Large-Scale Marsh Persistence and Restoration in the Chesapeake Bay: Preliminary Workshop Findings

October 6, 2022 • College Park, MD

Sea Grant Maryland

This report summarizes presentations, discussions, and results from the Large-Scale Marsh Persistence and Restoration in the Chesapeake Bay Workshop, held October 6, 2022, in College Park, Maryland. The workshop, sponsored by Maryland Sea Grant, was to discuss and brainstorm solutions to increase human resilience and adaptation to climate change through improved marsh management.

A PDF of the report can be downloaded online at www.mdsg.umd.edu.

Front cover image credit: Scott Lerberg, Chesapeake Bay National Estuarine Research Reserve –Virginia / Virginia Institute of Marine Science & Southwings

Preliminary Workshop Findings

Executive Summary

On October 6, 2022, Maryland Sea Grant and the Chesapeake Bay Sentinel Site Cooperative hosted the Large-Scale Marsh Persistence and Restoration in the Chesapeake Bay Workshop. The hybrid (in-person and virtual) workshop had 99 total participants. The goal of this workshop was to advance planning and implementation of large-scale marsh conservation in the Chesapeake and Coastal Bay regions with particular focus on both environmental justice and outreach strategies for involving communities and private landowners in management decisions. Workshop deliverables include a series of ideas developed by attendees for research and restoration projects to advance the workshop goal. The workshop had three lectures and four discussion breakout sessions to help workshop participants develop these ideas (for more information regarding the workshop structure, see Appendix A). Provided below (Table 1) is the matrix that participants completed to work through relationships between marsh geomorphology types and marsh ecosystem services (breakout session I). Additionally, outlined below is a summary of marsh project ideas generated and refined in breakout sessions III and IV. This preliminary report will be supplemented later with more detailed findings on site characteristics, recommended actions, and key ecological and socioeconomic factors that inform large-scale marsh project criteria. Maryland Sea Grant encourages continued dialogue among participants and is committed to helping connect people and build teams around these project ideas to move toward planning and implementation of large-scale marsh restoration. If you are interested in connecting with others on a particular project, please contact Maryland Sea Grant.

Workshop Purpose

Issue

The Chesapeake Bay region is experiencing intensifying conditions of climate change. Relative sea level rise is causing chronic inundation of low topographic coastal areas, erosion of the shore, tidal flooding events, salinization of the soil, and the transition of coastal ecosystems and nearby uplands to wetter and saltier ecotones. Tidal marshes, at the margin of the land-sea interface, are highly vulnerable to climate change. These marshes can provide ecosystem services to mitigate some effects of sea level rise and climate change (e.g., flood reduction, erosion control, carbon sequestration) and provide benefits to adjacent communities (e.g., recreation value, wildlife habitat, water purification). However, they are also vulnerable to increased inundation and changing tidal regimes which can threaten their existence. Subsequently, their persistence can also cause conflict with other coastal land uses (e.g., agriculture, development, etc.). Communities and private property owners with land at the marsh-upland interface are grappling with how to adapt to marsh migration and other sea level rise-induced changes to the landscape. Importantly, some communities and landowners bear a disproportionate load of climate vulnerabilities. Together, these societal and environmental complexities create a complicated landscape for determining adaptation strategies for marsh sustainability.

Background

Maryland Sea Grant, the Chesapeake Bay Sentinel Site Cooperative, and other partners have long noted the urgency for action on marsh persistence given current marsh vulnerabilities and the potential community benefits of healthy tidal marshes. The workshop convened marsh management decision-makers (e.g., government agencies, land managers,

nonprofits, industry, community representatives) to consider which marshes should be protected or restored; how marshes benefit adjacent communities; what role private landowners play in marsh persistence; and how to work among funding sources, regional and local priorities, and scientific expertise to implement marsh projects with the greatest social and environmental benefits.

Intent

The goal of the workshop was to advance the ability to plan and implement large-scale marsh conservation in the Chesapeake and Coastal Bays. The intent was to drive strategic, collaborative action among institutions, communities, and geographies to create regional solutions to ensure marsh persistence. Potential funding opportunities for marsh persistence activities were discussed and, in particular, the 2021 Bipartisan Infrastructure Law and the 2022 Inflation Reduction Act were highlighted.

Result

This workshop was one effort in a series of regional efforts to advance marsh resilience action (e.g., EPA Resilient Coastal Wetlands: Coastal Communities Multi-Regional Workshop [May 2022], Chesapeake Bay Program [CBP] Wetlands Outcome Attainability Workshop [August 2022], CBP Marsh Condition Assessment Workshop [2023]). The results of this workshop are designed to continue momentum among partners to pursue upcoming funding opportunities in tidal marsh persistence. Below, we provide summaries of the large-scale marsh project ideas that emerged from the workshop to facilitate connections for those interested in acting on these ideas.

Appendix A provides workshop details, including steering committee members, plenary speakers, breakout sessions, expected outcomes, and plans for a forthcoming detailed analysis. Table 1 summarizes priorities around marsh geomorphology and marsh ecosystem service interactions. This analysis identified fringe marshes as having the greatest potential to provide multiple ecosystem services. Table 1 is followed by a summary of large-scale marsh project ideas that emerged from breakout sessions III and IV.

In a forthcoming more detailed workshop report, Maryland Sea Grant and the Chesapeake Bay Sentinel Site Cooperative will conduct a more in-depth analysis of workshop findings about ecologic and socioeconomic considerations important to tidal marsh persistence projects.

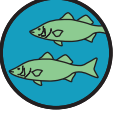# Summary of Large-Scale Marsh Project Ideas
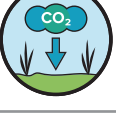
"Developed" Project Ideas

The following 13 ideas were selected by each breakout group as a priority and were fully developed in breakout session IV. Other valid ideas for projects were identified but not fully developed, due to time constraints. Those ideas are listed in the next section of this report.

Large-Scale Marsh and Floodplain Management in the Pocomoke Watershed

This project would bring together experts from state agencies in Maryland and Virginia, federal agencies, and regional nonprofits to protect, manage, and restore non-contiguous marshes within the Pocomoke watershed. Partners could include Maryland Department of Natural Resources, Virginia Department of Wildlife Resources, Saxis Wildlife Management Area, National Oceanic and Atmospheric Administration, U.S. Department of Agriculture Natural Resources Conservation Service, U.S. Army Corps of Engineers, and The Nature Conservancy. Ecologically, there are a variety of marsh types within the area. There are also areas of variable salinities with oysters and submerged aquatic vegetation which may be protected or restored via beneficial dredge, easement programs, or hydro-manipulations. These present additional questions, such as whether enough dredge is available, if landowner incentives exist, and how to get water to flow in low-lying areas. The selection of marsh sites will also depend on partner capacity and access to funding, landowner incentives (particularly for landowners with larger land holdings), and communities with

Table 1. Breakout session I participants completed this matrix based on discussions around marsh geomorphology types and marsh ecosystem service interactions. Each shape represents a breakout group (some services had multiple groups across the in-person and virtual spaces). A green circle indicates that this marsh type is a high priority to maximize the ecosystem service, a yellow triamgle is a medium priority, and a red square is a low priority. A white octogon indicates that no designation was selected.

Ecosystem Service–Marsh Geomorphology Matrix

Ecosystem service	Island	Back Barrier	Embayed/Pocket	Headland/Point	Mainland Fringe	Tidal Fresh	Urban Cluster
Bird habitat conservation	yellow triangle	green circle	yellow triangle	yellow triangle	green circle	red square	red square
Maintenance of fisheries	yellow triangle	green circle	green circle	green circle	green circle	yellow triangle	white octagon
Benefits to private agriculture and residential lands	red square	red square	green circle	yellow triangle	green circle	green circle	green circle
Benefits to the surrounding communities	yellow triangle, yellow triangle	red square, green circle	red square, yellow triangle	red square, yellow triangle	green circle, green circle	yellow triangle, red square	yellow triangle, green circle
Carbon sequestration	green circle, red square	yellow triangle, green circle	yellow triangle, yellow triangle	yellow triangle, green circle	green circle, red square	green circle, yellow triangle	red square, red square
Coastal protection	yellow triangle, green circle	yellow triangle, yellow triangle	yellow triangle, white octagon	yellow triangle, green circle	green circle, green circle	red square, green circle	yellow triangle, yellow triangle
Coastal erosion	yellow triangle, red square, yellow triangle	white octagon, yellow triangle	red square, red square, yellow triangle	red square, red square, yellow triangle	green circle, green circle, green circle	green circle, green circle, yellow triangle	yellow triangle, yellow triangle, green circle

environmental justice concerns (including Indigenous groups that reside in the region)[1]. One concern is how to connect with communities on a short timescale (i.e., one year). Funding may occur through inter-agency coordination, as well as the National Fish and Wildlife Foundation's America the Beautiful Challenge and National Coastal Resilience Fund grant opportunities. This project will likely take 20-30 years from planning to implementation, but the first step is to get agencies from Maryland and Virginia together to determine who will coordinate.

Cedar Island Restoration as a Way to Protect Crisfield, Maryland

Cedar Island Wildlife Management Area (WMA) could potentially provide coastal protection to the town of Crisfield, Maryland, which is highly vulnerable to flooding. A significant number of Crisfield residents also fall within the federal poverty level income. This community is facing the potential for managed retreat and moving infrastructure (e.g., hospital, churches) inland. Cedar Island WMA is also facing sea level rise stressors, and without restoration intervention, may have a limited lifespan. Modeling of Cedar Island WMA's marsh extent, migration corridors, and the costs of keeping it in place are needed. If restoration of Cedar Island WMA becomes possible, it also begs the question of how much time this buys the town of Crisfield to plan for managed retreat or other resilience strategies. Funding perhaps includes National Fish and Wildlife Foundation's Coastal Resilience Fund, Maryland Department of Natural Resources' Open Space Fund, or Federal Emergency Management Agency's Building Resilient Infrastructure and Communities Program.

Protect and Restore Maryland's Fishing Bay Wildlife Management Area

Maryland's Fishing Bay Wildlife Management Area (WMA) may be a target area for marsh protection and restoration. There appear to be adjacent lands to allow for marsh migration (good slope, some public and private properties), which could then provide habitat for the Eastern Black Rail (*Laterallus jamaicensis jamaicensis*) and Saltmarsh Sparrow (*Ammodramus caudacutus*), as well as nearby fish and oyster communities. Its potential for carbon sequestration is unknown. The fishing community and other small villages on Elliott's Island, Maryland, (the south side of Fishing Bay WMA) will need to be closely consulted on what marsh enhancements and infrastructure improvements should be pursued. A 20- to 30-year management plan will be necessary, including components of marsh migration (i.e., easements and buyouts).

Streamlining Marsh Prioritization Tool Use

Identifying what marsh to protect and/or restore can depend on several factors, such as physical geography, provision of multiple ecosystem services, local priorities, partner capacities, and environmental justice. Multiple tools exist that may help this selection process occur, but guidance is necessary for how these tools best inform development and management plans and restoration projects. Potentially, funding agencies could provide guidance and include tool use or guidance in RFPs. Alternatively, tool guidance could be integrated into law or policy by regulatory agencies. The intended audience would be at the local, municipal level, where stakeholders know the landscape best. However, streamlining the tool selection process requires several considerations: Do the existing tools have a marsh selection prioritization bias (i.e., agreement on the right things to prioritize, such as community priorities and impact to community)? Do the tools help determine the appropriate restoration strategy? Is the data within the tools up to date (e.g., existing stormwater pathways and infrastructure)? If tools help identify a project, are there also resources to help fund or implement those projects? Outside of the tool selection process, this team recognizes that the tool users would need to identify community priorities to inform project goals and that a community assessment relevant to marsh restoration should be designed. Finally, should such tool guidance exist, it would need updates, maintenance, and concerted outreach (e.g., presentations at conferences, extension services, partner and funder buy-in) to help ensure use.

How to Legally Accommodate Marsh Migration on Private Land

Sea level rise and the associated saltwater intrusion and ecological transgression of wetlands into uplands (i.e., marsh migration) is occurring on private lands, particularly agricultural lands in coastal Maryland and Virginia. Available science and management techniques suggest that, rather than preventing sea level rise through engineering drainage systems, one should allow inundation to occur and provide incentives to landowners to foster wetland conversion. In

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1   https://www.whitehouse.gov/environmentaljustice/

addition to incentives and understanding what drives marsh migration acceptance among private landowners, there are also legal considerations as mean high-water levels may influence what is considered public or private property.

This project would include:
- a legal analysis of property rights under sea level rise scenarios (i.e., review federal and state actions and what economic options are available, such as buy-outs and conservation easement designs)—project component duration of 1-2 years, project component cost estimate of $200,000-300,000;
- mapping property ownership with marsh migration and vulnerability—project component duration of 3 years, project component cost estimate of $2-10 million;
- and community engagement—project component duration of 3-5 years, project component cost estimate of $1-4 million.

Potential partners for legal analysis include the Virginia Coastal Policy Center, the National Sea Grant Law Center, University of Maryland Agriculture Law Education Initiative, and Wetlands Watch, among others.

Mattaponi Fringe Marsh Project

The fringe marsh along the Mattaponi and Pamunkey Rivers is a strong candidate for protection and restoration because it is a rare tidal fresh marsh ecosystem with high wildlife value, particularly critical fish habitat. Restoration would include subtidal restoration—such as submerged aquatic vegetation, oysters, and low-marsh fish nursery habitat—as well as promoting marsh migration into the uplands, which requires buy-in from private landowners. Ecological and social science questions include how best to facilitate marsh transition and migration, and how communities, landowners, resource managers, and regulators will respond to the plan. The team recognizes that multiple natural resource agencies (Maryland Department of Natural Resources, Maryland Department of the Environment, Natural Resources Conservation Service), nongovernmental organizations, industry, local government, community members, and landowners will need to collaborate on this project. A facilitator is necessary to coordinate with the multiple stakeholders, and a strong leader and funding are needed to drive the project forward. In the first five years, the team will need to gather partners (i.e., a community of practice, technical assistance for project implementation), develop a strategic plan (i.e., phased implementation, adaptive management), secure dedicated funding, and have community engagement.

Priority List of Large-System, Long-Timescale Projects

One approach to large-scale, regional restoration is to identify and manage for marshes with an existing or potential extent in the thousands of acres that can persist with management over the next 50-100 years (e.g., have a natural or artificial sediment source, such as dredge material, and/or the ability to migrate). This will narrow down possible projects in the Chesapeake region. Selection criteria should also include wetlands that have the greatest benefit to surrounding communities. Existing maps of wetland data can help identify projects. Whether marshes are predisposed to inundation regardless of management intervention should also be a consideration. Existing environmental justice screening tools can help with selection criteria. This project requires multiple partnerships, including strong connections with and buy-in from surrounding communities (e.g., grassroots and community-based organizations). It also needs a committed project coordinator and, ideally, self-sustained funding.

How to "Actionize" Data Sets for Project Implementation

A disconnect is observed between entities still working to determine what types of projects to pursue and available data sets that may or may not soundly inform choices for project implementation. For example, a land trust seeks to determine which marsh may have the least or greatest longevity under "no-intervention," passive management but is unaware or faces barriers to accessing data sets that have the necessary projection data. Additional work is also needed to define and find consensus on marsh resilience criteria at the regional level, possibly by assembling a working group for a data hub. Should a team be assembled, it would benefit from a facilitator or coordinator to ensure meetings are productive. One approach would be to first focus on a "low-hanging fruit" project which can be used as an example of success and a model that could function at a more regional scale.

Criteria-Driven Location Prioritization with Beneficial Reuse

Beneficial reuse of dredge material is a potentially effective restoration strategy. However, research gaps remain, including determining cost-effective implementation methods and applicability. This team suggests a project to help streamline the targeting of beneficial reuse projects. Criteria for consideration include: marsh suitability and sustainability; biological indicators, such as wildlife habitat, vegetation suitability, and carbon sequestration potential; process drivers, including federal data and state tools (e.g., Maryland Department of Natural Resources' Beneficial Use: Identifying Locations for Dredge); land ownership and access to public versus private lands; cost-effectiveness; and funding sources. Innovative technology funds may be a mechanism to move projects forward, as well as a Chesapeake Bay Program "task force" lead.

Crisfield: Designing a Marsh Project with Multiple Benefits

This effort would focus on a marsh restoration project that would yield multiple benefits to the Crisfield, Maryland, community. Research is needed to quantify co-benefits of marshes beyond nutrient reduction (e.g., flood protection, carbon sequestration, public health) and how to incorporate these co-benefits into policy and funding structures. This project would also delve into mechanisms for community buy-in with consideration of what project features are most desirable (e.g., waterfront access) and what local organizations are the best conduits for engagement. The timescale for engagement is much longer (i.e., years) than what is typically allotted in funding opportunities. Crisfield was nominated as a focus area because of the work The Nature Conservancy is doing to build community relations. However, sufficient and ongoing funding from multiple sources is beyond the capacity for localities and local nongovernmental organizations to obtain.

Vulnerability Assessment of Tidal Freshwater Marshes and Engaging the Surrounding Communities

Climate change and associated sea level rise stressors need to be further researched for tidal freshwater marshes. Examples include precipitation, runoff and salinity changes, thermal discharge, sediment sources, organic matter deposits, and transgression and migration ability. A cross-comparison of tidal freshwater marshes across different urban and rural geographies will yield interesting insights, because stressors will likely change given adjacent land use or scale. Concurrently, this project would engage with tribal nations and surrounding communities to understand their perceptions of climate vulnerability. Greater research, education, and outreach over a multi-year timeframe is required to understand community priorities and how they interact with tidal freshwater marshes. This may inspire ways to better address community priorities through tidal marsh conservation (e.g., employment, real estate value).

Restoring the Uppards, Tangier Island, Virginia

This project would create a 20- to 30-year plan to restore the northern "Uppards" region of Tangier Island, Virginia, that would include a transition plan for resident relocation off the island. Dredge material could possibly help restore Tangier Island, like other mid-Chesapeake Bay dredge projects, such as Poplar Island and James Island in Maryland. Design considerations include elevation capital[2]; erosion control; transgression to forested uplands potential; connectivity (i.e., avoiding fragmentation); and dredge management, coordination, and maintenance. Depending on the design, a project lifespan can be determined (e.g., 50-75 years), which can inform quality of life of residents over time, various community adaptation options, and policy response (e.g., options available to residents other than buy-outs). Collaboration with residents and other partners is essential to plan development.
Note: This project did not have a final breakout session, so this summary reflects ideas presented during breakout session III.

Developing a 50-Year, Multi-System Plan for Tangier and Pocomoke Sound

This geography was selected because it would allow for multi-system and multi-marsh projects, given that large-scale may mean doing smaller, interconnected projects that are concentrated in a particular area. In order to enact such a project, practitioner silos must be broken down and community engagement experts are needed to meaningfully connect with residents. Several community engagement practices (e.g., community experience mapping, scenario-

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2   "Accumulation of material reserves that have contributed to the elevation of the wetland within the tidal zone" D.R. Cahoon, G.R. Guntenspergen. Climate change, sea-level rise, and coastal wetlands. National Wetland Newsletter, 32 (2010)

planning, providing visuals and videos) were discussed, recognizing the value of traditional ecological knowledge and local community knowledge. Funding options were also discussed to help react faster to the changing landscape. Funding would require multimillion-dollar budgets. This may mean first accessing local funds with the intent to build up to federal funding sources or pursuing smaller-scale projects, wherever funding is more obtainable.

Planning and Implementing "Big" Thin-Layer Application Restoration Projects

This project would investigate how to plan for and implement thin-layer application projects, likely on mainland fringe marshes. Site suitability would first need to be determined because there is no framework to evaluate whether a marsh needs sediment. Thin-layer applications are sometimes proposed at unsuitable sites, due to the needs of the marsh versus the convenience of willing partners. For sites that are good candidates, criteria to help plan and implement the project include: have one trusted leader or project champion to manage and represent the project from start to finish (noting that it is hard to find an entity with this capacity); formalize communication between partners; build political will and emphasize local context; calibrate expectations on project timescale; and identify that monitoring and adaptive management is necessary to demonstrate success and inform future projects.

Other shared project ideas

Research

- How to address displacement of agricultural lands, including keeping the balance of land-use types, moving salt-tolerant plants into land, and siting renewable energy within displacement zones
- How to finance carbon sequestration to make carbon credits competitive with the international market
- How to sustain funding for living shoreline creation and maintenance and fringe marsh preservation and restoration in order for communities with environmental justice concerns to build coastal resilience
- Further understanding of the value of island marshes and their impact on agricultural lands
- Explore enhanced land subsidence occurring where the paper pulp facilities are located as it relates to relative sea level rise
- Understanding the sociological impacts of large-scale relocation, perhaps exploring options for governmental buy-outs, and looking to Smith Island, Maryland, as an example community that might need large-scale relocation

Implementation

- Bring together non-contiguous marshes to make large-scale impact. Includes prioritizing a specific area and identifying an entity to do initial characterization for area selection. Example: Pocomoke project in floodplains took an integrated approach and created a small working group to address 4,000 acres and 14 miles of river. Developed land-owner incentives: outreach to landowners, waterfall effect of outreach.
- Department of Natural Resources has tools and technology but a challenge with addressing equity. Do you put all tools in one basket or spread it out across the state?
- Potomac and/or Choptank River
  - Dike and embayed marshes
  - Building up multiple marshes along river extent and building access to the water for the public
  - Monitoring for 20 years with adaptive management
- Large-scale oyster reef restoration in the shallow waters of the Chesapeake Bay in combination with submerged aquatic vegetation (SAV) and low marsh restoration, taking a full ecosystem restoration approach
- Combined effort to save the marsh islands, oyster reefs, and SAV beds in Tangier and Pocomoke Sound
- Combined restoration effort in the Middle Peninsula, Virginia, (York, Rappahannock, Mattaponi, and Pamunkey Rivers) addressing tidal freshwater wetlands down to tidal marshes and including island marshes. This area encompasses both saltwater and freshwater habitats.

Appendix A

Workshop Overview

Maryland Sea Grant and the Chesapeake Bay Sentinel Site Cooperative hosted a hybrid in-person and virtual workshop October 6, 2022. Fifty participants convened at the University of Maryland Golf Course Club House in College Park, Maryland, and 49 participants joined virtually via Zoom. Participants were mostly from Maryland and Virginia, representing a range of expertise and organizations (e.g., federal, state, and local government; academia; land managers; nonprofits; and industry).

Steering Committee Planning

The 24-person steering committee was composed of academic researchers, federal and state agency representatives, and nonprofit representatives with marsh and coastal resilience expertise. The committee met between March and September to define the workshop objectives, plan associated workshop activities, and recruit the focus audience.

Workshop Objectives

Invited speakers and designed breakout sessions were chosen to meet the following objectives:
- Use an ecosystem-services approach to determine marsh projects that yield multiple benefits. This includes benefits to surrounding communities and private landowners.
- Evaluate management regimes and specific strategies from 2022–2050 to inform long-term project sustainability.
- Consider a project's benefits, feasibility, and sustainability. Identify characteristics for large-scale projects with regional impact and ways to fund these projects.
- Lay the foundation for creating and developing potential large-scale, multi-partner projects that consider social justice and outreach strategies for involving communities and private landowners in management decisions.

Plenary Talks

Three lectures were presented. First, Pamela Mason, Center for Coastal Resource Management, Virginia Institute of Marine Science, gave an overview of the current state of tidal wetlands in the Chesapeake Bay region and the limited progress on reaching Chesapeake Bay Program wetland goals. Second, Kyle Graham, Ecosystem Investment Partners, discussed the "ingredients for success" of large-scale marsh projects based on experiences in Louisiana, the Florida Everglades, and the Great Lakes. He highlighted how the Chesapeake Bay region could use lessons learned from those projects. Third, Holly Bamford, National Fish and Wildlife Foundation (NFWF), discussed funding opportunities at NFWF, their priority implementation strategies, trends they see in upcoming funding opportunities, and associated challenges in the current funding landscape.

Breakout Session I: Maximizing Ecosystem Services

The purpose of this breakout session was to assess how different marsh geomorphologies may best support varied ecosystem services. Each breakout group was assigned an ecosystem service and evaluated seven marsh geomorphologies

for that service. They determined if each geomorphology would be a high, medium, or low priority for maximizing this ecosystem service and provided the rationale (e.g., assets, costs, barriers, research questions, uncertainties, etc.) for their decisions. There were 12 breakout groups, each with a facilitator, notetaker, and three to six participants. Some ecosystem services were assessed by multiple groups. Participants were assigned to breakout groups based on their responses to workshop registration questions, with the intent that they would be assigned an ecosystem service based on their interest and expertise.

- The matrix showing the priority designation (high – green, medium – yellow, low – red) for each ecosystem service and marsh geomorphology is in Table 1.
- Maryland Sea Grant will further analyze the group discussions on ecosystem service priority designations for each marsh geomorphology. This analysis may reveal dominant decision-making criteria for selecting what marshes to preserve or where to invest in restoration efforts.

Breakout Session II: Designing Optimal Strategies for Project Longevity

The purpose of this breakout session was to discuss optimal conservation and restoration strategies across multiple timescales on each marsh geomorphology. Groups were asked to consider current vulnerabilities of the marsh type and best management strategies to sustain marsh goals, based on the ecosystem service priorities of the previous breakout session. They were then asked to consider how these vulnerabilities and management strategies may change by 2030 and 2050. To aid discussion, breakout groups received sea level rise projection maps of examples of each marsh geomorphology in the Chesapeake Bay for 2030 and 2050.

There were 13 breakout groups, each with a facilitator, notetaker, and two to five participants. Some marsh geomorphologies were assessed by multiple groups. Participants were assigned to breakout groups based on their responses to workshop registration questions, with the intent that they would be grouped by their interest and expertise in a particular marsh geomorphology.

- Maryland Sea Grant will further review breakout session notes to see what considerations and priorities informed management regimes over time; what factors influenced decision-making for the recommended management; what restoration strategies were popular; and what the associated assets, weaknesses, and unknowns were with each chosen approach.

Breakout Session III: Brainstorming Large-Scale Marsh Project Ideas

The purpose of this breakout session was to reflect on the first two breakout sessions and share specific ideas for large-scale projects (e.g., addressing research gaps, implementing a restoration project, coordinated planning efforts for regional strategies). Groups were encouraged to share potential project ideas and were asked to nominate and share one project by the end of the session. Selected projects would be further developed in breakout session IV. There were 13 breakout groups, each with a facilitator, notetaker, and two to five participants. Participants were assigned to breakout groups based on their responses to workshop registration questions, with the intent that group members would have a diverse range of affiliations and expertise.

- The list of ideas generated from this breakout session can be found in the section, "Summary of Large-Scale Marsh Project Ideas"
- Maryland Sea Grant will further review the notes to capture cross-cutting themes on large-scale criteria and best management practices to implement those ideas, such as recommendations for community engagement.

Breakout Session IV: Developing a Large-Scale Marsh Project

The purpose of this breakout session was to further develop an idea nominated from breakout session III and to consider what research components, partner collaborations, or funding resources are required to advance the project. There were 12 breakout groups, each with a facilitator, notetaker, and two to five participants. Participants were assigned to breakout groups based on their responses to workshop registration questions, with the intent that group members would have a diverse range of affiliations and expertise.

- The list of ideas generated from this breakout session can be found in the section, "Summary of Large-Scale Marsh Project Ideas." Maryland Sea Grant will connect any participants interested in pursuing a project via

email. Once those contacts are made, groups may self-organize and pursue project development as they see fit. Interest was determined via a survey at the end of the workshop and post-workshop emails.
- As in breakout session III, Maryland Sea Grant will further review the notes to capture cross-cutting themes on "large-scale" criteria and best management practices to implement those ideas.

Next Steps

The following outcomes were expected as a result of workshop activities and discussions:
- Understand common objectives and recommended actions for a Bay-wide tidal marsh conservation and restoration strategy
- Identify the site characteristics (e.g., parcel size, geomorphology, quality, ownership, adjacent community priorities) that meet the large-scale concept and the location in the Chesapeake Bay of these significant areas or a network of sites
- Detail constraints on site characterization, project design, and other implementation barriers and use these knowledge and resource gaps to inform funding opportunities, research proposals, and pilot projects
- Identify key sociologic and economic factors critical to advancing tidal marsh persistence and expansion

An additional report will be published on the Maryland Sea Grant website (mdsg.umd.edu/large_scale_marsh_workshop) after further analysis, as described above.

Maryland Sea Grant and the Chesapeake Bay Sentinel Site Cooperative thank the steering committee for their planning and recruiting efforts, as well as the workshop participants, facilitators, and notetakers for their time, consideration, and contributions to advancing the workshop goals.