

The Role of Natural and Nature-Based Features and Sediment Management in Climate Resilience in Maryland



Submitted to:

2017–2019 Coastal Management Fellowship Program
NOAA Coastal Services Center
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Submitted by:

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October 14, 2016



I. BACKGROUND AND INTRODUCTION

As Maryland and the Mid-Atlantic region grapple with the impacts of climate change there is a need to better understand how dredged material can be used to enhance restoration and resiliency projects that protect our coastal ecosystems and communities. There is also an ever-present need for dredging projects to maintain access to maritime commerce or recreational water access sites such as ports, harbors, marinas and bays throughout Maryland.

In 2001, Maryland passed the Dredge Material Management Act. This Act formally defines Maryland's definition of "Beneficial Use" of dredged material as any of the following uses of dredged material from the Chesapeake Bay and its tributary waters placed into waters or bottomland of the Chesapeake Bay or its tidal tributaries, including Baltimore Harbor:

- Restoration of underwater grasses
- Restoration of islands
- Stabilization of eroding shorelines
- Creation or restoration of wetlands
- Creation, restoration, or enhancement of fish or shellfish habitats

Since then, the Maryland Port Administration and the Maryland Dredged Material Management Program Executive Committee have made efforts to evaluate options within the Baltimore Harbor, but currently no policies or procedures exist for other regions in Maryland, specifically in relation to the application of dredged material on Maryland Department of Natural Resources (MD DNR) lands.

As Maryland begins to look at how its robust restoration programs and projects that are currently driven by a need to improve Chesapeake Bay water quality goals can also aid in advancing state climate and community resilience goals, the practice of incorporating dredge material into restoration projects is changing. At the same time, a number of efforts - especially on Maryland's Eastern Shore - are utilizing a technique called thin-layering to hydraulically pump sediment onto marshes. This practice has been done or proposed in various locations for different purposes and implemented on a pilot scale based on resource availability and convenience. In some places the thin layer sediment application has been pursued to assist marsh habitats persist in the face of rising sea levels, combat erosion, or support the capacity of wetlands to migrate (e.g. Blackwater National Wildlife Refuge, MD). In other areas the practice has been used not only in support of primary habitat goals, but also to help meet water quality improvement targets and local navigational dredging needs (e.g. Poplar Island, MD; Avalon, NJ). Habitat and dredging needs in these types of projects aren't always mutually exclusive. In projects such as the Ferry Point living shoreline site on Kent Island, MD¹ there was a need to dredge for access purposes and a need for project material for incorporation into containment berms.

As the conversations surrounding dredge material, restoration and climate resilience begin to overlap more frequently it is becoming increasingly apparent that there is limited information and research about the impacts of this type of application on marsh systems. Resource and coastal managers need more information and understanding about how existing ecosystems will perform with the introduction of layered sediments of unspecified depth, grain size, composition, etc. Additionally, many regional partners, such as the Chesapeake Bay Sentinel Site Cooperative (CBSSC) and the Mid-Atlantic Regional Council on the Ocean (MARCO), are beginning to focus their attention on the beneficial reuse of dredge material. Therefore, there is an immediate opportunity and need to identify how dredge material might help meet Maryland's climate resilience goals for communities and habitats alike.

¹ <http://news.maryland.gov/dnr/2014/01/30/dnr-and-partners-restore-shoreline-at-ferry-point-park/>

Throughout this project, the Coastal Fellow would not only have the opportunity to engage in Maryland processes and policy surrounding resilience projects and dredge materials, but would also be encouraged to develop an understanding of regional approaches to sediment management and beneficial uses of dredge material. One of the partners that Maryland is working with to advance this dialogue is the MARCO Climate Change Action Team (CCAT). The mission of CCAT is to prepare the region's coastal communities for the impacts of climate change on ocean and coastal resources. One of the CCAT's top priorities is to better understand and coordinate the beneficial use of dredge material.

The purpose of this fellowship project is to begin advancing the dialogue about beneficial use of dredge material in coastal resilience projects within Maryland and the Mid-Atlantic region; work toward development of a DNR lands policy guiding this practice; and address some on-the-ground examples of thin-layering projects to be able to advance the monitoring and science behind this practice and technology.

II. GOALS AND OBJECTIVES

This project has two overarching goals, each with related objectives. They are defined as follows:

Goal 1: Understand the challenges, options and practices for beneficial reuse of dredge material in Maryland and the Mid-Atlantic and what opportunities exist to promote and enhance natural and nature based features for community resilience with these materials.

Objective: Review and understand current work and science in Maryland and the Mid-Atlantic regarding (1) the practice and use of dredge material in habitat and restoration projects such as thin-layering and living shorelines and (2) restoration and habitat management's emerging role in planning for and adapting to climate change.

Objective: Maryland's Coastal Management Programs² are pursuing Project of Special Merit and Science Collaborative applications to identify the most protective marshes at risk due to future sea level rise or other climate and environmental impacts. The Fellow will explore management options to increase the resiliency of these sites, including restoration options such as thin-layering.

Objective: As a field-based component, work to develop and implement pre- and post-construction monitoring at a proposed thin-layer project at an Ellis Bay Wildlife Management Area to inform future beneficial reuse projects.

Goal 2: Develop a DNR-wide policy document and decision-support tool for beneficial reuse of dredge materials on DNR lands/waters.

Objective: Facilitate a conversation between DNR land and aquatic management units about the benefits and challenges of implementing beneficial reuse materials from various perspectives - e.g. access and navigation needs, habitat restoration, permitting challenges, and/or building climate resilience.

² Maryland's Coastal Management Programs (both the Coastal Zone Management Program and the Chesapeake Bay National Estuarine Research Reserve in Maryland) are housed within MD DNR's Chesapeake and Coastal Service Unit. From this point forward they will be referenced as "Coastal Management Programs."

Objective: Draft guidance and considerations for implementing beneficial reuse projects on DNR lands incorporating considerations such as land management or ecological goals of the site, vulnerability, chemical composition, grain size, vegetation, monitoring recommendations and other relevant factors.

Objective: Coordinate with other State/Federal/Regional entities to ensure a compatible policy across different scales/jurisdictions including, but not limited to: U.S. Army Corps of Engineers, and the Maryland Dredged Material Management Program Executive Committee.

Objective: Finalize the development of a MD DNR policy document and decision support tool that will enable land and aquatic management units to make effective decisions about appropriate locations, uses and other considerations of dredge material.

III. MILESTONES AND OUTCOMES

The following milestones and outcomes have been developed to provide a general timeline and outcome schedule for the Coastal Fellow project. Based on the Fellow's skill set and interests, training needs, project field components and meetings with project partners will be incorporated into the milestones and outcomes. Anticipated completion dates of the milestones and outcomes may be modified as the project develops. The Fellow would be directly involved in guiding and making these adjustments.

August - September 2017

Begin Fellowship. Orientation at the MD DNR. Meet with Coastal Management Program staff, regional ocean partners and other key contacts. Complete orientation of current data, policies, and practices regarding sediment management, restoration and climate resilience. Review project description and goals.

September - December 2017

Conduct a literature review of examples of beneficial reuse projects, lessons learned, policy gaps, and program changes. Begin participation in state and regional meetings and workgroups, including the Maryland Commission on Climate Change Adaptation and Response Working Group, the CBSSC, the MARCO-CCAT, and the Maryland Dredged Material Management Program Executive Committee. Meeting with partners to understand what is being pursued regarding beneficial reuse and restoration. Assist in the development of a Maryland-specific salt marsh rapid assessment.

January - April 2018

With support from DNR leadership, convene a Department-wide matrix team to evaluate beneficial reuse of dredge material on DNR lands or in state waters. This matrix team will be coordinated by the Fellow and will meet regularly to outline the applicable practices, management concerns, and processes that could be put into place.

May - September 2018

Pilot the rapid assessment protocols at CBSSC sites at a proposed thin-layering site (i.e. Ellis Bay). Participate in other field-based research projects, as interested, to gain an

understanding of restoration techniques, challenges, and opportunities. Present work at a national conference and participate in fellowship meeting.

October - December 2018

In partnership with regional entity (CBSSC and/or MARCO-CCAT) develop and host a webinar or workshop to highlight exemplary reuse projects and implemented policies.

January - March 2019

Formulate final recommendations for a DNR-wide policy regarding beneficial reuse of dredge material with input from the matrix team and other project partners. Develop communication products for both DNR units and regional partners that disseminate research and policy implications.

April - July 2019

Finalize DNR-policy supporting the beneficial reuse of dredge material and secure Departmental support and adoption. Translate policy into a decision tree/tool for field staff and land managers to use to identify sites for beneficial reuse and understand the process and who to engage to get the project complete.

IV. PROJECT DESCRIPTION

Maryland's Coastal Management Programs are committed to advancing state and regional climate policies^{3,4} and water quality improvement goals, and has been working to elevate the use of natural features to improve water quality and, where appropriate, concurrently site restoration projects in areas that also protect vulnerable coastal communities. There is an increasing recognition that tidal wetlands and marshes are some of Maryland's most protective natural features, providing direct benefits to coastal communities through wave attenuation, sediment stabilization and water absorption. These important ecosystem services enhance community resilience by reducing coastal storm impacts such as flooding and erosion.

At the same time these natural features are increasingly being recognized for their role in providing valuable ecosystem services, Maryland's coastal ecosystems are already experiencing some degree of erosion, with some areas losing as much as 8 feet of upland per year. This pattern is only anticipated to be exacerbated in the future due to climate change impacts such as sea level rise. Since 2010, the State of Maryland has moved forward a series of policy initiatives to preserve, protect, and prioritize wetland areas for conservation and investment, with particular emphasis on protecting potential wetland migration areas. These changes were largely driven by the Coastal Management Programs, facilitated via a 2009-2011 NOAA Coastal Management Fellow's project to target restoration tools and techniques, a 2012-2014 NOAA Coastal Management Fellow's project to integrate water quality goals and natural features into marine spatial planning, the CoastSmart Community Program, and leadership on the Maryland Commission on Climate Change.

Several key milestones addressing connections between climate vulnerability and natural and nature-based features (NNBF) have occurred in the past several years. In 2016, Maryland completed a Coastal Resiliency Assessment that identifies where natural habitats provide the greatest potential risk

³ 2010 Building Resilience to Climate Change Policy

⁴ 2014 Chesapeake Bay Watershed Agreement Climate Resilience Goal

reduction for coastal communities. By the end of 2016 two MARCO-supported projects⁵ will be released that aim to develop wetland restoration priorities for climate risk reduction and resilience and to improve the use and understanding of NNBF in the Mid-Atlantic. Both MARCO projects have identified partners throughout the region that are interested in advancing the reuse of dredge material for restoration and resiliency projects. In addition, this project will support two of Maryland's FY 2016–2020 Coastal Zone Management Act §309 Strategies. The overarching goal of the *Enhancing Resilience to Coastal Hazards and Climate Change* strategy is to “ensure that coastal hazards are addressed in local and state planning processes and that climate considerations are factored into decision making about nature-based infrastructure.” The overarching goal of the *Data to Decision-Making* strategy is to “lay the foundation for integrating spatial and scientific data into State and local decision-making processes.”

Being able to utilize both field and geospatial data - along with emerging NNBF practices - in complementary ways will help Maryland to accelerate many state and regional strategies related to restoring and protecting Maryland's natural resources and reducing impacts to existing built infrastructure and future growth and development. This Fellow project will not only advance the goals of Maryland's Coastal Management Programs, but align with state adaptation strategies and build upon existing efforts to enhance coastal resilience. The outcomes will enable MD DNR land and aquatic management units to make effective decisions about appropriate locations, uses and other considerations of dredge material.

This project will help Maryland's Coastal Management Programs to identify lessons learned from previous beneficial reuse projects, develop a Maryland-specific salt marsh rapid assessment and pilot the tool at a proposed thin-layering site, evaluate beneficial reuse of dredge material on DNR lands or in state waters, formulate final recommendations for a DNR-wide policy regarding beneficial reuse of dredge material with input from the matrix team and other project partners, and translate the policy into a decision tree/tool for field staff and land managers to use to identify sites for beneficial reuse and understand the process and who to engage for a successful project.

Project Deliverables

A number of project deliverables are expected to result from this fellowship that are able to be tailored to the fellow's skill set and interests. They may include:

- Literature review summary or synthesis document that outlines examples of successful projects that implemented beneficial reuse of dredge material policies for restoration and/or resilience
- Development of a Marsh Health Rapid Assessment tool and/or piloting the tool at a proposed thin layering site (e.g. Ellis Bay Wildlife Management Area)
 - Tool would be developed in conjunction with CBNERR-MD and other partners
- Synopsis document discussing the benefits and challenges of utilizing dredged material on DNR lands and in state waters
- Webinar to highlight exemplary reuse projects and implemented policies
- Communication materials (e.g. fact sheets, white paper, website content, etc.) that highlight beneficial reuse of dredge material considerations and policy applications
- Draft policy for the beneficial reuse of dredge material on DNR lands and in state waters
 - To be developed through a matrix team of other DNR units, with a goal to secure Departmental support and adoption

⁵ 2016 Facilitation of the Improved Use and Understanding of Natural and Nature-Based Features (NNBF) in the Mid-Atlantic, Report by the National Wildlife Federation. 2016 Developing Wetland Restoration Priorities for Climate Risk Reduction and Resilience in the MARCO Region, Report by the Environmental Law Institute.

- Decision tree or matrix tool to assist field/project staff in navigating the process of dredged material application (e.g. thin layering) and considerations for siting of beneficial reuse projects
- Training workshop to communicate the draft policy implications

The Fellow will work to achieve the project outcomes and deliverables in a team-based approach that will allow him/her to gain a broad understanding of how coastal management is implemented at the state level, while keeping in mind that many issues span multiple disciplines and require different types of solutions. The Fellow may become involved in activities which would further their professional development (e.g. field research or workgroup representation) depending on his/her interests and the progress of the project. The Fellow may work closely with staff whose specialties range from scientists and resource managers to planners and modelers - providing the Fellow an opportunity to consider how each of these groups may use and apply the project deliverables.

V. FELLOW MENTORING

The Fellow will become a member of, and represent, the MD DNR Chesapeake and Coastal Service Unit, and will be based at the MD DNR headquarters in Annapolis, MD. Staff within this Unit have a variety of expertise related to coastal management, habitat restoration, climate resilience, research and policy development and can offer support and advice based on numerous years of experience. Coastal Management Program staff are currently engaged in a number of activities related to resource conservation and management; coastal hazard adaptation and resiliency planning; restoration financing and policy; ecosystem restoration; spatial planning; and, data development and research. Working with staff across the Unit will provide a variety of opportunities for professional development. The goals and objectives set forth in this proposal will require a fellow to take a team-based approach and work with a variety of people and staff with different backgrounds.

The Fellow will be co-mentored by Jennifer Raulin (CBNERR-MD Manager) and Kimberly Hernandez (Coastal Planner and former Fellow), and supervised by the Coastal Management Programs Director, Catherine McCall.

VI. PROJECT PARTNERS

Through this project, the Fellow will have the opportunity to develop professional working relationships with a variety of groups and individuals currently engaged in sediment management, shoreline and wetland restoration, natural and nature-based features, climate resilience and dredging not only in Maryland but in the Mid-Atlantic region. In addition to Coastal Management Program staff (both in the Coastal Zone Management Program and the Chesapeake Bay National Estuarine Research Reserve-MD), the fellow will have the opportunity to work with other MD DNR groups that address these issues. These may include the Chesapeake and Coastal Service Center for Habitat Restoration & Conservation, the Chesapeake and Coastal Service Center for Restoration Finance, the Fisheries and Boating Services Unit, the Wildlife and Heritage Unit, the Engineering and Construction Unit, the Office of Communications, the Maryland Geological Survey, and the CBSSC. The Fellow could also expect to work with staff from the U.S. Army Corps of Engineers, the Maryland Port Administration, the Conservation Fund, and the Nature Conservancy. Other project partners will include MARCO – comprised of principally of other state coastal program staff from New York, New Jersey, Delaware, and Virginia – and Regional Planning Body partners – comprised of state, federal and tribal representatives.

It is anticipated that in order to complete this project the Fellow may also work with other regional, state and local government programs; non-governmental organizations; and businesses, citizens and

private organizations that may have a stake in sediment policy decisions. These partners and stakeholders will play a role in shaping the outcomes of the Fellow's project.

VII. COST SHARE

The Maryland Coastal Management Programs will provide the Fellow with a work space complete with a personal computer, software and a telephone. The Fellow will be equipped with a State ID to gain access to parking facilities and state buildings, a State email account, and access to network data drives. The Fellow will also have access to a shared printer, office supplies, mailing, necessary training and resources that include a program laptop and projector and other specialty software for presentation and document design needs. The Coastal Management Programs will also commit some limited, additional travel and/or training funds for the Fellow above and beyond what will be provided through the fellowship. The Chesapeake and Coastal Service Unit will provide the 2-year \$15,000 non-federal fellowship match.

VIII. STRATEGIC FOCUS AREA

The proposed project addresses or touches upon several points in both the "Healthy Coastal Ecosystems" and the "Resilient Coastal Communities" strategic focus areas.

1. Primary Focus Area. Related to the "Healthy Coastal Ecosystems" strategic focus area, this fellowship project addresses the following items:
 - 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.

This project will use the best available science to synthesize, communicate, and transfer research results in a way that will strengthen policies and decisions made with the Department regarding the beneficial reuse of dredge material for enhancing the natural function of critical coastal ecosystems on DNR lands or in state waters. The Fellow will work to integrate restoration and climate resiliency priorities across multiple agencies and partner organizations, including the CBSSC and MARCO-CCAT, with the aim to broaden the understanding of the beneficial reuse of dredge material throughout the Mid-Atlantic region. This project will build the capacity of not only the Coastal Management Programs, but also other Chesapeake and Coastal Service Unit and Departmental staff engaged in decisions that affect our critical coastal ecosystems.

2. Secondary Focus Area. Related to the "Resilient Coastal Communities" strategic focus area, this fellowship project addresses the following items:

- 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.
- Identify and engage partners in maximizing the understanding, visualization, and application of risk-wise strategies.

Because of an increasing recognition of NNBF projects' roles in coastal community climate resilience, this project will merge discussions about how coastal ecosystem restoration and dredge material might help meet Maryland's climate resilience goals for communities and habitats alike. This project will not only use the best available science to understand how beneficial reuse of dredge material can be used to enhance climate resiliency in vulnerable coastal communities, but will also ensure that the best available data and information is considered in decision-making. In addition, the project will allow the Fellow to communicate their findings to a broad regional audience, with the hope that this information dissemination strengthens the use of natural features (e.g. marshes) for climate resilience throughout the region.