Sea Level Rise + Coastal Wetlands

Determining Status and Trends

Tidal Wetland Workgroup

May 21, 2024

+ Land Use

+ Climate Resiliency

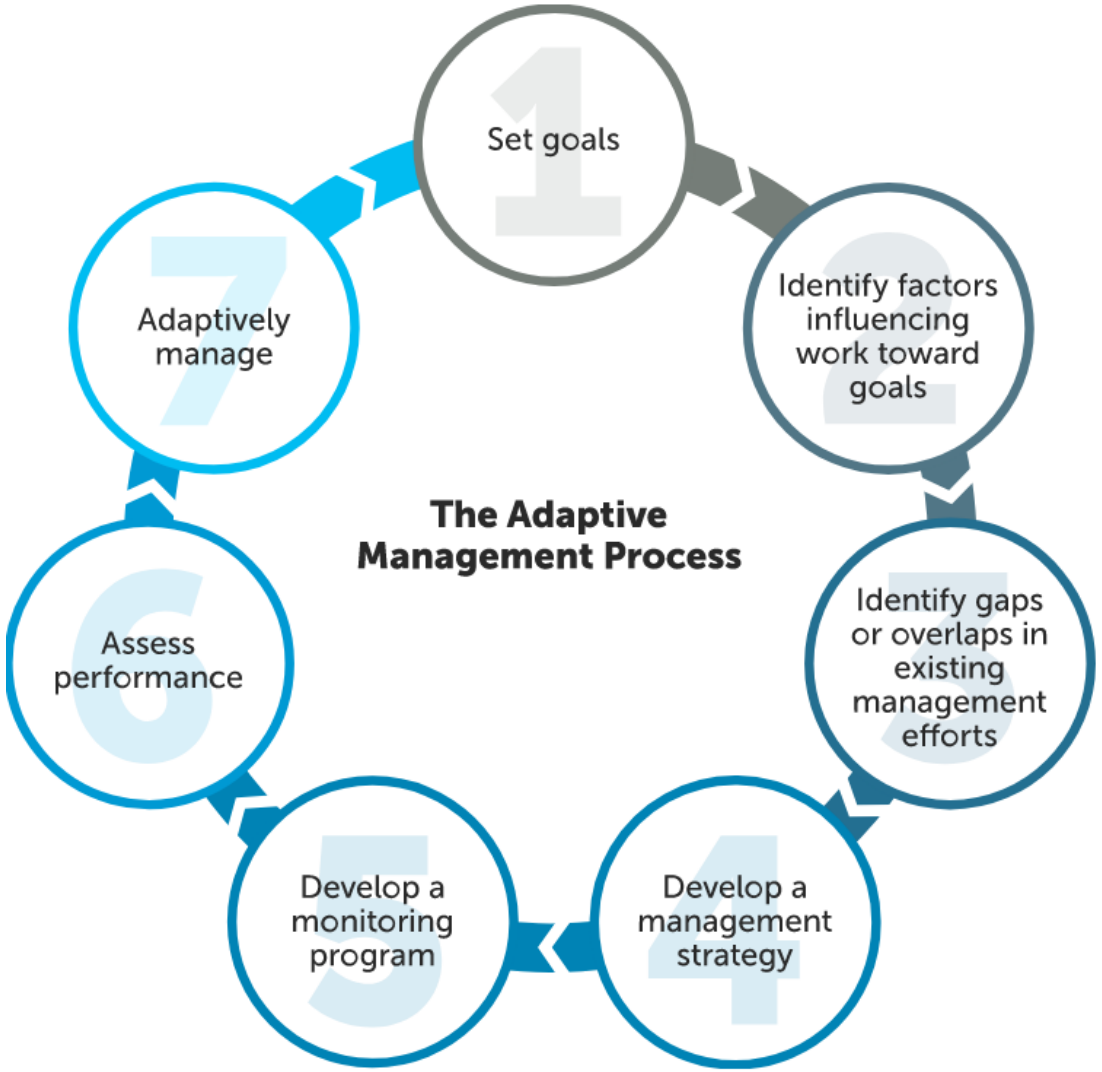
+ Status and Trends

Outline

- Why talk about indicators?
- Vision and management need for a Sea Level Rise-Tidal Wetland Impact Indicator
- What might this indicator entail?
  - Conceptualization
  - Data availability
    - Extent
    - Distribution
    - Health
    - Migration Potential
    - Landscape Change
  - Connections to other Watershed Agreement outcomes – Black Duck, Fish Habitat, Climate Adaptation, Protected Lands

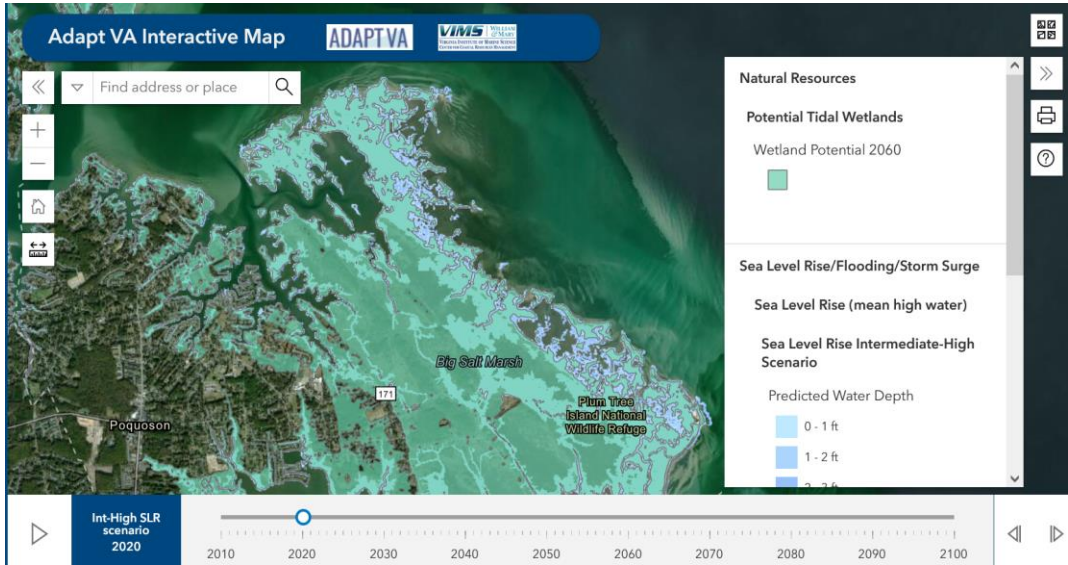
Why Indicators?

- Indicators tell us how we are doing on our goals
- This work is critical to adaptive management and the strategic review system
- A major component in understanding wetlands resources is monitoring and assessment



Tidal Wetlands Trends

- Tidal wetlands change has been modeled/ protected by various efforts bounded by water levels, time, or both.
- The general trends are:
  - Short term gains possible as marsh migrates where possible
  - Long term losses with development and topographic limits on migration and drowning and erosion conversion to open water
- Effective indication development along with monitoring and assessment enables tracking

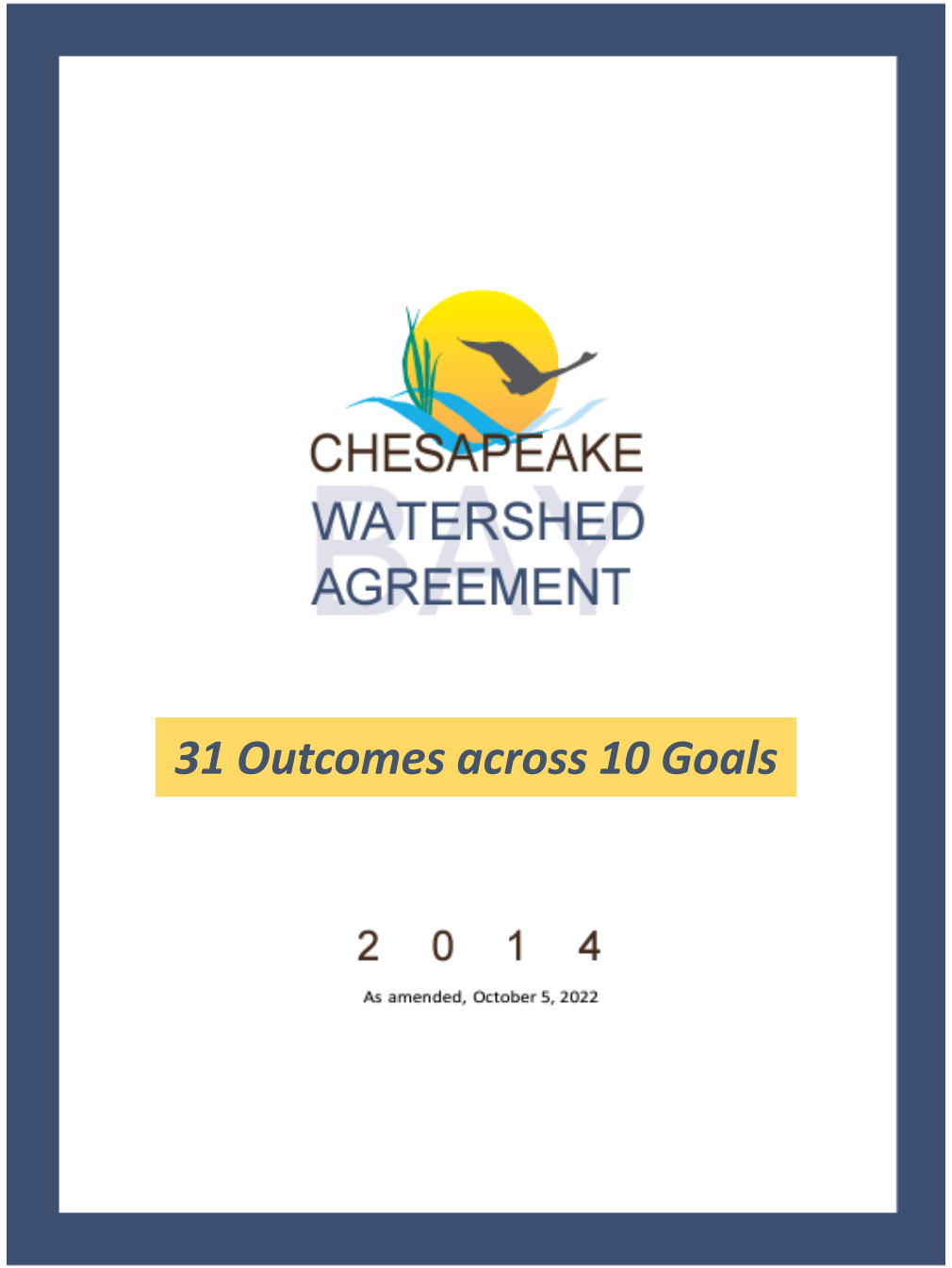


What should the Indicators be?

- We need to consider space, time and provision of ecosystem services
- What change is projected?
    - Wetland Extent
    - Distribution
    - Migration Potential
    - Landscape Change
- Need to consider other Watershed Agreement outcomes – Black Duck, Fish Habitat, Climate Adaptation, Protected Lands

Monitoring and Assessment Efforts

- What is already available
- Wetland Program Plan monitoring and assessment by jurisdictions
  - Include field and remote components
- NWCA National Wetland Condition Assessment
- Wetland Health Remote Assessments: UVUR, Vegetation health, Landuse / Landcover
- Aerial photography
- Others? Climate Change



Outcome Attainability…. Are we, as a program, making progress on the goals and outcome we agreed to?

- 2 Outcomes Completed
- 18 Outcomes On Track
- 11 Outcomes Off Course

Re-envisioning for Beyond 2025….

- Timepoint on many Outcomes (e.g. Wetlands)
- Small Groups speak to interdisciplinary cross-outcome, ecosystem approach towards climate, shallow waters, and land use. What does that future look like?

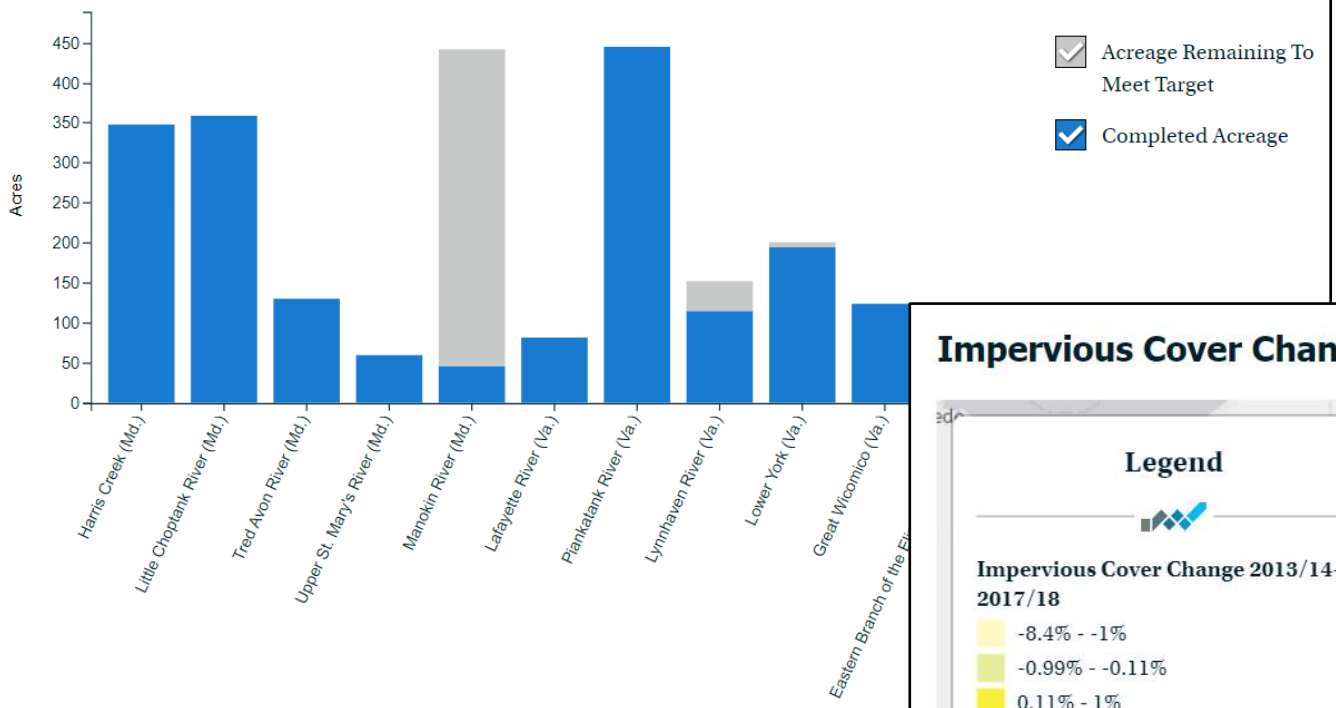
Robust Indicators…

- Demonstrate program effectiveness
- Reinforce the need for long-term monitoring
- Provide ecosystem assessment
- Data application

Oyster Reef Restoration (2022)

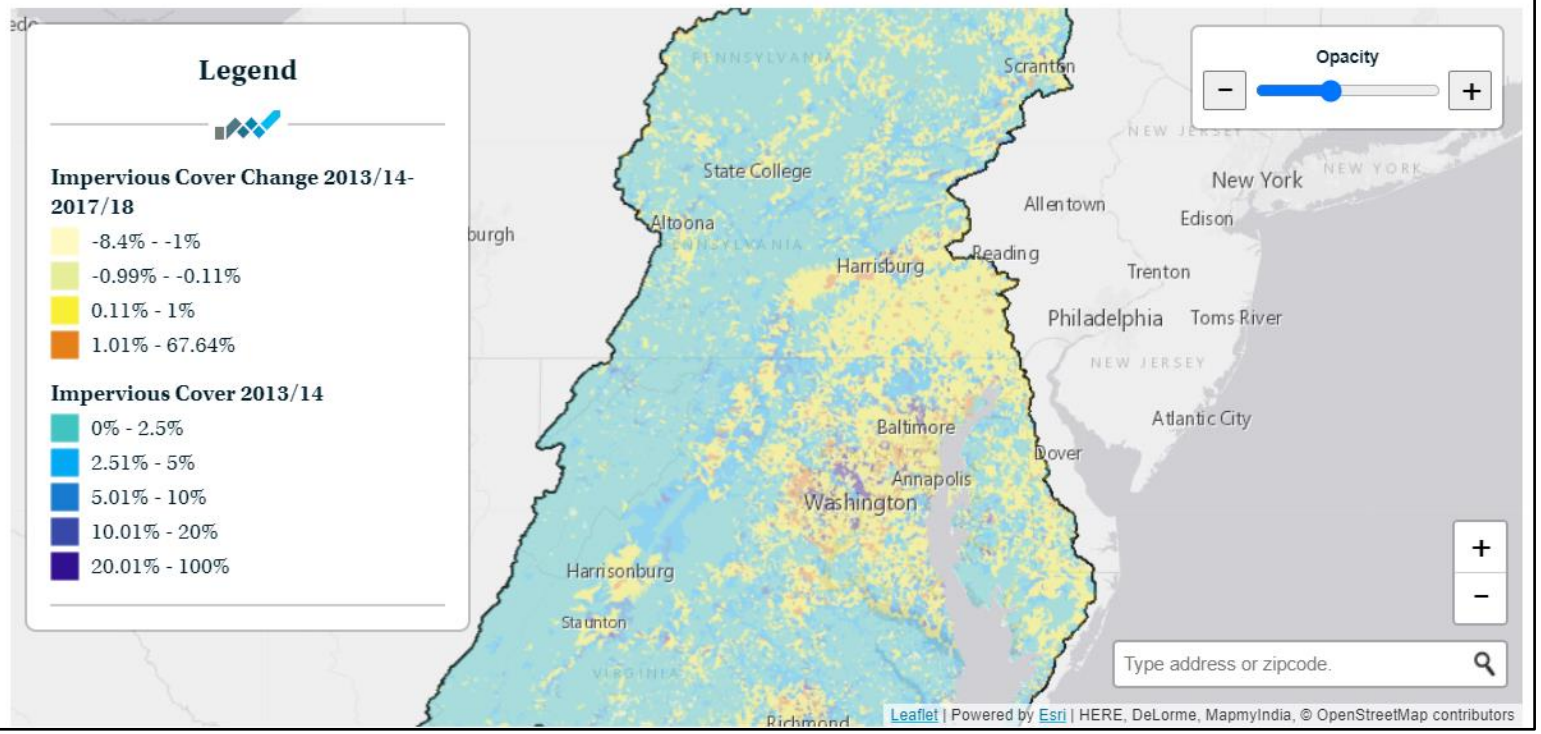
Individual acreage targets are based on a tributary's historic oyster habitat and currently restorable area.

VIEW CHART VIEW TABLE

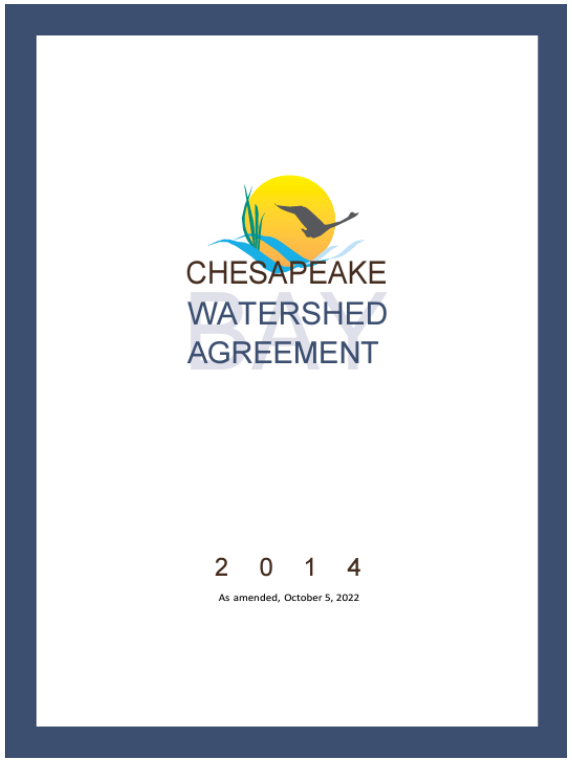


Some indicators demonstrate implementation metrics

Impervious Cover Change 2013/14-2017/18



Others demonstrate environmental status and change



Climate Adaptation

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

Climate Monitoring and Assessment

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

Wetlands

RECENT PROGRESS INCREASE | OUTLOOK OFF COURSE

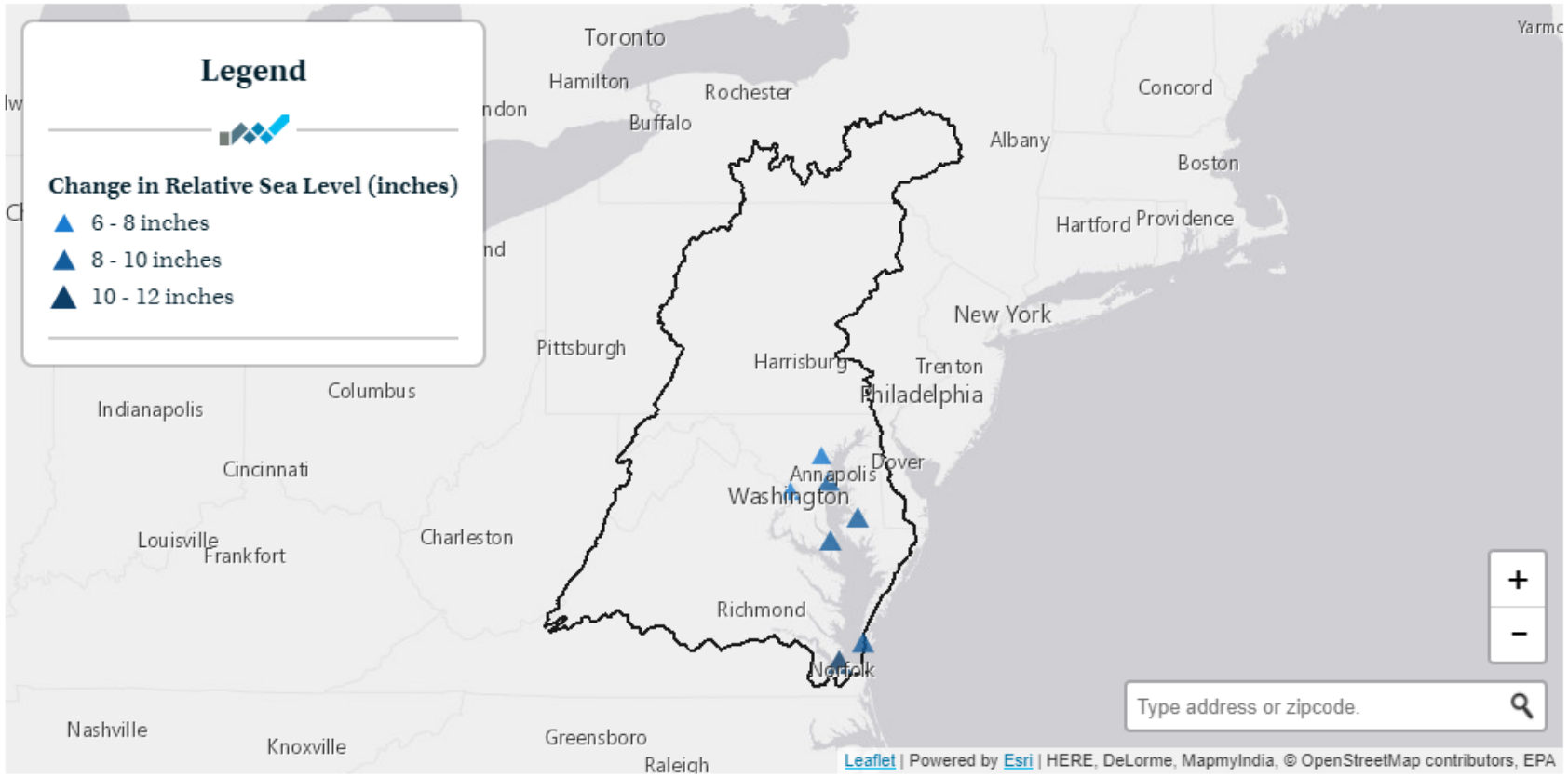
Continually increase the capacity of wetlands to provide water quality and habitat benefits throughout the watershed. Create or reestablish 85,000 acres of tidal and non-tidal wetlands and enhance function of an additional 150,000 acres of degraded wetlands by 2025. These activities may occur in any land use (including urban), but primarily occur in agricultural or natural landscapes.

Land Use Options Evaluation

By the end of 2017, with the direct involvement of local governments or their representatives, evaluate policy options, incentives and planning tools that could assist them in continually improving their capacity to reduce the rate of conversion of agricultural lands, forests and wetlands as well as the rate of changing landscapes from more natural lands that soak up pollutants to those that are paved over, hardscaped or otherwise impervious. Strategies should be developed for supporting local governments' and others' efforts in reducing these rates by 2025 and beyond.

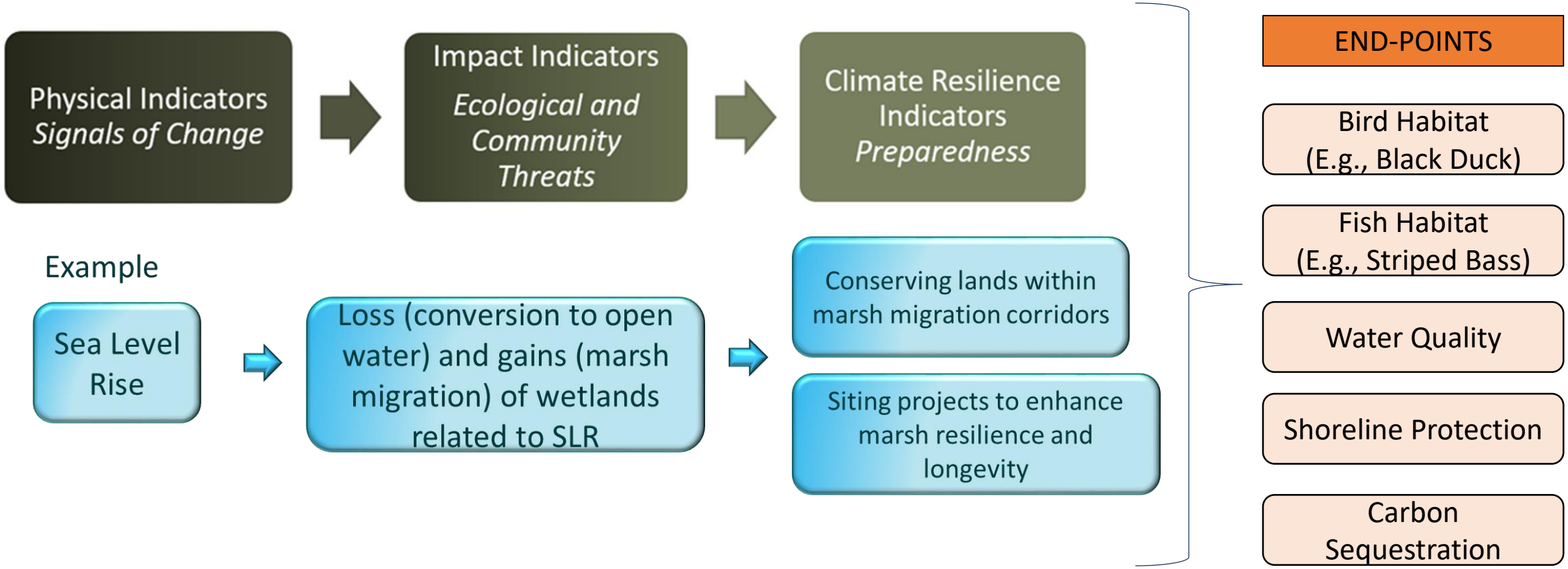
Chesapeake Progress: Current Sea Level Rise Climate Change Indicator

Relative Sea Level Rise in the Chesapeake Bay (1960-2017)



Downloads: Data (.xlsx) | Methods (.pdf) | Image (.jpg)

Enhancing Climate Change Indicators



Goal: Multi-Outcome Indicator

- Pursue well-designed indicators to inform multiple outcomes
  - Aligns with Beyond 2025 discussions
- Sea Level Rise – Tidal Wetland Impact: Indicator is both backwards and forward looking
- Indicator(s) should have clear endpoints for management utility

Data and Information to Consider

Available Now

- Sea Level Rise (SLR) data readily available from NOAA
- Marsh migration model synthesis methodology from GIT-funded “Synthesis of Shoreline, Sea Level Rise, and Marsh Migration Data for Wetland Restoration Targeting” project
- **Marsh migration model envelope for MD and VA based on simplified version of marsh migration model synthesis methodology**
- **VIMS Tidal Marsh Model/ VA Tidal Marsh Inventory**
- **High-resolution land cover data**

Available Soon

- **GIT-funded Marsh Adaptation Project Report – synthesis of existing resilience metrics (includes UVVR data from USGS) to provide siting decision support of projects**
- Wetland Acres Report
- Efforts to improve wetland accounting

Available Later

- **2023 GIT-funded Marsh Vegetation Condition Project (Delmarva)**
- Wetland Mowing Project

Collaborative Marsh Adaptation Project

Marsh Adaptation:
Incorporating climate change information and resilience strategies when planning, designing, implementing, and managing marsh restoration and conservation projects to enhance longevity of marsh area and health.

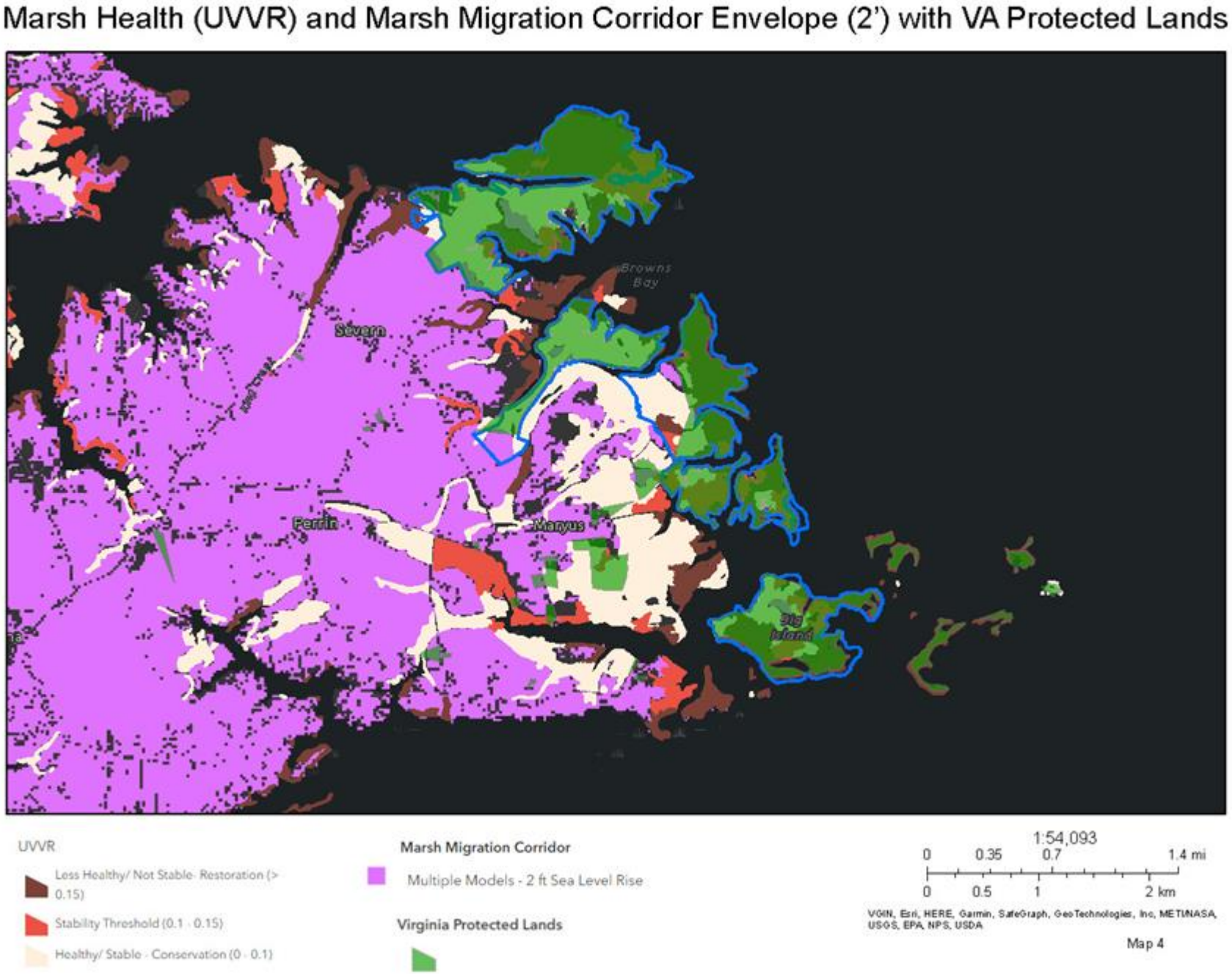
Climate Change Factors	Resilience Strategies
Sea Level Rise (SLR)	• Identify and conserve marsh migration corridors • Acquire land/easements for marsh migration • Restore/preserve healthy marsh sediment dynamics and vegetation • Ensure habitat connectivity • Pursue conservation incentives/carbon credit programs • Construct living shorelines/natural breakwaters
Increase in Storm Events and Precipitation	

Marsh Adaptation Mapper

Marsh Migration Corridor Envelope – 2' Sea Level Rise Scenario

USGS Unvegetated to Vegetated Ratio

Protected Lands



Marsh Extent & Distribution

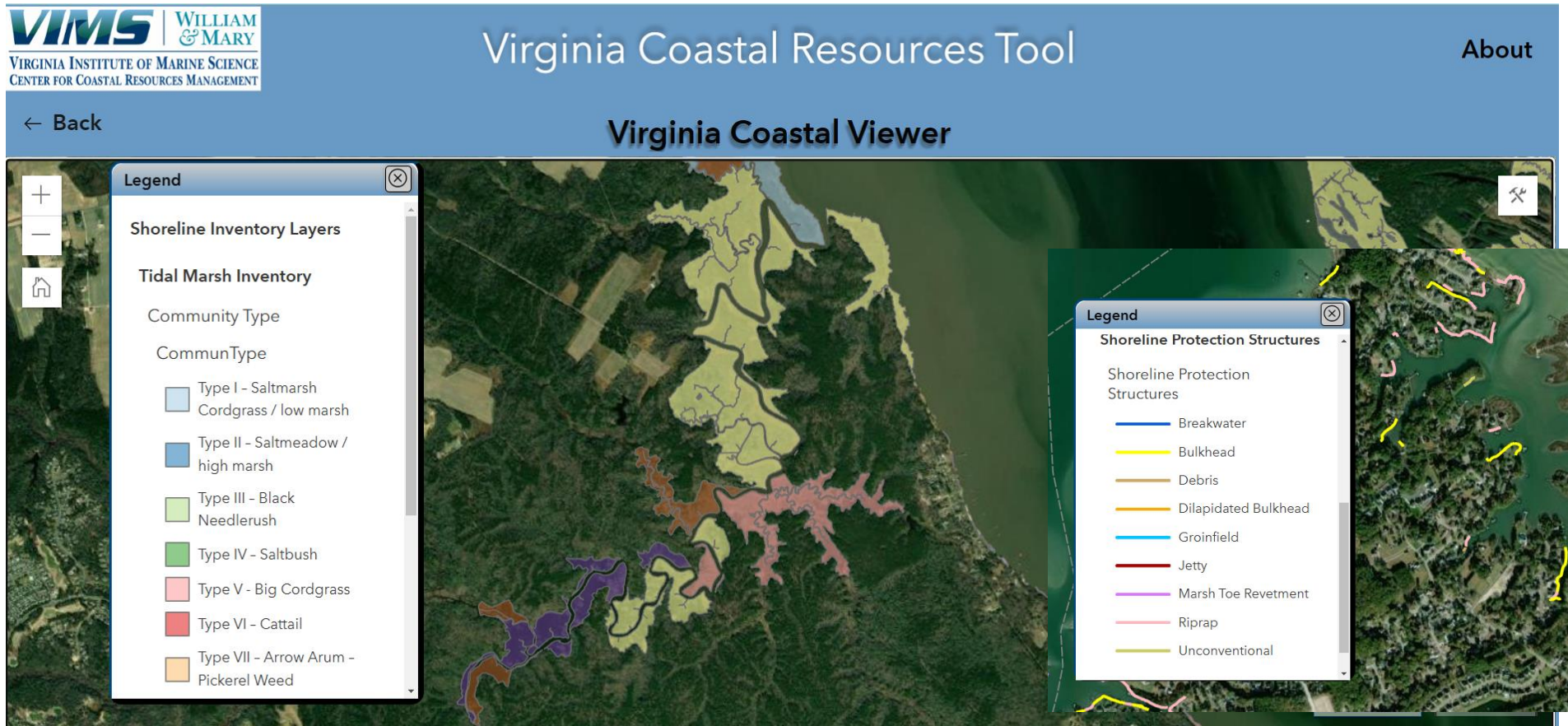
Data availability:

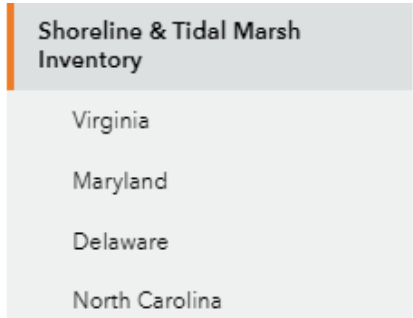
Spatially-explicit and highly-resolved shoreline & tidal marsh inventories: *historic and current inventories*

https://www.vims.edu/ccrm/research/inventory/

Shoreline & Tidal Marsh Inventory

CCRM is a recognized global leader in the science and technology of shoreline and tidal marsh inventories. Over decades of conducting inventories in the Chesapeake region, we have developed several advanced data collection and analysis techniques. Our work is informing the management and protection of shoreline areas and tidal marshes throughout the Chesapeake Bay.

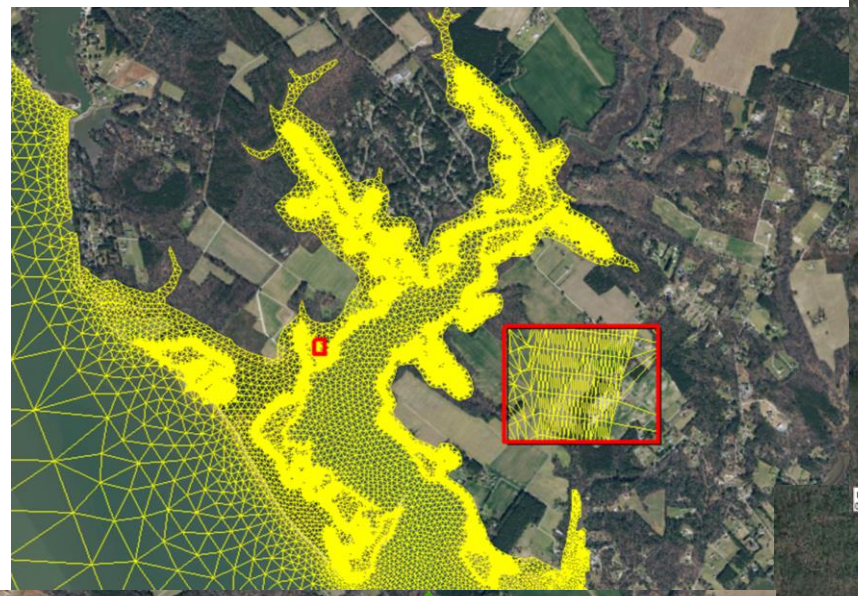


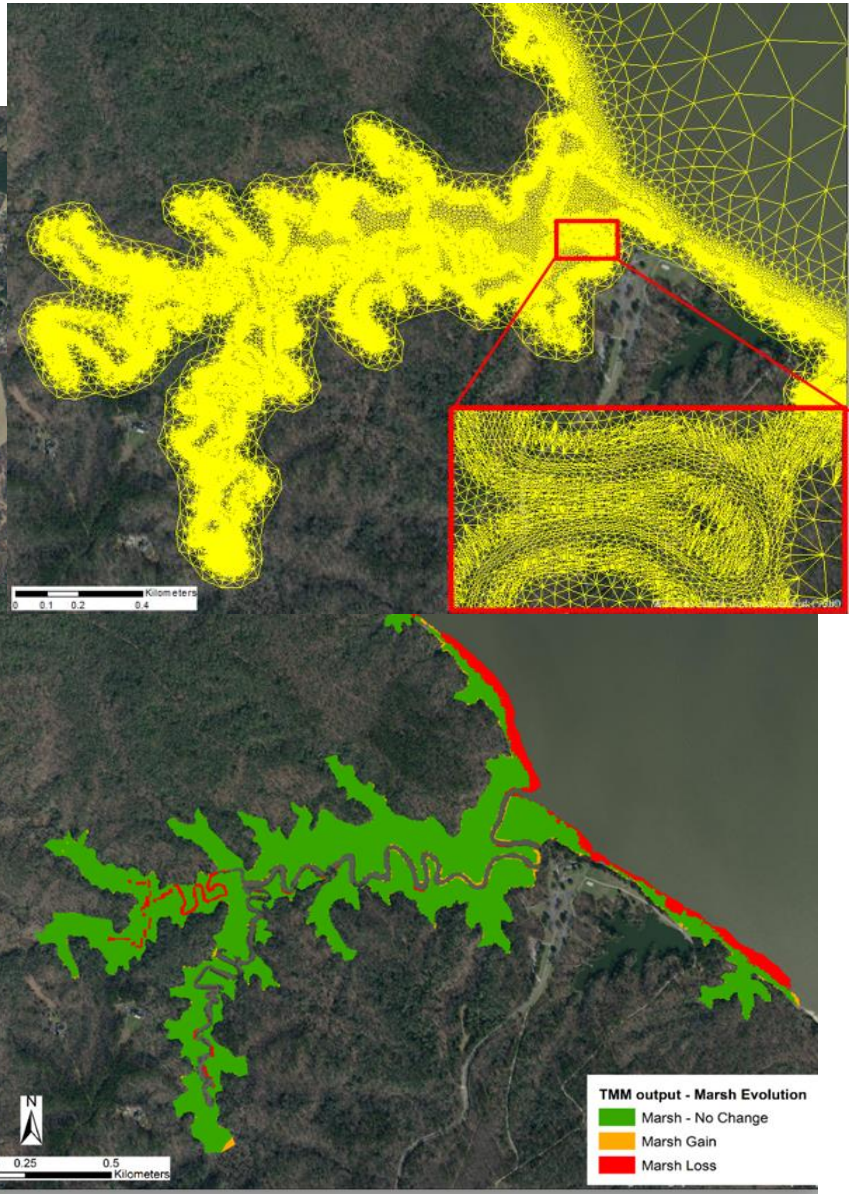


Modeling Marsh Evolution

Examples:

- **SLAMM:** Sea Level Affecting Marshes Model
- **InVEST:** Integrated Valuation of Ecosystem Services and Tradeoffs
- **NOAA:** Sea Level Rise Viewer: Marsh Migration
- **VIMS ETM:** Evolution of Tidal Marsh
- **VIMS SCHISM-TMM: Tidal Marsh Model** ***(input: shoreline & tidal marsh inventory data)***

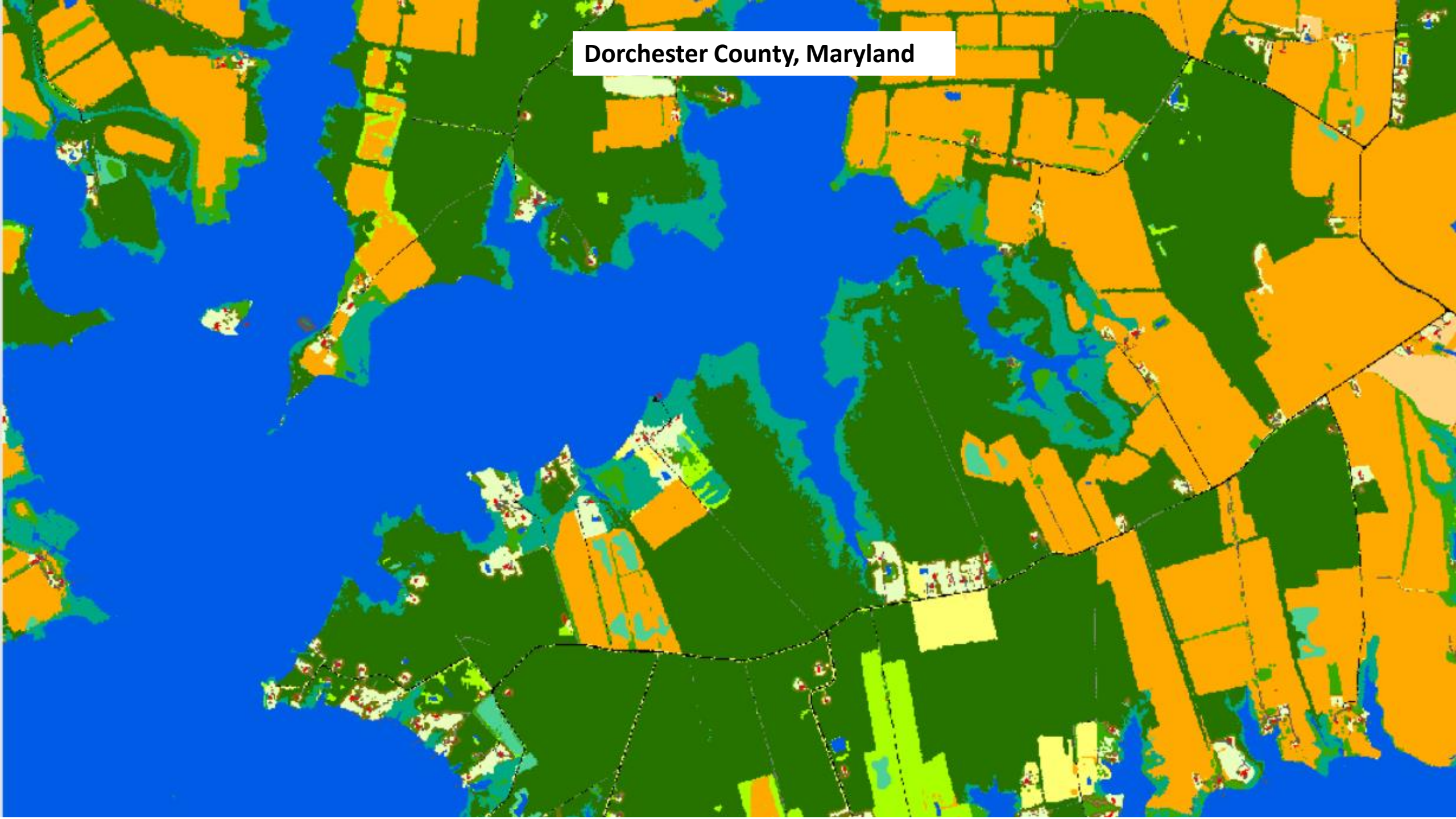




SCHISM-TMM: Tidal Marsh Model *(Nunez et al., 2020)*

Hindcast: past 40 years

(Overall accuracy = 86%)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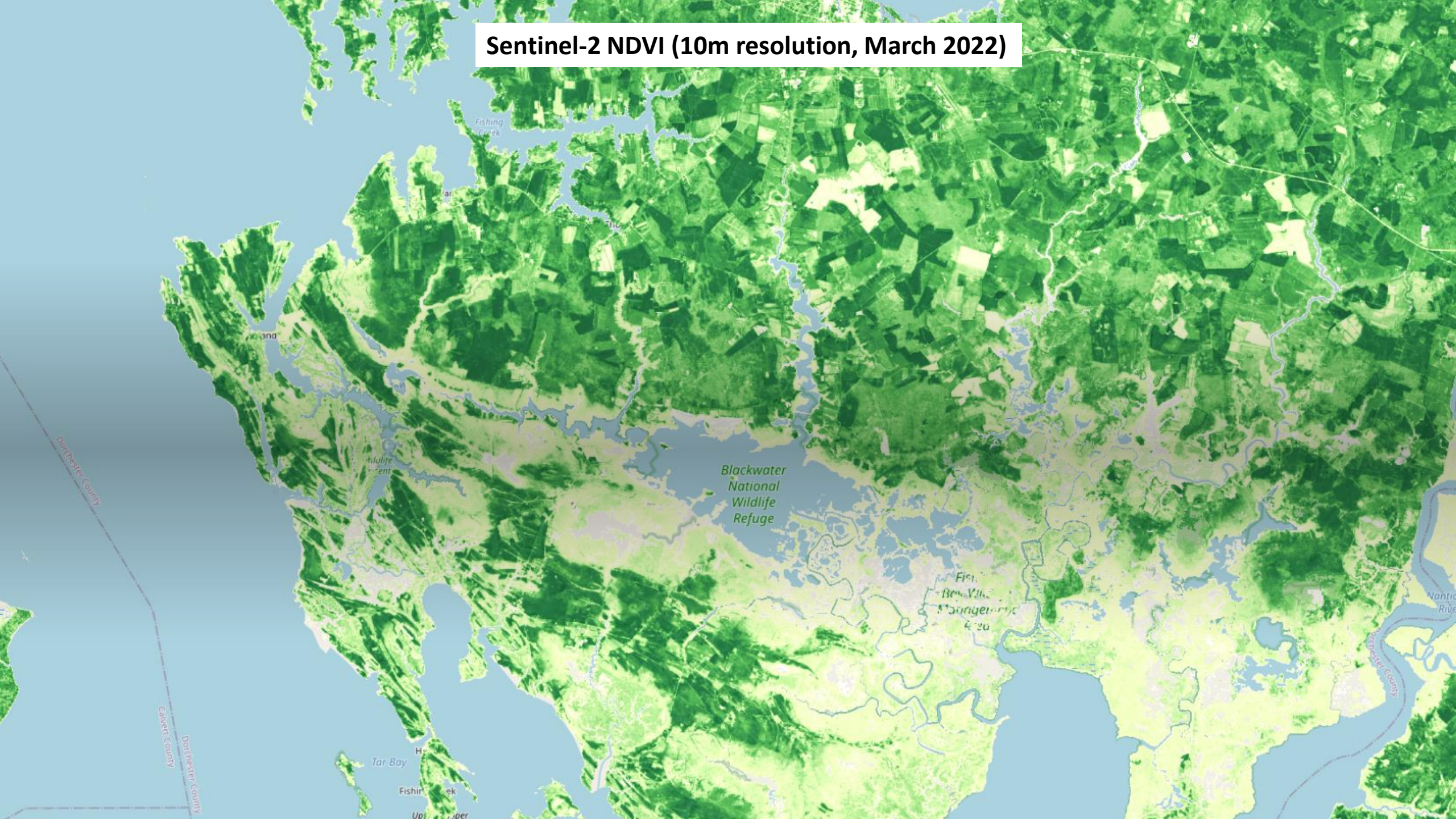
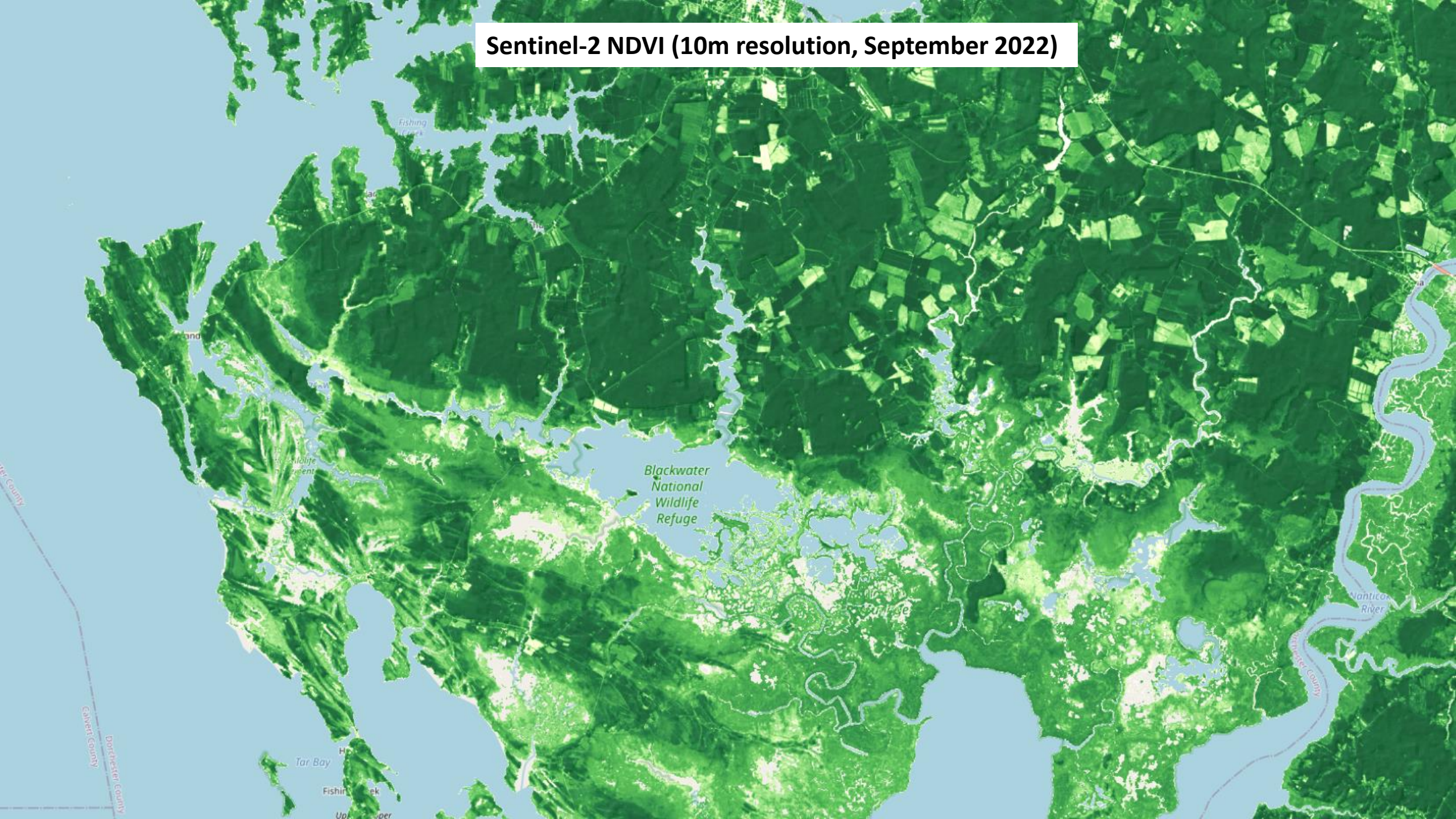

Sentinel-2 NDVI (10m resolution, March 2022)
Blackwater
National
Wildlife
Refuge
Tar Bay
Dorchester County
Calvert County


Sentinel-2 NDVI (10m resolution, September 2022)
Blackwater National Wildlife Refuge
Tar Bay
Calvert County
Dorchester County

Considerations

- Decision-support at which spatial and temporal scales for short and long-term restoration and conservation
- Endpoints for wetland function, e.g., Black Duck Habitat, Fish Habitat, Saltmarsh Sparrow, etc.
- How to establish baseline for wetland loss and gains?
- How best to assess future wetland acres for resilience planning?