

# CBP Climate Resiliency Management Strategy: From Development to Implementation



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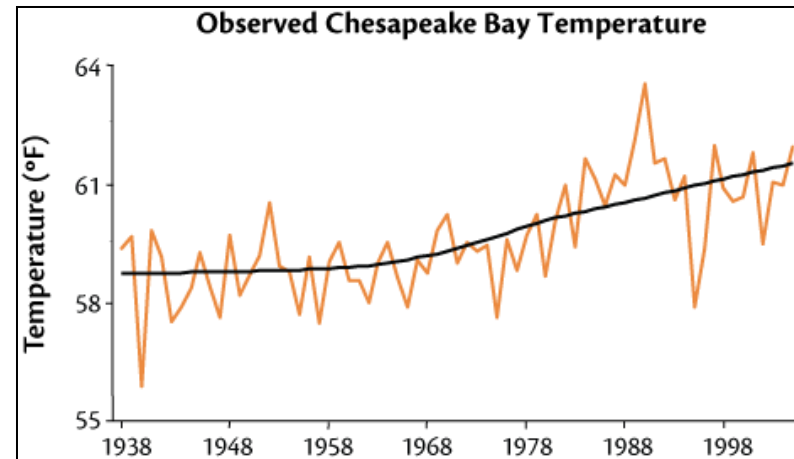


**CBP MANAGEMENT BOARD**

# Climate Change: A Shifting Backdrop



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



Chesapeake Bay has warmed by more than 2°F.

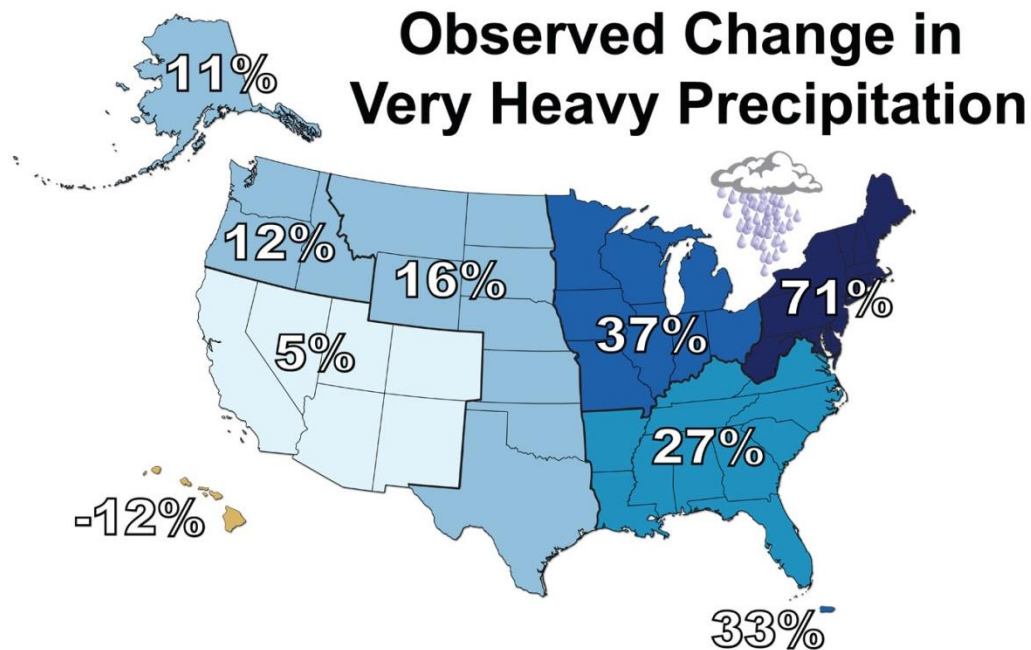


Extreme Events, such as Hurricane Sandy in 2012, foreshadow the Watersheds vulnerability to climate change impacts.

# Increased Precipitation & Extreme Rainfall Events



There is a clear national trend toward a greater amount of precipitation being concentrated in very heavy events, particularly in the Northeast and Midwest.



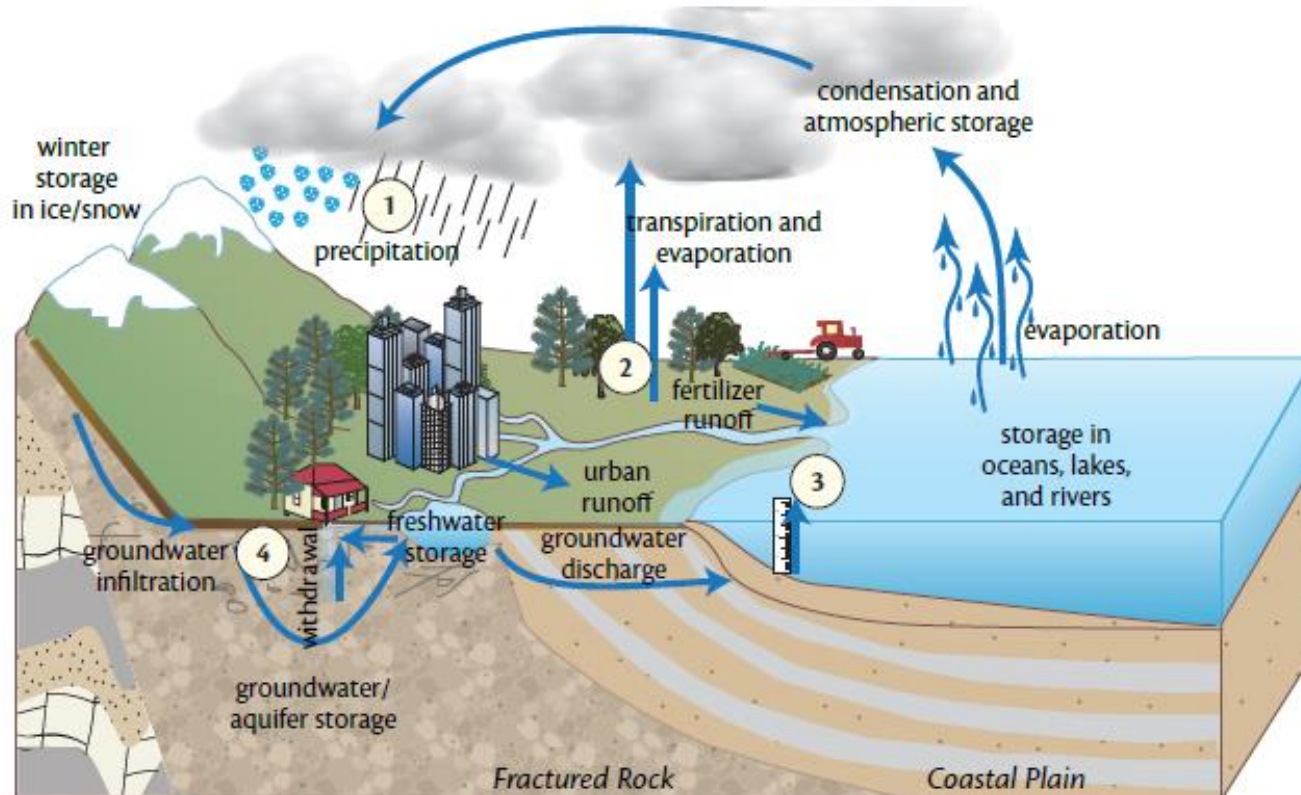
Percent changes in the amount of precipitation falling in very heavy events (the heaviest 1%) from 1958 to 2012 for each region.



# Climate Change & the Chesapeake Watershed



# Changes to Water Supply



## Climate change impacts



1. Increased frequency and variability of extreme rain may lead to flooding, surface runoff, and high energy flows, impacting water quality, stormwater infrastructure, and water and wastewater treatment infrastructure.
2. Increased likelihood of summer drought may affect stream ecosystems, lead to increased demand for irrigation, and result in water shortages.
3. Saline intrusion of freshwater resources may occur as a result of the combined effects of sea level rise and storm surge, and as a result of increased rates of groundwater withdrawal.
4. Increased withdrawal due to drought may reduce groundwater supplies.





# Impacts to High Quality Cold Water Resource Areas



**Brook Trout, *Salvelinus fontinalis***

Source: Chesapeake Bay Program

# Consequences - Impacts to Bay & Aquatic Resources

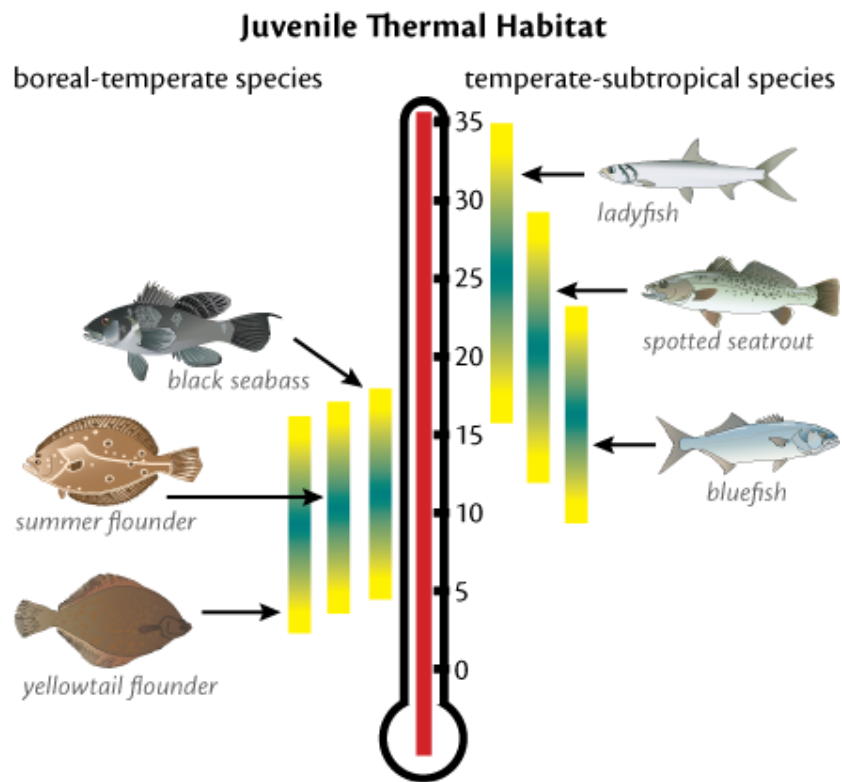


Photo: MD DNR



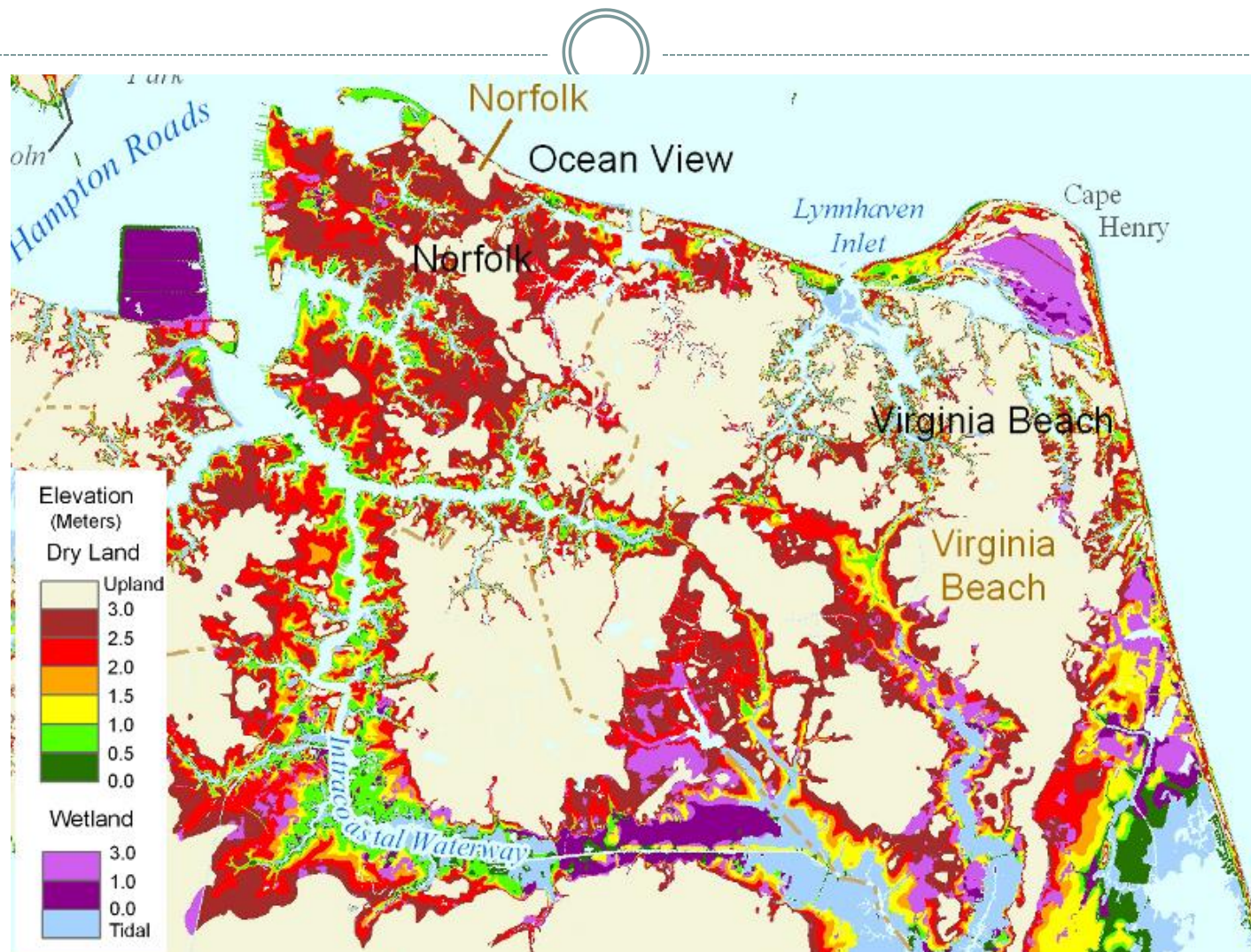
# Consequences – Loss of Vital Habitats



Photo Credit: Zoe Johnson



# Coastal Community Impacts



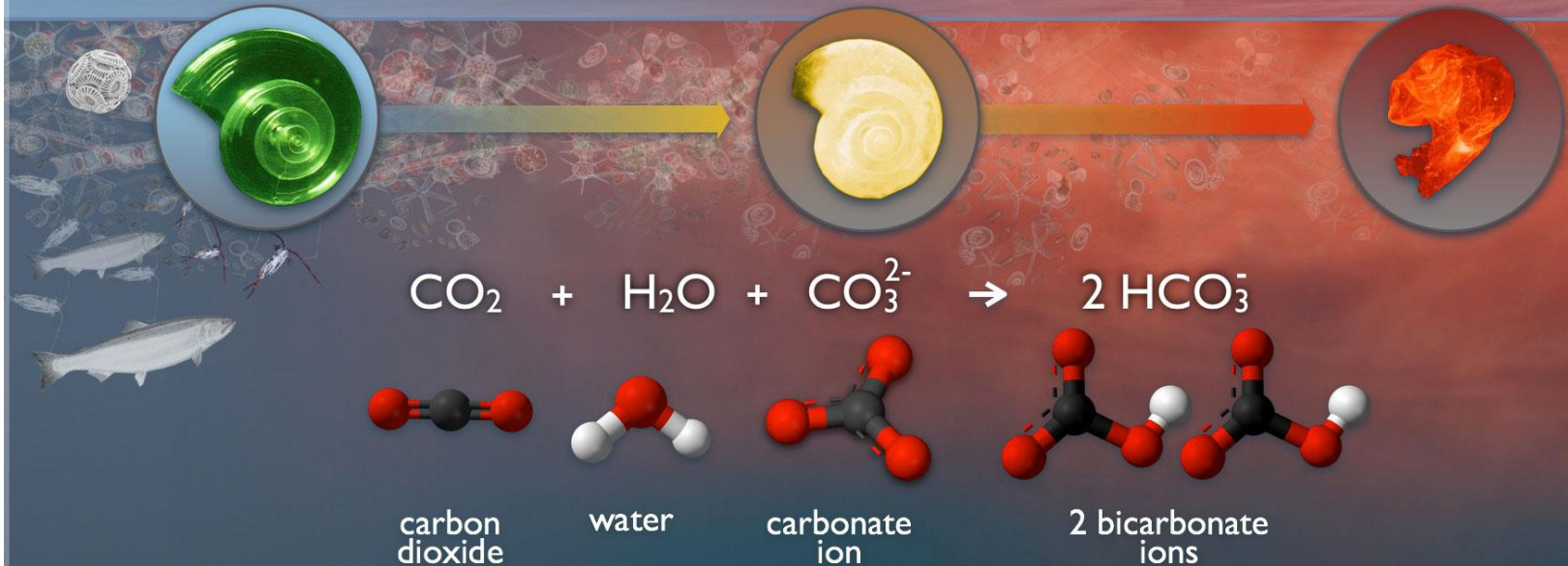
# Bay Acidification



## OCEAN ACIDIFICATION

HOW WILL CHANGES IN OCEAN CHEMISTRY AFFECT MARINE LIFE?

CO<sub>2</sub> absorbed from the atmosphere



consumption of carbonate ions impedes calcification



# STAC Workshop: The Development of Climate Projections for Use in CBP Assessments



## Take Home Messages

- The Northeast US has gotten warmer and wetter
- Precipitation has become more intense
- Trends will continue in the coming decades
- There is a large sensitivity to emissions scenarios, but not until mid-century
- Natural variability is important, particularly for precipitation
- Sea levels are rising faster than the global average and rates are increasing
- Build the capacity within the Partnership to ensure ready access to data, scenario outputs, indicators and to be able to continue to evaluate, learn, and adapt.

# Key Partnership Climate Change-Related Commitments and Recommendations



- *2009 Presidential Executive Order 13508*
- *2010 Chesapeake Bay TMDL*
- *2010 Executive Order 13058: Strategy for Protecting and Restoring the Chesapeake Bay Watershed*
- *2014 Chesapeake Bay Watershed Agreement*



## 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.

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# 2014 Chesapeake Bay Agreement



## *CLIMATE RESILIENCY*

**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 and 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.

# MANAGEMENT APPROACH

Develop a framework for engaging one-on-one with CB Partnership Goal Implementation Teams on climate related management needs.

Management Strategy	Baseline	Factor Influencing Success	Current Efforts & Gaps	Management Approach	Cross-Outcome Collaboration and Mutual Benefit	Adaptive Mgmt. & Monitoring Progress	No Mention	Rating
Water Quality		x		x	x	x		4
Black Duck		x	x	x		x		4
Brook Trout		x	x	x		x		4
Wetlands		x	x	x				3
Protected Lands		x	x	x				3
Public Access		x		x				2
Healthy Watersheds		x		x				2
Urban Tree Canopy			x	x				2
Blue Crab		x			x			2
Oyster Restoration		x			x			2
Fish Habitat		x			x			2
SAV		x						1
Diversity				x				1
Local Leadership		x						1
Fish Passage		x						1
Forage Fish		x						1
Toxics Research	x							1
Stream Health							x	0
Land Use Methods and Metrics							x	0
Land Use Options Evaluations							x	0
Citizen Stewardship							x	0
Environmental Literacy							x	0
Toxics Prevention and Policy							x	0
Forest Buffer							x	0

x = climate change related element



# Climate Resiliency Management Strategy

## “In a Nutshell”



- Unlike many other Bay Agreement Goals and Outcomes; it is very broad, with no numerical goals and outcomes and no established indicators.
- It's different in that it touches on both regulatory aspects of water quality and watershed restoration, as well as the need for the integration of climate considerations into many other CB Agreement goals and outcomes.
- Implementation is complicated by the fact that goal attainment requires research, monitoring, modeling, assessment, on-the-ground projects, policy and regulatory mechanisms, performance measurement, and adaptive management.
- Implementation priorities needed to be established due to the breadth of the issue; recognizing new priorities will evolve over time.
- Work Plan contains 108 actions divided between “individual signatory and partner” actions and a small set of “collective” actions .

# Key Management Actions



## Monitoring & Assessment

- Define goals and establish baselines
- Prioritize climate impacts (those most critical to goal attainment)
- Design monitoring and modeling plans
- Develop a research agenda
- Assess trends and conduct assessments
  - Select appropriate climate scenarios, forecasts and projections
- Undertake public, stakeholder and local engagement
- Review progress and reassess implementation priorities

# Key Management Actions



## Adaptation

- Review and revise conservation, restoration and protection goals and objectives
- Increase the institutional capacity to prepare for and respond to climate change
- Implement priority adaptation actions
  - On-the-ground projects, including pilot projects
- Increase local engagement and targeted education and outreach
- Foster larger discussion on linkage between climate impacts and diversity
- Track adaptation action effectiveness and ecological response
  - Programmatic progress
  - Develop suite of climate indicators



# Goal Attainment

## *Qualitative Factor of Risk*



Goal	Outcome	Qualitative Factor of Risk	Primary Climate Drivers
Water Quality	2025 WIP Outcome	Medium	SLR, T, P, EE
	WQ Attainment	High (over long-term)	SLR, T, P, EE
Healthy Watersheds	Healthy Waters	Varied response	T, P, EE
Vital Habitats	Black Duck	High	SLR
	Brook Trout	High	T, P
	Wetlands	Medium (non-tidal)/High (tidal)	SLR, P
	Stream Health	High	T, P
	SAV	High	SLR, T, EE
	Forest Buffer	Medium	SLR, P, EE
	Urban Tree Canopy	Medium	T, P
Land Conservation	Protected Lands	Low - Medium	SLR
	Public Access	Low - Medium	SLR
Sustainable Fisheries	Blue Crab	Medium	T
	Oyster Restoration	Medium	T, OA
	Fish Habitat	High	SLR, T, P, EE
	Forage Fish	High	SLR, T, P

# Climate Resiliency Work Plan

## *“Collective” Priority Actions*



- **Cross-Goal Climate Resiliency Analysis and Decision-Making Matrix (Wetlands and Protected Lands) – EPA/GIT Funded Project (2016-2017)**
- **Assessment of Monitoring Needs for 4-select workgroups - STAR**
- **The Development of Climate Projections for Use in Chesapeake Program Assessments - STAC Workshop (March, 2016)**
- **Technical and Policy Support related to the Climate Change Component of the Chesapeake Bay Mid-Point Assessment – CBP EPA (2017)**
- **An Analytical Framework for Aligning Chesapeake Bay Program (CBP) Monitoring Efforts to Support Climate Change Impact and Trend Analyses and Adaptive Management (SAV, Blue Crabs and Oysters) – STAC Workshop (Spring, 2017)**

# Climate Change & the TMDL Mid-Point Assessment and Beyond



- Assess how climate change may affect current water quality standards (i.e., nutrient and sediment source loads over time )
  - Precipitation change (increased volume and intensity)
  - Temperature increase (air and water)
  - Sea level rise (hydrodynamics and impacts to beneficial resources (i.e., wetlands))
- Evaluate climate impacts on the effectiveness of existing water quality BMPs over time
  - BMP water quality efficiencies
  - “Climate-smart “ siting and design guidance for BMP implementation
- Explore the policy response options to address projected climate-related changes in water quality standards
  - Many options:
    - ✦ Incorporate changes into Phase III WIPS
    - ✦ Strategically incorporate into select BMP practices (e.g., wetland restoration, storm water)
    - ✦ Defer integration
- Identify the ancillary “climate resilience” benefits of existing water quality BMP’s
  - Quantify the climate resiliency benefit of existing water quality BMP’s (storm surge and flood attenuation, shore protection, wetland adaptation)



# CBP Management Board

## *Areas for Future Engagement*



### Participation, Input, and Ideas

- Feedback on the programmatic approach to climate resiliency
- Guidance on future implementation priorities
- Advocate for more active participation among workgroup members in the implementation of “collective” priorities
- Thoughts on appropriate forums and the process to begin the policy dialog related to the Mid-Point Assessment, Phase III WIPS, and beyond (2050).





Thank you.

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