

3.1 Adapting to Changing Environmental Conditions

Outcome SubChapter

Adapting to Changing Environmental Conditions:

Increase the capacity for pursuing solutions, including those that are nature-based, to improve planning and responses to changing conditions while balancing long-term resilience of watershed communities, economies and ecosystems.

- **Target 1:** By 2040, support at least seven sub-watershed areas with knowledge-sharing and technical assistance to identify adaptation options with a preference for nature-based solutions. These solutions include restoration and protection projects that will help address risks to people, infrastructure and habitats from changes in temperature, precipitation and landscapes.
- **Target 2:** By 2040, inform and lead to an increase in the implementation of the identified adaptation options that prioritize and integrate nature-based solutions in the above sub-watershed areas.

Baseline and Current Condition

The previous adaptation outcome under the 2014 Watershed Agreement did not have a formalized quantitative baseline or explicit project-tracking mechanisms for resilience-related projects. This was mainly due to the outcome being structured under the CBP's Scientific, Technical, Assessment, and Reporting (STAR) team where progress was assessed from a qualitative perspective on addressing science needs. Under the revised 2025 Watershed Agreement framework, the Adapting to Changing Environmental Conditions (ACEC) outcome now has defined targets. To facilitate progress on the targets, we are utilizing a place-based, adaptation needs-driven approach across chosen sub-watershed areas. This strategy targets the unique impacts of changing environmental conditions—specifically changes in precipitation, changes in air and water temperatures, and sea level rise—on local landscapes within the sub-watershed area. Ideally, the selected seven sub-watershed areas will have varying geographic and development considerations (e.g., urban, suburban, rural) where the workgroup can build capacity for nature-based solutions (NbS) to maximize resilience and ecosystem benefits across coastal (tidal) and inland (nontidal) areas.

Upon selection of a sub-watershed, existing datasets and tools can be used to assess trends in changing precipitation, temperatures, and sea levels, along with reviewing any existing vulnerability assessments and adaptation plans, to determine a baseline and current condition related to the adaptation needs conveyed by local governments and stakeholders. Adaptation needs could include, but are not limited to, addressing issues around coastal and inland flooding, shoreline erosion, droughts or warming temperatures, habitat loss, invasive species, or other issues of local concern. If such information does not exist, the workgroup will support activities to empower jurisdictions and communities to develop the needed information.

Ultimately, the baseline will be defined by the current capacity of localities within a sub-watershed to understand climate impacts and develop solutions to address climate adaptation needs and the existing and future use of NbS. These solutions encompass both tidal and nontidal restoration and protection projects, including, but limited to:

- Tidal and nontidal wetland restoration
- Living shorelines
- Tree canopy expansion and forest conservation
- Green infrastructure and small-scale stormwater management
- Stream restoration and floodplain management

The workgroup, in coordination with signatories, will develop an inventory of candidate sub-watersheds and categorize current conditions based on land use, landscape geography, and the specific environmental stressors related to the adaptation needs within the sub-watershed and capacity to implement solutions. This categorization would be used to establish baselines for the sub-watersheds.

Monitoring Progress and Indicators

The previous adaptation outcome did not have any quantitative indicators. Instead, progress was assessed qualitatively based on collaborative projects being supported by the workgroup participants. Moving forward, the group will be evaluating options for quantitative indicators to track progress on the outcome. This outcome and its targets are unique in that they depend on stakeholder feedback integration on adaptation needs in the sub-watershed area. Collaboration and strategic networking will be key in monitoring progress.

To move forward in identifying and implementing NbS, we plan to take an adaptation planning-to-implementation pipeline approach where the workgroup will collaborate with local and regional partnerships presiding or working within a sub-watershed to share and deliver data and tools, assess adaptation needs, connect groups with NbS best practices, and implement other knowledge sharing activities, such as workshops to address specific adaptation challenges. These activities will aid groups in the sub-watershed area in advancing their use of NbS where they are at in the process. For instance, some areas may already have in-depth vulnerability assessments and have identified NbS strategies, but need improved information to support design and implementation. Others may be starting at an initial concept and need guidance on which NbS to consider.

The adaptation planning-to-implementation pipeline could vary depending on the jurisdiction's policies and resources. Flexibility will be key to work where local and regional partners are in the process and provide technical assistance where needed. Examples of activities that the workgroup could support to empower local and regional groups with their adaptation needs include:

- Connecting partners with existing datasets and data tools to aid in their vulnerability assessments,
- Identifying innovative NbS strategies or hybrid green-gray infrastructure approaches that bolster multiple benefits (e.g. hazard mitigation, water quality, habitat, outdoor recreation, etc.) for implementing groups to consider in their adaptation planning,
- Producing best practices on pre-project and post-project monitoring to assist in efforts to assess and track resilience progress and performance,
- Aligning research with adaptation efforts to improve and standardize NbS approaches over time,
- Translating project-level adaptation efforts to additive resilience and ecosystem services benefits across the sub-watershed,
- Identifying and sharing funding opportunities.

Progress will be measured based on the adaptation activities occurring in the sub-watersheds, building up to a minimum of seven sub-watersheds supported by 2040. Tracking progress would encompass documenting the workgroup's and participating partners' evolution through the adaptation planning-to-implementation pipeline across the selected sub-watersheds. Future indicators will demonstrate progress made on a sub-watershed-scale, aiming to quantify the additive benefits across implementing NbS for prioritized end-points (e.g., reduced flooding damage, resilient habitat, reduced erosion, etc.). These will depend on the adaptation needs identified in the sub-watershed area.

Adapting to Changing Environmental Conditions Situation Analysis

The following table identifies challenges that will impact progress towards attaining this outcome and its targets over the upcoming six-year Management Strategy cycle. Priority challenges identified by the Goal Team are shown in **bold**. Challenges associated with Changing Environmental Conditions are denoted with an asterisk (*). In some instances, the Working Group's ability to act will depend on the financial resources available.

	Within CBPs ability to influence	Within CBPs ability to act	Outside of CBP's ability to influence or act
Challenges			
Selecting which sub-watersheds to support that align with available expertise (operational for workgroup)		X	

*Lack of quantitative adaptation metrics and indicators for evaluating long-term resilience enhancement.		X	
*Lack of centralized NbS project-tracking database		X	
*Regulatory and permitting challenges that stall innovative nature-based engineering solutions.	X		
*Short-term horizon (under 5 years) of major resilience grants, which discourages long-term adaptation planning and monitoring of progress of desired adaptation end-points.	X		
*Lack of long-term datasets needed to better inform adaptation planning and design with NbS		X	
Limited operational capacity to support localized, “boots-on-the-ground” relationship-building	X	X	
Limited technical capacity of local governments to draft complex, competitive federal grant proposals	X	X	
*Defining and quantifying impacts of changing climatic and environmental conditions	X	X	
*Limited public and private landowner awareness regarding existing land-use transition incentives, cost-share options, and resilient easements.		X	
Tradeoffs of implementing one NbS to address a particular issue (shoreline erosion, stormwater management), but may negatively impact another area (increased flooding to adjacent shoreline or neighborhood/private land).	X		

Future forward land use planning and strategies to address risks to private property.	X		
Long-term fiscal uncertainty for sustaining post-construction monitoring and maintenance after grant expiration	X		
<i>*Accelerating rate of sea level rise drowning coastal wetlands and driving saltwater intrusion</i>			X
<i>*Increasing frequency, duration, and peak intensity of heavy precipitation events and flash flooding</i>			X
<i>*Warming atmospheric conditions driving chronic riverine and estuarine water temperature increases</i>			X
<i>Cost inflation, material supply chain shortages (native seed stock, saplings), and localized labor constraints</i>			X
<i>High fiscal costs of project construction, ranging into millions of dollars per installation</i>			X
<i>High percentage of watershed land under private ownership, requiring voluntary property owner adoption</i>			X
<i>Fragmented ownership (private, public, commercial) across sub-watershed limiting NbS strategy options at the landscape-scale</i>			X

Snapshot of Signatory Programs

[The identification of jurisdictional and federal signatory partners is currently underway. This section will be comprehensively updated as formal participation is confirmed and additional partners are onboarded. If the reviewer knows of specific resilience or nature-based solutions-related state or federal programs, please provide information about them in your comments for the team to review.]

The single point-in-time funding profiles spotlighted below capture the key state and federal programs supporting nature-based solutions across our watershed:

- **Maryland Department of Natural Resources (MD DNR):** The Resilience through Restoration Initiative (\$31.5 Million requested in FY25) prioritizes nature-based solutions to harness living shorelines, wetlands, and natural stormwater practices to maximize shoreline protection.
- **Virginia Department of Conservation and Recreation (VA DCR):** The Community Flood Preparedness Fund empowers coastal and inland communities to complete vulnerability assessments and execute action-oriented nature-based flood mitigation, allocating at least 25% of funds to low-income geographic areas.
- **Virginia Department of Environmental Quality (VA DEQ):** The Virginia CZM Program funds place-based spatial modeling, macro-scale SAV distribution tracking, and localized planning district adaptation strategies.
- **Pennsylvania State University (PSU) / Commonwealth Partners:**
- **District of Columbia Department of Energy and Environment (DOEE):** A
- **Federal Partnership (NOAA / USGS / EPA):**
- **Chesapeake Bay Commission (CBC):**

Management Approaches

Management Approach 3.1.1 Develop Selection Strategy for the Sub-watersheds to Focus Workgroup's Adaptation Support Efforts

Candidate sub-watersheds will be selected based on the review of available climate vulnerability indices, geographic differences (e.g., urban, suburban, rural, coastal, inland), and common adaptation needs (e.g., flooding, heatwaves, habitat protection) in collaboration with signatory partners and participating organizations.

Management Approach 3.1.2: Pursue Strategic Network Mapping and Build Connector Framework

The workgroup will serve as a strategic "connector" and "translator" to bridge the gap between high-level science and localized action. Rather than attempting to track every independent project across the watershed, the workgroup will strategically work with existing local and regional partnerships and resilience networks encompassing local restoration practitioners, planners, soil conservation districts, scientists, and community champions within selected sub-watersheds. This overarching network will be used to exchange peer-to-peer lessons, share successful state-level archetypes (such as Maryland's Whole Watershed fund or Virginia's coastal resilience framework), and match localized technical assistance needs with available regional expertise.

Management Approach 3.1.3: Support Place-Based, Needs-Driven Technical Assistance for Additive Benefits

To ensure impactful implementation, the workgroup will structure its meetings and assistance around one or two sub-watersheds at a time, building on lessons learned to support translation of data and implementation of adaptation strategies. The combined expertise of participating agencies, organizations, and networks will prioritize efforts that deliver clear "additive benefits" — maximizing the overlap between community protection (e.g., urban tree canopy for heat cooling, green infrastructure for flood reduction) and critical ecosystem services (e.g., stream and wetland restoration for water quality and fish habitat). The workgroup supports the Collaborative Tidal Marsh Adaptation [framework](#) as an example of a place-based approach that promotes adaptation and delivers multiple benefits.

Management Approach 3.1.4: Document best practices for NbS monitoring and Data Collection to Assess Long-Term Resilience at the Project and Landscape-Scale

The workgroup will develop and implement a survey or data call to identify existing and proposed NbS of various types and at various scales that have been or are planned to be the subject of post-implementation monitoring to identify examples of successful monitoring practices.

Management Approach 3.1.5. Develop standardized data sharing mechanisms to support development of adaptation metrics and indicators

The workgroup will evaluate NbS monitoring metrics from the practices identified in Management Approach 3.1.4 to identify meaningful, common measures of performance across NbS types to recommend for use in the sub-watershed-based initiatives and local, regional, and state adaptation initiatives.

Participating Partners

[The identification of jurisdictional and federal signatory partners is currently underway. This section will be comprehensively updated as formal participation is confirmed and additional partners are onboarded]

The following partners participated in the creation of this Management Strategy and expressed their intention to collaborate on Management Strategy implementation over the next six years. Per the Chesapeake Bay Watershed Agreement, “participation in developing Management Strategies or in the achievement of Outcomes varies by signatory based on differing priorities across the watershed. This participation may include commitments such as sharing knowledge, data or information, educating the public, working on future legislation and developing or implementing programs or verified practices” (2025). Signatory partners may join implementation efforts at any time. Partners also recognize that Signatory participation is voluntary and may vary accordingly.

- **Signatory Partners**

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- **Other Partners**

-