Maryland Climate Adaptation Workforce:

Building capacity for nature-based solutions & adaptive management

2024-2026 Coastal Management Fellowship Proposal
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1. Background and Introduction

Building and maintaining healthy coastal ecosystems, communities and nature-based economies that are resilient to climate change will require transformations in the ways that conservation, restoration, management and workforces operate and respond to changing conditions. Maryland's Coastal Management Program (CMP) in the Department of Natural Resources' Chesapeake and Coastal Service (CCS) Unit leads efforts to coordinate state adaptation action to meet these challenges.

As the CMP continues to invest in resilient management approaches and natural- and nature-based projects, future conditions are always in mind. With more than 3,000 miles of shoreline and a coastal zone that includes all the lands and waters bordering 16 coastal counties and Baltimore City that lie adjacent to the Chesapeake Bay and its tidal tributaries, the Coastal Bays and the Atlantic Ocean, the scope of resilience building in our natural systems and communities is great.

One example of how the Maryland CMP bolsters this resilience building is the Program's support for planning, design and implementation of coastal restoration projects to enhance community resilience to the impacts of climate change. Resilient natural- and nature-based projects such as living shorelines, riparian buffers, floodplain reconnections and wetland and stormwater practices are designed to provide wave attenuation, sediment stabilization, flood buffer and infiltration benefits, both now and in the future. The state's Resiliency through Restoration Initiative is working towards implementation of 29 projects with a continually growing project portfolio as flooding, coastal storms and sea level rise increasingly impacts diverse communities. The state works with local governments, marine contractors, engineers and restoration crews to ensure that these nature-based projects are designed to adjust over time and adapt to on-the-ground and changing conditions. However, mother nature often acts unexpectedly through frequent or infrequent storm events, resulting in the need for site-level adjustments to ensure that community and habitat resilience benefits are sustained.

Adjusting a restoration practice in the face of changing and dynamic conditions is often referred to as adaptive management. Adaptive management activities may include but are not limited to storm repairs, change of the project layout, or other design-level or planting adjustments that add to or modify approved design plans so that projects can meet project goals while still meeting permit requirements and functioning to the greatest extent possible. Even as investments are made in these nature-based practices, communities are often uncertain if softer approaches can withstand site-specific hydrodynamics within a changing climate. These concerns are understandable given the traditional use of hardened infrastructure (i.e. seawalls, bulkheads, rip rap, etc.) and the proximity between proposed practices and community infrastructure. Adaptive management provides a "learning by doing" approach that fosters innovative projects while providing an added level of security that allows incorporation of new restoration science.

These examples are just a few of the coastal systems expected to incorporate additional flexibility or that will require new industry expertise and job growth. The implementation of natural- and nature-based practices requires marine contractors, forestry managers, restoration crews and other skilled professionals that understand adaptive management activities. A workforce with these skills are needed for project planning, site preparation, construction and maintenance. Transferring adaptive management knowledge to adaptation-focused industries will be key as landowners look to hire workers to implement natural- and nature-based projects on their property.

Project Need: As the number of resilient natural- and nature-based projects increase across Maryland and capacity is directed to underserved communities, community and state partners are grappling with

the need for adaptive management approaches and a skilled workforce to construct and maintain those approaches. Maryland's CMP partnered with the Maryland Chesapeake Bay National Estuarine Research Reserve (CBNERR) to develop monitoring protocols for select restoration sites. Additionally, Maryland recently launched a community photo monitoring Restoration Tracker tool through the MyCoast Maryland web and phone app. As quantitative and qualitative data are collected by partners, coastal managers can apply restoration science and data to inform adaptive management of site and state-recommended management practices. The CMP will benefit from a fellow supporting the co-development of adaptive management frameworks and natural- and nature-based restoration outreach/communication materials with a specific focus to engage adaptation-focused industries.

2. Goals and Objectives

Site Level:
Goal #1: Based on quantitative and qualitative data for monitored restoration sites, identify site-level restoration successes and adaptive management needs.

Objective: Within the first four months, work with CBNERR staff to inventory monitoring data to identify trends between site-level restoration success and associated adaptive management strategies. Analyze results by project goals, practice type, location and other natural features (hydrology, geology, bathymetry, fetch, vegetation density).

Objective: Correlate identified trends to adaptive management strategies.

Objective: Develop an adaptive management structured decision-making framework for applying restoration science to management decisions at the site-level.

  a. Include a robust list of possible triggers for adaptive management based on project goals.
  b. Include specific skills to consider when hiring a crew to conduct operation and maintenance activities.

Objective: Disseminate a site-level adaptive management framework to DNR land managers, project implementation partners (e.g. contractors) and project funders for review.

Objective: Communicate site-level restoration successes and adaptive management needs to local and state land managers and other audiences responsible for the maintenance of restoration projects.

State Level:
Goal #2: Increase transparency of Department-recommended resilient natural- and nature-based solutions to address climate change.

Objective: By December 2024, communicate quantitative and qualitative data to state-level staff within the Resource Assessment Service (RAS) Unit for inclusion in climate indicators annual reports.

Objective: During the 2025 Maryland legislative session (January 2025 - April 2025), assist in bill reviews and fiscal notes for adaptation related legislation to ensure natural- and nature-based solutions are

incorporated into climate adaptation goals and programs.

Objective: Identify state-recommended resilient natural- and nature-based solutions.

Objective: Develop an adaptive management structured decision-making framework for technical assistance and funding programs (e.g. Resiliency through Restoration) that applies restoration science to state-recommended resilient natural- and nature-based solutions.

    a. Outline recommended adaptive management strategies for specific practices based on project goal/design, location and other natural features.

Goal #3: Develop Department goals for advancing investments in nature-based adaptation industries and expand the coastal natural-resource based workforce.

Objective: Select one or more adaptation-related job/industry types and recommend and develop funding, programmatic and policy steps to broaden workforce initiatives to build a skilled workforce for adaptation-related industries to plan, design, operate and maintain natural- and nature-based solutions and other coastal systems. [The adaptation-related industries are defined in the "Project Description"]

Objective: Apply the Next Generation (NextGen) Adaptation Plan Justice, Equity, Diversity and Inclusion (JEDI) principles to ensure workforce development in natural resource resilience sectors is equitable across all communities.

Objective: Communicate adaptive management techniques and adaptation-related industry needs for adaptation-focused industry development, training and retraining programs.

Deliverables:

1. Communication Materials: Site-level adaptive management findings
2. Communication Materials: Science-backed Department recommended nature-based solutions
3. Adaptive Management Framework: Structured site-level project decision-making framework
4. Adaptive Management Framework: Structured decision-making framework for Department-recommended nature-based solutions
5. Process Documents and Programs: Recommend and implement specific approaches to develop a skilled workforce that will construct and adaptively manage nature-based solutions

3. Milestones and Outcomes

August - October 2024:
- Initial orientation and onboarding with CCS
- Complete background orientation about Resiliency through Restoration sites and participate in site monitoring activities [Goal #1]
- Review the state's NextGen Adaptation Plan to understand sector-based adaptation priorities and planned milestones. Focus on Climate Jobs & Training (CJT) and JEDI priorities. [Goal #3]
- Meet with partners addressing resilience in coastal natural-resource based industries [Goal #3]

October - December 2024:
- Analyze site-level monitoring data for trends [Goal #1]
- Review the current statewide monitoring strategy to identify opportunities to include water

resource climate indicators [Goal #2]
- Identify and scope CCS/DNR-specific CJT goals for selected nature-based adaptation industries that include coastal habitat and shoreline restoration; natural resource resilience; risk reduction and resilience planning [Goal #3]
- Review state, funding and federal definitions, maps and goals for JEDI. Identify how each may relate to DNR's expansion of workforce development efforts [Goal #3]

January - April 2025
- Develop data-driven approaches for site-level adaptive management, including possible triggers for various project types [Goal #1]
- Begin to develop communications materials for adaptive management findings [Goal #1]
- Conduct bill reviews and fiscal notes on adaptation-related legislation [Goal #2]
- Support development of water resource climate indicators [Goal #2]
- Select adaptation-related industries and develop Departmental goals for investments [Goal #3]

May - December 2025
- Issue a site-level adaptive management framework [Goal #1]
- Integrate water resource climate indicators into state monitoring strategy [Goal #2]
- Develop data-driven approaches for adaptive management, including possible triggers for various project types [Goal #2]
- Identify how DNR's expansion of workforce development in natural resource resilience sectors will be equitable [Goal #3]
- Improve decision-making processes for climate adaptation funding programs to prioritize investment in underserved and overburdened communities [Goal #3]

January 2026 - May 2026

- Issue state-level adaptive management framework [Goal #2]
- Conduct bill reviews and fiscal notes on adaptation-related legislation [Goal #2]
- Support scoping and development of adaptation-related job/industry goals [Goal #3]
- Work with selected nature-based adaptation industry partners to align funding, programmatic and policy steps to advance workforce initiatives that integrate adaptive management strategies for natural- and nature-based solutions [Goal #3]

June - August 2026

- Present deliverables to interested and impacted parties, specifically the Adaptation and Resiliency Work Group (ARWG) [all Goals]
- Connect with state and industry partners to share adaptation-focused skill, training and job needs based on fellowship work [all Goals]
- Wrap up fellowship

4. Project Description
Maryland continues to advance and expand its commitments to climate resilience and an engaged citizenry and workforce prepared for future risks. Governor Moore announced the establishment of Maryland's Department of Service and Civic Innovation (DSCI) following the "Serving Every Region Through Vocational Exploration (SERVE) Act of 2023" that passed during Maryland's most recent legislative session. The DSCI is promoting service and volunteerism in Maryland, including a focus to help the state address some of the most pressing challenges that climate change is posing to communities

across the state. As Maryland's CMP continues to advance and invest in restoration efforts that address both water quality improvements and resilience, there is an ever-growing need to build and sustain a workforce to identify, design and implement these very projects. It will require a vast range of skills - from people that build community partnerships, those that provide engineering services, and organizations that possess the capacity and skill sets to permit and implement projects. Beyond habitat restoration, there are an even greater number of workforce needs that exist to advance adaptation-related actions. The state's NextGen Adaptation Plan is nearing completion and a key focus area that is identified as a cross-cutting need is in the area of "Climate Jobs and Training." Every facet of the climate adaptation work that Maryland is committed to advancing has some element of workforce, job and training need and they all have varying levels of development status.

The fellow will advance work to meet these growing demands - by building our collective ability to adaptively evaluate and manage projects under changing conditions and shaping adaptation-focused industry skill development. The 2024-2026 fellow will address two key needs through the three goals outlined above: (1) develop data-driven approaches for site- and state-level adaptive management and water resource climate indicators; and, (2) develop Department goals for and advance investments in coastal, nature-based adaptation industries that equitably expand these workforce development steps.

The fellow will begin their time in Maryland by learning about and participating in various phases of resilient restoration project management and monitoring to learn about the skills and partnerships required to plan, design, permit, implement and monitor these projects. The fellow will also actively engage with workforce development partners to learn about project-industry connections in adaptation-focused work. The CMP has identified several industry categories that are integral to meeting future state adaptation goals. These include:

- Coastal habitat and shoreline restoration
  - **Marine contractors** design and install coastal habitat and shoreline restoration projects that buffer and protect communities from storm surge, flooding, and sea level rise
  - **Restoration crews** perform adaptive management and support project implementation and maintenance
- Natural resource resilience
  - **Forestry managers** perform pre-commercial thinning, invasive control, and site preparation to restore community and open space
  - **Restoration crews** perform site preparation, seed collection, controlled burns and natural area management to manage wildfire response and risk reduction
- Risk reduction and resilience planning professionals
  - **Environmental and civil engineers** and **marine contractors** that design, build, and maintain resilient community infrastructure, open space, and public access
  - **Resilience planning professionals** that audit and develop community plans, conservation resilience strategies and agronomic solutions to coastal hazards that identify resilient solutions for land planning and the built and natural environments
  - **Climate educators** that provide skill-based training and retraining opportunities focused on adaptation strategies and management practices

The coastal management fellow would have the opportunity to be engaged in and help shape adaptive management and adaptation-focused industry conversations from the very early stages of scoping and program development. Along with the newly-formed DSCI, the NextGen CJT focus group plan brought together many non-traditional agency partners with established workforce development programs that could be built upon to inject new energy for climate adaptation jobs. By leading programs like Resiliency through Restoration and the Innovative Technology Fund, CCS and the CMP have several opportunities

to focus on natural resource and natural-resources based industry workforce development needs due to the relationships of these programs with industries that range from the restoration economy to forestry and wood and timber to outdoor recreation and community resilience planning.

The Maryland CMP has hosted nine coastal fellows since 1998. Many of the climate adaptation advancements that the Program, Unit and Department have made were possible through the forward-looking accomplishments of these fellows. From establishing the state's first wetland migration corridors to developing resilience planning frameworks for DNR public lands to adaptation in fisheries management - the work of the fellows is enthusiastically embraced, they stand the test of time, and in some cases are on second-round updates that continue to shape state policy and management.

5. Diversity, Equity, Inclusion, and Justice

In Maryland's 2022 Adaptation Framework and the anticipated 2024 completion of the NextGen Plan, Diversity, Equity, Inclusion and Justice (DEIJ - termed "JEDI" in the state strategies) is one of the guiding cross-framework principles. Maryland recognizes that communities that have historically had more resources will be in a better position to respond, recover and adjust as climate changes occur.

In discussions with partners - and in preparing a Letter of Intent for NOAA's Climate-Ready Workforce funding opportunity - the mentor team is actively focused on how job growth opportunities and project implementation can benefit frontline communities and support investment in communities that have experienced historic patterns of disinvestment or haven't had the capacity to access and build resilience.

The project team has had intentional discussions with partners about considering DEIJ in NextGen strategy and milestone development and the goals that have shaped this proposal. The fellow should feel empowered to review DEIJ definitions and data, state JEDI milestones and Justice40 and other DEIJ funding requirements and then actively encourage project partners to incorporate equity.

6. Fellow Mentoring
Maryland's coastal fellow will be co-mentored by two members of the CCS Unit. **Catherine McCall** (Office Director, Coastal and Ocean Management) will serve as the primary contact for NOAA and a co-mentor. Catherine's work in CCS as the Maryland Coastal Program Director focuses on advancing state, community and habitat climate adaptation planning; offshore energy; dredging and beneficial use; and waterway access. **Sarah Lane** (Center Director for Policy, Planning, and Communication) will serve as a co-mentor. Sarah's work in CCS focuses on water quality and climate adaptation and resilience technologies, policies, programs and legislation. Catherine and Sarah served as the co-leads for the NextGen CJT focus group and are coordinating an interagency team around adaptation-focused workforce needs, particularly for those industries necessary to advance MDNR and CCS climate goals. Catherine and Sarah will integrate the fellow into their regular staff meetings and connect the fellow with other groups, projects and meetings related to the project outcomes. Some of those may include state adaptation work groups, Unit climate coordination and DEIJ groups. **Nicole Carlozo** (Waterfront & Resource Planning section lead) will serve as the supervisor for the fellow and will guide work on the adaptive management goals. In addition to serving as the section lead, Nicole manages the state's Resiliency through Restoration initiative and was a 2012-2014 coastal fellow.

Together with the fellow, the mentoring team will work collaboratively to ensure that the fellowship experience provides an opportunity to learn and apply interdisciplinary skills. CCS is the lead agency for coastal technical assistance, resilient restoration, and climate adaptation, and is deeply involved in resilience planning partnerships, policy development, grant making and restoration. The fellow will be

encouraged to develop their own project planning approach for this fellowship that highlights discrete milestones to meet the outlined goals and that reflects the CCS value of cross-training and skill development. Because CCS leads a variety of programs and initiatives that have field work, policy and partnership opportunities, where a fellow has interest, the mentoring team would encourage the fellow to connect with these opportunities as a regular way to meet and network with other Unit colleagues, MDNR team members, and partner organizations to build rapport, acquire additional skills, and learn about work in other coastal disciplines. Networking opportunities for project deliverables would likely include work with various Maryland state agencies such as the Departments of Labor, Commerce, and Service and Civil Innovation, private adaptation-focused industry companies, early- to mid-career job seekers and MDNR advisory bodies and constituent groups.

7. Office Environment
As of Fall 2023, the MDNR and CCS are operating on a 2 day office/3 day telework hybrid schedule. CCS staff are assigned to and asked to be at the Tawes office in Annapolis on Wednesdays, and the other day at either Tawes, an on-site or field meeting or other collaborative team meeting location. A fellow would follow the same procedure and if schedules change, updates would be provided.

The fellow would be assigned a workspace (either dedicated or "hotel" space) with a desk, chair, laptop docking station and phone line equipped with a VOIP system. The fellow will be issued a state laptop and email account and will have access to shared office building printers and copiers for business purposes. MDNR utilizes the Google platform for collaboration (i.e. Google Meet and other G-suite products such as Docs, Sheets, Drive) and the office continues to expand hybrid workspace technology including shared video conferencing equipment. The fellow will be set up with a state ID badge to gain access to parking facilities and state buildings and the fellow may also be able to utilize the state pool car system (including EV vehicles) for work-related activities. For at-home telework, the fellow would be expected to use their state laptop and furnish a workspace. The CCS would provide a limited budget for work items such as an external mouse/keyboard, office supplies and headset. The Maryland CMP provides some limited, additional travel and training funds above and beyond what is provided through the fellowship and this budget will be defined and discussed at the beginning of each CZM grant season.

CCS staff have a variety of expertise related to coastal management, climate adaptation, research and policy development, partnership development, conservation education and GIS and are able to offer support based on numerous years of experience. 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 workplace and office culture continues to evolve with hybrid work schedules. The mentoring team recognizes that for new professionals in the fellowship program a hybrid working environment can present unique challenges - especially for those that may also be relocating. The mentors and fellow will work together both virtually and in person to catch up on projects, plan work and jointly develop a preferred project coordination and check-in schedule to ensure project success. CCS is committed to creating a workplace where everyone's ideas and contributions are valued and expects a fellow to share a similar perspective - that the ultimate success of any project depends upon a team's collective ability and commitment to continually improve communication, advance work and provide support.

8. Project Partners
Across Maryland's coastal zone, climate adaptation and natural- and nature-based resilience projects are advanced and implemented by numerous agencies and organizations. The fellow will be encouraged to engage with and learn from existing partners and groups and also to expand these groups and build

new networks to identify and develop the best approaches for this project. A few examples of existing partners for adaptation workforce and adaptive management are included below.

Climate Adaptation Strategies & CJT Goals. CCS staffs and coordinates the Maryland Commission on Climate Change - ARWG. Partners engaged in climate job discussions include:

Maryland Department of Labor   Maryland Department of Commerce
Maryland Department of the Environment   Maryland Department of Service and Civic Innovation
Greater Baltimore Wilderness Coalition   The Chesapeake Bay Trust
MDNR Units: CCS (restoration, resilience, coastal planning, education and training); Forest Service (timber and agronomics); Engineering & Construction (marine contractors and engineers)
Private industry and business partners   University System of Maryland partners

Water Resource Climate Indicators & Adaptive Management. To inform these science-based measures the fellow can plug into several existing science networks and agency initiatives that include:

MDNR Resource Assessment Service   Maryland Department of the Environment
Maryland Coastal Bays Program   Local government and project site partners
CCS: Resilience through Restoration project team, CBNERR

9. Cost-Share Description
The CCS Unit will provide the 2-year $15,000 fellowship match, likely in the form of 50:50 federal and non-federal fund sources. The Unit may need to enter into a contract with the fellowship partner organization to be able to more easily transfer the cost share match.

10. Strategic Focus Area
This fellowship proposal incorporates elements of all three focus areas in the following ways:

Healthy Coastal Ecosystems
The need for natural- and nature-based resilience projects is increasing and more communities and public land managers are embracing the need for habitat migration and restoration. The fellow's work will facilitate the use of site-specific science in coastal ecosystem restoration by integrating monitoring data into adaptive management practices and funding decisions. It will further integrate coastal ecosystem restoration practices into the landscape, foster resilient ecosystem outcomes and create meaningful dialogues and partnership opportunities.

Resilient Coastal Communities
Building community resilience through restoration is a key tool in coastal adaptation, and blending green and gray infrastructure solutions will increase public understanding and acceptance of risks and solutions. From an equity perspective, Maryland is also working with partners such as the Coastal States Organization and the National Wildlife Federation - through the Maryland Capacity Network - to build capacity within frontline communities. In addition, utilizing Bipartisan Infrastructure Funds, the CMP is supporting the Community-Based Organization - Capacity Building Initiative with the Chesapeake Bay Trust to create more equitable access to the services needed to prepare resilient project applications.

Vibrant and Sustainable Coastal Economies
This project will increase Maryland's understanding of resilience workforce needs and opportunities in natural resource-based industries and create pathways for crews and jobs to address some of our most pressing climate challenges.