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Climate Resiliency Goal Successes and Future Direction

September 18, 2025

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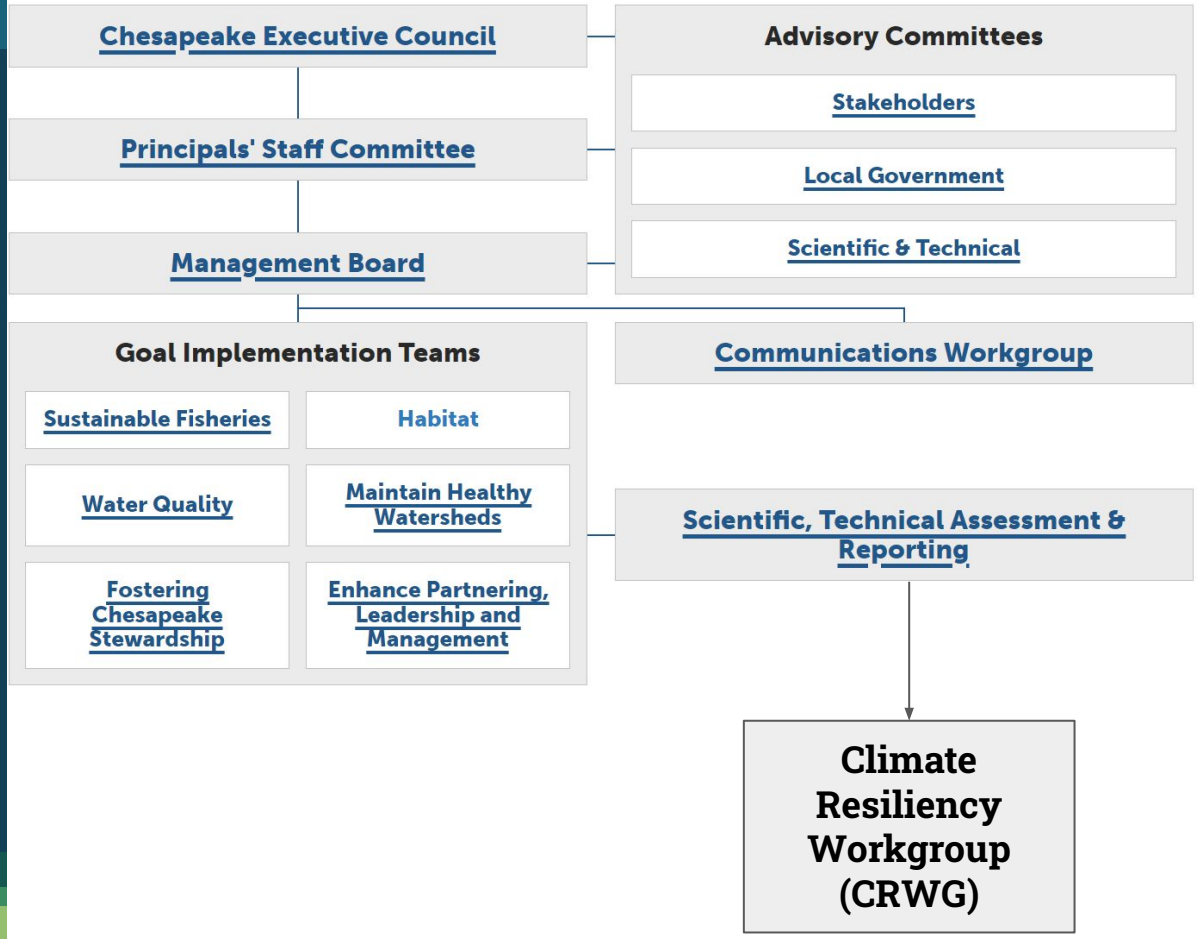
Mark Bennett, USGS

CBP Current Structure



Through the Chesapeake Bay Watershed Agreement*, the Chesapeake Bay Program has committed to…*

Goal: *Climate Resiliency*

Monitoring & Assessment

Monitor and assess trends and likely impacts of changing climatic and sea level conditions on the Chesapeake Bay ecosystem, including effectiveness of restoration, protection policies, programs and projects.

Adaptation

Pursue, design and construct restoration and protection projects to enhance resiliency of the Chesapeake Bay and aquatic ecosystems from the impacts of coastal erosion, coastal flooding, more intense and more frequent storms and sea level rise.

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Successes Over the Last Decade (2015-2025)

Climate Resiliency Workgroup

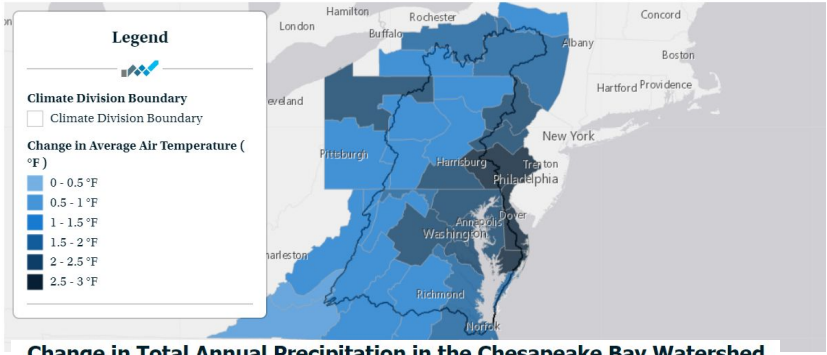
Climate Change Indicators

Monitoring & Assessment:

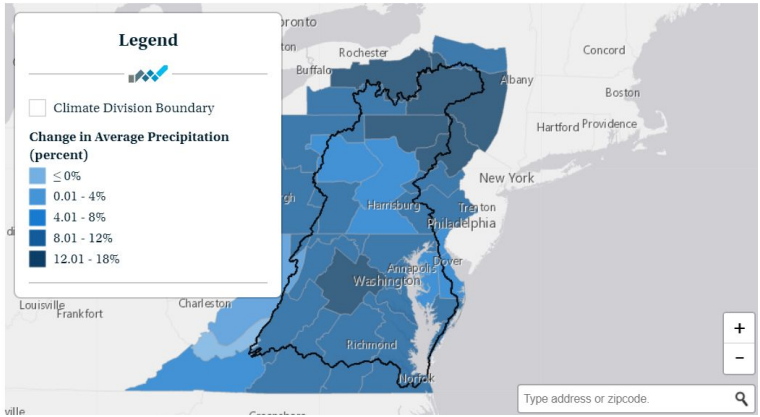
- [2018 Climate Change Indicator Implementation Strategy]

- Climate change indicators on Chesapeake Progress–maps on regional changes in the watershed.
  - Collaboration with EPA Climate Change Indicators Team

Average Air Temperature Increases in the Chesapeake Bay Watershed (1901-2021)



Change in Total Annual Precipitation in the Chesapeake Bay Watershed (1901-2021)



https://www.chesapeakeprogress.com/climate-change/climate-monitoring-and-assessment

Climate Resiliency Workgroup

Water Quality

TMDL Climate Model & WIPS

Monitoring & Assessment

- STAC Climate Change Modeling 2.0
- Advised on sea level rise TMDL climate model scenario with Modeling Workgroup

Adaptation:

- Collaborated with Water Quality Goal Implementation Team (WQGIT) to integrate climate-informed nitrogen and phosphorus targets in Phase III Watershed Implementation Plans (WIPS)

Bottom Dissolved Oxygen Change (mg/L)
(1995-2025)

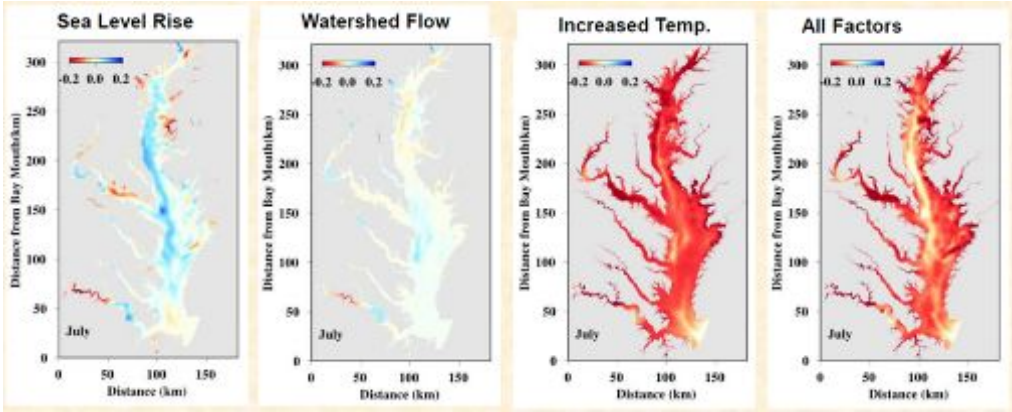


Image: CBP Modeling Team

Climate Resiliency Workgroup

Water Quality Best Management Practices (BMPs)

Monitoring & Assessment

- Supported Virginia Tech and WQGIT on report that assesses literature on BMP performance under changing climate conditions.

Adaptation:

- Participated in joint meetings with Urban Stormwater and Modeling workgroups to advise on partner projects:
  - Climate-informed Intensity Duration Frequency Curves for stormwater management (RAND/MARISA)

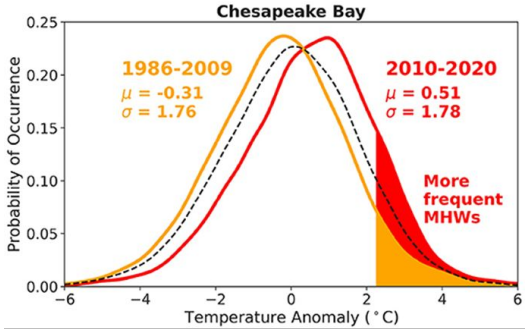
Climate Resiliency Workgroup

Rising Water Temperatures

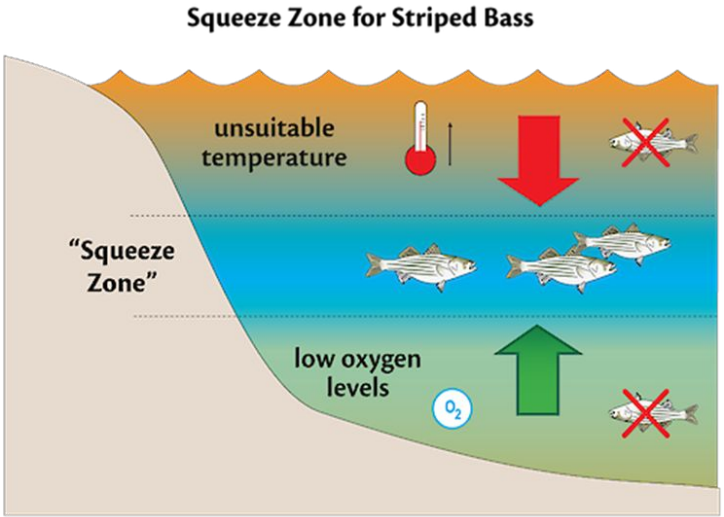
Monitoring & Assessment

- Co-led the Rising Water Temperature STAC workshops and tidal aspects of report: synthesized ecological implications and recommended management responses (large CBP partnership effort)

- Organized special session at the 2024 Chesapeake Community and Research Symposium featuring research to inform implementation of management responses



Source: Mazzini and Pianca 2022

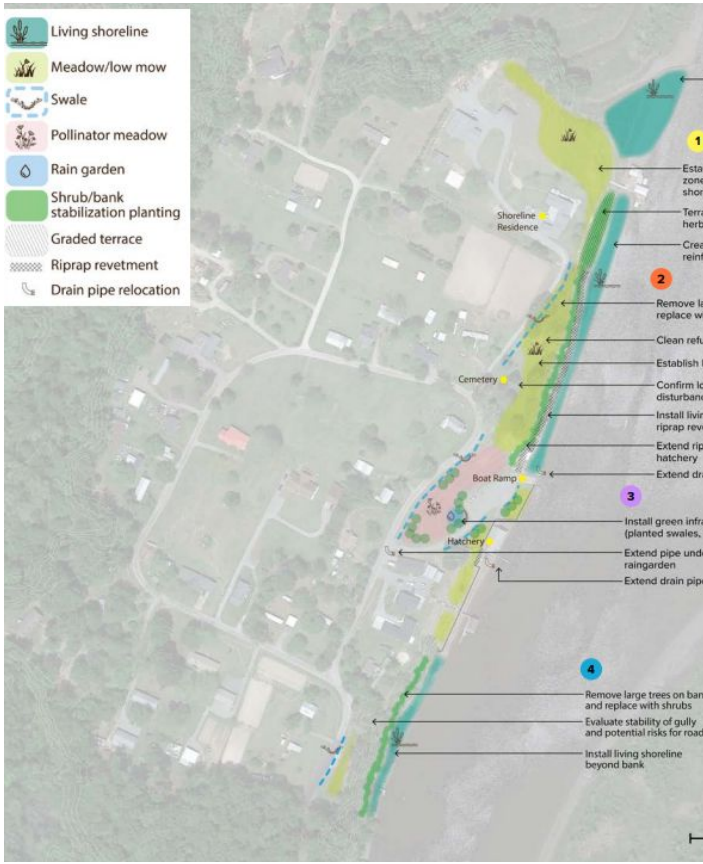


Conceptual diagram illustrating the compressed habitat of the striped bass from the low oxygen levels from the bottom, and the unsuitable unsuitiable tempatures on the top waters.
Diagram courtesy of the Integration and Application Network (ian.umces.edu), University of Maryland Center for Enviromental Science. Source: Boesch, D.F. (editor). 2008. Global Warming and the Free State: Comprehensive Assessment of Climate Change Impacts in Maryland. Report of the Scientific and Technical Working Group of the Maryland Commission on Climate Change. University of Maryland Center for Environmental Science, Cambridge, Maryland. This report is a component of the Plan of Action of the Maryland Commission on Climate Change, submitted to the Governor and General Assembly pursuant to Executive Order 01.10.2007.07.

Climate Resiliency Workgroup

Adaptation Project Support

- Supported Habitat GIT's targeted outreach for green infrastructure GIT-funded project with Skeo Solutions, Inc.
  - Worked with 4 communities that led to conceptual designs and organizations supporting communities in pursuing grants leading to funded projects



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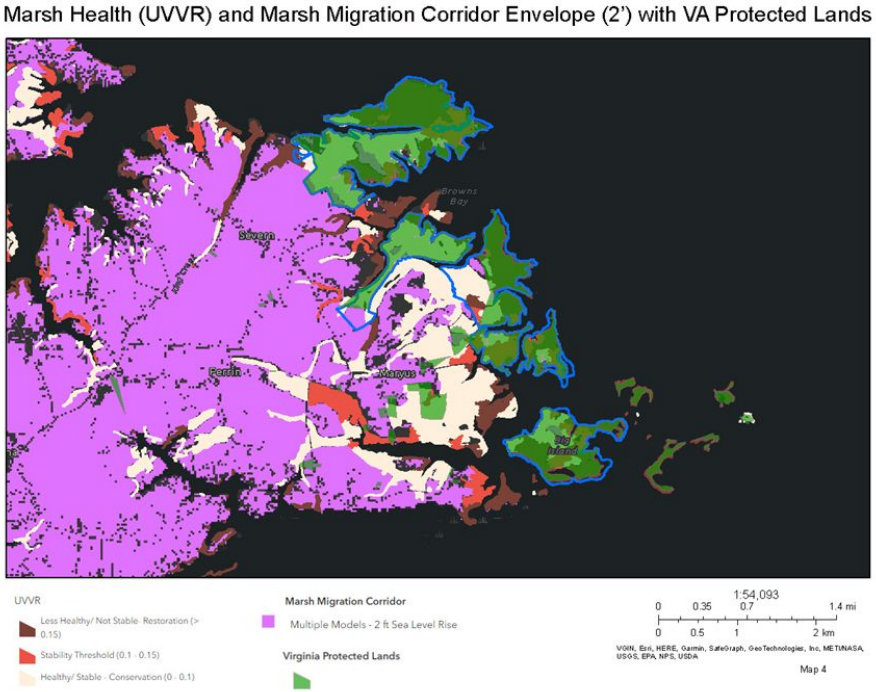
Marsh Adaptation GIT-Funded Project



- Framework to promote partnership-building for collaborative marsh adaptation projects (report and appendix)
- Synthesized datasets
  - Overlays of marsh migration, marsh condition, social vulnerability, and state conservation metrics.
  - VA and MD marsh migration corridor layer using VIMS method from marsh data synthesis project with Wetlands Workgroup
  - Mapped areas of interest and areas in need of marsh adaptation based on feedback from stakeholders

Climate Resiliency Workgroup

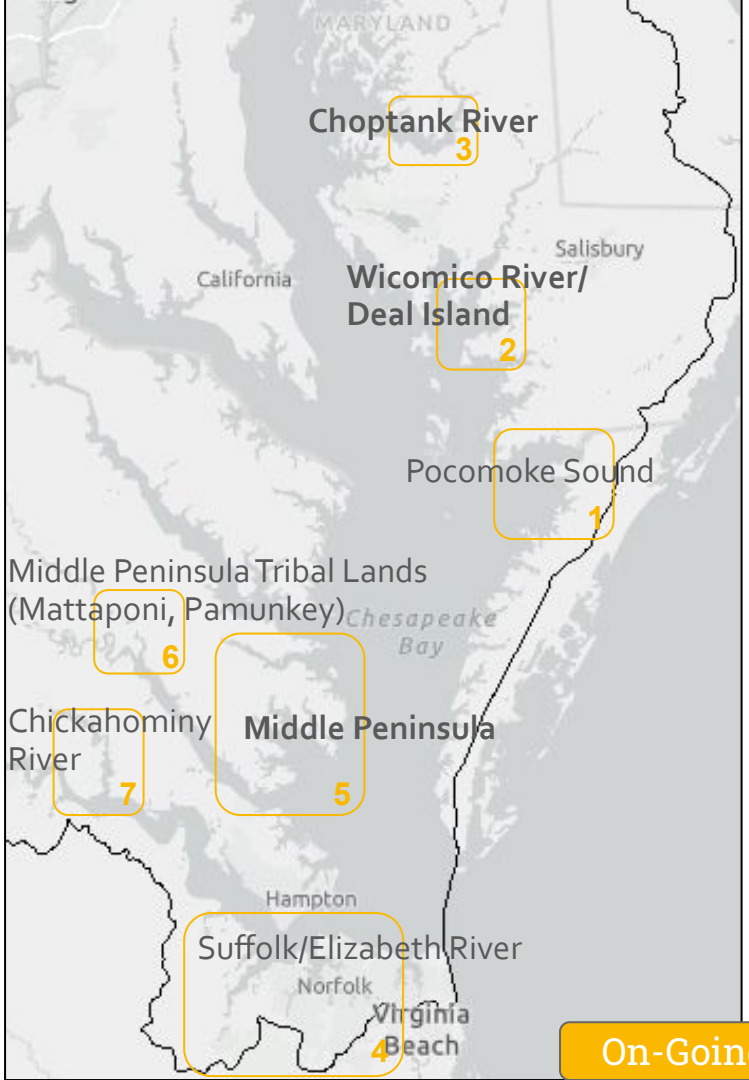
Marsh Adaptation Continued

Marsh Adaptation Workshops

- Hosted workshops to assess marsh adaptation needs–Wicomico River/Deal Island, Middle Peninsula, and Choptank River

Technical Assistance

- Analyses to support proposal development for Guinea Marsh in Middle Peninsula
- University of Michigan SEAS Program–4 Master Students assisting with analyses to inform a Choptank R. Coastal Wetland Resilience Plan with Envision the Choptank



On-Going

Plus More Collaborative Efforts

Local Government

Workshops on flooding and resilience recommendations with Local Government Advisory Committee

Blue Carbon

Evaluation of monitoring needs for blue carbon crediting programs

Finance coaching with Leadership GIT

Nature-Based Solutions (NBS)

STAC Synthesis Study - Research on NBS performance under changing conditions

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Future Direction

Proposed Simplified 4 Goal Framework

Regrouped & Revised Outcomes

Healthy Landscapes

- Healthy Forests and Trees*
- Protected Lands*
- Land Use Decision Support
- Adapting to Changing Environmental Conditions

Clean Water

- Reducing Excess Nitrogen, Phosphorus and Sediment**
- Toxic Contaminants Mitigation
- Water Quality Standards Attainment and Monitoring

Thriving Habitat and Wildlife

- Blue Crab Sustainability
- Brook Trout*
- Fish Habitat**
- Fish Passage
- Oysters
- Stream Health
- Submerged Aquatic Vegetation (SAV)
- Wetlands**

Engaged Communities

- Local Leadership
- Public Access*
- School District Planning
- Stewardship
- Student Experiences
- Workforce

* Outcome target placeholders
** Plans to develop targets

Updated Adaptation Outcome

Capacity-Building ○ Nature-Based Solutions ○ Tidal & Non-Tidal

Increase the capacity for pursuing nature-based solutions to improve planning and response to changing conditions while balancing long-term resiliency of watershed communities, economies, and ecosystems.

Healthy Landscapes Goal

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Adaptation Workgroup

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Adapting to Changing Environmental Conditions Outcome

Updated Adaptation Outcome

Measurable Targets ○ Place-based ○ Value Added ○ Increased Engagement

- By 2040, at least seven subwatershed areas have benefited from knowledge-sharing and technical assistance to identify adaptation options with 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.

- By 2040, workgroup activities will inform and lead to an increase in the implementation of adaptation strategies that integrate nature-based solutions in the above subwatershed areas.

Connections to Healthy Landscapes

Revised Goal Language: Conserve, restore and enhance landscapes of ecological, economic and cultural value to maintain water quality, provide habitat for wildlife and increase resilience.

Adaptation Portfolio

Community Resilience

Support partner projects that identify best practices for community engaged adaptation

Economic & Cultural Value

Marsh Adaptation

Collaborative identification of marsh restoration and protection opportunities with changing sea level

Water Quality, Habitat, & Ecological Value

Nature-Based Solutions (NBS)

Support research on NBS performance under changing conditions

Support proposal development for NBS projects

Resilience

Natural and Nature-Based Solutions/ Green Infrastructure

Changing Conditions

MORE PRECIPITATION

WARMING TEMPERATURES

RISING SEA LEVELS

Landward Zone

Forest Buffers

No Till Farming/ Cover Crops

Stream Restoration/ Restore Flood Plain Connectivity

Bioretention Basin

Transition Zone

Living Shoreline

Tidal Marsh Migration & Restoration

Waterward Zone

Oyster Reef Restoration

Island Ecosystem Restoration

Submerged Aquatic Vegetation Restoration

Transition CRWG into Two Proposed Groups

- **Adapting to Change Workgroup under a new Healthy Landscapes Goal**
  - Will focus on implementing the management strategy of the Adapting to Changing Environmental Conditions outcome in the revised Chesapeake Bay Watershed Agreement
- **Changing Environmental Conditions Team under STAR**
  - Will focus on collaborating with the Chesapeake Bay Program Goal Implementation Teams to incorporate the effects of changing environmental conditions into each outcome in the revised Chesapeake Bay Watershed Agreement, working with a subset of outcomes each year

Additional Transition Information

- Revised Chesapeake Bay Watershed Agreement to be finalized in December 2025
- CRWG Email List will remain active during transition period (September-December 2025)
- Questionnaire to be sent soon to CRWG email list to collect information on participation interests in proposed new groups
- Planning Healthy Landscapes Goal meeting in December
- Planning Adapting to Changing Environmental Conditions meeting in January 2026