Climate Resiliency Workgroup Projects and Collaboration Opportunities

STAR

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Chesapeake Bay Watershed Agreement

II. Goal, Outcomes and Baseline

This management strategy identifies approaches for achieving the following goal and outcomes:

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.

Climate Resiliency Workgroup Projects – FY2020-2022

- **Climate Indicator Development (~ Oct 2020 – Oct 2022)**
  - Develop physical indicators (signals of change), impact indicators (tracks ecological and community threats), and climate resilience indicators (tracks preparedness)
  - Develop 2-3 new climate indicators that have cross-workgroup use related to water quality, habitat, living resources, and/or communities

- **Climate Smart Framework and Decision-Making Tool (~ May 2020 – May 2021)**
  - Apply structured, science-based framework to assist with incorporating climate resilience and adaptation principles with all Chesapeake Bay Watershed Agreement goals/outcomes
  - Refine based on past pilot workgroup feedback
  - Pilot updated framework with Healthy Watersheds and one other workgroup

- **GIT-Funded Bay-Wide Climate Resilience Scorecard (~ April 2020 – April 2021)**
  - Identify and develop method to track climate resilience actions by communities in the Chesapeake Bay Watershed

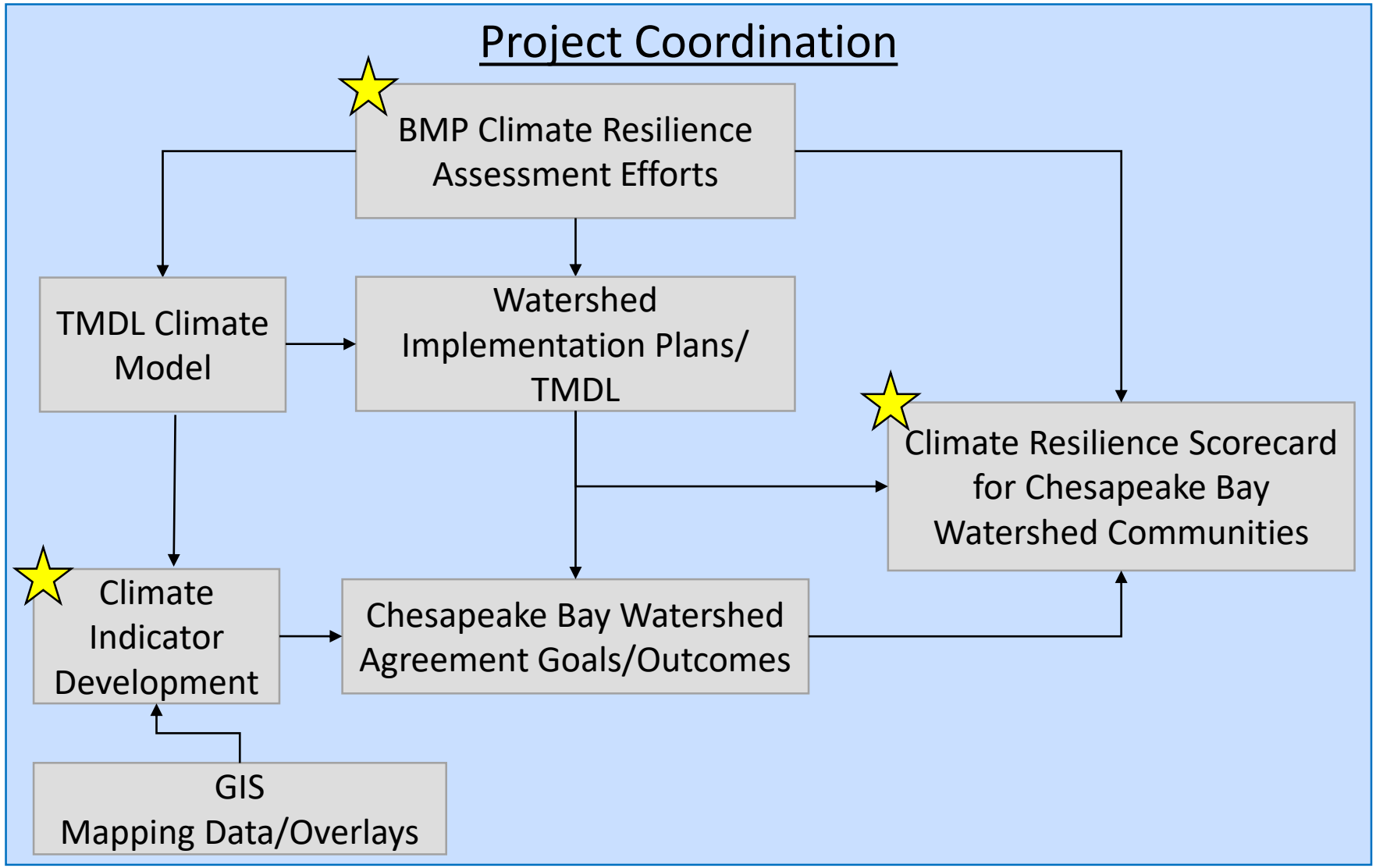
BMP Climate Resiliency Assessment Efforts

- **Urban Stormwater Workgroup (Point of Contact: David Wood, Chesapeake Stormwater Network)**
  - GIT-Funded – Piloting the Development of Probabilistic Intensity Duration Frequency (IDF) Curves for Chesapeake Bay Watershed (~ March 2020 – March 2021)
    - Evaluation of climate downscaling methods/calibration with historical precipitation extremes; quantification of climate model uncertainties for projected precipitation extremes
    - Urban stormwater BMP climate vulnerability assessment (~ Jan 2020 – October 2020)

- **STAC-Funded Climate Change and Uncertainty Science Synthesis (Point of Contacts: Kurt Stephenson and Zach Easton; ~ Jan 2020 – Dec 2020)**
  - Awarded to Virginia Tech: Assessing questions related to climate change and variability effects on nutrient/sediment cycling and BMP performance

- **NOAA Chesapeake Bay Office (NCBO) – Interagency agreement with CBPO (Point of Contact: Julie Reichert-Nguyen; FY21)**
  - Developing RFP that will support performance assessment of BMPs with habitat and living resource co-benefits (e.g., wetland restoration, living shorelines) under changing climate conditions

Climate Resiliency Coordination



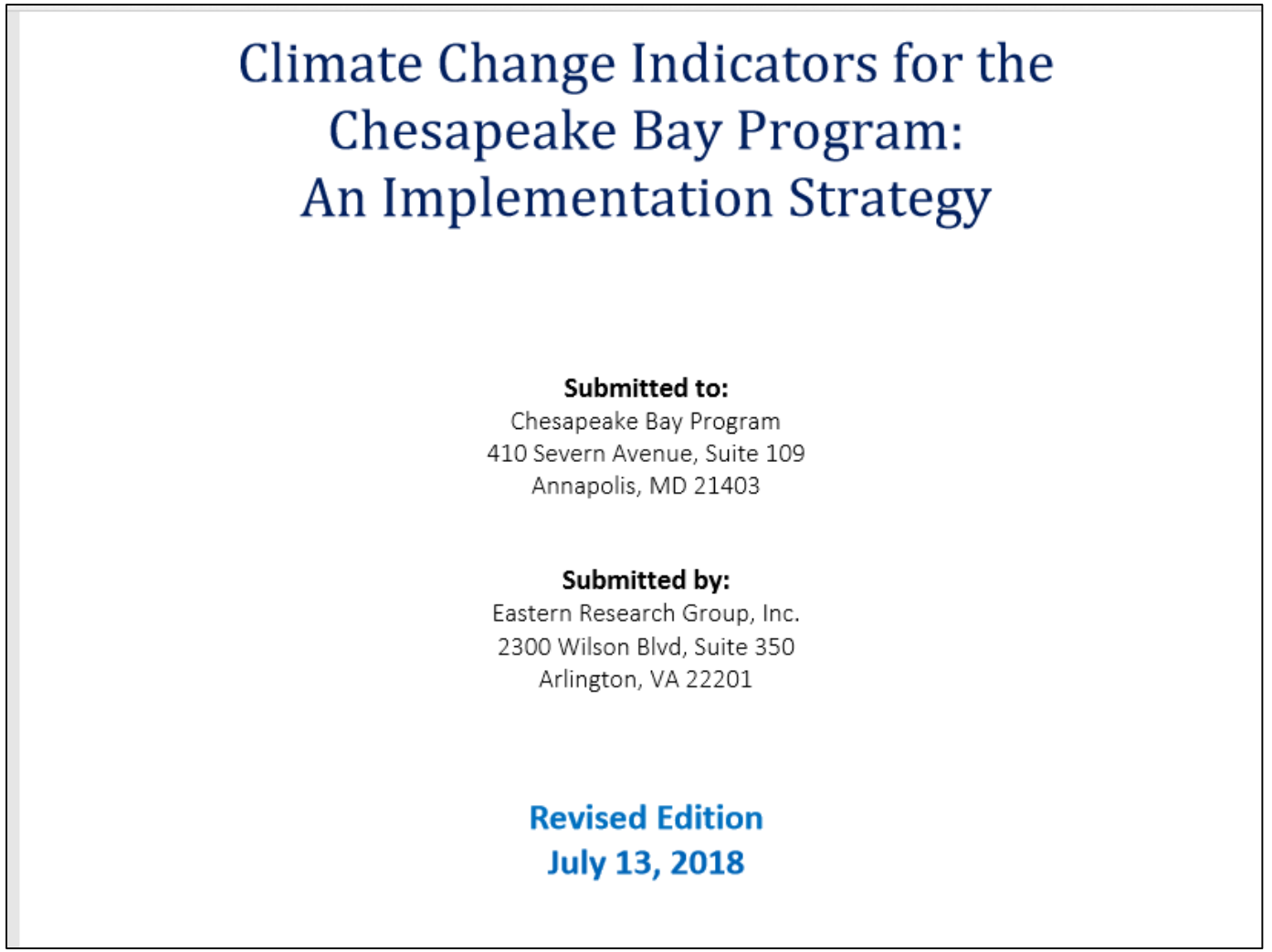
Support

- Climate Resiliency Workgroup
- STAR (Science/Research Needs)
- STAC (Science Review)
- GITS/Workgroups
- Local Government Advisory Committee
- Modeling Team
- GIS Team
- Partners
- Consultants
- Jurisdictions

Identify and coordinate who is doing what to support climate resiliency efforts

CRWG Climate Indicators Project

- GIT Funded Project:
  - 2017 - 2018
  - Eastern Research Group, Inc. (ERG)
- Goal: Conceptualize, select, and partially develop a suite of indicators that can be used to track progress toward the Climate Resiliency goal and outcomes in the 2014 Watershed Agreement



Climate Change Indicators for the Chesapeake Bay Program: An Implementation Strategy

Submitted to:
Chesapeake Bay Program
410 Severn Avenue, Suite 109
Annapolis, MD 21403

Submitted by:
Eastern Research Group, Inc.
2300 Wilson Blvd, Suite 350
Arlington, VA 22201

Revised Edition
July 13, 2018

Indicator development process

210 topics

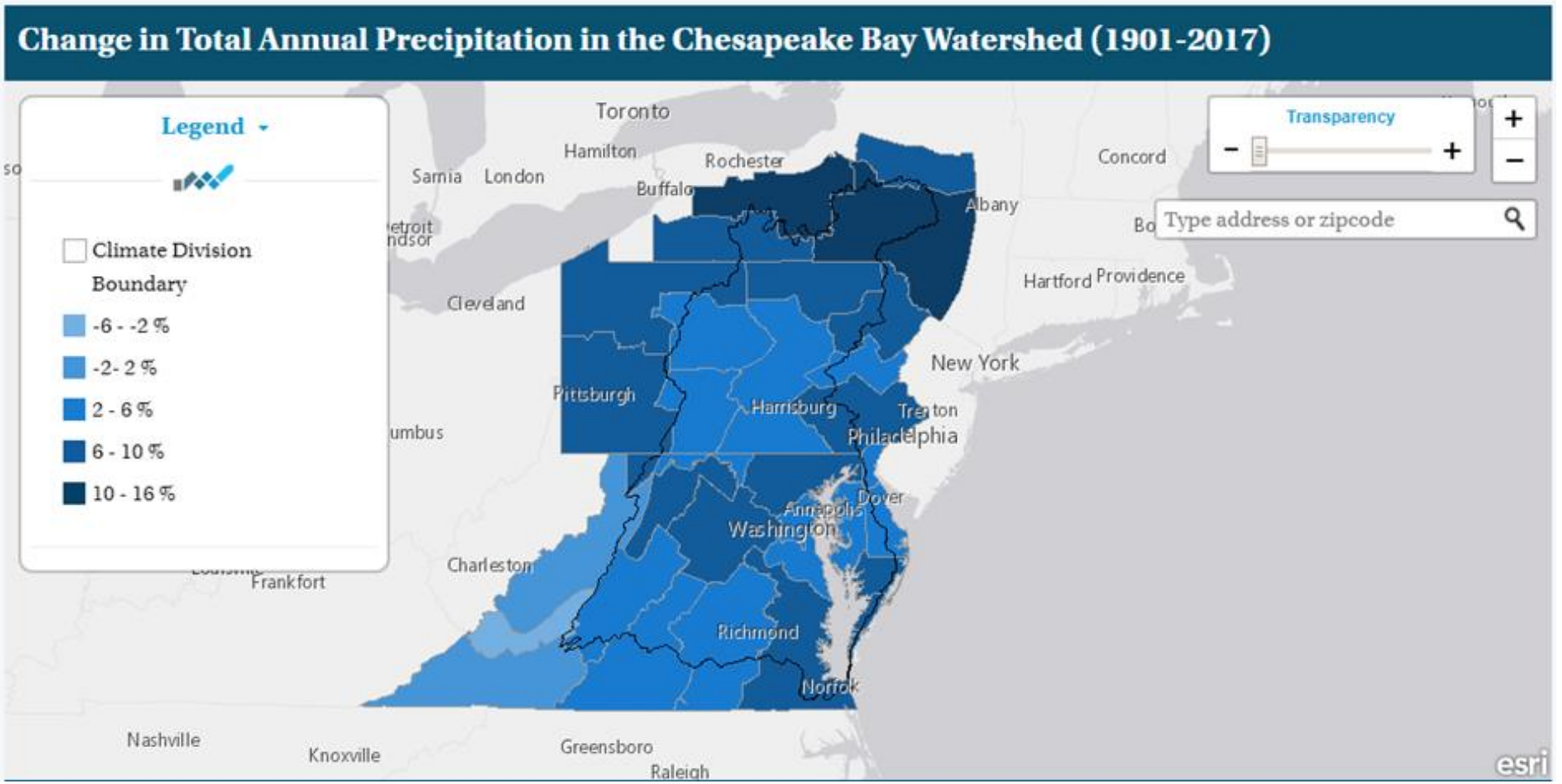
- ERG developed a master list of potential topics

21 indicators

- Criteria was created for choosing indicators for development
- ERG proposed a suite of 21 indicators for possible development

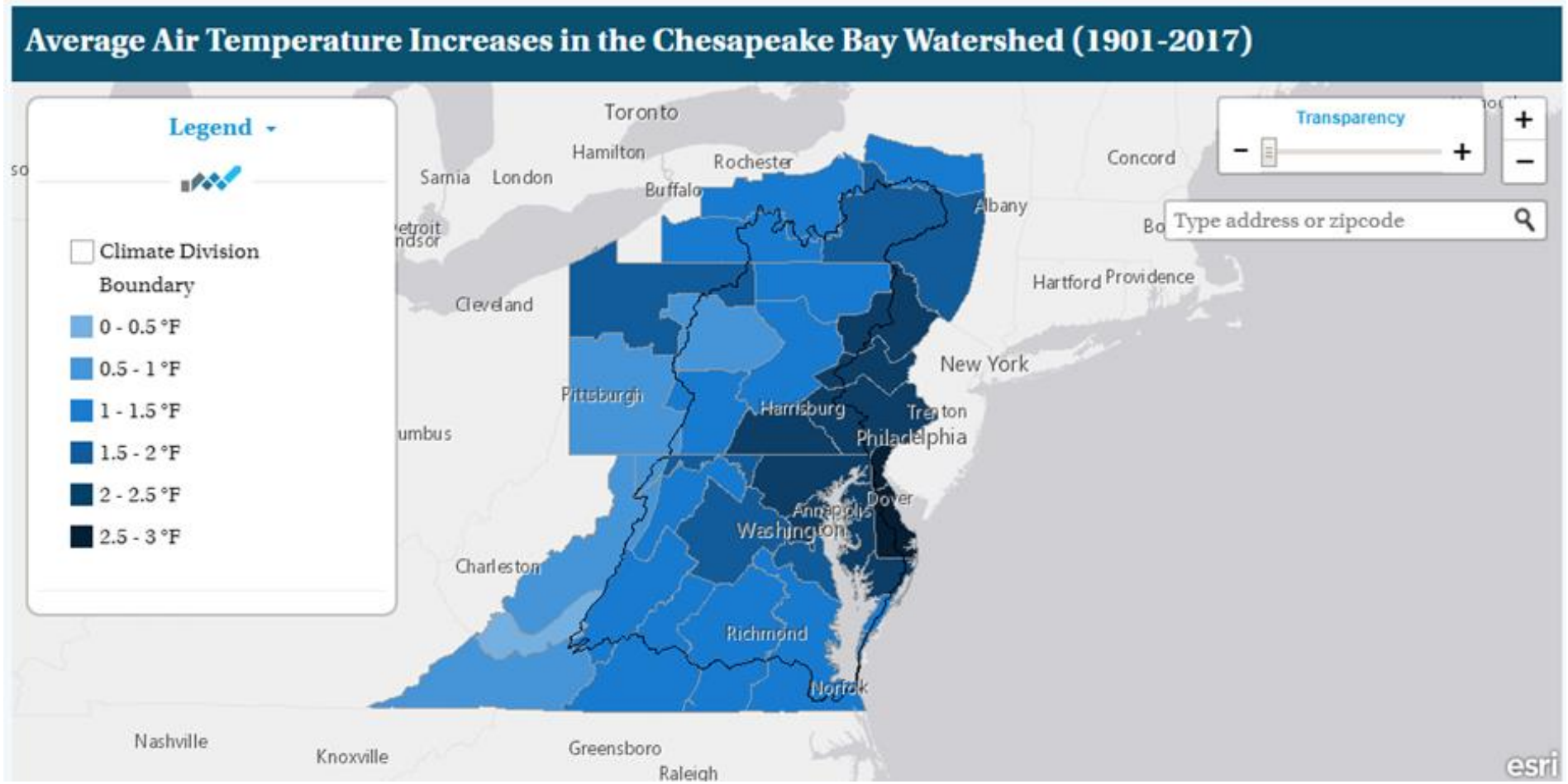
10 CBP indicators

- Data and metrics for 9 indicators were available immediately
- Three were existing indicators with other workgroups: Protected Lands and Restored Oyster and Ag Wetland Habitat
- Seven were new climate indicators posted to Chesapeake Progress
- Indicator Implementation Plan



Baseline 1901-2000
Now have data for 2018 (update in progress)

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



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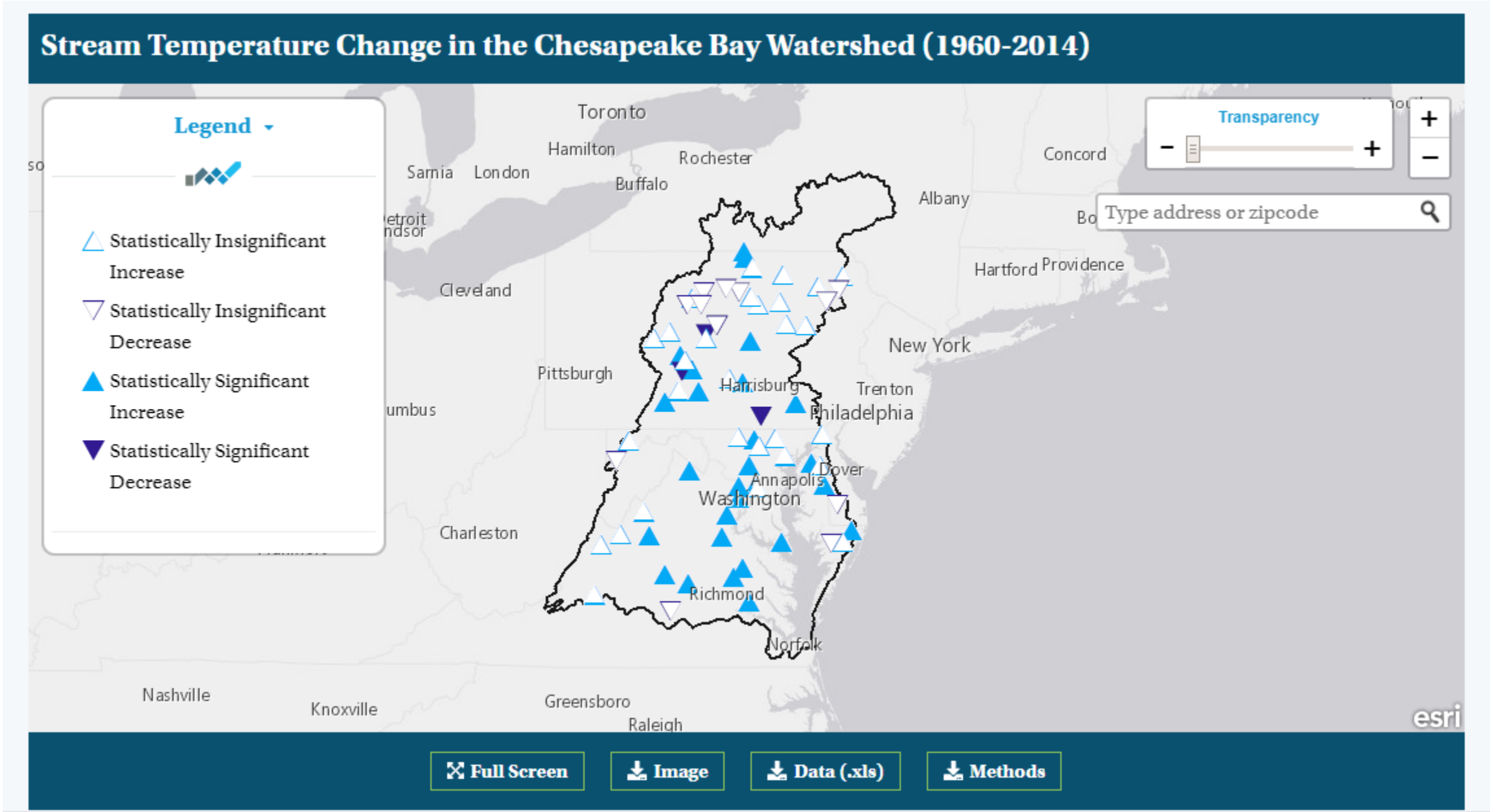


https://www.chesapeakeprogress.com/climate-change/climate-monitoring-and-assessment

Remaining Proposed Indicators

14 Remaining

- ERG evaluated implementation readiness of indicators

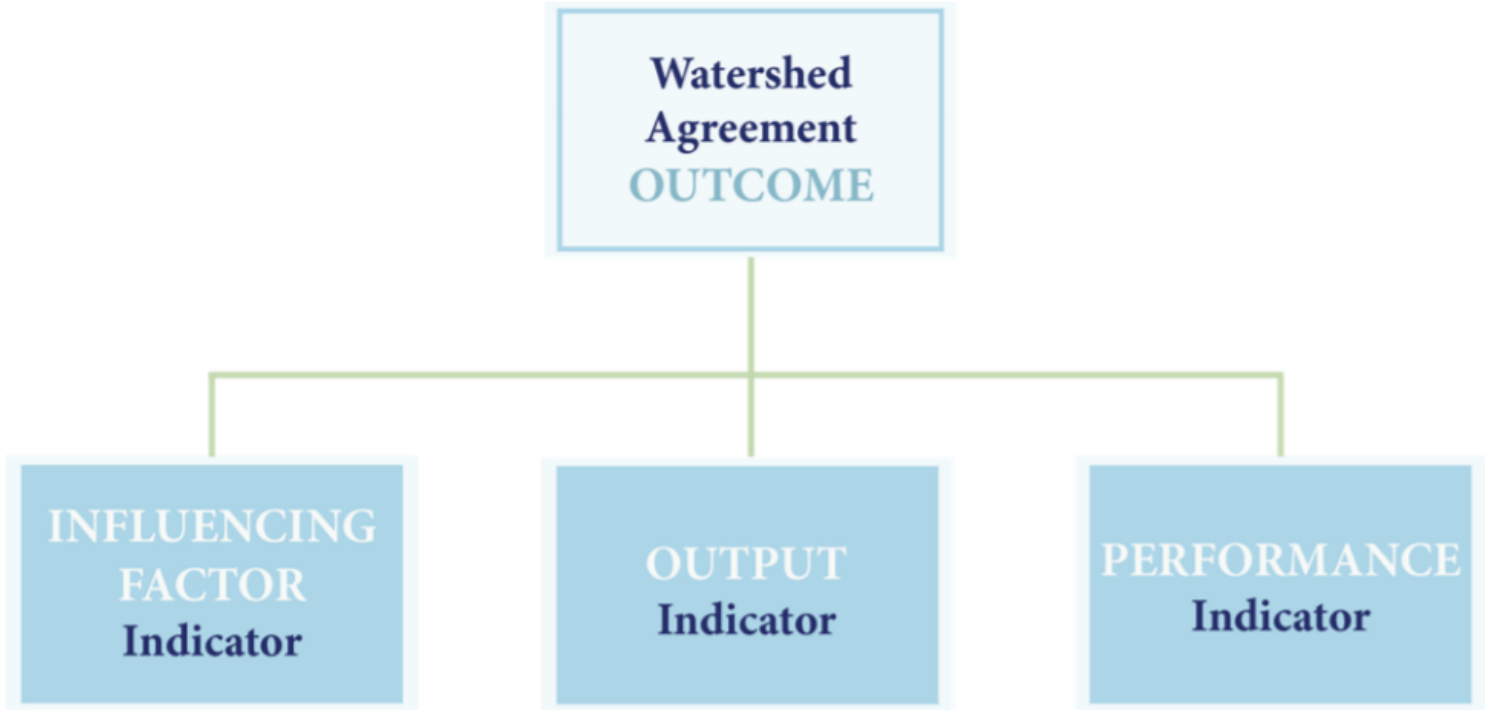
CBP Workgroup Outreach

- Link climate indicator work with goals and outcomes in Watershed Agreement

CRWG Evaluation

- Strategize which climate indicators to focus development on in 2020

Chesapeake Bay Program Indicator Framework



Influencing Factors – What KEY influencing factors are impacting the achievement of an outcome?

Outputs – Are we doing what we said we would do in our work plans and management strategies?

Performance – Are we achieving the outcome?

https://www.chesapeakebay.net/channel_files/23821/approved_cbp_indicators_framework_and_management_process.pdf

Proposed Climate Indicator Framework

Topic (green = indicator available)	Anticipated cost	Anticipated timeframe
Group A: Indicators for Physical Stressors		
Air Temperature	Low	Short-term
Precipitation	Low	Short-term
Sea Level Change	Low	Short-term
Stream Water Temperature	Low	Short-term
Acidification (low pH; low carbonate availability)	Low	Short-term
Bay Water Temperature	Moderate	Short-term
Group B: Indicators for Climate Related Impacts		
Upstream Flooding	Low	Short-term
Coastal Flooding	Low	Short-term
Submerged Aquatic Vegetation Composition	Medium	Medium-term
Wetland Extent and Physical Buffering Capacity	Medium	Short-term
Bird Species Ranges	Medium	Medium-term
Property at Risk or Damaged	High	Long-term
Fish Population Distribution	High	Long-term
Harmful Algal Blooms	TBD	Short-term
Group C: Indicators to Measure Climate Resilience		
Protected Lands	None	Short-term
Restored Habitat (Oyster and Ag wetlands)	None	Short-term
Land Use/Land Cover	Medium	Short-term
BMPs and Green Infrastructure	High	Medium-term
Shoreline Condition	High	Medium-term
Wetland Migration Corridors	High	Medium-term
Urban Tree Canopy	TBD	Short-term

CBP Workgroup Interests (Habitat and Living Resources)

- Wetlands Workgroup
- SAV Workgroup
- Forestry Workgroup
- Fish Habitat Team
- Fish Forage Team
- Healthy Watersheds

GREEN = Indicator of some sort available on Chesapeake Progress

Preliminary Evaluation: Selected by 4 or more workgroup leads

Workgroup Feedback Summarized

Physical Indicators (Signals of Change)

Change in Air Temperature
(seasonal shifts)

Change in **Water Temperature**
(Streams/Bay)

Change in Precipitation
(Effects on dissolved oxygen, salinity, nutrient loadings, freshwater flow)

Sea Level Rise
(Need finer spatial scale)

Ocean/Coastal Acidification

Impact Indicators (Ecological and Community Threats)

Habitat quality
- Suitability for key fish (brook trout, forage fish, striped bass) and SAV species
- Fish, SAV, tree species abundance and distribution
- Pathogens/invasives
- Harmful algal blooms

Land-Use Change
- Population migration/increase in development
- Forest, wetland, marsh fragmentation and loss/change in migration corridors

Seasonality/Phenology Shifts
- Summer abundance of forage fish
- Longer growing seasons (trees)
- Tree mortality from late-season “flash droughts”

Climate Resilience Indicators (Preparedness)

Conservation/Preservation
- Restore/protect critical habitat areas in climate resilient locations

BMP Implementation
- Temperature lowering BMPs (e.g., forest buffers) in high priority aquatic habitat areas
- Living/hardened shorelines

Species Diversity
(Forests and SAV)

Behavior Change
- Shift planting schedules/change species
- Development plans allow for tree/marsh migration

Specific Example from Healthy Watersheds

Physical Indicators (Signals of Change) → Impact Indicators (Ecological and Community Threats) → Climate Resilience Indicators (Preparedness)

Example:

Change in Stream Temperature → Change in Brook Trout Habitat (Upper threshold = 6 degree Celsius change) → Amount of Restored/Protected Brook Trout Habitat in Identified Climate Resilient Locations

Climate Indicators – Next Steps

- **Assess available data**
  - Inform level of effort
- **Identify specific resilience indicators of interest**
  - Follow-up with individual workgroups
- **Select climate indicators to update/develop**
  - Ideally, indicators will have cross-workgroup application and inform resilience actions
  - Evaluate GIT-funding to support indicator development – Focus on pilot areas for application
- **Support: Summer Internships (~ April – August 2020)**
  - NOAA Chesapeake Bay Summer Internship Program in partnership with the Chesapeake Research Consortium: Climate Change Indicator Development Support (Habitat and Living Resource Focus)
  - C-StREAM: GIS Analysis of Flooding and Sea Level Rise Impacts on Land Use and Communities

QUESTIONS