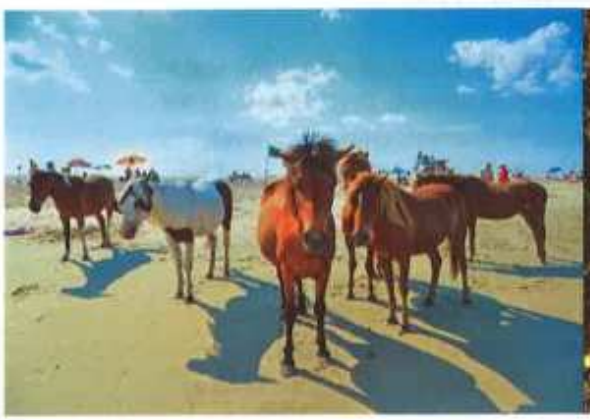
Resilience and Public Recreational Lands in Maryland: Developing strategies for on-the-ground climate adaptation

2020-2022 NOAA Coastal Management Fellowship Proposal



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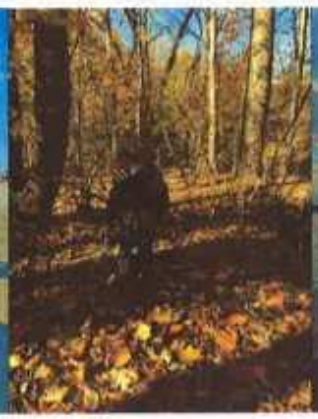

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I. Background and Introduction

"The level of Chesapeake Bay water with respect to the land is now rising about three times as fast as it was during Colonial times…"[1] Sea level has risen approximately one foot in the last century and the likely range (66% probability) of relative sea level rise rates along Maryland's coastline between 2000 and 2050 is 0.8 to 1.6 feet. This range is expected to vary depending on future pathways of global emissions of greenhouse gases. Effects of accelerated sea-level rise are already apparent and will continue - it will result in coastal flooding and more frequent nuisance flooding, the deterioration of tidal wetlands and the saline contamination of low-lying lands. Such impacts pose a significant threat to the steep cliffs, wetlands and marshes, tidal estuaries, sandy beaches, and barrier islands that comprise Maryland's coastal environment and the recreational lands and waters that Marylanders cherish.

Maryland's Coastal Management Program (CMP) has always been on the forefront of advancing state climate adaptation and resilience and Coastal Fellows have played a significant role in this work - even so far back as a 1998-2000 fellowship project that advanced early efforts in developing a sea-level response strategy. At the state level, Maryland's Commission on Climate Change was established by Executive Order in 2007 and permanently formalized into law in 2016. Through a stakeholder-based process, the Commission published Maryland's first Climate Adaptation Action Plan in August 2008, one of the first in the country, and one that remains a foundational document to this day. Since that time the Commission's Adaptation and Resiliency Work Group - chaired and staffed by the Maryland Department of Natural Resources (MDNR or "Department") - has continued to engage many state agencies, citizens, university and non-governmental partners, working to integrate resilience in all of Maryland's work and sectors.

In 2010 the Department adopted its own climate policy, *Building Resilience to Climate Change.* This policy included a provision to guide investments and management of land to better mitigate and adapt to climate change. As a result, the Department first began integrating climate change considerations into its land conservation programs following a Coastal Management Fellow's work on wetland migration corridors. The project developed and mapped high priority wetland adaptation areas using theSea Level Affecting Marshes Model (SLAMM). The resulting policy integrated sea level rise-driven habitat migration corridors into coastal zone-wide land conservation priorities.

With work underway addressing climate, habitat and land conservation, in 2014 a new state statute established the Coast Smart Council within the MDNR to address the built environment. This Council works to establish specific siting and design criteria and consideration to address impacts associated with sea level rise and coastal flooding on state infrastructure and of future capital projects. One example is the Assateague State Park Nature Center Building, which was subject to periodic flooding, and sat five feet below the minimum first floor elevation necessary to meet flood hazard code regulations. It was at significant risk of major damage from a large storm event or hurricane. In order to mitigate impacts to the building, it was lifted, and raised five feet in elevation on new timber pilings

The Department owns and manages 475,000 acres of open space and protected lands for the recreational use and enjoyment of the public and preservation of important ecosystems. Sea-level rise models indicate that 68,700 acres of these MDNR-managed lands are located under 2 foot of elevation and vulnerable to inundation by 2050, with an additional 16,300 acres vulnerable by 2100. MDNR parks, wildlife and forestry land managers are already seeing impacts on these lands and their associated

[1] Boesch, D.F., W.C. Boicourt, R.I. Cullather, T. Ezer, G.E. Galloway, Jr., Z.P. Johnson, K.H. Kilbourne, M.L. Kirwan, R.E. Kopp, S. Land, M. Li, W. Nardin, C.K. Sommerfield, W.V. Sweet. 2018. Sea-level Rise: Projections for Maryland 2018, 27 pp. University of Maryland Center for Environmental Science, Cambridge, MD.

infrastructure: chronic flooding of access roads, heavy precipitation events that flood recreational use areas and damage infrastructure, evidence of salt-water intrusion on forest stands and downed trees and damage from storms, coastal erosion, increased invasive species and loss of coastal habitats threatening rare, threatened and endangered species and the resilience of ecosystems. These observed impacts, paired with the Coast Smart Council siting and design conversations, have prompted coastal management and other MDNR staff to discuss climate risks and future actions that may be needed to facilitate the continued safe use and enjoyment of the public lands and facilities that the Department stewards. Maryland's CMP is now building off our state and department level policies and utilizing the data developed by our NOAA fellows and staff, to focus on assisting state and local decision makers.

In 2018, Maryland's CMP worked with Salisbury University to conduct a GIS-based vulnerability assessment of state recreational lands. This GIS assessment utilized climate change, infrastructure, and ecological data to identify impacts to State Parks, State Forests, Wildlife Management Areas, and Fishery Management Areas. There is now a need to develop on-the-ground, site-level recommendations for climate resilience, including short- and long-term impacts on recreational use, water access, infrastructure, and ecosystem management.

This fellowship project will focus on identifying and implementing on-the-ground climate adaptation best practices at several MDNR land unit sites in order to assist land managers in ensuring the long-term resilience of our ecosystems, infrastructure, recreational uses, and public access. The project will result in new technical guidance and best practices on climate adaptation for the management of public lands that can serve as a model for state and local land managers.

II. Goals and Objectives

Goal #1: Identify and understand best practices in on-the-ground, site- or parcel-level climate adaptation measures to protect and support coastal ecosystems and built infrastructure.

Objective: Review and analyze literature and policies regarding adaptation, sea level rise, climate change, coastal habitats, land management and resources in Maryland. Review and compare similar actions, plans, or research in other states and agencies related to climate adaptation.

Objective: Form and meet with a technical advisory committee on a bi-monthly basis composed of interdisciplinary resource experts within DNR and cooperating agencies including specialists in habitat restoration, wildlife management, forestry, parks, fisheries, cultural resources, and engineering.

Goal #2: Develop a guidance template and three pilot Resilience Strategy Plans that provide recommendations for actions to enhance the resilience of ecosystems, infrastructure, and recreational public access on state MDNR lands.

Objective: Meet with land managers from Maryland Park Service, Forest Service, and Wildlife and Heritage Service to identify challenges and needs of selected land units.

Objective: Work with MDNR's GIS team to assess climate vulnerabilities and conduct site visits to ground-truth the data.

Objective: Form and utilize a technical advisory group for each site to develop management recommendations for enhancing resilience.

Objective: Working with the managing land units and the MDNR restoration team, identify and design potential natural infrastructure and restoration projects to advance the Resilience Strategy Plans.

Objective: Align Resilience Strategy Plan with land manager's annual work plans or long-term vision plans as appropriate.

Objective: Develop communication materials and tools to engage partners and visitors on climate risks and adaptation strategies.

Goal #3: Assess department-wide needs for additional climate adaptation modeling and data for use in land management.

Objective: Assess gaps and needs in current GIS data and models that would assist in future land management in a changing climate, such as nuisance flooding of roadways and invasive species migration.

Objective: Participate and contribute to Maryland's Adaptation and Resiliency Work Group and CCS's Climate Team.

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 – November 2019
Orientation at the Maryland DNR. Meet with CMP and MDNR land unit staff, interdisciplinary partners and other key contacts; visit land unit sites. Review current data, policies, and practices regarding land management and climate resilience including: CoastSmart Construction Guidelines, Maryland's Climate Action Plan and Adaptation and Resiliency Work Group reports, Assateague State Park Management Plan, Pocomoke State Forest Annual Workplan, and the Maryland State Wildlife Action Plan. Review other state and federal climate adaptation guidance such as National Park Service Climate Change Response Strategy and the U.S. Forest Service Adaptation Workbook. Attend meetings of Maryland's Adaptation and Resiliency Work Group and CCS' Climate Team.

December 2019 – May 2020
Work with mentors to identify and meet with technical advisory group members. Meet on a bi-monthly basis with technical advisory group to define climate adaptation and resilience parameters for use in the site-level Climate Resilience Strategy Plans. Develop a guidance template and associated climate risk and risk-reduction considerations for a Climate Resiliency Strategy Plan.

October – May 2020
Conduct a series of meetings with land management staff to identify needs. Conduct site visits with technical advisory group members to identify on-the-ground management recommendations and opportunities for restoration and natural infrastructure projects. Additional in depth- site visits with restoration and/or engineering and construction specialists will be conducted before meeting again with land management staff.

June – December 2020
Draft and develop three Pilot Climate Resilience Strategy Plans for the land unit sites. Work with technical advisors to identify potential restoration or demonstration projects, infrastructure mitigation, capital improvements, and funding needs. Develop designs for identified projects. Identify partners and funding for implementation as feasible.

January – June 2021
Seek feedback and input on Resilience Strategy Plans, review and finalize. Identify GIS data gaps and needs for future state lands management efforts. Develop communications tools for use by land managers to educate and partner with local user groups and communities on climate adaptation impacts and measures being undertaken on site.

June – July 2021
Work with land units to incorporate Resilience Strategy Plans into current Management Plans, Annual Workplans, and Vision Plans. Present findings to Chesapeake and Coastal Service and land management unit staff and Adaptation & Resiliency Work Group. Develop a communications or technical guidance package of the plans that describes options for how to address various conditions, site needs and climate risks.

IV. Project Description

Following a decade of adaptation progress, it is critical to continue seeking ways to address rapidly evolving changes and implement actions that reduce or mitigate risk and conditions and also continue to provide recreational opportunities on our public lands. There is a wide breadth of habitats, recreational uses, infrastructure, policies, funding and stakeholders that are present on or that occur on public land. In addressing MDNR lands and their climate vulnerability and recreational opportunities, this fellowship provides the opportunity to enact data to decision making through the development of resilience strategy recommendations for adoption into state-level planning. The Fellow's activities will be centered around the following three project goals previously described:

- Identify and understand best practices in on-the-ground climate adaptation measures to protect and support coastal ecosystems and built infrastructure at a parcel level.
- Develop a guidance template and three pilot Resilience Strategy Plans that provide recommendations for actions to enhance the resilience of ecosystems, infrastructure, and recreational public access on state lands.
- Assess department-wide needs for additional climate adaptation modeling and data for use in land management.

This Fellowship project will result in (1) the development of a guidance template that addresses general and site-level climate risks and options for addressing those risks, and (2) pilot Resilience Strategy Plans for three state land units: Assateague Island State Park, Pocomoke State Forest, and Nanticoke River Wildlife Management Area. These land unit strategy plans will address climate impacts to infrastructure, ecosystem management, recreational use, and water access by providing specific management recommendations related to: relocation or floodproofing of infrastructure and water access points, implementation of natural infrastructure solutions, assisting wetland migration, invasive species management, cultural resource management, and continued public recreational services in a changing climate.

The Resilience Strategy Plans that will result from this fellowship project will vary from site to site, driven by local ecosystem conditions. Site factors for each are overviewed as follows:

Assateague State Park - Maryland's most visited State Park, and only oceanfront park, located on Assateague Island, a barrier island bordered by the Atlantic Ocean on the east and the Sinepuxent Bay Atlantic Coastal Bay on the west, and adjacent to a National Seashore. Its two miles of ocean beaches offer swimming, beachcombing, sunbathing, surfing and fishing. The bayside offers visitors the chance to explore secluded coves by canoe or kayak. The marsh areas have a variety of wildlife, including deer, waterfowl and feral horses. Over the past decade, Assateague State Park has already experienced climate impacts such as erosion and beach loss, flooding, and infrastructure stressors that have negatively impacted the park visitor experience.

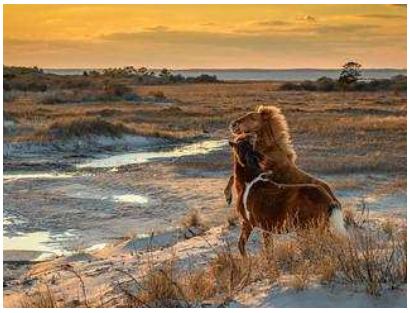
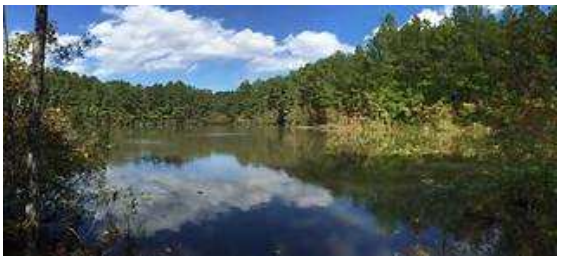
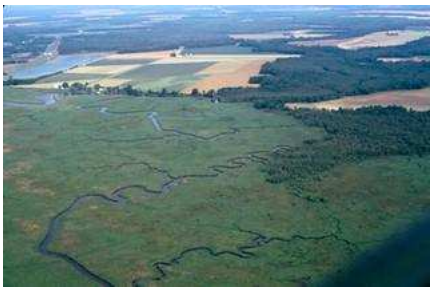


Photo Credit: John Whaley

Pocomoke State Forest - Consists of 18,198 acres of land on Maryland's eastern shore with the vast majority of it located in Worcester County. Pocomoke State Forest is characterized by large areas of loblolly pine, mixed pine-hardwood, bottomland hardwood, and bald-cypress forests. The Cypress swamps, which are State designated Wildlands, border the Pocomoke River, which is a State designated Scenic River. A significant portion of Pocomoke State Forest had previously been managed for industrial forest production for decades. Currently, a primary objective of Pocomoke State Forest is to become a national model of certified sustainable forestry, and is committed to certification under both the Sustainable Forestry Initiative (SFI) standard and the Forest Stewardship Council (FSC) standard. There are a variety of recreational opportunities from fishing and canoeing along the Pocomoke River to enjoying one of the many hiking trails that run through the forest, which also includes mountain bike trails. In recent years the forest has experienced flooding of roads and culverts from high precipitation events, salt-water intrusion of forest stands, and increased incidence of invasive species.



Nanticoke River Wildlife Management Area **-** The Nanticoke River is one of the largest rivers on the Delmarva Peninsula, supported by a watershed that is nearly 530,000 acres in size, and draining into the Chesapeake Bay. The Nanticoke River Wildlife Management Area (WMA) was established to help conserve the wildlife habitats found along this mostly tidal river, and to provide outdoor recreational opportunities for the public to enjoy. Visitors to Nanticoke River WMA might glimpse one of the many bald eagles that frequent the river in search of food. A trip along the bottomland forests yields opportunities to see wading birds and waterfowl, as the marshes are extremely productive and support a wide variety of birds. Wild turkeys have long been established in the area, and Sika deer continue to expand into habitats surrounding the stream corridors in the watershed. In the past decade, sea-level rise has threatened tidal wetlands, as well as road and water access for recreational users such as bird-watchers and hunters.



In addition to the development of Resilience Strategy Plans, the Fellow's project will also include development of public outreach and educational tools for engaging and coordinating with visitors, 'friends of' groups, adjacent communities and other partners. The goal of the public outreach will be to help our communities and partners understand the impacts that climate change is having on our state lands, and the measures being taken to facilitate adaptation. The guidance template document for a Resilience Strategy Action Plan may also be distributed to county and municipal parks managers for use in developing their Land Preservation and Recreation Plans.

Throughout the Fellow's project, they will assess Department-wide gaps and needs for additional GIS data and models to support land management now and into the future. Depending on the Fellow's level of interest, they may have the opportunity to manage funding or contracts to address data gaps or develop outreach materials. The Fellow will have the opportunity to become an active participant in CCS's Climate Team and the State's Adaptation and Resiliency Work Group. The Fellow will conclude with presentations to both groups as well as conversations with the land units.

Project Deliverables

A number of project deliverables are expected to result from this fellowship. They may include:

- Literature review summary or synthesis document that outlines examples of site-level climate adaptation and resilience considerations, plans and management approaches
- A guidance template for a Resilience Strategy Plan
- Three pilot Resilience Strategy Plans for state land units
- Communication materials (e.g. fact sheets, website content, signs, etc.) and strategies to engage and educate communities and partners on climate adaptation on MDNR state lands

V. Fellow Mentoring

The Fellow will become a member of, and represent, the MDNR Chesapeake and Coastal Service (CCS) Unit, and will be based at the MDNR headquarters in Annapolis, Maryland. As this project will work on Resilience Strategy Plans for three sites on the eastern shore, it is anticipated that there will be some routine travel to those locations. Staff within CCS have a variety of expertise related to coastal management, site planning, habitat restoration, climate resilience, research and policy development, waterway access and planning and GIS and are able to offer support and advice based on numerous years of experience. The Maryland CMP staff are currently engaged in a number of activities related to resource conservation and management; adaptation and resiliency planning; restoration financing and policy; coastal recreation; ecosystem restoration; spatial planning; and, data development and research. Working with staff across the Unit and with land management Units 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 Kelly Collins Choi (Section Chief, Center for Coastal Planning) and Sandra Olek (Senior Policy Advisor, Sustainable Communities) and supervised by Catherine McCall (Director, Office of Coastal and Ocean Management).

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 MDNR land management, climate resilience planning, restoration, and coastal habitat and recreation issues in Maryland. In addition to CCS staff, the fellow will have the opportunity to work with other DNR groups including the Land Acquisition and Planning Unit; Maryland Park Service; Maryland Forest Service; Wildlife and Heritage Service; Engineering & Construction; Fisheries Service, and the Office of Communications. The Fellow will also have access to staff at other federal, state, and local agencies who are working on issues relevant to the Fellow's project. More specifically, there may be the opportunity to work with staff at the Maryland Department of the Environment, Maryland Historic Trust, and Office of Tourism Development. University partners may include Salisbury University's Eastern Shore Regional GIS Cooperative.

VII. Cost Share Description

The CCS 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, and a pool car system for project-related travel. . The CMP 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 CCS Unit will provide the 2-year $15,000 non-federal fellowship match.

VII. Strategic Focus Area

1. Primary Focus Area. This project will primarily advance the "Resilient Coastal Communities" strategic focus area. It will address this by building MDNR's capacity to consider climate impacts in site- and land-unit level planning and subsequently identify project implementation steps that could or should be taken to address the vulnerabilities, ensure short- and long-term user safety and access and maintain recreational enjoyment of our lands into the future. The project will address elements of all four focus area outcomes:

- 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. *This project will allow the fellow to garner perspectives and priorities from land and resource managers and incorporate these into actionable steps to help land units adapt to climate impacts.*
- Increase public awareness of coastal hazards and actions that can be taken to reduce the loss of life and property. *Through the outreach and education materials portion of the project, work will assist in helping a variety of audiences to understand risks and specific actions being undertaken to address them. In addition, the project will develop tools to communicate to our public land visitors why certain amenities may be altered as part of these actions (e.g. trails or camping grounds being relocated).*
- 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. *The project will build MDNR's understanding of specific risks to three land units by compiling data and information and pairing that with specific steps that can be taken to address them. The Resilience Strategy Plans*

will serve as model templates for other land units and increase staff's ability to more rapidly assess risk and then identify and implement adaptation steps.

- Identify and engage partners in maximizing the understanding, visualization, and application of risk-wise strategies. *This project will engage and inform many partners in understanding how state-level risks translate to site-specific conditions. It will also assist in helping to apply this knowledge in planning and improvement projects (e.g. infrastructure improvements, natural and nature-based projects).*

2. Secondary Focus Area. This project will also address some themes from the "Vibrant and Sustainable Coastal Economies" strategic focus area. Because MDNR lands are enjoyed by Maryland residents and out-of-state visitors alike for a variety of recreational purposes, this fellowship project will assist in ensuring that these opportunities to enjoy our public lands and waters remain well into the future. The work will specifically address the following elements of this focus area:

- 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. *Thousands of acres of MDNR's recreational and wildlife lands are located in coastal areas vulnerable to climate impacts. This project will assist CMP and land unit staff to conserve active and passive recreational uses into the future by understanding where existing uses or lands might be vulnerable and translating that to actions that can help management evolve over time. In addition, some of the site-specific projects identified (e.g. resilient restoration designs or infrastructure improvements) through this project may prepare staff to identify future opportunities for funding to implement the actions.*

2. Third Focus Area. This project will also address some themes from the "Healthy Coastal Ecosystems" strategic focus area. MDNR lands protect significant coastal habitats and large acreages of lands, some of which are vulnerable to climate impacts. The project will specifically address the following elements of this focus area:

- 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 aid in mapping out what habitat areas are present and potentially vulnerable and aid in the identification of resilient restoration projects or other actions that could assist various habitats remain in place or migrate over time.*