

Sea Grant Climate Adaptation Initiative 2013: Implementing Comprehensive Community Resilience Planning in St. Marys, GA and Hyde County, NC

A. Introduction

1. Statement of work

The southeastern (SE) Atlantic coast is highly vulnerable to climate stressors such as hurricanes, extreme rainfall, extreme drought, and sea level rise (Hopkinson et al. 2008; Pielke et al. 2008; Wang et al. 2010; Blake et al. 2013). In recent decades this region has also experienced exceptional growth in both population and the built environment (Crossett 2004). Although recently slowed to some extent by the housing crisis and economic downturn that began in 2008, rapid population and building growth in the SE Atlantic coastal region is expected to soon resume and continue well above the pace of growth in other U.S. regions for the next several decades (White et al. 2009; NOAA 2013).

A variety of studies have shown that rapid development in coastal communities of the SE is associated with the region's generally mild average climate conditions, as well as the high amenity and recreational value of natural resources such as the Atlantic Ocean, near shore estuaries, and coastal marshes (e.g., Saint Onge et al. 2007; Poudyai et al. 2008; Napton et al. 2010). Because lands adjacent to these natural resources are inherently scarce, future development pressure in the Atlantic SE coastal region likely will not be restricted to existing urban centers, but may extend significantly into some of the few remaining rural stretches of the coastline (Hammer et al. 2009; Titus et al. 2009; FEMA 2011). Large hurricanes such as Hugo (1989), Floyd (1999), and Irene (2011) have vividly demonstrated the region's vulnerability to storm surges, high winds, and extreme rainfall events (Blake et al. 2011), and in some cases have made it quite apparent that developments have been misplaced, poorly protected, and thus at high risk of catastrophic loss (Bin and Polasky 2004; Bures and Kanapaux 2011; Arumala 2012). Without appropriate planning that takes climate stressors and geophysical hazards into account, an unfortunate consequence of these growth trends is that increasing numbers of people, property, infrastructure, and natural systems along the SE Atlantic coast are likely to become vulnerable to severe climate-related risks (Titus et al. 2009; FEMA 2011).

For these reasons, there is growing recognition that long-term sustainability of human and natural communities of the SE Atlantic coast, like other coastal regions, will require careful adaptation planning and associated management strategies that provide resilience to a wide range of future climate and extreme event scenarios (Fussel 2007; Brody et al. 2008; Preston et al. 2011). While the issue of climate change has become politically charged in recent years (e.g., Maibach et al. 2009; NC House of Representatives 2012), a number of local, regional, and state governments along the SE Atlantic coast are nevertheless beginning to develop adaptation plans for sea level rise and other climate change phenomena (Smith and Donovan 2010; SFRCCCC 2012; Rasmussen 2013). Common concerns that prompt adaptation planning are observations of increased damages to critical infrastructure and private property from coastal flooding, threats to local water supply from drought and/or saltwater intrusion for rising seas, and changes to natural ecosystems driven by sea level rise and other climate stressors (Smith and Donovan 2010; NOAA 2012b; SFRCCCC 2012). By extension, it is increasingly recognized that employment of facilitation and planning strategies that focus on identification of critical infrastructure vulnerabilities, flood risk prevention and mitigation, and future resilience of valued natural systems can productively overcome outward political divides about climate change (NOAA 2012b).

Given the seriousness of climate change risks for the SE Atlantic coastal region, demonstration and implementation of benefits from climate adaptation planning for local communities – including those where discussion of climate change may be challenging – is clearly a priority for sustainable management of regional coastal resources. In support of this goal, this project proposes an innovative and regional climate adaptation planning collaboration between Georgia Sea Grant (GaSG), North Carolina Sea Grant (NCSG), and the University of Georgia’s Carl Vinson Institute of Government (CVIOG). The specific goal of this project is to implement a detailed local climate adaptation planning process in two partner communities: St. Marys, GA and Hyde County, NC. To achieve this goal the project team will integrate NCSG’s expertise in the Vulnerability Consequences Adaptation Planning Scenarios (VCAPS) participatory engagement method with the expertise of GaSG and CVIOG in developing GIS-based benefit/cost evaluations of resilience and climate adaptation planning (Evans 2006; Evans et al. 2010; Evans et al., *In review*; Evans et al., *In preparation*). In addition, specific policy adaptation options for local government consideration will be developed in coordination with recommendations from the most recent Community Rating Systems (CRS) guidebook (FEMA 2013a). This linkage of local adaptation actions to the CRS credit system, which can translate into potential reductions in Federal Flood Insurance Program (FFIP) premiums for community residents (FEMA 2013a), provides a tangible near-term economic benefit that can be expected to increase likelihood of project recommendations being adopted by the partner governments.

As noted in the attached letters of support, both partner governments have pledged significant in-kind support to this project and have enthusiastically agreed to consider adoption of policy and adaptation recommendations developed through the climate adaptation planning process. Additionally, a broad number of other local, state, and regional stakeholders have expressed their commitment of support for this project. With this high degree of partnerships, we fully expect that our project’s innovative integration of VCAPS, GIS-based benefit-cost evaluations, and direct adaptation policy linkages with the CRS will serve as an important demonstration model for climate adaptation planning that can be applied regionally and nationally.

Project Objectives

The generalized objectives and relevant activities for this project include:

1. Assess current climate vulnerabilities and future vulnerability trends for each community
Activities: Interviews with local experts and management officials (e.g., community planners, flood plain managers, public works directors, etc.) to identify lands, facilities, and infrastructure vulnerabilities; geospatial overlay analysis to verify expert assessments and identify additional vulnerabilities; technical presentation of expert and geo-spatial vulnerability assessments; and participatory diagramming of current and future climate impacts using VCAPS process.
2. Develop participatory scenarios for specific adaptation actions to address current and future vulnerabilities
Activities: Technical presentation of adaptation options (including local zoning and codes, capital infrastructure projects, and policy incentives to encourage voluntary action by property owners); participatory diagramming of adaptation options and expected consequences using VCAPS process; identify dollar value source for expected benefits (e.g., reduction of flood damage to property, protection of ecosystem services, maintenance of critical infrastructure, potential for improved CRS score); prioritization for benefit-cost modeling of specific adaptation actions.

3. Conduct geo-spatial benefit/cost evaluations for a subset of identified adaptation actions in each community

Activities: Assemble necessary datasets for benefit/cost modeling (e.g., local tax assessments in GIS form; high resolution elevation (LiDAR), land cover; local tide gauge records; storm surge heights and return frequency; future sea level rise curves, assembly of magnitudes for 10, 25, 50, and 100 year local rainfall events; identification of expected future decreases or increases in the magnitude of local rainfall events); identify locally appropriate depth-damage functions for saltwater and freshwater flooding events; construct model workflow in ArcGIS 10.1 based on participatory scenarios defined in Objective 2; technical review and, as necessary, calibration of benefit-cost model inputs among project principals (GaSG, NCSG, local governments, and supporting agencies).
4. Hold participatory discussions of benefit-cost relationships and develop planning language with local communities

Activities: Technical presentation of benefit-cost model results in community workshops; iterative and participatory discussion of benefit-cost results through the VCAPS framework; discussion of specific policy language and tools that may be used to implement adaptation actions in which there is broad consensus of very high benefit; modification of previous adaptation actions or definition of new actions that might be considered for additional benefit-cost modeling.
5. Develop community resilience and adaptation plans for Hyde County, NC and St. Marys, GA

Activities: Conduct a one-day workshop or charrette in each community to summarize project results and solicit community feedback for plan development; work with local planning officials in each community to write specific action planning documents for each community that define linkages to CRS priorities; develop resolutions for formal consideration of resilience plans by the local governing authorities (i.e., Hyde County Commission and St. Marys City Council).
6. Extend the project as regional and national model

Activities: Jointly present project status and results through Southeast and Caribbean Climate Community of Practice StormSmart site (<http://stormsmart.org/groups/sec-ccop/>) and bi-annual meetings of this organization; jointly present project results at National Sea Grant Climate Network Workshop; publicize project through regional media channels; publish project results in appropriate peer review journals.

2. Community descriptions

Hyde County, NC

Hyde County was formed in 1705 and is located in eastern NC, along the Pamlico Sound. The county has a total area of 1,424 square miles (3,688.1 km²), of which 613 square miles (1,587.7 km²) is land and 811 square miles (2,100.5 km²) is water (US Census Bureau, 2013). Hyde County is unique in that part of the county, Ocracoke Island, is located across the Pamlico Sound and is only accessible by ferry service, provided by the NC Department of Transportation. Hyde County is divided into five unincorporated townships: Currituck, Fairfield, Lake Landing, Ocracoke, and Swan Quarter. A sixth township, Mattamuskeet, is an "unorganized territory" and mainly comprised of Mattamuskeet National Wildlife Refuge. Much of the county land resides within four National Wildlife Refuges (NWR): Alligator River NWR, Mattamuskeet NWR,

Swanquarter NWR, Pocosin Lakes NWR. Additionally, the Cape Hatteras National Seashore encompasses much of Ocracoke Island. All of Hyde County's critical facilities (schools, police stations, fire stations, and communications towers) and 81% of its roads (754 miles) are located in the floodplain (NOAA CSC 2013b). Image 1 provides a visual representation of the amount of county land located within and outside of the FEMA designated Floodplain. Currently 83% (4,839) of the Hyde County residents live within the FEMA floodplain and 17% (971) live outside of the floodplain (NOAA CSC 2013b).

Hyde County Floodplain

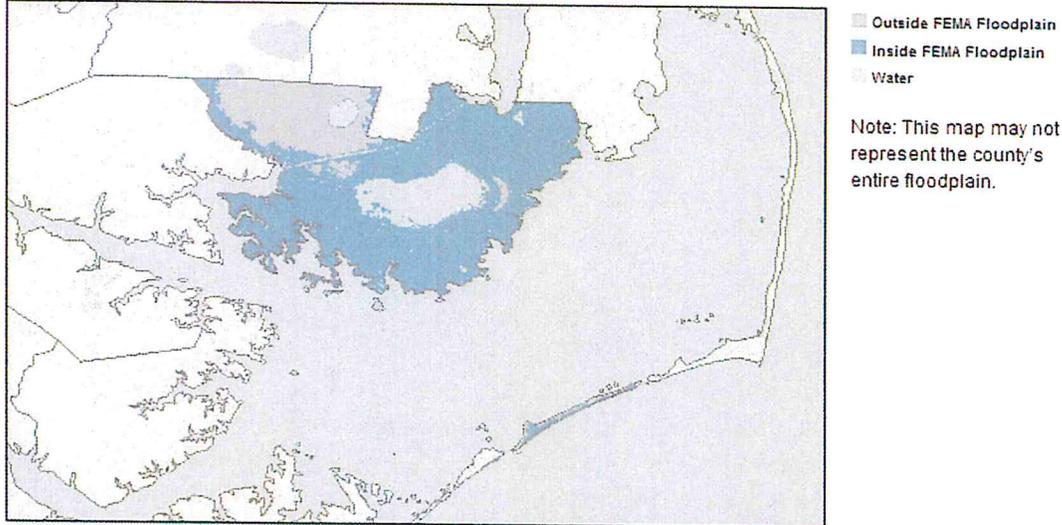


Figure 1: Hyde County FEMA floodplain. Image courtesy of NOAA Coastal Services Center.

<http://www.csc.noaa.gov/snapshots/#flood%2637095>

St. Marys, GA

The City of St. Marys is located along the north side of the St. Marys River, which forms the Georgia/Florida border. The City of St. Marys was established in 1787 and incorporated as a city in 1802 (www.preserveamerica.gov). The current population of the city is approximately 17,099 in a total area of 22.51 square miles (37.52 km²) (US Census Bureau 2013b). The city is located in Camden County, which has a total population of 50,513 and land area of 613 square miles (1021.67 km²). The City of St. Marys is perhaps best known as the gateway to Cumberland Island, the largest barrier island on the Georgia coast and location of the National Parks Service's Cumberland Island National Seashore. St. Marys is also located adjacent to the U.S. Navy Kings Bay Naval Submarine Base, which serves as the east coast's primary base for the Trident submarine fleet. Although located in Georgia, the City of St. Marys and Camden County are adjacent to the Jacksonville, FL metropolitan area, which has a 2012 population of ~1.3 million (US Census Bureau 2012). Camden County communities, including St. Marys, are widely served by media outlets from Jacksonville. Approximately 13% of Camden County's critical facilities (e.g. schools, police stations, fire stations, medical facilities, emergency centers, and communications towers) and 23% of its roads (388 miles) are located in floodplains (NOAA CSC 2013c). Image 2 provides a visual representation of the amount of county land located within and outside of the FEMA designated Floodplain. Currently 36% (18,151) of the Camden County residents live within the FEMA floodplain (NOAA CSC 2013c).

Camden County Floodplain

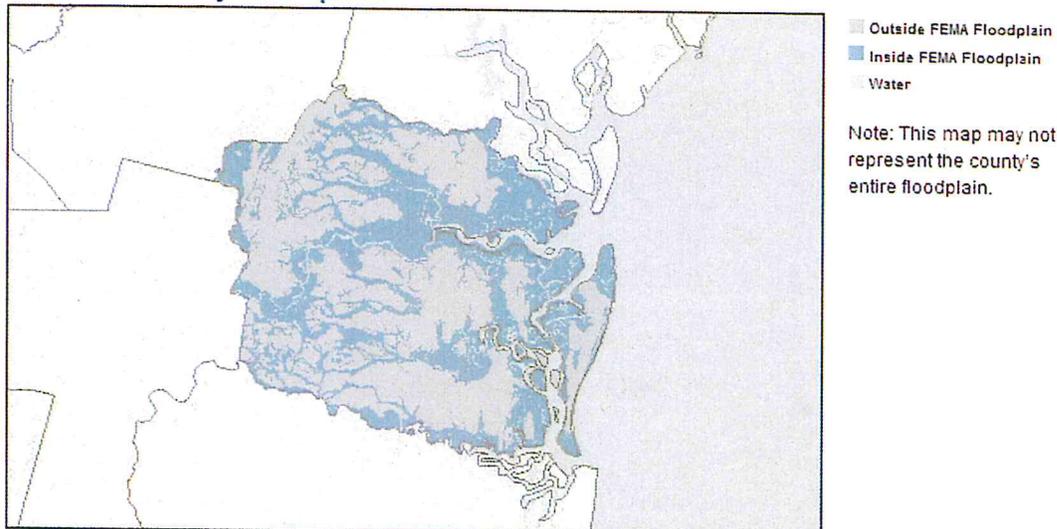


Figure 2: Camden County FEMA floodplain. Image courtesy of NOAA Coastal Services Center.

<http://www.csc.noaa.gov/snapshots/#flood%2613039>

3. **Methodological justifications**

Vulnerability Consequences and Adaptation Planning Scenarios (VCAPS)

The VCAPS process was developed by the Social and Environmental Research Institute, the Carolinas Integrated Sciences and Assessments Center at the University of South Carolina, and the South Carolina Sea Grant Consortium. To date VCAPS has been used to explore hazard mitigation and climate adaptation in 10 coastal communities, including communities in NC and GA. VCAPS is a facilitated participatory process based in the causal structure of hazards and vulnerability assessment (Webler et al., *In progress*). The specific purpose of VCAPS is to assist communities in diagramming the outcomes and consequences of climate stressors on aspects of municipal management. Real time projection of a diagram documenting the group conversation assists community members with discussion of potential adaptation and response options that public and private entities may implement, while also facilitating consideration of positive outcomes as well as potential negative consequences of interventions.

During a VCAPS exercise facilitators provide a group of stakeholder decision-makers with relevant technical background and climate information, and then actively facilitate discussion of the outcomes, consequences, and actions that result from a climate stressor. This discussion is captured in a diagram depicting chains of outcomes and consequences using the VCAPS building blocks to guide its structure, as demonstrated in Figure 3. Participants in VCAPS communities report that this robust yet flexible process has been valuable in synthesizing expert and local knowledge, promoting systems thinking and learning, and facilitating governance through the discussion of adaptive actions (Webler et al., *in progress*). As such, it is clearly a valuable tool for initiating resilience planning.

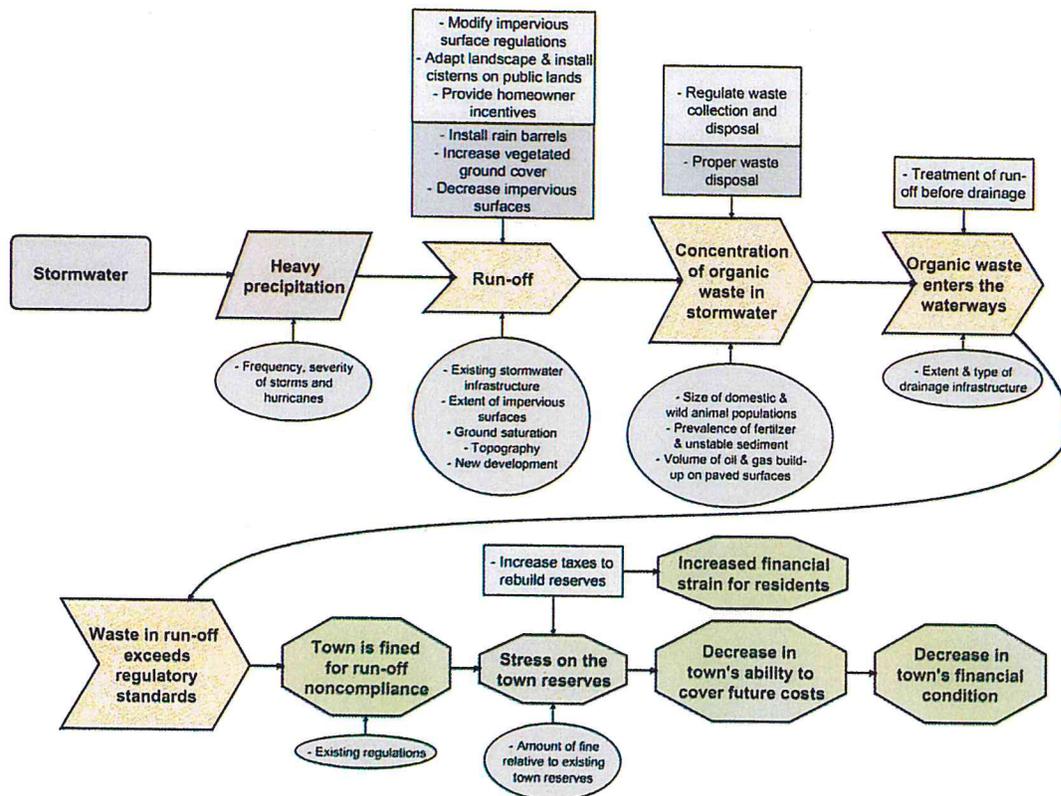


Figure 3: Sample VCAPS chain using stormwater management as a starting point (SERI 2013)

Benefit/cost modeling

Previous experience with VCAPS has made it clear that further analysis of the benefits, costs, and feasibility of adaptation options is a required next step for development of adaptation and resilience planning recommendations that local governments *may be willing to implement* (also see Nicholls and Cazenave 2010; NOAA 2012b). For this reason, this project will extend the VCAPS process to include benefit/cost evaluations of specific actions for sea level rise adaptation as identified by each local community.

The benefit/cost model will follow an intensive GIS workflow that begins with an initial vulnerability assessment, or “No action” scenario, of future flood risks to existing critical infrastructure and private property. These “No action” scenario damage evaluations will then be compared to damage evaluations obtained under scenarios of adaptation action, which will be defined through the VCAPS process. Any reduction in damages associated with adaptation actions is defined as the benefit, while dollars spent to implement adaptation actions are defined as the cost. The net benefit to cost gain (or loss) is defined as costs subtracted from benefits as summed over a given time period. The benefit/cost ratio is obtained by dividing expected benefits by cost over the same time periods. Benefit/cost ratios that are greater than 1 suggest a net economic benefit, while a benefit/cost ratio less than 1 suggests a net economic loss.

Local environmental flood risks for “No action” and all adaptation action scenarios will be defined through methods that closely follow those described in *Mapping Coastal Inundation Primer* (NOAA CSC 2012). Base elevation maps will be based on high quality LIDAR (Laser Imaging Detection and Ranging) datasets available for each community (NOAA CSC 2013a), with daily high tide elevation ranges and current high tide flood event exceedances evaluated

through analysis of daily records from nearby tide gages over the past 5-year period. Local storm surge heights for 10, 50, 100, and 500 year events will then be determined through review of the most recent FEMA flood map evaluations for each community, and assigned appropriate probabilistic frequencies (FEMA 2013b). Annual time-step sea level rise functions and associated increased high tide flood event exceedances and storm surge heights will then be applied over 50 and 100 year periods. We will initially advise following recommendations given by NOAA (2012a). As further recommended by NOAA (2012b) in the report *Incorporating Sea Level Change Scenarios at the Local Level*, specific sea level rise rates to be considered for local planning purposes by each partner community will be defined through participatory dialogue.

In cooperation with GIS and planning staff from Hyde County, St. Marys, and Camden County, tax parcel and infrastructure datasets will be obtained and, as necessary, adapted into appropriate GIS formats for development of vulnerability assessments. A series of overlay analyses will then be performed in ArcGIS 10.1 for the purpose of developing annualized flood depth exceedance frequencies for each building/property parcel and critical infrastructure components. These exceedance frequencies will be solved based on average ground LIDAR elevation surfaces for building/parcel polygons, with applied sea level rise functions deterministically raising the elevation of daily high tide events through each successive year of the planning horizon. Spatial extent of probabilistic storm surge heights, as defined by most recent FEMA (2013b) evaluations, will also be evaluated and similarly adjusted by deterministic functions associated with each sea level rise scenario. Using generalized depth damage curves for buildings, building contents, and agricultural lands (USACE 1996, 1997; Scawthorn et al. 2006), the depth exceedance frequencies for private property and public infrastructure will be translated into dollar damages at an annualized basis. Future damages will be adjusted through a default annualized economic discount rate of 2% per year to simulate average inflation, although this discount assumption will be subject to revision based on participatory discussion in the VCAPS process. Future growth in annualized expected damages will be derived from extrapolation of local population increase trends onto increases of private building and infrastructure stock at the existing geo-spatial risk profile (i.e., future building will be assumed to continue with “business as usual” risk characteristics).

Adaptation options will be developed through the VCAPS process. These adaptations may include changes in future land use development policies (e.g., rolling easements, buyouts, open space preservation and zoning prohibitions), hard and soft coastal engineering (e.g., beach renourishment, levees/dikes, seawalls, and surge barriers), infrastructure and property modifications (elevation of homes, elevation of infrastructure, flood-proofing, and drainage upgrades), and preservation/restoration of natural systems (coastal wetland buffers, living shorelines, and dune restorations). Importantly, flood models developed for benefit/cost modeling will take into account hydrologic connectivity at given high tide heights, and thus provide simulation of both protection and failure points associated with elevated ridges, dunes, levees, and other barriers between the marine and built environments. Although formalized land use change modeling with specific predictions of future building locations is beyond the scope of this project, risk reduction benefits from zoning changes and other future building restrictions may be estimated through reduction or prevention of future building – or increased free board height requirements – in defined flood zones as compared to the “business as usual” assumption.

4. Project contribution to adaptation in partner communities and beyond

This project promises to make strong contributions to climate adaptation in both partner communities. The VCAPS method, as applied previously in numerous communities by co-PI Whitehead and adapted in Tybee Island, GA by PI Hopkinson and co-PIs Bryant and Evans, provides a proven mechanism for obtaining broad stakeholder input and buy-in for adaptation planning. Application of similar benefit/cost modeling of adaptation actions by PI Hopkinson and co-PI Evans in Tybee Island, GA has proven highly successful in stimulating community discussion, paring away adaptation options that show negative to marginal benefit/cost returns (e.g., construction of a large municipal seawall was found to be cost-prohibitive and generally ineffective as a local sea level rise adaptation option), and providing increased local support for near-term implementation of adaptation actions that show “no-regrets” benefit (e.g., upgrades of stormwater drainage systems, raising municipal well houses, and dedication of local funds for beach renourishment and dune maintenance). Notably, GeorgiaTrend magazine has very recently recognized GaSG and Tybee Island’s sea level rise adaptation planning efforts through a “Four for the Future” award (Rasmussen 2013). We expect that the pooled expertise between the two Sea Grant programs, as well as the broad level of local, state, and regional interest in this project as noted in attached support letters, provide the opportunity for value-added contributions to adaptation planning in Hyde County, St. Marys, throughout the SE Atlantic coastal region, and the rest of the nation.

The explicit linkage of local planning and policy recommendations to the national Flood Insurance Program’s Community Rating System (CRS) provides a further level of confidence that this project will make concrete contributions to climate adaptation in both partner communities. The benefit of CRS linkage is that implementation of adaptation actions will not only prepare the community for increased resilience to future natural hazards, but also immediately provides the very tangible possibility for residents to obtain flood insurance coverage at a lower cost that reflects the decreased hazard risk. Hyde County is currently a participant in the program, but desires to maintain its current standing in the program and further aspires to achieve a lower rating. While St. Marys is not currently a participant in the CRS, the City’s Planning Director is currently pursuing an application to CRS and desires to coordinate the activities of this project directly with the City’s CRS application. This project’s activities will specifically address the following criteria required for the CRS: public information (advising the citizens of flood hazards, flood insurance, and ways to reduce flood damage), regulations (including open space preservation, thus guaranteeing that currently vacant floodplain parcels will be kept free from development), flood preparedness and flood damage reduction. These project activities will enhance each community’s participation within the CRS, and facilitate achievement of benchmarks necessary to continue to maintain and lower their ratings over time.

The leveraging of expertise between two regional Sea Grant programs and the wide geographic spread of approximately 600 miles between Hyde County, NC (which is located on the mainland, adjacent to the Pamlico Sound) and St. Marys, GA (which is located just north of the Georgia/Florida state line and in the Jacksonville, FL metropolitan area) provide additional opportunity for making this project an important regional and national model. Pairing NCSG’s VCAPS capacity with GaSG’s benefit/cost expertise will enable both programs to perfect a community resilience planning methodology that can be expanded to other communities in each state. Core project activities will include cross-training project personnel from both programs to develop expertise in VCAPS facilitation, application of benefit/cost analyses, and linkages between adaptation planning and tangible benefits provided by CRS linkage. This will clearly represent a significant benefit for climate outreach and capacity in both programs. The lessons

learned from running two case studies in socioeconomically and governance-diverse communities will enable project personnel to develop training that would transfer the innovative methodological framework to other Sea Grant programs nationwide.

B. General Work Plan/Milestones

The central work plan activity for achieving project goals and objectives is a series of five (GA) to six (NC) site visits to each partner community over the 19-month project period (July 1, 2013 – January 31, 2015). We have organized the project work plan and milestones around the specific goals and follow up activities associated with each site visit.

Site visit 1 (~Project Month 1): An initial site visit will be made to each partner community to conduct pre-VCAPS interviews with technical staff and engage in reconnaissance of specific areas and infrastructure that the local communities have observed as being vulnerable to flood impacts. While GIS data gathering and literature review will begin before the site visit, additional GIS data and historic flood risk literature that may not be readily available through on-line sources will be solicited from the local communities. Whitehead will travel to St. Marys and Evans will travel to Hyde County for the initial site visits in each community.

Site Visit 2 (~Project Month 4): The second site visit to each community will implement the first series of VCAPS workshops. These workshops will be broken into two half day sessions, with lead facilitation provided by Whitehead for both partner communities. NCSG personnel will provide technical background and logistics support for VCAPS workshop in Hyde County, and GaSG will provide technical background and logistics support in St. Marys. Evans will partner with Whitehead and GIS specialists in each partner community to develop general vulnerability assessments as technical background for VCAPS discussions. Primary goals for these workshops will be for local stakeholders to engage with local vulnerabilities, learn about and discuss ranges of potential adaptation actions, and begin defining the community's risk tolerance thresholds for the adaptation planning process (e.g., what levels of local sea level rise and future rainfall extremes should be considered?). All of these discussions will be formally recorded through the VCAPS diagramming process.

Site Visit 3 (~Project Month 8): The third site visit to each community will implement a second series of VCAPS workshops that focus on development of detailed adaptation action scenarios. These workshops will be broken into two half days sessions, and will be co-facilitated by Whitehead and Evans using the VCAPS diagramming process for both partner communities. The key questions that will frame these sessions are: 1) What assets (both natural and built) in each partner community are most threatened by flood risk from future sea level rise? 2) What specific actions are available for the communities to address, avoid, and/or adapt to these vulnerabilities? 3) Are there identified actions that offer clear "no regret" benefits, particularly in terms of CRS criteria? 4) What actions do communities wish to consider for formal benefit/cost modeling? General technical background into the benefit/cost modeling approach will be presented in the community workshops, with additional technical details for model implementation developed through follow up communications with local flood plain managers, collaborating agency officials, and stakeholder volunteers solicited from community workshops.

Site Visit 4 (~Project Month 13): The fourth site visit to each community will provide a full workshop presentation and facilitated discussion of benefit/cost results. Through discussion of these results, the VCAPS process will iterate back from "Planning Scenarios" to the "Consequences" phase. These discussions will likely orient in three ways: 1) toward development of available tools for implementing adaptation actions in which there is broad

consensus of high benefit; 2) the provisional abandonment of adaptation options that appear to have negative or low benefit; and 3) more detailed consideration and definition of alternative adaptation action items that are suitable for benefit/cost modeling. A formal outcome from these workshops will be an outline for development of the community resilience and adaptation plan.

Site Visit 5-6 (~Project Month 19): Following site visit 4, the project principals will work with leaders in each community to develop a formal community resilience and adaptation plan that integrated VCAPS diagrams, benefit/cost modeling, and explicit links of adaptation actions to CRS criteria. While plan writing will be coordinated closely between investigators and personnel from GaSG and NCSG, GaSG will lead the plan development effort in GaSG and NCSG will lead plan development for Hyde County. These planning documents will go through technical review and revision in cooperation with each respective partner community, and will be formally presented for consideration by the governing bodies of each community in January 2015. We anticipate requiring two site visits for this purpose in NC to accommodate additional public input.

Project Deliverables: Agendas, PowerPoint presentations, VCAPS diagrams, summary write ups, and participant questionnaires will serve as deliverables for each project workshop (Site Visits 2-4). Technical benefit/cost workflows, results, supporting GIS files and spreadsheets, and summary write ups will also be provided as project deliverables. The community resilience and adaptation planning documents for each community will provide the basis for a final project report that will be the project's capstone deliverable. Communication and outreach documents, media reports, professional presentations outside of workshops, and scientific publications will also be provided as project deliverables.

1. Integration of extension/outreach to attaining outcomes

The central work flow of this project involves a series of public workshops and working collaborations with partner communities to develop community resilience and adaptation plans. This process is inherently an outreach and extension activity. To further share the process and products developed through this project, the following outreach plan will be followed. Communication specialists from North Carolina (Register) and Georgia Sea Grant (Gambill) will work with the team to publicize and record the local planning events. In addition, three outreach products will be developed: 1) a short 2-4 page overview of the process and results; 2) a resource-guide that provides contact information and trainings on the VCAPS and benefit-cost analysis process; and 3) a final project report that will allow other Sea Grant programs and/or communities to understand the process and results. The products will primarily be electronic web-based documents that are designed for easy downloading and printing. In addition professional papers will be developed, presented at professional meetings, and submitted for publication to appropriate journals and popular periodicals.

2. Evaluation criteria

This project will increase the Sea Grant National Performance Measure "number of communities that implemented hazard resiliency practices to prepare for, respond to or minimize coastal hazardous events as a result of Sea Grant activities by 2017" by two. The primary target metric for evaluating success of this project is development and implementation of adaptation plans for both partner communities. The goal of these plans will be to foster increased economic and environmental sustainability that takes into account both current climate stressors and anticipated future climate change. The most feasible near-term quantitative measure for

evaluating these outcomes will be improvements in CRS score for Hyde County, and entry of St. Marys into the CRS program. However, because tracking of plan implementation and contributions toward long-term sustainability will also involve time-scales well outside of this project period, process-based evaluations will serve as valuable proxy. Short participant questionnaires at all workshops will provide a quantitative record of workshop quality and qualitative feedback. These questionnaire results, as well as close relationships and frank discussion with community partners about project progress, will allow the team to make necessary adjustments to the project.

3. Roles of all project personnel

Charles Hopkinson will serve as the Principal Investigator for the overall project, and will provide lead supervision over project personnel and activities for GaSG. Hopkinson will also work closely with Jack Thigpen and Susan White of NC SG to coordinate NC and GA efforts and analyze the manner in which approaches need to be tailored in our two communities. Determining what works, when, and why will enable us to be more effective in other SE communities and to share *lessons learned* to other Sea Grant programs. Jason Evans will lead the development of geospatial benefit/cost analyses for both communities, co-supervise the University of Georgia graduate student assistant, assist with development of project workshops, and provide authorship support for technical project reports and outreach publications. David Bryant will provide co-development and facilitation assistance for public workshops at St. Marys, co-authorship of technical project reports, and leadership in developing outreach publications. Kelly Spratt will provide lead coordination for all St. Marys workshop and provide assistance to St. Marys and Hyde County in developing linkages between project activities and CRS. Ms. Jill Gambill will develop press releases for project activities and assist with other public outreach materials for the St. Marys project.

Susan White will oversee the project and in conjunction with Charles Hopkinson have responsibility for coordinating with other state and federal agencies and NGOs in NC, GA and the SE region, including the SECART Climate Community of Practice. This will allow the leveraging of human resources from other groups and strengthen the outreach component of the project by using the networking capabilities of these partners. Jess Whitehead will lead VCAPS facilitation in St. Marys and Hyde County, assist Evans with benefit/cost modeling assessment and outreach for both communities, and communicate technical capacity regionally. Jack Thigpen will provide outreach support for community meetings and facilitate teamwork with project members, particularly leveraging local contacts with Hyde County officials, and disseminate projects findings regionally and to other Sea Grant programs. Rhett Register will handle the public information duties for the Hyde County portion of the project, and work with Gambill to develop outreach products for community and media dissemination. Jennifer Dorton will serve as the primary contact with Hyde County and handle meeting logistics.

C. Outcomes

We expect that this project's implementation of a stakeholder-driven process for local climate adaptation action planning process has a high probability of providing action steps that will be adopted as ordinances, changes in zoning/building codes, infrastructural improvements, and ongoing education programs in both partner communities. The use of advanced adaptation facilitation tool (VCAPS) and innovative benefit/cost modeling will greatly increase the local and scientific knowledge base for developing these plans. Moreover, policy linkages to CRS

criteria will provide measurable benchmarks and the potential of immediate flood insurance reduction benefits to residents that together reflect a condition of increased local resilience. We fully expect this project will provide a replicable model for successful adaptation and resilience planning in coastal communities, and that the outreach and extension plan will successfully transfer technical capacity for conducting similarly designed projects to other Sea Grant programs and local communities throughout the region.

D. Contribution to programmatic priorities and other program element linkages

NOAA's Next Generation Strategic Plan (NGSP): The project contributes to the NGSP goals 1) Climate Adaptation and Mitigation and 4) Resilient Coastal Communities and Economies.

NSGP Goal (1) specifies that “Coastal managers incorporate a greater understanding of the risks of sea level rise” and “other climate impacts to reduce the vulnerability of coastal communities and ecosystem resources.” This project will create a framework in which both communities can identify and reduce their vulnerability to sea level rise. **NSGP Goal (4)** calls for “Resilient coastal communities that can adapt to the impacts of ...climate change.” This project would apply “science-based tools and information for assessing hazard risk, vulnerability, and resilience that coastal decision makers and community leaders can understand and use.”

NOAA National Sea Grant College 2014-2017 Strategic Plan: This project contributes to Goal (9) in the Resilient Communities and Economies Focus Area – Resilient Coastal Communities adapt to the impacts of hazards and climate change. The project will meet all four Learning Outcomes in Goal 9, and help communities make progress in achieving Action Outcomes (9.5, 9.6, 9.7, 9.8 and 9.9) that should ultimately lead to Learning Outcomes 9.10 and 9.11. The project's primary goal is to help local communities prepare for climate-related change and provide a benefit/cost analysis for mitigation strategy implementation.

National and State Performance Measure: the proposed project will hopefully lead to two communities “implementing hazard resiliency practices to prepare for, respond to, or minimize coastal hazardous events as a result of SG activities” (Hyde County, NC and St. Marys, GA). Building off of the success of previous VCAPS efforts, this project will increase the number of communities that in NC and GA that have implemented adaptation practices and policies and become a model for incorporation benefit/cost analysis in the planning process. GA SG 2014-2018 Strategic Plan has two goals in its Hazard Resiliency in Coastal Communities Focus Area, and this project will contribute towards meeting all 5 Expected Outcomes of those two goals.

GaSG and NCSG are both coordinating closely with coastal communities and state agencies to identify climate and weather induced problems and plan adaptation strategies (See current and pending projects). The project will complement current efforts by the Georgia Coastal Zone Management Program (Clough 2012) and North Carolina researchers (Allen et al. 2013) to ecosystem change models from future sea level rise, as well as ongoing research by co-PI Evans to develop spatial conflict analyses of regional land use change and sea level rise scenarios in coastal Georgia. This work will provide an initial focus for the new NCSG Coastal Communities Hazard Adaptation Specialist (co-PI Whitehead), who will work to expand NC's programmatic assistance to communities along the continuum of short-to-long-term weather and climate hazards. Recent legislation in NC on sea level rise calls attention to the need for benefit/cost analyses of adaptation options (NC House 2012). This project will begin to address this need by demonstrating a methodology for combining a proven planning tool VCAPS with a benefit/cost analysis program that will allow local leaders to objectively weigh the options of adaptation strategies in a comparative scale.

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Albemarle-Pamlico National Estuary Partnership

N.C. Department of Environment and Natural Resources

Pat McCrory, Governor

John E. Skvarla, III, Secretary

Bill Crowell, Director



April 15, 2013

To Whom It May Concern:

I am writing to express support for N.C. Sea Grant's proposal to the 2013 NOAA Sea Grant Community Climate Adaptation Initiative. This project will work with unincorporated communities in Hyde County to identify and evaluate adaptation strategies for their most pressing flood-prone areas.

For years, APNEP and N.C. Sea Grant have partnered with local communities to support climate adaptation efforts in a coordinated and complimentary way. While previous adaptation efforts in Hyde County have focused on management of farmland and natural areas, this effort will be the first to meaningfully engage the communities of Hyde County in strategically planning for projected climate influences.

Nearly all of the land in Hyde County is at less than 1m of elevation, and the county is designated as both a majority-minority and a low income area by the U.S. Environmental Protection Agency. The proposed project offers a prime example of how state and federal resources can be used to promote both climate-related and environmental justice initiatives in one of the country's most geographically and socioeconomically vulnerable regions, the Albemarle-Pamlico peninsula.

In our climate-related work, we are often reminded by our local partners that their concerns are primarily with the day-to-day operations of their government. N.C. Sea Grant provides much needed expertise, resources, and contacts to help the communities of Hyde County comprehensively address the long term challenges associated with a changing climate. We respectfully request that this project is selected for funding, and we look forward to supporting Hyde County and N.C. Sea Grant in this critical endeavor.

Sincerely,

A handwritten signature in cursive script that reads "Bill Crowell".

Bill Crowell, Ph.D., AICP, CEE

Director

Albemarle-Pamlico National Estuary Partnership

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April 18, 2013

To Whom It May Concern:

I am writing in support of the NC Sea Grant proposal to address community climate adaption in Hyde County, NC and St. Mary's GA. The State Climate Office of North Carolina is a public service center at NC State University focused on development and delivery of climate services to support communities, including extension, research, and education programs.

I have seen the success of the VCAPS process, and am eager to see this effort expanded to other communities. Hyde County, NC is particularly vulnerable to a range of climate impacts, including excess water from storms and slowly rising seas.

As an extension resource for climate information and climate science, the State Climate Office is excited to help NC Sea Grant engage Hyde County partners to better learn about their climate sensitivities and provide the historical climate risk information, and guidance on what they might expect in the future using our wealth of climate data. I also look to see how we can better integrate historical climate data into VCAPS to more easily enable other communities to explore their climate sensitivities and develop adaption planning.

Sincerely,



Ryan P. Boyles, Ph.D.

Director and State Climatologist



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric
Administration
National Weather Service
533 Roberts Road
Newport, NC 28570

April 17, 2013

Dear Reviewer,

I am writing to express support for the NC Sea Grant proposal to the 2013 NOAA Sea Grant Community Climate Adaptation Initiative which will focus on Hyde County, NC and St. Marys, GA. The NOAA National Weather Service's (NWS) mission is to provide weather, water, and climate data, and forecasts and warnings for the protection of life and property and enhancement of the national economy. The NWS Weather Forecast Office (WFO) in Newport, NC is responsible for providing weather forecast and climate information for Eastern North Carolina, including Hyde County. North Carolina's coast, particularly Hyde County's, is unique due to a barrier island system which fronts extensive sound systems that support many of North Carolina's most economically important industries such as agriculture, tourism, commercial fishing, and recreational fishing.

Depending on resources available, the NWS Office in Newport, NC would like to support and work with NC Sea Grant on their proposal for Hyde County, NC. The Vulnerability and Consequences Adaptation Planning Scenarios (VCAPS) process will provide valuable information on the local vulnerabilities which Hyde County faces and allow forecasters to better tailor weather and hazard alerts to meet the local community needs. It will also provide additional avenues for the office to provide education and outreach on weather related threats for the local communities.

WFO Newport/Morehead City, NC could participate by providing the following:

- Background information on weather events from post-storm assessments, which identifies locations or "hotspots" where hazardous conditions (e.g. flooding, surge, wind damage) have previously or frequently occurred.
- Participation at community meetings to convey information on weather-related hazards and impacts.
- Review of products and outreach materials for accuracy and appropriateness.

I view potential participation on this project with NC Sea Grant focusing on Hyde County as a valuable additional outlet for NWS WFO Newport/Morehead City's ongoing efforts to improve our services to our local stakeholders and in NWS and Sea Grant joint efforts to incorporate weather and climatology into community outreach and safety. I encourage your favorable consideration of this proposal. If you have any questions, please do not hesitate to call me at 252-223-5122 extension 222 or e-mail at richard.bandy@noaa.gov.

Sincerely,

A handwritten signature in blue ink, appearing to read "R. Bandy", with a long horizontal stroke extending to the right.

Richard Bandy
Meteorologist-in-Charge
NOAA's National Weather Service
Weather Forecast Office Newport/Morehead City, NC