

Development of a Sea Level Rise Adaptation Plan for the State of Delaware

A Response to NOAA's Coastal Services Center
Announcement for Coastal Management Fellowship

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Prepared by the Delaware Coastal Programs

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Project Contact: _____ Date: _____
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Introduction

This document represents the Delaware Coastal Programs (DCP) response to NOAA's Coastal Services Center's (CSC) request for project proposals for 2008–2010 Coastal Management Fellowships. It outlines a project proposal from the DCP, which includes the Delaware Coastal Management Program and the Delaware National Estuarine Research Reserve (DNERR) which addresses one of Delaware's most pressing issues, the development of a sea level rise adaptation plan for the State. This project includes components that meet all eight of the criteria outlined in the Project Application Requirements section of the Coastal Management Fellowship announcement.

Coastal areas and natural resource-based economies are particularly vulnerable to climate change, especially with respect to accelerated sea level rise, shoreline erosion, increased storm frequency or intensity, changes in rainfall, and related flooding. Other impacts may include changes in chemical (ocean acidification) and physical characteristics (change in current dynamics and heat exchange) of marine systems, saltwater intrusion into groundwater aquifers, spread of invasive species, habitat loss (principally coastal wetlands), species migrations, and changes in population dynamics among marine and coastal species.

Preparing for and coping with the impacts of climate change has been termed "adaptation" by the coastal research and management community. Many of these impacts will require adaptation solutions that cross federal, state, regional, and local agencies, programs, policies, and political jurisdictions. A number of federal agencies and programs have begun to explore information needs and policy options at the federal level; however, state and local governments have immediate responsibilities for managing many of the resources and communities that are likely to be impacted by climate change.

Many states are beginning to address climate change by examining the social, environmental, and economic impacts of accelerated sea level rise scenarios, resulting shoreline changes, and potential adaptation strategies. New policies are being developed to address public infrastructure siting, site-level project planning, wetland conservation and restoration, shoreline building setbacks, building elevation requirements, and alternatives to shoreline "armoring."

Sea level rise has been referred to as the ultimate planning challenge. Understanding how to address the potential for significant, or perhaps incremental, change is a difficult task. This challenge is further complicated by the broad spectrum of coastal issues and interests involved, as well as the inherent uncertainty associated with projecting changes in sea level rise. Despite these challenges, coastal managers around the world have realized the need to begin planning. The cost of not proactively planning for sea level rise could be very high on an economic, environment, cultural and social scales.

The development of a Sea Level Rise Adaptation Plan for the State of Delaware enables the State to move forward with the identified critical planning need, within the context of scientific uncertainty. Strategies will be developed based on the best science

available. Utilizing adaptive management allows for revisions to management strategies as new science and information becomes available.

Goals and Objectives

The goal of this project is to support the development and begin the implementation of a Sea Level Rise Adaptation Plan for the State of Delaware. The Fellow will play a critical part in this effort and take the lead in several areas of this project.

The major objectives of the project are to:

- Research and evaluate sea level rise management strategies and tools used at the federal level and in other states to identify potential models for Delaware.
- Review and prioritize sea level rise issues in Delaware and develop a report on the state of the science, policy, and regulatory environment.
- Develop recommendations for comprehensive sea level rise adaptation planning and management strategies and regulatory revisions.
- Develop an implementation plan for these recommendations.

Milestones and Outcomes

This project will identify and provide needed information management strategies for sea level rise that will enable coastal managers to properly manage many of the resources and communities that are likely to be impacted by climate change. This is a multi-year project that requires the effort of many individuals with varying technical backgrounds. The Fellow will be one the individuals that is crucial to the successful completion of the project.

Certain aspects of the project will be the led by the Fellow, along with being a member on the project team. The Fellow's responsibilities are divided into four phases, each of which is considered a significant milestone and has a product or anticipated outcome. The project phases, deliverables, and deliverable date from the time of project initiation are summarized in the attached flowchart. Each phase and associated deliverable is described in more detail in the project description section of this proposal.

Project Description

Phase 1: Analytic Synthesis of Preliminary Information

Compilation of background data and relevant information

Phase 1 will entail a preliminary information assessment and characterization that will enable the Fellow to become familiar with the aspects of sea level rise adaptation. This information needs assessment stage will require a background literature search and a series of face to face meetings with a diverse group of people. These meetings will discuss the many issues surrounding sea level rise adaptation and the types of information that would be most useful to make decisions on best management strategies and developing a project implementation plan.

Targeted users and decision makers, such as local governments, property owners, economic development representatives, elected officials, technical experts, non-governmental organizations and community activists, must be involved early-on. This will ensure that the adaptation plan will meet their needs and contain the information they require for informed decision making. A Core Working Group will be identified and formed to identify a set of questions to bound data needs and keep information focused on facts that will be used in process of the plan development.

Core Group Responsibilities

- Determine the structure and outcome of the process through consensus and/or informed consent (where possible), and by consulting with the agencies/groups involved
- Act as a liaison between the team and individual agencies/groups, e.g., team members represent their agency/group's position on the issues and will be responsible for reporting group decisions to their agency/group and any higher level committees that may be formed during this process
- Help plan and develop text, data, and other information to support workshops, e.g. review and summarize reports, generate summary information from data bases, etc.
- Help plan and prepare "Focus Group" meetings
- Assist with the facilitation and management of workshops and "Focus Group" meetings
- Help refine the raw materials generated at workshops and "Focus Group" meetings, e.g., review and refine materials, assist with synthesis, analysis and characterization, help write supporting summary pieces
- Take the lead in developing major components of the plan such as the characterization of the problems

Phase 2: Issue Characterization and Prioritization

Describe and prioritiz issues and shape the information for direct use

Phase 2 will result in the development of a prioritized list of sea level rise adaptation issues for the State of Delaware. It will require the Fellow to organize and lead structured workshop(s) with numerous stakeholders. These workshops will further define and characterize the issues identified in Phase 1, describing what we know, what we don't know, and what the outstanding needs are.

Components of Issue Characterization

- Description / Discussion
- Causes (Sense of Priority)

- Ecosystem Implications
 - Short & Long Term
- Socioeconomic Implications
 - Short & Long Term
- Overall Trend or Threat
 - Rapidly Declining
 - Declining
 - Not Changing
 - Improving
 - Unknown
- Occurrence
 - Seasonal
 - Year-Round / Continuous
 - Episodic
- Spatial Characteristics
- Connection to Other Problems
- Public Perception

Ranking criteria will be developed to prioritize the issues for sea level rise adaptation based on the knowledge gained from the issue characterization experience. This prioritization will be conducted with a group of stakeholders and professionals involved in sea level rise adaptation, thru a combination of meetings, workshops, and face-to-face consultations with individual stakeholders.

The prioritization of the issues will enable the group to identify and sort out which issues to move forward on first. This is important considering the reality that all issues can not be resolved simultaneously because of limited resources (people, time, funds). There is also the possibility that some issues are more important than others, and that small successes may lead to larger successes.

Sample Prioritization Criteria

- Future Resiliency – Will smaller actions now significantly reduce the threat and economic cost of addressing a much larger problem in the future?
- Urgency - Is the issue of such urgency that management solutions must be implemented to rectify the situation?
- Spatial Characteristics - Does the problem involve numerous resources over a broad area? Does it involve critical resources in a limited area?
- Existing Management - How well is the issue being addressed by existing management activities?
- Institutional Complexity- How many institutions currently have authority for addressing the problem?
- Regulatory Regime - Can existing regulations be significantly modified/ strengthened to help address the problem?
- Available Financial Resources - Does funding exist, or is it easily available, for developing and implementing management strategies to address the problem?
- Public/Political Preference - Will efforts to resolve this issue be supported?

Phase 3: Strategy Development

Identify and describe management strategies

In Phase 3, the Fellow and Core Working Group will review the prioritized issue characterizations, identify specific targets and draft strategies to meet targets. These strategies will incorporate additional information and develop/improve operational details.

The additional details that must be developed will require assistance from technical experts outside the Core Working Group. Small, specialized focus groups will be formed in order to carry out this work. This information will become the raw material for crafting action plans that reflect reality.

Phase 4: Implementation

Building/maintaining momentum and getting results

In Phase 4, the Fellow will continue working with focus groups for the further refinement and initial drafts of mechanisms (legislation, policies, interagency agreements, etc.) that will put the ideas into action. After review and recommendation by the Core Working Group, action plans, draft implementation mechanisms, a framework/process for ongoing management of sea level rise adaptation will be developed.

Fellow Mentoring

From joining the project to completion of the Fellowship term, the Fellow will be fully integrated into this project as part of a team. The Fellow will be under the primary supervision of the Delaware Coastal Programs' Environmental Program Manager II, but will work very closely with staff from both the DCP and the DNERR. The Fellow will be located in the same offices as the DCP staff, and may have office space available at the DNERR. The Fellow will truly be a part of the Delaware Coastal Programs and one of the Program's key networked partners for the full two years.

The challenging tasks of this project cannot be met by an individual effort. It will require the teamwork of many. As such, the Fellow will be part of this team of coastal management professionals, and will never be left without a team member to provide guidance or assistance at the time it is needed. This team integration approach will ensure that the Fellow receives the maximum concentration of educational and professional development opportunity possible while gaining valuable experience on the front lines of one of the most pressing, and challenging, coastal management issues facing not only the State of Delaware, but coastal states nationwide.

The DCP team for this project has extensive experience to carryout each phase of this project, providing the Fellow an opportunity to work very closely with professionals with various types of specialized expertise. The Fellow will be encouraged to take the lead on several phases, and will have the guidance, assistance, and leadership from a pool of team members whenever needed to ensure the project's success.

The Project Team and percent of their staff time dedicated to this project is outlined below:

- Coastal Management Fellow (100%)
- David B. Carter, DCP Environmental Program Manager II (20%)
- Kimberly B. Cole, DCP Environmental Scientist (30%)
- Robert W. Scarborough, Ph.D., DNERR Research Coordinator (40%)
- Bartholomew Wilson, DCP Environmental Scientist (10%)
- Carl Yetter, DCP Environmental Engineer (20%)

- Lonnie Dye, DCP Application Support (10%)
- Jennifer Holmes, DNERR Education Coordinator (10%)
- Tony Pratt, Shoreline & Waterway Management Administrator (10%)
- Michael Powell, DEMA Program Coordinator (10%)
- Lisa Pietro, SWM Environmental Scientist (10%)
- Greg Williams, SWM Environmental Scientist (10%)

The Fellow will also be offered the opportunity to participate in other Delaware Coastal Programs efforts for further educational and professional development and integration into Delaware's Coastal Management Program and the Delaware National Estuarine Research Reserve. This may include working on the technical aspect of sea level rise modeling, an assistance grant program to local governments, federal consistency, benthic habitat mapping program, sediment elevation tables and working with environmental justice issues. This will provide the Fellow additional experience in conducting fieldwork, policy analysis, data analysis, and technical research.

Project Partners

The project partners listed below each have communicated interest and support in the development of a sea level rise adaptation plan for the State of Delaware. They also have a vested interest in the high quality data that this project will provide. All have agreed to participate in the project and provide the data and technical support to make the project a success.

- Delaware Department of Natural Resources and Environmental Control
 - Division of Soil and Water Conservation
 - Delaware Coastal Programs
 - Delaware Coastal Management Programs
 - Delaware National Estuarine Research Reserve
 - Shoreline & Waterway Management Program
 - Division of Fish and Wildlife
- Federal Government
 - NOAA
 - USGS
 - USFWS
- NGOs
 - Delaware Nature Society
 - The Nature Conservancy
 - Partnership for the Delaware Estuary
 - Center for the Inland Bays
 - Sierra Club
- Private
 - Business/Industry

- Tourism
- Real Estate
- Insurance
- Academia
 - SeaGrant
 - Port of Wilmington
 - Public/Special Interest
 - Waterfowl hunters
 - Recreational fishing
 - Waterfront residents
 - Birders
 - Civic Groups

Cost Share Description

The Delaware Coastal Management Program will provide a furnished office including a personal computer with office software (Microsoft Office), ArcGIS Software, and other software as needed. The Fellow will also have full State e-mail and internet e-mail capabilities, access to all DNREC and DCP network data drives (Approximately 60 GB of GIS & non-spatial data), and will have access to a shared laptop.

In addition, the DCP will provide funds and materials for all workshops & symposiums required for the project, funding for any necessary training, as well as printing, photocopying, mailing, and incidental costs for project interim products. Significant DCP grant funds will also be utilized for research to support the project through sea level rise modeling, sediment elevation tables, and bathymetric mapping.

The DCP will provide all work transportation and state vehicles will be available for all project work activities as needed.

Funds are also available for travel to professional conferences or meetings in which the project aspects are presented and for project related training

The DCP will provide the \$15,000 Fellowship match through the State match. This will be paid in two \$7,500 per year payments.

Thematic Area

This fellowship touches on each of the thematic areas described in the call for proposals.

- i. Projects contributing to the development of a Community Resilience Index for assisting and measuring hazard resilience in all areas – economically, culturally, socially, and environmentally**
 - **Development of adaptive management tools for local resilience assessment**

Many states are beginning to address climate change by examining the social, environmental, and economic impacts of accelerated sea level rise scenarios, resulting shoreline changes,

and potential adaptation strategies. New policies are being developed to address public infrastructure siting, site-level project planning, wetland conservation and restoration, shoreline building setbacks, building elevation requirements, and alternatives to shoreline “armoring.” The cost of not proactively planning for sea level rise could be very high on an economic, environment, cultural and social scales. The development of a Sea Level Rise Adaptation policy for the State of Delaware must be considered a fundamental aspect of community and natural resource resiliency to coastal storms.

- ii. Projects that will identify hazard resilience indicators, including physical, environmental, sociocultural, and economic resilience factors**
- **Development of multidisciplinary vulnerability assessment tools**
 - **Development of local decision-support or scenario tools related to a Community Resilience Index**

The identification, characterization, prioritization and collection of a wide range of coastal data through Phase 1 and 2 of this project will provide the input needed to assess vulnerability. Development of Sea Level Rise Adaptation policies will be based on these identified data and related analyses and can be used to prioritize policy agendas and risk mitigation activities in higher risk areas.

- iii. Outreach projects aimed at improving decision makers’ understanding of resilience concepts and applications**
- **Projects improving knowledge and practices related to risk perception**

Targeted users and decision makers, such as local governments, property owners, economic development representatives, elected officials, technical experts, non-governmental organizations and community activists, will be involved early-on in the process with the assistance of the Education Coordinator of the Delaware National Estuarine Research Reserve. This will ensure that the Sea Level Rise Adaptation Plan will meet their needs and contain the information they require for informed decision making.

- iv. Projects that increase information about or integrate ocean observations to develop visualization and forecasting tools related to the following:**
- **Coastal inundation caused by a variety of stressors**
 - **Shoreline change and coastal buffers**
 - **Coastal storms and event-related coastal and inland flooding**
 - **Climate variability and sea level hazards**

Examples of visualization products developed during this project include maps and figures showing current sea level rise, predicted average sea level rise and predicted maximum sea level rise for the years 2050 and 2100 and estimated sea level rise due to Nor’easters based on historic data.

- v. Projects that provide data, tools, or information related to landscape or seascape conditions or use patterns (historical, current, or future) to support the following:**
- **conservation and habitat restoration planning**

- **alternative land use planning**
- **recreation and tourism planning**

The development of a Sea Level Rise Adaptation Plan addresses the thematic area focused on historical, current, and future conditions of landscapes and seascapes to support alternative land use and conservation planning. The Plan will incorporate the social, environmental, and economic impacts of accelerated sea level rise scenarios, resulting shoreline changes, and potential adaptation strategies. New policies will need to be developed to address issues such as public infrastructure siting, site-level project planning, wetland conservation and restoration, shoreline building setbacks, building elevation requirements, and alternatives to shoreline “armoring.”

- vi. Projects that exemplify, provide access to, allow for understanding of, or explicitly incorporate the principles of ecosystem-based management strategies**
- **Projects that integrate biophysical and socioeconomic data and information with applicable policies and laws.**

As described in Phase 2 and 3, scientific data and concepts will be considered with social, economic, geographic, and political realities to develop attainable and realistic Sea Level Rise Adaptation strategies.

- vii. Projects that increase coastal managers’ strategic knowledge of laws, policies, and decision-making processes for watershed management**

The goal of this project includes the review and prioritize sea level rise issues in Delaware and develop a report on the state of the science, policy, and regulatory environment; the development of recommendations for comprehensive sea level rise adaptation planning and management strategies and regulatory revisions and the development of an implementation plan for these recommendations.

- viii. Projects that demonstrate the benefit of integrated ocean observations to the coastal management issues listed above (e.g., applying hydrographic models to coastal erosion issues, assessing seascape conditions using climatological ocean observation data)**

Phase 1 and 2 of this project will include an assessment of potential applications of Integrated Ocean Observing System assets such as the Delaware Environmental Observation System (DEOS) a support tool for decision makers involved with emergency management, natural resource monitoring, transportation, and other activities throughout the State of Delaware as part of the Delaware Coastal Programs efforts to evaluate the effects of sea level rise on coastal Delaware.



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Coastal Services Center
2234 South Hobson Avenue
Charleston, South Carolina 29405-2413

November 14, 2007

Mr. David Carter
Department of Natural Resources and Environmental Control
Division of Soil and Water Conservation
89 Kings Highway
Dover, DE 19901



Dear Mr. Carter:

On behalf of the National Oceanic and Atmospheric Administration (NOAA) Coastal Management Fellowship Program, I am pleased to provide official notification of the selection of the Delaware Coastal Management Program to receive a Coastal Management Fellow. The NOAA Coastal Services Center received a number of outstanding proposals, and your project, "Development of a Sea Level Rise Adaptation Plan for the State of Delaware," was selected as one of the best. The selection committee felt your project would provide an excellent opportunity for a fellow to work on a project of critical need.

The recruitment process for the fellow candidates is now underway. We have sent the formal selection announcement and application packages to all Sea Grant programs, and I have enclosed several fact sheets about the fellowship for your information. By the middle of March, the committee will have selected the 12 finalists who will come to the matching workshop in Charleston, South Carolina, in May 2008.

As mentioned in previous materials, the state is responsible for providing \$15,000 in nonfederal matching funds. In the fall of 2008 and 2009, you will need to transfer \$7,500 to the fellowship administrator. More details will be provided at the matching workshop in May.

The next steps for you are as follows:

1. As the mentor, plan to attend the matching workshop from May 5 to 9, 2008, in Charleston. During this four-and-a-half-day meeting, final interviews, selections, and fellow placements will be made. The state is responsible for covering the costs of your trip to the workshop.
2. Plan to host the fellow during May, June, or July for a pre-fellowship planning visit. The purpose of this visit is to introduce the fellow to the office, to begin preliminary discussions on the project, and to provide an opportunity for the fellow to look for housing. Normally these visits last several days. The NOAA Coastal Services Center will pay for the fellow's airfare to the state for this visit, but the state is responsible for reimbursing the fellow for hotel, per diem, and ground transportation.

Here are important upcoming dates for the fellowship program:

- Applications due to Sea Grant directors from candidates – January 28, 2008
- Nominations due from Sea Grant directors – February 25, 2008
- Finalists selected – March 24, 2008



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November 14, 2007

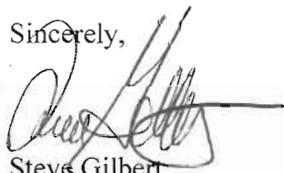
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- Matching workshop – May 5 to 9, 2008
- Fellow planning visit to the state – May/June/July 2008
- Fellow begins – August 1, 2008

As the date of the matching workshop approaches, Margaret VanderWilt will send you information on hotel accommodations. In addition, in late March she will send the application packages of the selected finalists for your review.

Congratulations again on your selection for placement of a NOAA Coastal Management Fellow. We look forward to working with you in this program. If you have any questions, please feel free to contact Margaret VanderWilt at (843) 740-1273 or via e-mail at Margaret.VanderWilt@noaa.gov.

Sincerely,



Steve Gilbert
Program Manager
Coastal Learning Services