Embargoed until January 21st, 2022 at 1 PM

Maryland
Coastal Adaptation Report Card 2021

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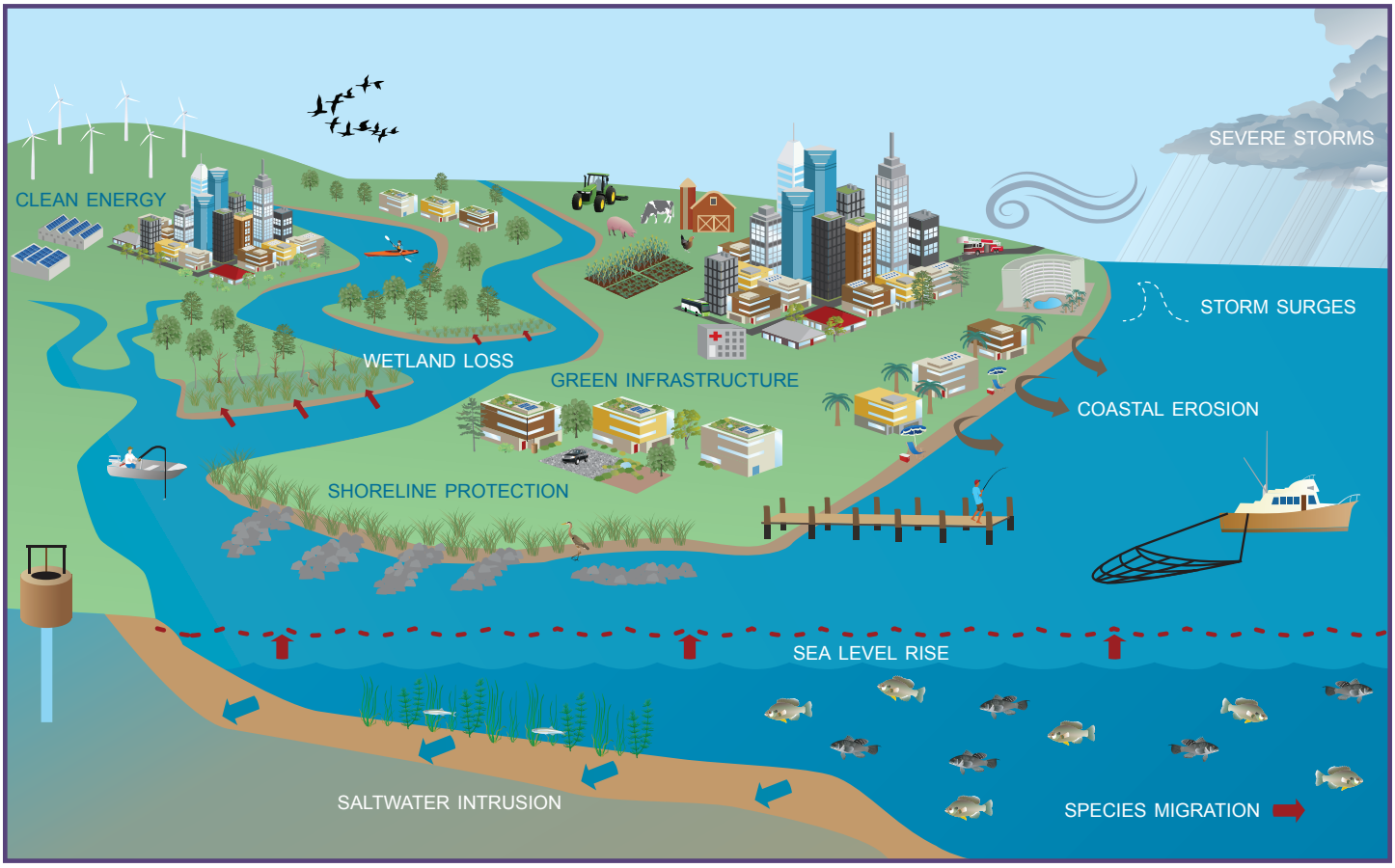
What is coastal adaptation?

Coastal adaptation refers to the processes and actions taken to improve the ability of a community or ecosystem to respond to and withstand climate change impacts. Adapting to climate change is vitally important, and many coastal communities are already working toward adaptation. Just what does this entail, though? Adaptation may include adjusting behaviors, physical processes, or environmental relationships. These adjustments should consider and integrate human and natural systems.

Urgency of coastal adaptation is increasing

In Maryland, 4.24 million people (72% of the state's population) live and work along the coast. The fisheries and tourism industries surrounding the Chesapeake Bay provide livelihoods for tens of thousands of Marylanders, and seafood for many more. These industries, along with the people who live, work, recreate, and farm in coastal areas, are threatened by numerous climate change hazards.

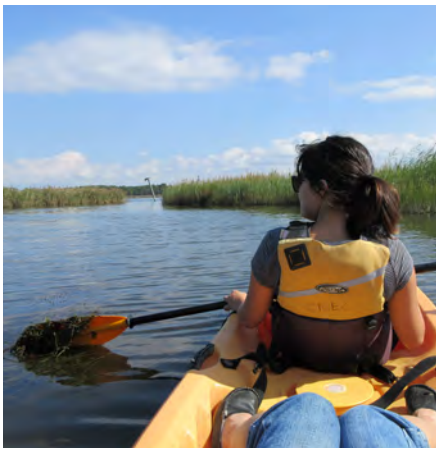
Climate change causes increasingly frequent and severe storms, hotter summers, warmer winters, sea level rise, and changes in precipitation patterns. Heavy rains and storm surges accelerate coastal erosion and threaten wetland buffers. Sea level rise contributes to wetland loss and saltwater intrusion. Temperature changes impact habitat suitability for plant and animal species, which leads to species migration to ensure survival. Governance and management actions influence the adaptive capacity of these systems. For example, shoreline protection projects provide buffering against storm surges and flooding, green infrastructure reduces and slows stormwater runoff, reducing the impact heavy rains have on communities, and structural modifications prevent flood damage. By implementing these and other adaptation actions, Maryland's government and citizens can reduce and prepare for the negative impacts of climate change, protecting their people, economies, and ecosystems. Some of these effects and adaptation actions are illustrated below.



Climate change impacts coastal regions in many ways, some of which are illustrated above. White text indicates climate-related changes, including wetland loss, coastal erosion, storm surges, severe storms, sea level rise, species migration, and saltwater intrusion. Blue text indicates adaptive actions that can be taken to protect coastal communities, such as investment in clean energy, shoreline protection, and green infrastructure.
Cover photos, from top to bottom: Blackwater National Wildlife Refuge (photo by Jane Thomas, UMCES-IAN); road damage from flooding in Maryland (photo by Jenn Raulin, MDNR).

Climate change threatens Maryland's coastal areas

The Chesapeake Bay accounts for most of Maryland's shoreline, and is hugely important to the state's culture, economy, and ecosystems. The Bay is home to diverse marine life that supports Maryland's fisheries. Commercial fisheries, tourism, recreation, and forestry employ nearly 175,000 Marylanders. Climate change threatens these economies and the communities that depend on them. Loss of habitats such as wetlands, coastal forests, and seagrass beds results in the decline of ecologically and commercially important species. Climate change is affecting the recovery of endangered species such as the Atlantic sturgeon and green sea turtle. Also impacted is the blue crab, around which Maryland's seafood culture and international fame is based. Adaptation efforts must continue to ensure the survival of not only these, but all of coastal Maryland's people, economy, and ecosystems.

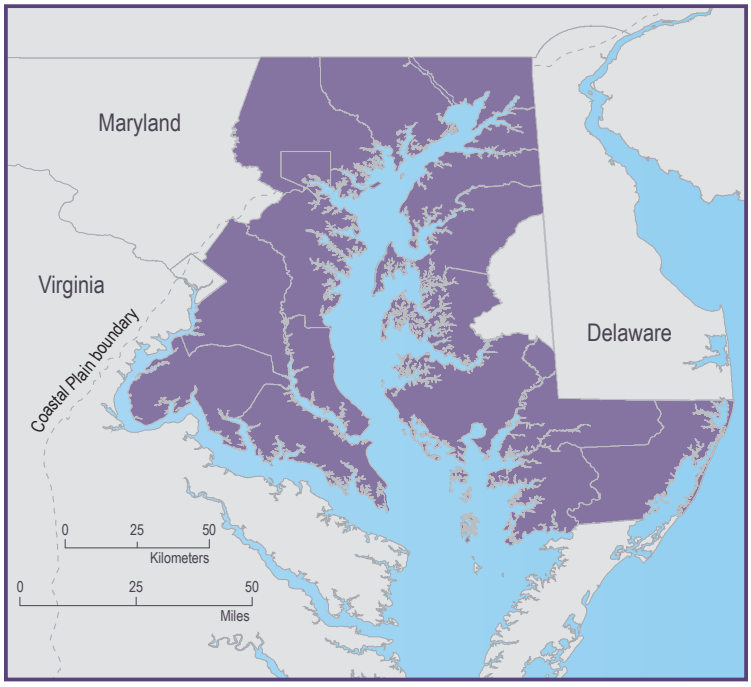


From left to right: a kayaker enjoys the Bay scenery (photo by Katie May Laumann, UMCES-IAN); an egret lands in the Anacostia River (photo by Will Parsons, Chesapeake Bay Program); stakeholders help plant marsh grasses in Dorchester County (photo by Alicia Pimental, Chesapeake Bay Program).

State and county management address the threats of climate change

State government plays a critical role in supporting adaptation efforts by setting goals, establishing regulations, and leading by example. The state also provides technical support, information, and funding to assist local efforts. Local management decisions are based on this support and guidance from the state, as well as on the unique needs of each jurisdiction. In this way, state and local initiatives complement one another, providing additive protection to coastal communities. For example, the state-level goal of "no net loss" protects wetlands and forests, and local governments set regulations, establish zoning ordinances, and plan projects to meet these goals.

This system should facilitate the implementation of adaptation actions to meet state and local goals based on data. However, the information and data upon which management decisions should be based are not always available at the state level, let alone the local level. A greater understanding, more data, and additional projections of climate change impacts are needed to ensure best management decisions and continued success. The next step in building upon current adaptation efforts is adding to the data that inform these efforts. This will require collaboration among local, state, and federal governments and the research community.



The Atlantic Coastal Plain and Maryland's coastal counties. In purple: Anne Arundel, Baltimore, Baltimore City, Calvert, Charles, Cecil, Dorchester, Harford, Kent, Prince George's, Queen Anne's, Somerset, St. Mary's, Talbot, Wicomico, and Worcester.

Why a report card?

Report cards are effective in measuring ecosystem condition and adaptation. They help communities, governments, and organizations identify goals for ongoing activities, and measure progress toward those goals. They provide a snapshot of current progress and allow for tracking continued improvement over time. They also identify gaps in data and efforts.

For the last decade, the State of Maryland has invested in and made progress toward adaptation. Through increased funding, planning, regulatory changes, and restoration, Maryland has become a leader in coastal and climate adaptation. However, there is a need to clarify adaptation goals in order to measure progress and hold the state accountable.

The Maryland Coastal Adaptation Report Card, a collaboration between the Adaptation and Resiliency Work Group (ARWG) of the Maryland Commission on Climate Change (MCCC) and University of Maryland Center for Environmental Science Integration and Application Network (UMCES-IAN), begins to address this need. By developing a suite of adaptation indicators and thresholds based on stakeholder expertise, the Coastal Adaptation Report Card gives a snapshot of current adaptation status in Maryland's coastal zone, and establishes a framework for measuring future progress.

The development of the Coastal Adaptation Report Card followed a well-established, multi-step methodology. Through a series of workshops in the fall and winter of 2020, the research team identified the climate change threats that most concern stakeholders, how these threats are addressed, and what adaptation actions are most critical in measuring progress. The stakeholder process, combined with a literature review to identify viable indicators, resulted in the selection of 15 indicators across four categories: Planning, Flooding, Socioeconomic, and Ecosystem. The current status of each adaptation indicator was assessed by comparing best available data to established goals based on expert knowledge, scientific consensus, and regulatory initiatives.

Nuisance flooding occurs throughout Maryland's coastal region (photo by Nathan Miller, UMCES-IAN).

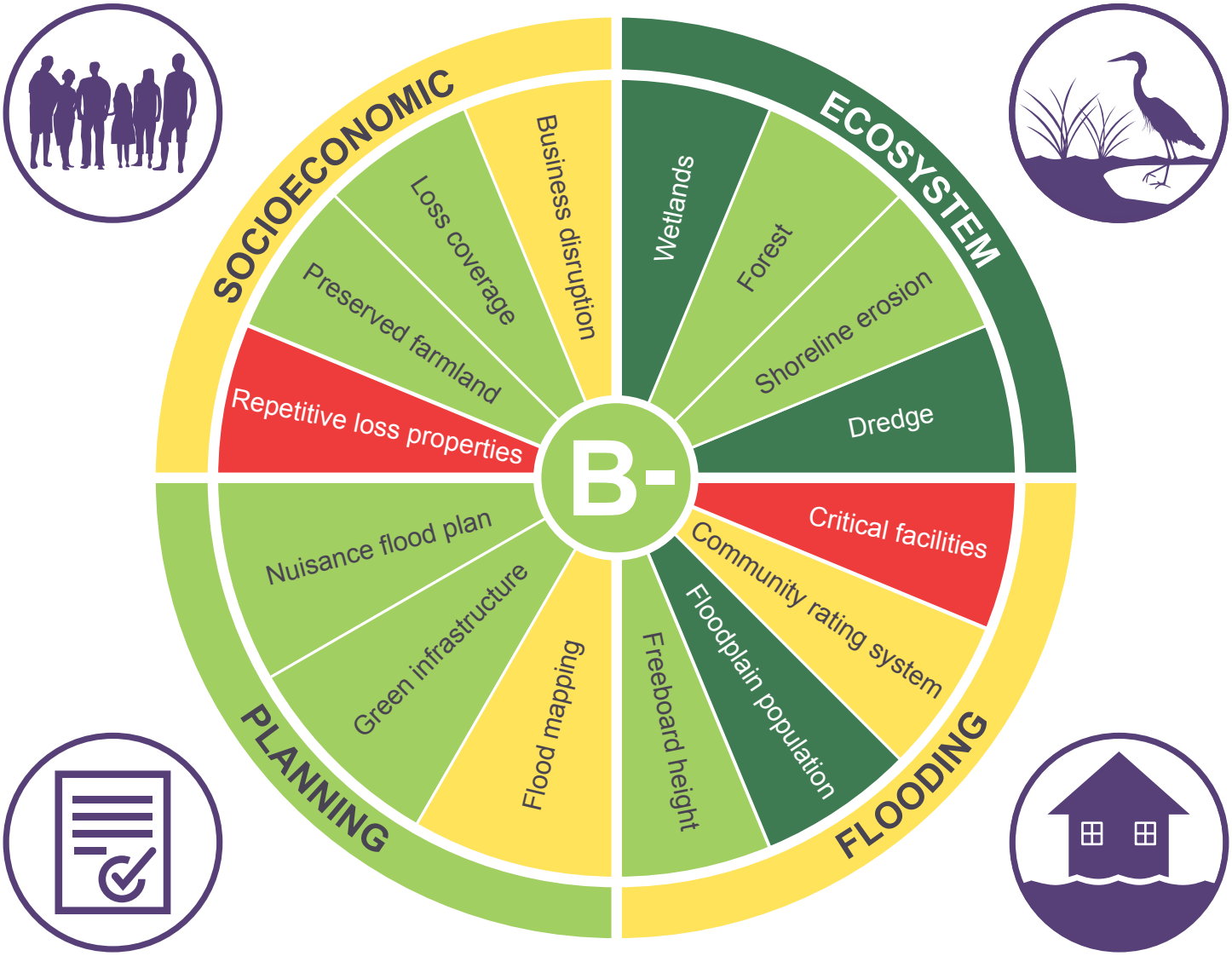
Report card development is an adaptive process

The development of this report card was impacted by the COVID-19 pandemic. Typically, stakeholder workshops are held in person, with a large number of participants. Due to the inability to meet in person, several small, web-based workshops were held. Even in the midst of the pandemic, UMCES-IAN engaged over 125 stakeholders across every coastal county in Maryland. Stakeholders represented organizations including state and local governments, universities, non-governmental organizations, and the general public.

This process resulted in the identification of over 35 potential indicators. The final list of indicators was determined based on applicability, stakeholders' perspective on prioritization, data availability, and the scientific validity of indicators and data. In some instances, data were unavailable for priority indicators. In these cases, proxy indicators with available data were used instead. For example, stakeholders agreed that an indicator for shoreline condition would be critical to understanding Maryland's adaptation capacity, but appropriate data for the entire coastal zone were unavailable. Instead, shoreline erosion rate, as reported by Maryland Department of Natural Resources (MDNR), was identified as an effective proxy data source to approximate the status of shoreline health.

Researchers collect data in the Chesapeake Bay (photo by Jon Lefcheck, Smithsonian Environmental Research Center).

Maryland coastal adaptation scores: a B



Key

F	0–20% misses adaptation goals	D	21–40%	C	41–60%	B	61–80%	A	81–100% meets adaptation goals

What do these scores tell us?

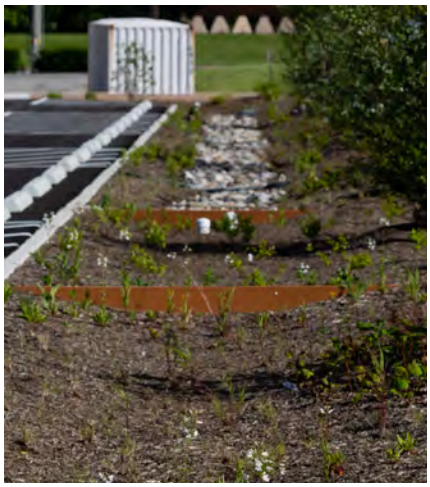
The wheel above illustrates indicator and category scores using a stoplight color scheme. Indicators in dark green are those for which adaptation goals are met, and light green indicators are close to meeting adaptation goals. Yellow indicators are being managed for climate change, but not adequately so, and orange indicators are nearly failing to meet adaptation goals. Indicators in red fail to meet adaptation goals. Yellow, orange, and red indicators require much more work to reach adaptation goals. In terms of letter grades, dark green is scored as an A, light green a B, yellow a C, orange a D, and red an F.

Overall, Maryland has a score of B-. Some indicators measured already meet, or are close to meeting, current adaptation goals, while others require significant investment to achieve adaptation goals. The Ecosystem and Planning categories score an A and a B+, respectively. Indicators in these categories are close to adaptation targets, but effort is required to improve certain indicators. Progress toward meeting Flooding and Socioeconomic adaptation goals is moderate, with both categories scoring a C. Many indicators in these categories miss adaptation targets and require further action.

Maryland is a leader in coastal adaptation

Maryland's research and higher education institutions are working to identify and understand present and future risks of climate change. Statewide, policies and programs identify solutions and support their implementation; funding sources help target, prioritize, and support adaptation actions; and legislation further progresses on climate and coastal change policy. The State of Maryland has been a leader in coastal and climate adaptation for well over a decade. Collaborative efforts across agencies, NGOs, communities, and individuals bring coastal adaptation and climate solutions to Maryland's communities, economies, and ecosystems. Recognizing that solving climate change requires the breaking down of silos, Maryland is proud to collaborate with neighboring states through agency partnerships including the Chesapeake Bay Program and the Regional Greenhouse Gas Initiative; such collaborations continue to push the envelope on coastal adaptation.

Maryland pursued the development of adaptation indicators through this report card in order to establish an accountability and progress metric to the state of adaptation efforts. By identifying indicators that can measure progress, Maryland is taking a necessary step towards enhancing climate and coastal adaptation efforts. Maryland has been a leader in adaptation for well over a decade, but recognizes how much further we have to go to succeed as climate change continues. By establishing indicators and holding ourselves accountable we ensure that Maryland protects its communities, economies, and ecosystems now and into the future.



Left to right: volunteers clean a stream in Anne Arundel County (photo by Chesapeake Bay Program); the Maryland State House in Annapolis (photo by Sky Swanson, UMCES-IAN); a rain garden in Baltimore (photo by Chesapeake Bay Program).

Maryland still faces challenges in coastal adaptation

Challenges across indicators include needs for more data, updated goals, and improved access to funding. Although scores inform us about the state of adaptation in Maryland, they do not tell us if adaptation strategies are applied equitably. Many adaptation programs, policies, and funding sources operate with an equity lens and justice principles, but data to assess equity are unavailable. The most urgent challenges are to the Socioeconomic, Planning, and Flooding indicator categories.

Socioeconomic climate threats are insufficiently and unevenly addressed. While physical property loss in the 100-year floodplain is adequately addressed by Federal Emergency Management Agency (FEMA) flood insurance policies, impacts extend beyond the floodplain. Updated climate change projections would facilitate better assessment of coast-wide flood insurance adequacy. Some properties experience repeated flood damage and require adaptation. This may be cost-prohibitive, so repetitive damage continues. Beyond physical damage, climate change will cause economic loss due to business disruption, which is not managed for.

Although **planning** indicators are nearly meeting current goals, these goals are inadequate considering future risk. Planning for nuisance flooding and green infrastructure is a first step toward adaptation, but plans alone are not enough. Goals must be set, and progress made. Setting goals requires up-to-date information including flood risk maps. Flood maps extending beyond the FEMA floodplain are available, but they require updating to facilitate effective planning and adaptation.

Beyond planning, more effort is needed to meet **flooding** indicator goals. Critical facilities in floodplains may become non-operational during flood events. To ensure vital services remain available when they are most needed, facilities must be relocated or adapted. Other community adaptation efforts are being made, with some tracked through the Community Rating System (CRS), but progress toward these goals is slow and access to funding for implementation is not universal.

Indicators measure coastal adaptation

Socioeconomic indicators

Events related to climate change frequently cause property damage, business closures, and loss of productive land. Further, some properties are located in frequently flooded areas and are repeatedly damaged by increasingly frequent floods. These factors impose economic challenges on Maryland's residents and businesses, which impact individuals, communities, and local economies. Various adaptation options are available to defray costs and prevent further damage.

Loss coverage evaluates how much of estimated future flood damage would be covered by current insurance policies. Flood insurance is only required in FEMA-identified flood risk areas, but floods in the near future are predicted to impact properties beyond these areas. Flood insurance is available for properties not in the FEMA floodplain, but because it is not required, these areas may be un- or under-insured. This indicator considers how much of the property that is expected to be impacted in a 100-year flood is covered by existing flood insurance policies.

Business disruption is a financially expensive result of coastal change events. Storms and floods, increasing with climate change, threaten short- and long-term business closures that may impact whole economies. The Congressional Budget Office calls a loss of 5% of annual income "substantial." This indicator considers whether the expected business disruption cost from a climate change event exceeds 5%.

Repetitive loss properties are properties that have had two or more National Flood Insurance Program claims over $1,000 within 10 years. These properties may be adapted to better withstand threats of climate change by, for example, elevating them. This indicator assesses the proportion of repetitive loss properties with such adaptations implemented.

Preserved farmland evaluates the amount of farmland that has been protected through conservation easements or other avenues. Such protection can reduce climate threats and safeguard farmland against development, bolstering the future of farming. Maryland has an official goal of preserving 1,030,000 acres by 2022. Programs working toward this goal include The Maryland Agricultural Land Preservation Foundation, The Rural Legacy Program, and local programs. This indicator score is based on what percent of the goal has already been met through these programs.

Planning indicators

Planning is a critically important step in the development and implementation of coastal adaptation. Planning efforts occur at all levels of government and across a diverse range of organizations. Developing plans requires a robust repository of data and stakeholder input, and benefits from a shared vision or goal. In Maryland, plans are developed at the state level, for example, the State Hazard Mitigation Plan (currently undergoing an update); at the local level, as in the county or municipality nuisance flood plans; and at the organizational level, such as the Phase I and Phase II Climate Adaptation Plans developed by ARWG. The suite of planning indicators measures progress towards comprehensive planning for coastal adaptation to address climate change threats.

Nuisance flood plans are required for Maryland jurisdictions that experience high-tide flooding, sea level rise inundation, and coastal flooding. These plans are developed at the local level in accordance with state-level legislation (House Bill 1427). This indicator is scored based on how many communities that are required to complete a nuisance flood plan have done so.

Green infrastructure plans, developed at the local level, help municipalities identify and plan implementation of adaptation actions to reduce climate change effects such as flooding, erosion, and urban heat. Adaptations may include installing rain gardens and green roofs, increasing greenspace, and installing pervious concrete to allow absorption of excess stormwater. This indicator is scored based on the availability of green infrastructure plans in Maryland's coastal counties.

Flood mapping is critical to understanding current and future flood risk. The State of Maryland has a wide array of mapping products available, some developed in response to legislative requirements and others developed for specific projects or communities. This indicator measures the current state of flood mapping products available, the quality of data within, and the geographic scope and technical assistance available to support use of this essential tool.

Indicators measure coastal adaptation

Ecosystem indicators

Coastal Maryland has a diversity of ecosystems including coastal forests, wetlands, and islands. These ecosystems are the first line of defense against climate change. When intense storms approach the coast, wetlands buffer against strong wave action and hold excess water, reducing flooding. Living shorelines and coastal forests prevent excess erosion and dampen flooding.

As climate change accelerates, services provided by these ecosystems will become increasingly important. Unfortunately, ecosystem decline and loss is occurring rapidly. Adaptation actions can help protect and restore these habitats, maintaining and bolstering the benefits they provide. The implementation and results of such adaptation actions are assessed here.

Forests help lessen the severity of climate change effects by reducing erosion and buffering against increasingly intense storms. Adaptation to climate change includes activities such as reforestation and forest maintenance. This indicator considers whether forest canopy loss is occurring in critical areas for Bay health.

Wetlands are negatively impacted by sea level rise, saltwater intrusion, and other climate change effects. Through the Chesapeake Bay Agreement and the Nontidal Wetlands Act, Maryland has a regulatory goal of “no net loss” of wetland acreage and function. This indicator evaluates whether this goal is being met.

Shoreline erosion, a natural process, is amplified by the increasing storms and flooding caused by climate change. Shoreline management and adaptation activities, such as restoring living shorelines, can reduce this erosion. Shoreline erosion rates, reported by MDNR, were used to illustrate the effectiveness of shoreline management.

Dredge materials result from necessary waterway maintenance dredging. These materials can be beneficially used to restore wetlands, stabilize shorelines, and rebuild islands lost to erosion. This indicator assesses how much dredge material is beneficially used, annually, in Waterway Improvement Fund (WIF) projects in comparison to previous years.

Flooding indicators

Flooding can be coastal or inland, and is caused by a variety of sources including precipitation, high tides, and storm surges during extreme events. The magnitude of flood events and the severity of impact on the surrounding area is influenced by the amount of water present, the conditions of the area (e.g. amount of impervious surface), and a community’s or environment’s ability to adapt and recover. Stakeholders identified four indicators critical to understanding adaptation progress in relation to flooding for Maryland.

Critical facilities include hospitals, emergency services, and utilities. These facilities and their services are important in everyday life, but their continued operation during emergency events, such as floods, is crucial. FEMA indicates that “even a slight chance of flooding” of these structures is too great, and that they should not be located in floodplains. This indicator considers how many of Maryland’s coastal counties have critical facilities located in FEMA-identified flood risk areas.

The **Community Rating System** is a voluntary program that rates communities based on the coastal adaptation indicators they implement. A tiered system that runs from a rating of 1 to 10, the CRS grants flood insurance discounts to participating communities. This indicator considers only communities that participate in the CRS, and assesses their progress toward adaptation based on their rating.

Freeboard height is the height above the 100-year flood elevation that a structure is built. Building or raising the first floor of a structure above flood elevation reduces the risk of flood damage. The State of Maryland recommends freeboard height of two feet, but local governments may set different height requirements. This indicator assesses these requirements.

Floodplain populations face property damage, injury, and loss of life during flooding events. A larger population living in the floodplain creates a greater risk of damage. This indicator considers changes in the human population in the floodplain.

Planning for coastal floods requires information

Climate change is contributing to an increase in flooding impacts in coastal counties, and these are expected to worsen in the future. Comprehensive, downscalable, publicly available data and maps are essential in planning for and adapting to current and future flood events. Both regulatory and nonregulatory mapping products are available for Maryland, including FEMA flood maps, the Coast Smart Climate Ready Action Boundary, the Maryland State Highway Administration Climate Change Vulnerability Viewer, and local flood risk visualization maps. These products provide planners with a greater understanding of where flooding may occur. As climate change continues, though, flood risk visualizations must be updated and enhanced to adapt for future impacts. In addition to visualizations, technical assistance on how to apply, use, and interpret them should be provided at the state and local levels.

Current and future flood maps are an important part of the state's coastal adaptation efforts. Legislation passed in 2015 (House Bill 514) requires "science-based sea level rise projections," including maps that display areas most at risk of storm surges, floods, and extreme weather events. These maps must also "be made publicly available on the internet." Progress has been made towards these mandated requirements, but more work is needed.

From left to right: a flooded road in Blackwater National Wildlife Refuge (photo by Nathan Miller, UMCES-IAN); flooded properties (photo by UMCES-IAN); downtown flooding in Annapolis, Maryland (photo by Chesapeake Bay Program).

Flood insurance is not required everywhere

Property owners on the coast face major financial burdens when disaster strikes. FEMA requires homeowners in the floodplain to purchase flood insurance; in the State of Maryland, FEMA flood insurance is valued at about $16 billion a year. But FEMA flood insurance is only required in the 100-year floodplain, and increasingly frequent and severe floods are impacting areas outside of this floodplain. Although insurance can help defray losses from future flood events, it is not required and not commonly purchased in areas outside the 100-year floodplain.

Property owners in at-risk areas may not know what flood insurance options are available to them, or they may view it as an unnecessary expense unlikely to offer any benefit. Those who rent their homes may not be aware of flood insurance options to protect their belongings, or of the status of their landlords' flood insurance. This leads to properties at risk of flooding being un- or under-insured, and poses significant risk of future losses. Public outreach regarding flooding, including providing science-based flood maps and flood insurance options, is a key facet of improving awareness of flood risk and insurance availability. State or local outreach programs would likely lead to an increase in the adaptive capacity of communities in the face of climate impacts, and should be implemented.

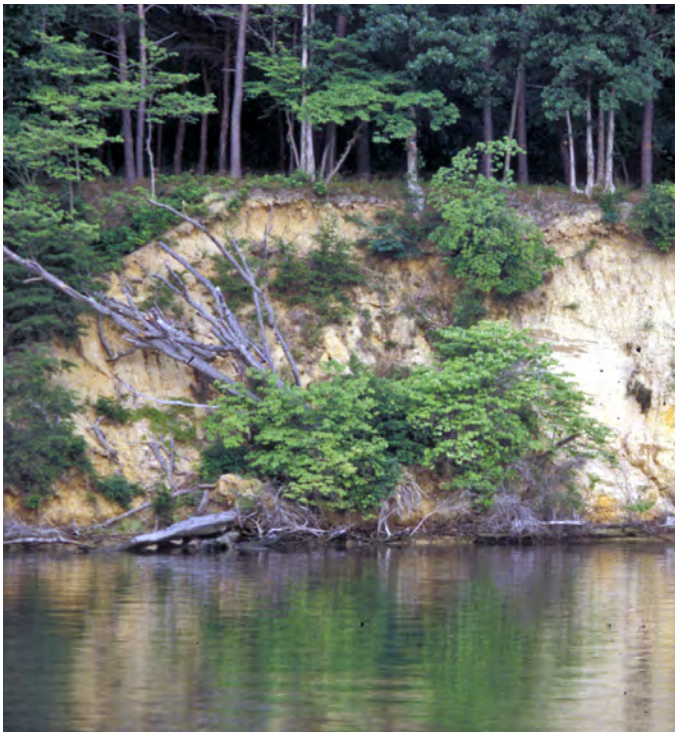
Maintenance dredging can be beneficial

Maintenance dredging of waterways is necessary to maintain accessibility, but creates thousands of cubic yards of material that is often treated as waste. Dredge materials can instead be used beneficially for the restoration, adaptation, and protection of coastal habitats. Waterway Improvement Funds that help local governments use dredge sediments beneficially are provided by MDNR Center for Waterway Improvement & Infrastructure. Over the last several years, WIF funds led to the use of up to 24% of annual dredge materials in restoration.

In addition to WIF-funded, local-scale projects, the Maryland Department of Transportation Maryland Port Administration and the U.S. Army Corps of Engineers use dredge materials from their large-scale dredge projects in the Port of Baltimore's channels. In February 2021, MDOT MPA and the Army Corps completed the restoration of Poplar Island, which was nearly eroded away, to its original 1,150-acre area. This effort, lasting 23 years, restored habitat for wetland and other species, including Maryland's state reptile, the diamondback terrapin.

Left: bulldozer unloads dredge material into barge (photo by UMCES-IAN). Right: Poplar Island was restored with dredge materials (photo by Will Parsons, Chesapeake Bay Program).

Climate change amplifies erosion problems



Coastal erosion causes shoreline collapse (photo by Chesapeake Bay Program).

Coastal erosion is a natural process. The constant movement of sea against shore shifts beaches and shorelines along the coast, building them up and wearing them down. Erosion rates can be heightened during intense storms, which are increasing in intensity and frequency with climate change. Along with sea level rise, this results in accelerated erosion and, ultimately, shoreline loss.

Erosion along Maryland's coast threatens public safety, property, services, and ecosystems. Homes and infrastructure near shorelines may be lost. Erosion near roadways and bridges restricts access to provisions, first responders, and evacuation routes. Threats to natural areas include the loss of important coastal wetlands.

Adaptation measures to reduce erosion in the face of climate change include shoreline modification. Hardened shorelines involve stone or concrete barriers. Living shorelines, on the other hand, mimic natural wetlands with a variety of plants, providing an absorptive buffer against the ocean.

As climate changes, it is important to monitor shoreline status in order to identify areas in need of restoration and adaptation. Data were not available for shoreline status coastwide, so erosion rates are used as a proxy in this report card.

Saltwater intrusion threatens vital habitats

Saltwater intrusion, the invasion of salt water into previously freshwater habitats, is one way sea level rise threatens Maryland's people and ecosystems. Saltwater intrusion impacts previously fresh water, making drinking and irrigation water sources unusable. This will eventually make Maryland's agricultural fields unproductive, causing economic loss for farmers and others who rely on these crops.

Saltwater intrusion also causes habitat loss, killing freshwater wetlands and coastal forests. Their loss means the loss of beneficial services they provide, including flood protection, water filtration, and in the case of coastal forests, provision of timber for Maryland's forestry industry. Dead trees may remain standing, forming "ghost forests," which can be found along Maryland's lower Eastern Shore. Maryland's Plan to Adapt to Saltwater Intrusion and Salinization includes recommendations for managing ghost forests, as preventing forest death is difficult. Actions include removing dead timber and allowing salt marshes to take over formerly forested areas.

Blackwater National Wildlife Refuge houses acres of ghost forest (photo by Dylan Taillie, UMCES-IAN).

How do we improve adaptation in Maryland?

The State of Maryland is fairly well-adapted to handle continuing threats of climate change. Particular success has been seen in maintaining wetland acreage and in increasing capacity to use dredge materials for restoration. Floodplain populations have also been reduced, decreasing the potential threat of coastal emergencies. Despite this, several challenges remain:

Equity: While many adaptation efforts in Maryland consider and successfully incorporate equity principles, improvements in evaluation and tracking of outcomes is essential to ensuring Maryland's adaptation is equitably apportioned.

Data needs: Lack of data for scoring certain indicators reflects a lack of adequate data for planning. Data gaps must be filled in order to adapt to climate change. Integrated data and mapping visualizations are needed to understand how storm surge, flooding, and other impacts will occur under projected sea level rise scenarios. These projections must inform planning maps and be considered in policy.

Structural adaptation: Siting buildings outside of the 100-year floodplain and implementing structural adaptations (e.g. high freeboard requirements) is one way to address climate change risks. In order to reduce risk, the Coast Smart Program requires state-funded capital projects to be located outside a boundary beyond the 100-year floodplain. Adaptation indicators, however, show that there are still significant critical facility assets within the floodplain, and therefore a need for relocation or structural adaptation to increase resiliency.

Funding: Many counties and communities are striving to improve adaptation, including by exceeding state recommendations in terms of freeboard height and participating in the Community Rating System. Some investments in adapting repetitive loss properties have been made, but these may be cost-prohibitive. Adaptation is expensive, and financial investment from the state or federal level would help communities adapt to known risks. Stakeholders working at the local level expressed that available funding opportunities are difficult to access. Processes for acquiring funding should be simplified, or assistance in applying for funds should be provided.

Insurance awareness: Flood insurance is only required within FEMA floodplains, and only for a set amount of time. Most of those who are not required to purchase flood insurance do not, despite high levels of flood risk. Outreach activities regarding flood risk, and how much it threatens properties outside of the floodplain, should be undertaken.

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Contributors

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Report card team: Allison Breitenother (Maryland DNR), Katie May Laumann, Annie Carew, and Heath Kelsey (UMCES-IAN).

Website: ian.umces.edu

From left to right: the famous Mr. Trash Wheel in Baltimore, Maryland (photo by Chesapeake Bay Program); the boardwalk of Ocean City, Maryland (photo by Paulo O on Flickr); the skyline of Annapolis, Maryland (photo by UMCES-IAN).

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