



# Monitoring & Assessment, Adaptation Outcomes

*Climate Resiliency Working Group*  
*Mark Bennett, USGS*  
*Co-Chair*

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



## Climate Resiliency Outcomes Management Strategy 2015–2025, v.1



Photo Credit: Lee Goodwin

### I. Introduction

All aspects of life in the Chesapeake Bay watershed—from living resources to public health, from habitat to infrastructure—are at risk from the effects of a changing climate. As one of the most vulnerable regions in the nation, the Chesapeake Bay is expected to experience major shifts in environmental conditions. Warming temperatures, rising sea levels and more extreme weather events have already been observed in the region, along with coastal flooding, eroding shorelines and changes in the abundance and migration patterns of wildlife. The stakeholders of the Chesapeake Bay watershed are large and diverse and are a critical component of any work to evaluate current and possible future conditions of the watershed. It is important that the work of the Climate Change Work Group embrace the diversity of these stakeholders, which includes decision makers, and utilizes the best available science while being responsive to their needs as they deliberate and make choices about implementation of the management strategy.

## Goal:

Increase the resiliency of the Chesapeake Bay watershed, including its living resources, habitats, public infrastructure and communities, to withstand adverse impacts from changing environmental and climate conditions.

## Monitoring & Assessment Outcome:

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.

## Adaptation Outcome:

*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.*



## What We Want



## To have the Management Board support our efforts in:

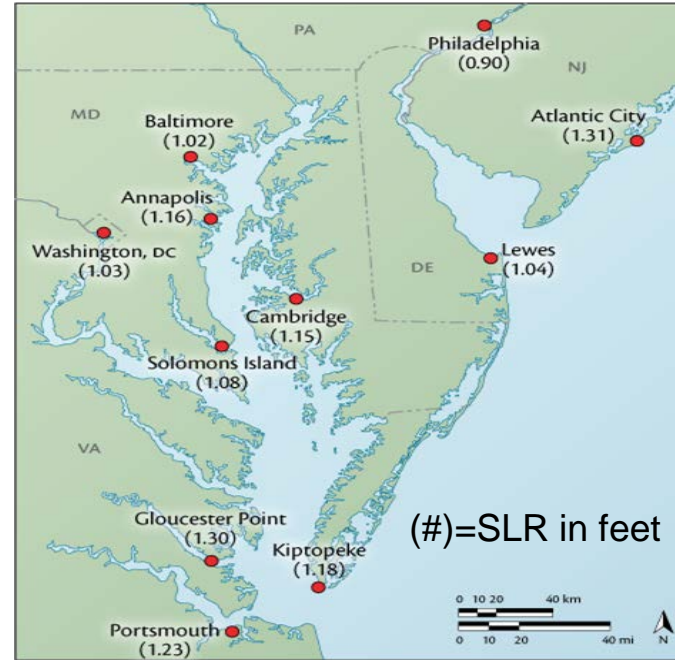
- Addressing recommendations for data/research needs associated with the results of the “Monitoring and Assessing Impacts of Changes in Weather Patterns and Extreme Events on BMP Siting and Design” STAC Workshop:
  - “Starting with the 2022-2023 milestones, determine how climate change will impact the BMPs included in the WIPs and address these vulnerabilities in the two-year milestones”
- Communicating monitoring priorities to nontraditional partners and Citizen Science programs.
  - These priorities should include climate-related monitoring needs. MB (with input from CRWG and GITs) will develop a priority list of specific (space & time) data needs for this purpose.
- Promoting utilization of the Chesapeake Bay Program Climate Smart Framework & Decision-Support Tool –
  - Encourage GIT chairs and coordinators to utilize this decision making tool in their workgroup decisions.
- Jurisdiction, WQGIT input and support re: WIP narrative guidance- a qualitative approach for incorporating climate change into the phase III WIPs

1

# Setting the Stage:

*What are our assumptions?*

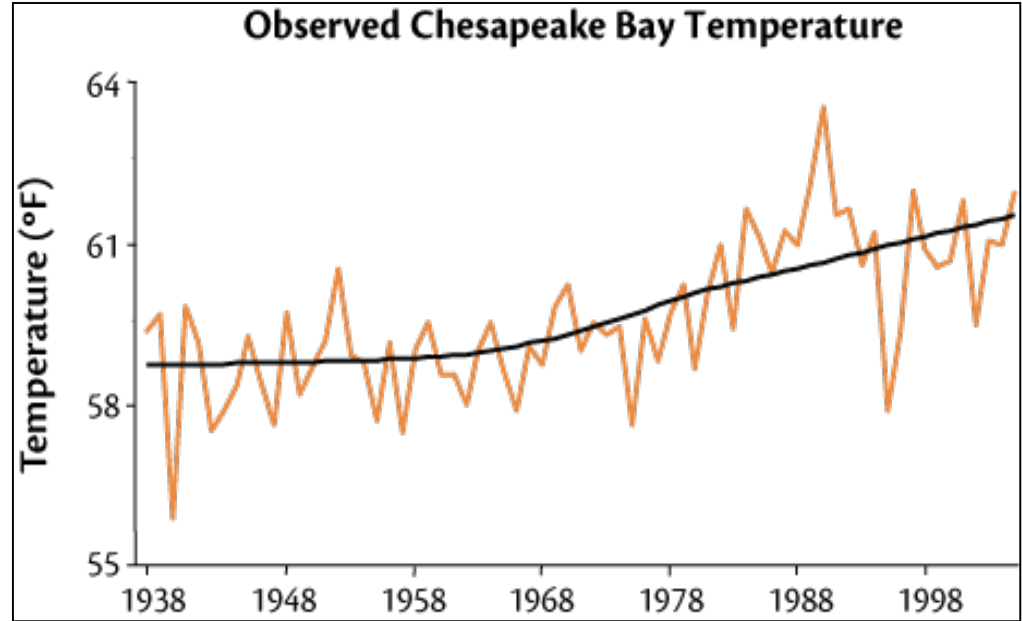
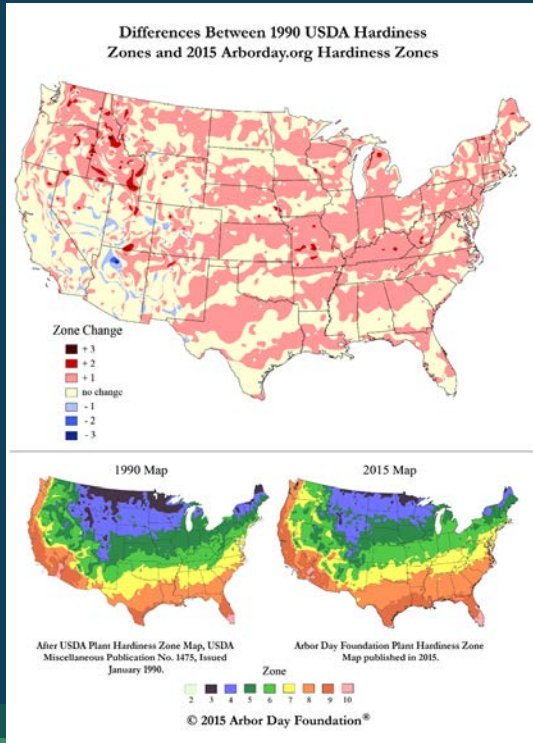
# Climate Change: *Real Consequences*



Sea level has risen approximately one-foot in the last century

Source: [www.umces.edu/climateimpacts/](http://www.umces.edu/climateimpacts/)

# Climate Change: *Real Consequences*



Chesapeake Bay has warmed by more than 2°F.



# Climate Change: Real Consequences



Annapolis 2004

Balt Sun



Ellicott City 2018

NY Times

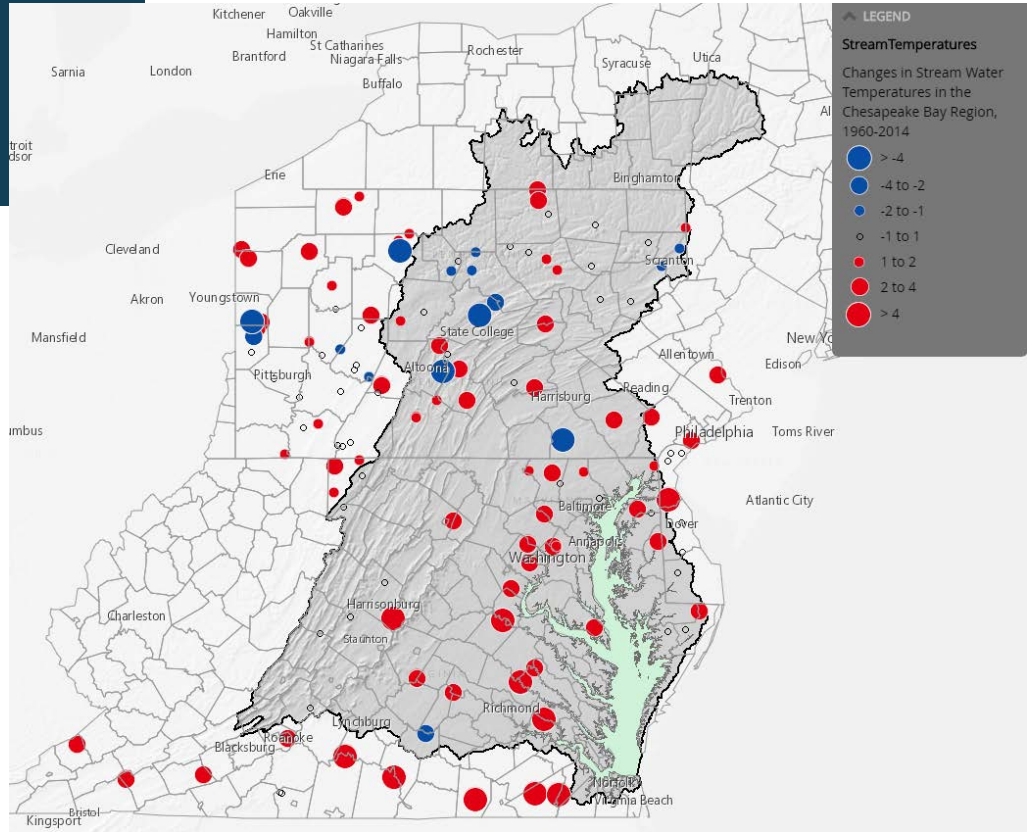


Extreme Events, such as Hurricane Isabel 2004, or higher intensity storm events (Ellicott City 2018) foreshadow the Watersheds vulnerability to climate change

# Changes in Stream Water Temperatures in the Chesapeake Bay Region, 1960-2014



## Cross-Outcome Considerations



Cross GIT Mapping: Stream Temperature Change



# Agreement Goals and Outcomes

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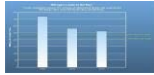
## Sustainable Fisheries

- Blue Crab Abundance
- Blue Crab Management
- Oyster
- Forage Fish
- Fish Habitat



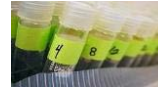
## Vital Habitats Goal

- Wetlands
- Black Duck
- Stream Health
- Brook Trout
- Fish Passage
- Submerged Aquatic Vegetation (SAV)
- Forest Buffer
- Tree Canopy



## Water Quality Goal

- 2017 Watershed Implementation Plans (WIP)
- 2025 WIP
- Water Quality Standards Attainment and Monitoring



## Toxic Contaminants Goal

- Toxic Contaminants Research
- Toxic Contaminants Policy and Prevention



## Healthy Watersheds Goal

- Healthy Waters



## Stewardship Goal

- Citizen Stewardship
- Local Leadership
- Diversity



## Land Conservation Goal

- Protected Lands
- Land Use Methods and Metrics Development
- Land Use Options Evaluation



## Public Access Goal

- Public Access Site Development



## Environmental Literacy Goal

- Student
- Sustainable Schools
- Environmental Literacy Planning



## Climate Resiliency Goal

- Monitoring and Assessment
- Adaptation Outcome

Green = Climate Change links



## **Logic Behind Our Outcome**

**Factors  
Influencing  
Success**

**Current  
Efforts  
and Gaps**

**Management  
Approaches**

## Factors Influencing Success:

- Scientific Capabilities: data availability and accessibility
- Variability across the Watershed: wide range of monitoring, assessment and adaptation needs throughout the region
- Collaboration among Goal Implementation Teams (GITs), stakeholders and others that are addressing climate science and adaptation

## Current Efforts and Gaps

### EFFORTS

- There is a wide range of partner efforts related to the climate resiliency outcomes. They are too numerous to list here. A Compendium of Climate Change Research and Adaptation Efforts among the partners was developed.

### GAPS

- Consistent incorporation of climate into jurisdiction efforts
- Indicators to inform decision making
- Impact of climate on BMPs

## Management Approaches

- Continually monitor and assess the trends and likely impacts of changing climatic and sea level conditions on the Chesapeake Bay ecosystem
- 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

# 2

## **Progress:**

*Are we doing what we said we would do?*





## What is our progress?

- Compendium of Climate Change Research and Adaptation Efforts (2016)
- Technical Recommendations to Modeling Workgroup: Guidance on climate projections & scenarios - sea level rise, temperature, precipitation “[Recommendations on Incorporating Climate-Related Data Inputs and Assessments: Selection of Sea Level Rise Scenarios and Tidal Marsh Change Models](#)”
- STAC Workshops: BMP and The Development of Climate Projections for Use in the Chesapeake Bay Program Assessments
- Development of Climate Change Indicators and Progress Measures for the Chesapeake Bay Program
- Three, One-Day Workshops for SAV, Blue Crabs, and Oysters: “[An Analytical Framework for Aligning Chesapeake Bay Program Monitoring Efforts to Support Climate Change Impact and Trend Analyses and Adaptive Management](#)”



## What is our progress?

- Implementation of STAC Workshop “Monitoring and Assessing Impacts of Changes in Weather Patterns and Extreme Events on BMP Siting and Design”(September 2017)
- Climate Smart Framework & Decision-Support Tool Workshops with Toxic Contaminant, SAV, Tidal Wetlands workgroups
- Inform policy implementation of the Phase III Watershed Implementation Plans (WIPs) – 2017 mid-point assessment

## Tools & Resources for Resilient BMPs

Chesapeake Bay Program  
Climate-Smart Framework and Decision-Support Tool  
*Final Report*



## Climate Change Research and Adaptation in the Chesapeake Bay Watershed

A compilation of recent and ongoing efforts  
compiled by the Chesapeake Bay Program  
Partnership's Climate Resiliency Working Group  
July, 2016





## Analysis

Which management actions will be the most critical to your progress in the future?

- STAC Workshop in September 2018: Chesapeake Bay Program Climate Change Modeling 2.0: Developing recommendations for new/refined methods for modeling techniques to assess future impacts of projected climate change on watershed loads and estuarine processes
- Research related to the impact of climate change on BMPs – “Starting with the 2022-2023 milestones, determine how climate change will impact the BMPs included in the WIPs and address these vulnerabilities in the two-year milestones”

# 3

## Challenges:

*Are our actions having the expected effect?*



## Challenges

What scientific, fiscal or policy-related developments or lessons learned (if any) have changed your logic or assumptions about your Outcome?

- Fiscal challenges associated with monitoring recommendations
- Uncertainty of climate science
- Lack of quantitative endpoint

# 4

## **Adaptations:**

*How should we adapt?*





## Based on what we've learned, we plan to...

What (if anything) would you recommend changing about your management approach at this time? Will these changes lead you to add, edit or remove content in your work plan?

- **Modify work plan format and narrow the work plan focus into four main areas:**
  - Shoreline condition and response;
  - Climate change on BMPs;
  - Inland and urban flooding;
  - Stream health condition
- **Potentially narrow the focus of the work plan to report on those activities that the Climate Resiliency Working Group directly impact**



## Cross-Outcome Considerations

Continue to focus on climate change impacts to:

- Black Duck
- Brook Trout
- Diversity
- Fish Habitat
- Forest Buffer
- Healthy Watersheds
- SAV
- Stream Health
- Wetlands
- Water Quality



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## What We Want



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# Discussion