

## *New Jersey Coastal Resiliency Enhancement Project*

### 1. BACKGROUND AND INTRODUCTION

New Jersey is the most developed and densely populated state in the nation with much of that population concentrated in coastal and tidal shoreline areas.

Many parts of New Jersey's densely populated coast are highly vulnerable to the effects of flooding, storm surge, episodic erosion, chronic erosion, sea level rise, extra-tropical, tropical storms, and hurricanes. New Jersey's coastal area is comprised of a variety of different landscape types ranging from elevated headlands to wave-dominated and mixed-energy barrier islands to extensive mosaics of tidal and freshwater wetlands. The entirety of New Jersey's coastal area is subject to the damaging impacts of coastal hazards including riverine and coastal flooding and gale-force winds from hurricanes, nor'easters and extreme rain events. Unfortunately, the proximity of much of New Jersey's population and infrastructure lies within these highly vulnerable regions of the state. Long-term biophysical and climate trends indicate that New Jersey will likely be subject to continued shoreline erosion, higher sea levels, and accompanying loss of natural coastal buffers (leading subsequently to more extensive overland storm surges and periodic inundation/flooding) as well as stronger and more frequent storm events. As a result, coastal managers and decision makers need to accurately identify natural hazard risks and vulnerabilities in order to provide proactive guidance in planning and mitigating against potentially damaging events. (New Jersey Coastal Management Program Section 309 Assessment [2011-2015], Coastal Hazards Priority)

New Jersey suffered extraordinary levels of damage to homes, businesses, and infrastructure as a result of Hurricane Sandy. In addition to the loss of life, damage to property and businesses, and disruption to the lives of the state's residents, unprecedented damage was done to the coastal environment. In light of the increased likelihood of similar events, it has become apparent that New Jersey needs to develop comprehensive and integrated programs for improving the long-term safety and sustainability of coastal communities and critical natural resources.

The New Jersey Department of Environmental Protection, led by the New Jersey Coastal Management Program (NJCMP), has developed and has begun to implement two related initiatives – **Resilient Coastal Shorelines** and **Resilient Coastal Communities** – that will:

- characterize and assess coastal vulnerabilities under a range of hazard scenarios,
- develop risk management options to address these vulnerabilities,
- assist communities and resource managers in implementing these strategies, and,
- within a stakeholder-based process, identify long-term changes in State policies and regulations that will institutionalize increased coastal resiliency requirements and practice.

A growing body of literature confirms that ecosystem-based management strategies are a superior and lower cost approach to improving and maintaining shoreline protection and coastal ecological quality.<sup>1</sup>

### **Resilient Coastal Shorelines Initiative**

*New or revised coastal management and restoration programs and/or guidelines, procedures and policy documents are being proposed as a Wetlands strategy. The strategy proposes to identify adaptive and/or alternative shoreline stabilization strategies to protect and enhance tidal wetlands as well as to identify the geographic areas and situations best suited to the implementation of the strategies. This strategy will also address the development of guidelines and enforceable policies supportive of the use of living shorelines or other adaptive management strategies as alternatives to or in conjunction with new or retrofitted shoreline stabilization structures. (NJCMP Section 309 Assessment [2011-2015], Wetlands)*

Prior to Hurricane Sandy, the NJ Coastal Management Program, working with its partners, was focused on the growing hazards of sea level rise which, along with erosion, was contributing to the loss of coastal wetland areas. The State had recognized the need for and taken preliminary steps that enable the use of living shorelines that protect, restore or create coastal wetlands and other natural shoreline types. In the aftermath of Hurricane Sandy, most New Jersey communities are struggling to effectively manage recovery and rebuilding efforts. The effectiveness of natural shorelines to absorb storm energy and minimize flood damage has raised interest in the use of more natural living shorelines techniques in all coastal areas to increase resiliency. Most New Jersey communities do not have the capacity to begin the monumental effort of becoming more resilient in the face of increasing coastal hazards. Conversely, there is a significant and growing capacity in government, academia, and non-governmental organizations (NGOs) to provide assistance on these issues.

Recognizing the need and the existing expert capacity, relevant coastal management stakeholders have met and developed the outline of a Resilient Coastal Shoreline Initiative. The following first steps have been identified:

- establishment of a professional network of partners to assist in the development and implementation of the statewide resilient coastal shorelines plan;
- coordination of the various efforts of living and “green” shoreline practitioners;
- establishment of a centralized and coordinated source of information through the creation of a NJ Resilient Coastal Shorelines webpage; and
- a comprehensive shoreline characterization and assessment inventory to guide and coordinate the implementation of resilient shoreline practices.

A primary proposed output of this effort is a NJ Resilient Coastal Shorelines Strategic Plan. The statewide resilient coastal shorelines plan will be used to influence and shape coastal zone policy and regulations.

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<sup>1</sup> Arkema, K. et al. Coastal habitats shield people and property from sea-level rise and storms. 2013. Nature Climate Change, 3, 913-918.

A key component of the statewide Resilient Coastal Shorelines Plan will be a GIS-based assessment of New Jersey's coastal shorelines that identifies coastal areas most vulnerable to coastal hazards including storm surge and sea level rise, and considering both current and future risks. A characterization of the suitability of coastal shoreline areas for green infrastructure approaches will also be completed. This shoreline characterization and assessment will look not only at areas suitable for installation of living shorelines and related green infrastructure but also consider areas subject to conventional protection structures and evaluate existing and potential opportunities to enhance the ecological values at these locations while maintaining (or increasing) protection from flooding and erosion hazards.

### **Resilient Coastal Communities Initiative**

With the one-year anniversary of Hurricane Sandy quickly approaching, the State of New Jersey and impacted communities are beginning the transition from recovery to planning and redevelopment. This program change will seek to make New Jersey communities more resilient to coastal hazards by providing them the appropriate tools, information, guidance, and technical assistance needed to make informed decisions on mitigation and adaptation measures. As noted above, towns will require assistance from higher levels of government as well as NGOs and academia to develop appropriate resiliency and hazard mitigation plans. The New Jersey **Resilient Coastal Communities Initiative** will provide technical assistance to communities impacted by Sandy and those vulnerable to future coastal hazards.

#### **Goal and Objectives**

- The goal of the Resilient Coastal Communities Initiative is to provide improved and coordinated tools and technical assistance to New Jersey's coastal communities seeking to recover from Hurricane Sandy, improve community resilience, and reduce impacts from future coastal hazards.

#### **Year One Objectives**

- Complete coastal hazard vulnerability assessments for coastal communities;
- Communicate to coastal communities the intent, value and proper use of the vulnerability assessments;
- Assess community needs, and the status and effectiveness of current and planned measures;
- **Prepare an online compendium of resiliency tools and strategies that reflect on-the-ground conditions and community needs in New Jersey, as well as best management practices in the U.S. and abroad.**

#### **Year Two Objectives**

- **Enhance and optimize coastal resiliency tools for implementation by coastal communities, project partner, and others;**
- Provide outreach, guidance and technical assistance to communities recovering from Hurricane Sandy;
- Determine recommended changes to the New Jersey Coastal Management Program.

It is anticipated that the work conducted under the **Resilient Coastal Shorelines Initiative** – identifying the most appropriate locations for living shorelines and other green infrastructure that will provide protection from coastal hazards while also enhancing ecological quality in these areas -- will input into and directly support the **Resilient Coastal Communities Initiative** and community efforts to improve hazard resiliency and coastal environmental quality (per the bolded Objectives above).

## **2. GOALS AND OBJECTIVES**

Goal:

The Goal of the **New Jersey Coastal Resiliency Enhancement Project** is to improve the ability of the State of New Jersey and the state’s coastal communities to reduce the risks to residents, businesses, property and natural resources from future storm events by identifying and implementing feasible, effective and affordable hazard mitigation strategies.

Objectives:

- 1) Work with State agencies, local govt., NGO and the academic community to help implement NJDEP's on-going Resilient Shorelines and Resilient Community Initiatives
- 2) Assess the vulnerabilities of coastal community populations, property, infrastructure and natural resources due to coastal hazards.
- 3) Identify risk management options for addressing these vulnerability risks, with a special emphasis on shoreline protection strategies that also improve ecological quality and outcomes
  - a) Develop NJ Resilient Coastal Shorelines Strategic Plan (includes plan to develop design guidance for “greening” shorelines with traditional hard protection structures)
  - b) Adhere to Dutch engineering principle to build “Soft where soft is possible and hard where hard is required.”
- 4) Develop long-term changes in State coastal policies and regulations to institutionalize increased coastal resiliency.

## **3. MILESTONES AND OUTCOMES**

*Year 1:*

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|----------|---|
| Month 2  | Establishment of a Resilient Coastal Shorelines Steering Committee; Committee meeting; development of preliminary Resilient Coastal Shorelines Initiative work plan |
| Month 6  | Development of a Resilient Coastal Shorelines Webpage   |
| Month 12 | General characterization and assessment of coastline for areas at-risk; suitability analysis for shoreline protection projects that enhance ecological quality      |
| Month 12 | Draft statewide NJ Resilient Coastal Shorelines Strategic Plan  |

**2014 Coastal Management Fellowship Application** (Nov 19, 2013 Rev.)

**New Jersey Coastal Management Program** (contact: Marty Rosen; martin.rosen@dep.state.nj.us)

*Year 2:*

- Month 10 Detailed characterization and assessment of three distinct shoreline types; project design for living shoreline and eco-enhanced conventional coast armoring.
- Month 10 Identification of shoreline zones where similar types of projects are warranted
- Month 10 Identification of research and development needs to address technical issues and information gaps
- Month 12 Final statewide NJ Resilient Coastal Shorelines Strategic Plan

**4. PROJECT DESCRIPTION**

- a) Convene Stakeholder Steering Committee – roles: strategic direction and project partners
  - i) State government (land use and natural resource programs); NGOs active in living shoreline development and/or coastal protection; property owners; municipal officials; academia.
  - ii) Project commencement workshop –LS Program purpose & direction; solicit feedback and participation
  - iii) Identify partners for pilot project collaborations
  - iv) Meet periodically at key project decision points.
  
- b) Shoreline Assessment
  - i) Characterize NJ coastline for areas at-risk and living shoreline project suitability (GIS-based)
    - (1) The Rutgers University Center for Remote Sensing and Spatial Analysis will be hired to serve as technical lead on this task. NJDEP staff will supplement this effort.
    - (2) NJ shoreline will be inventoried and assessed for those physical parameters having greatest relevance to design and construction of coastal protection and resilience structures; existing structures will be a part of the inventory.
  - ii) Identify “zones” (based on similar physical characteristics) where similar types of projects are warranted in order to ensure their mutual success
    - (1) Under contract to NJDEP, the Stevens Institute of Technology is developing engineering guidance for the selection and design of the types of living shorelines approaches likely to be implemented in NJ. This project will have two primary deliverables:
      - (a) A series of reports, one for each selected approach, detailing analyses of physical principles and site characteristics related to the stability, constructability and performance of each approach; and
      - (b) A site evaluation tool to assist engineers, developers and regulators in assessing conditions at a proposed site. The tool will provide a template to ensure that all necessary factors are taken into consideration prior to project design.
  - iii) Identify locations where conventional coastal armoring exists and evaluate opportunities to “green” (add/increase ecological benefits).
    - (1) The Stevens Institute of Technology guidance document noted above will also be applied to this task.

- c) NJ Resilient Coastal Shoreline webpage
  - i) Create central repository and resource for living shoreline and green coastal infrastructure information and activities
  - ii) Establish a website that would include links to and/or data from relevant research, projects, State and Federal programs, literature reviews, and any other information relating to living shorelines.
  
- d) Research and assessment tasks
  - i) Literature search of current technology and practice relating to greening shore protection structures.
  - ii) Identify where more detailed assessment of coastal conditions is needed
  - iii) Examine successful Living Shoreline/green infrastructure programs elsewhere for models and useful lessons
  - iv) Update NJ shore protection structure inventory
  
- e) Identify and design pilot projects within the different “zones.”
  - i) Test Living Shoreline design guidelines developed by Stevens Institute of Technology (under NJCMP contract)
  - ii) Develop and initiate project monitoring program with pilots; modify as necessary to serve as monitoring process for all projects.
  
- f) Assess NJ living shorelines rule and governance framework for potential amendments
  - i) Develop criteria and evaluate projects’ development, construction and implementation experience under current NJ living shorelines rules.
  - ii) Identify where rule and/or policy changes may be warranted.
  
- g) Develop NJ Resilient Coastal Shorelines Strategic Plan
  - i) Provide short, medium and long-term direction and outcomes for establishing living shorelines and green coastal infrastructure as the state’s preferred approach to coastal protection and hazard management

**4.A. FELLOW DUTIES UNDER THIS PROJECT DESCRIPTION**

It is anticipated that the Fellow will primarily be engaged in the coastal engineering and other technical tasks identified above. Thus, a Fellow with a background in engineering and/or coastal processes is preferred. If this match is not possible, there is a sufficient array of needs within this overall project plan that different types of expertise can be productively accommodated.

**Primary Duties:**

- *Task b) i) Coastline Characterization* – This task will commence but not be completed prior to start of fellowship. Fellow will assist in its completion, including site visits to validate GIS mapping results.

- *Task b) ii) Development of “zones” map* – Fellow will have the lead in evaluating coastline characterization assessment and developing a map of “zones” reflecting areas suitable for similar resiliency measures (either new or retrofits).
- *Task b) iii) Assessment of “Green” Resiliency Retrofits Potential* – Fellow will assist mentor in evaluating existing hard coastal protection structures for their potential to add design changes that improve ecological values.
- *Task d) Research and assessment tasks* – Within this overall task, fellow will have lead in exploring and documenting literature for instances and experience in incorporating green design features during construction of conventional coastal protection structures as well as retrofitting existing structures.
- *Task e) Identify and design pilot projects within the different “zones”* – Fellow will have the lead in designing and implementing this task.
- *Additional Resilient Shoreline tasks as time and interest permit.*

## **5. FELLOW MENTORING**

### Project and Staff Engagement

While the fellow’s primary responsibility will be to assist in this NJ Coastal Resiliency Enhancement Project, including both independent and supporting tasks, it is expected that, per NJDEP’s previous fellow placements, the fellow will be given every opportunity to participate in a wide range of coastal management activities (planning, regulatory and policy). This will include attendance at a variety of meetings and other events both within and external to the NJ Coastal Management Program, e.g., project planning discussion, staff meetings, stakeholder engagement activities, training, conferences, seminars, etc. The fellow will, as interests dictate, expertise allows and time permits, have the opportunity to participate in additional projects beyond the one described here. We take the fellow’s professional development very seriously and will make every effort to ensure his/her career development goals and expectations are met -- constant communication between the fellow, mentor and coastal management program staff will strive to keep the fellow targeted and supported in the day-to-day activities while also allowing understanding the larger coastal management context within which these activities occur.

### Day-to-Day Supervision and Education

While the assigned mentor will have daily responsibility for overseeing and guiding the fellow’s activities, it is anticipated that other key program staff will also provide close and regular contact with the fellow related to this project’s aspects as well as other coastal issues, reflective of their respective expertise and experience. Basically, we envision mentoring as a team teaching effort. Program staff understands its responsibility to support the fellow as needed and will be accessible as requested.

### Mentor

Steven Jacobus will serve as Mentor to the fellow. Mr. Jacobus possesses a Bachelor of Science in Civil Engineering with a specialization in Water Resources from Rutgers University. He is a Section Chief

within the Office of Coastal and Land Use Planning and is the project manager for NJDEP's Living Shorelines Initiative.

## **6. PROJECT PARTNERS**

### Resilient Coastal Shorelines Initiative:

- Grant F. Walton Center for Remote Sensing and Spatial Analysis, Rutgers University
- Partnership for the Delaware Estuary
- Barnegat Bay Partnership
- Jacques Cousteau National Estuarine Research Reserve
- American Littoral Society
- New Jersey Sea Grant Consortium
- NOAA Office of Restoration

### Resilient Coastal Communities Initiative:

- Jacques Cousteau National Estuarine Research Reserve
- Rutgers University, Edward J. Bloustein School of Planning and Public Policy
- Recovery Planning Manager, New Jersey Future
- Monmouth University Urban Coast Institute
- Sustainable Jersey

## **7. COST SHARE DESCRIPTION**

NJDEP will provide its \$15,000 cost share from the Department's Policy and Planning account.

The Fellow will be given individual office space and have access to all office support and resources available to the full-time staff. Any special needs will be met to the best of the program's ability.

## **8. STRATEGIC FOCUS AREA**

This project will support the following Strategic Focus Areas:

### *Healthy Coastal Ecosystems*

- Build innovative natural and social science research capacity, products, and applications that reflect user-driven science, and synthesize, visualize, communicate, and transfer research results to strengthen policies and decisions, and effectively manage coastal and ocean resources.
- Support coastal and ocean resource managers through cooperative funding, data, information, tools, training, technical assistance, analysis, and exchange of best practices to strengthen ecosystem policies, build capacity, and implement prioritized management efforts.
- Enable conservation and restoration of critical coastal ecosystems and habitat by integrating

priorities and interests across agencies and partner organizations using geospatial applications to align interests, communicate priorities, and pool resources.

*Resilient Coastal Communities*

- Foster user-driven science and assessment efforts to enhance understanding of natural, social, and economic impacts of coastal hazards and climate change, and the approaches needed to adapt to and communicate about these threats.
- Build capacity to pursue strategies such as hazard preparedness, mitigation, and post-hazard redevelopment planning by providing an integrated suite of data, information, training, technical assistance, cooperative funding, and policy tools to coastal communities.
- Identify and engage partners in maximizing the understanding, visualization, and application of risk-wise strategies.

*Vibrant and Sustainable Coastal Economies*

- Promote policies and practices that foster trust, transparency, predictability, and efficiency in government decision-making for coastal and ocean uses.
- Assist coastal decision makers in conserving active and passive recreational uses and in preparing for existing and emerging coastal and ocean uses by providing socioeconomic data, information, visualizations, technical assistance, funding, and tools.
- Build capacity of coastal states and communities to foster ecologically sustainable economic development and activities.
- Understand, quantify, visualize, and communicate ecosystem services of key natural areas along the coasts to inform decision-making.