report

North Carolina Sea Grant
Varsity Research Bldg. (Module 1), NCSU
1575 Varsity Drive
Raleigh, NC 27695
Tel: 919-515-2455

August 23, 2011

Dr. Terry Smith
National Sea Grant College Program Office
NOAA/Sea Grant, R/SG
1315 East-West Highway
SSMC-3, Eleventh Floor
Silver Spring, MD 20910

Dear Terry:

I write to thank you, co-chair Ross Heath, and the rest of the SRT for the high level of engagement in the review of the NCSG program in June of 2011, and for providing the final written report.

Through my own efforts prior to my retirement (planned for December 2012) and by making sure the next director is aware of the outcome of the review, action will be taken to address the SRT's single recommendation that our advisory board adopt an official charter including rules of order and lengths of appointment for members.

We, too, strongly believe that NCSG's philosophy and practice in allocating much of its omnibus program development account to the timely investment in minigrants is indeed a best management practice that other programs might consider. We sincerely thank the SRT for the endorsement of this special and deliberate way our program has elected to invest these federal funds.

We will carefully consider all the suggestions offered by the SRT, but we take clear exception to one at this time. The report states that "the SRT would have benefited from direct contact/presentations from at least some of the agents during the review." In building our agenda, we placed an emphasis on having the SRT hear directly and predominantly from stakeholders and partners. Our thinking was that doing so would reflect on our program's high level of

stakeholder/partner engagement and collaboration (i.e., two of the three elements that the review was to be focused on, according to the site review procedures manual). Given the tight time constraints of the actual review, we recognized that taking this tack would mean fewer extension staff being directly involved in the agenda. Nevertheless, we did indeed expose the team to direct and live input from our extension staff. For the record, the SRT met with and heard from four of our extension specialists (we do not employ any "agents" in NC) during the review, including Spencer Rogers (in the Day I session on "Coastal Hazards"); Barbara Doll (in the Day I session on "Currituck Goes Green") and Gloria Putnam (in the Day I sessions on "Currituck Goes Green" and "Community-Climate Initiative"), and Jessica Whitehead (in the Day I session on "Community-Climate Initiative" and in the Day II session on "Climate Extension Initiative"). This group constitutes 40 percent of our program's extension educator staffing. As such, we find the SRT suggestion, essentially implying that the team had no direct interaction with, or presentations from, extension staff, to be unfounded and unfortunate, and makes our sharing of the SRT report with our full staff (which would include the specialists named above) a sensitive undertaking for management.

Again, we thank you and the SRT for all the effort associated with our review.

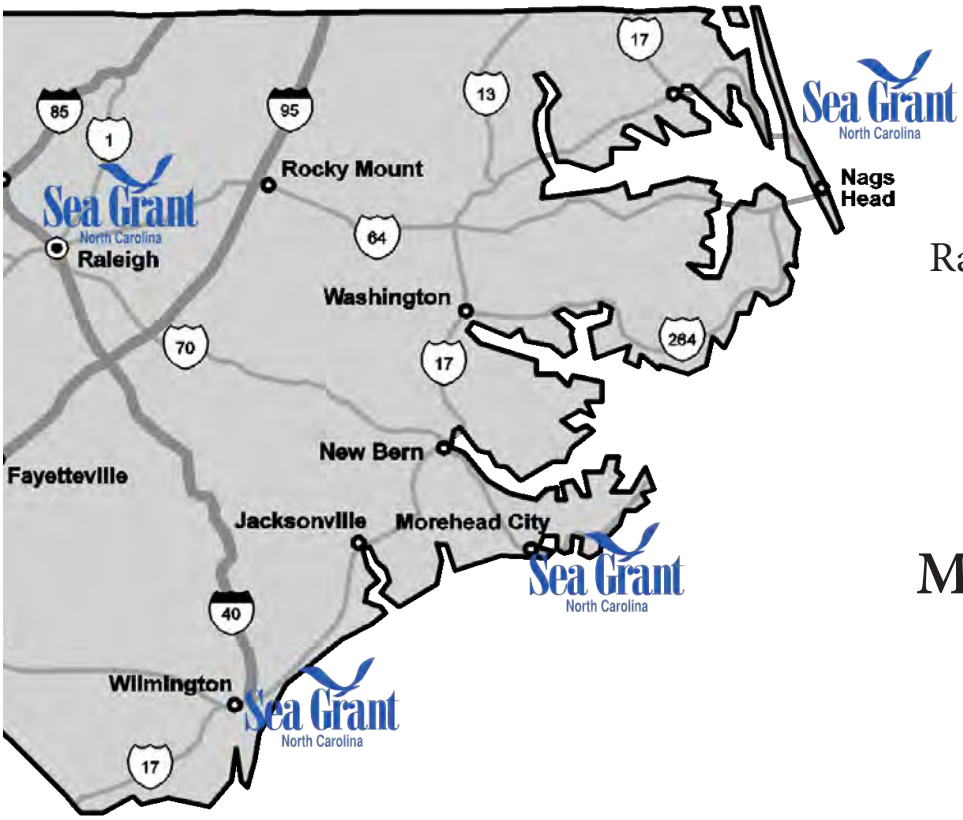
Sincerely,

Michael Voiland, Ph.D.
Executive Director

Cc: Dr. Terri Lomax
Dr. Courtney Thornton
NCSG Management Team

List of Abbreviations

APNEP	Albemarle Pamlico National Estuary Partnership
AAAS	American Association for the Advancement of Science
BAE	Biological and Agricultural Engineering Department
BCSRP	N.C. Blue Crab and Shellfish Research Program
CISA	Carolinas Integrated Sciences and Assessments
CMRC	Coastal and Marine Research Council
COSEE–SE	Centers for Ocean Sciences Education Excellence–SouthEast
EPA	U.S. Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FRG	N.C. Fishery Resource Grant Program
FTE	Full-time equivalent
GASG	Georgia Sea Grant
GSAA	Governors' South Atlantic Alliance
N.C.	North Carolina
NCCR-NCNEER	N.C. Coastal Reserve/N.C. National Estuarine Research Reserve
NCDCM	North Carolina Division of Coastal Management
NCDENR	North Carolina Department of Environment and Natural Resources
NCDMF	North Carolina Division of Marine Fisheries
NCSG	North Carolina Sea Grant
NC State	North Carolina State University
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
ORIED	Office of Research, Innovation and Economic Development
PIER	Planning, Implementation, and Evaluations Resources
REEF	Researchers and Educators Exchange Forum
RFP	Request for Proposal
SciREN	Scientific Research and Education Network
SCSG	South Carolina Sea Grant
SECART	Southeastern and Caribbean Regional Team
SRT	Site Review Team
TAA	Trade Adjustment Assistance
UNC	University of North Carolina
UNC-CH	University of North Carolina at Chapel Hill
USDA	U.S. Department of Agriculture
VCAPS	Vulnerability, Consequences, and Adaption Planning Scenario
WRRI	Water Resources Research Institute of the University of North Carolina System



Raleigh

Headquarters
NC State University
Campus Box 8605
Raleigh, NC 27695-8605
919-515-2454

Manteo

252-475-3663

Morehead City

252-222-6307

Wilmington

910-962-2490

Sea Grant
North Carolina
www.ncseagrant.org

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NOAA
U.S. DEPARTMENT OF COMMERCE

UNC-SG-14-09