

# Proposed Climate Change Indicators for CRWG to Focus On

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FEBRUARY 17, 2021



# Climate Change Indicator Challenges

- Many outcomes in the Chesapeake Bay Watershed Agreement affected by climate change
- Time-intensive to develop - involves complex data integration/synthesis
- Any indicator developed also needs to be maintained – includes coordinating & updating data and metadata documentation.
- Climate Resiliency Workgroup has limited resources and capacity to develop & update indicators – need partner support

GOAL: Focus on climate change indicators that benefit multiple workgroups and have clearly defined management purposes

- Cross-outcome utility
- Cross-workgroup/agency collaboration for development and updating
- Informs adaptation decision-making for managing Bay/watershed outcomes (habitat, water quality, living resources)



Climate Change Indicator Implementation Strategy:

[www.chesapeakebay.net/channel\\_files/31218/indicator\\_implementation\\_plan - revised - 07-13-18.pdf](http://www.chesapeakebay.net/channel_files/31218/indicator_implementation_plan_-_revised_-_07-13-18.pdf)

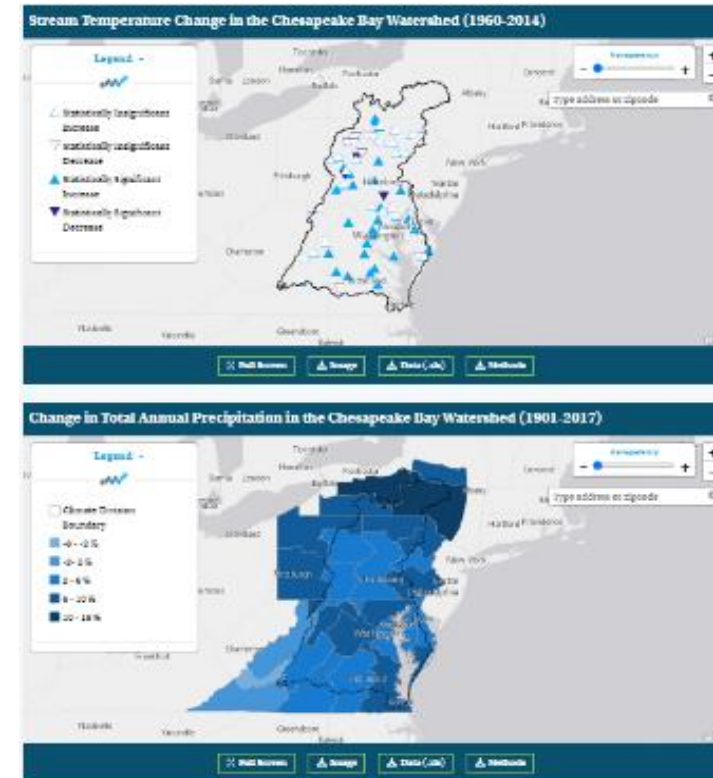
# Current Climate Change Indicators on Chesapeake Progress

- **Avg. Air Temp Increase**
- **Total Annual Precip Change**
- **Stream Temp Change**
- **Relative Sea Level Rise**

## Archive

- **Change in High Temp Extremes**
- **River Flood Frequency**
- **River Flood Magnitude**

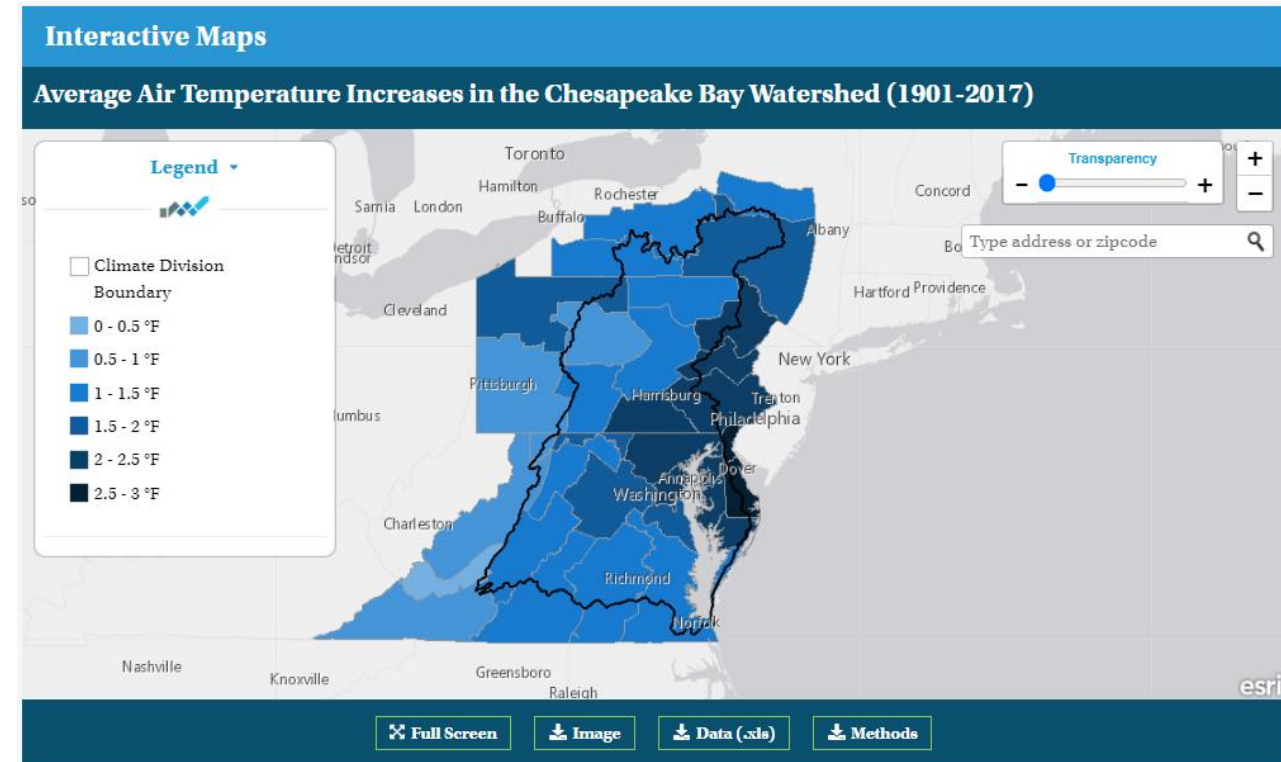
Red = updates currently not available



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

# Cross-Workgroup Collaboration – Air Temperature and Precipitation Change

- **Average Air Temperature Increase & Total Annual Precipitation Change**
  - Overall general trends – keep as is
  - Communications Workgroup – Bay Barometer
  - U.S. EPA National Indicator Project provides updates to data/maps



# Cross-Workgroup Collaboration – Stream Temperature

- Revise **Stream temperature change** indicator – relate to healthy watersheds
  - Healthy Watersheds Assessment includes projected brook trout occurrence with 6 degree Celsius change
  - Agency Support: USGS provides stream temperature updates (currently delayed)

## Healthy Watersheds GIT & CRWG Collaboration

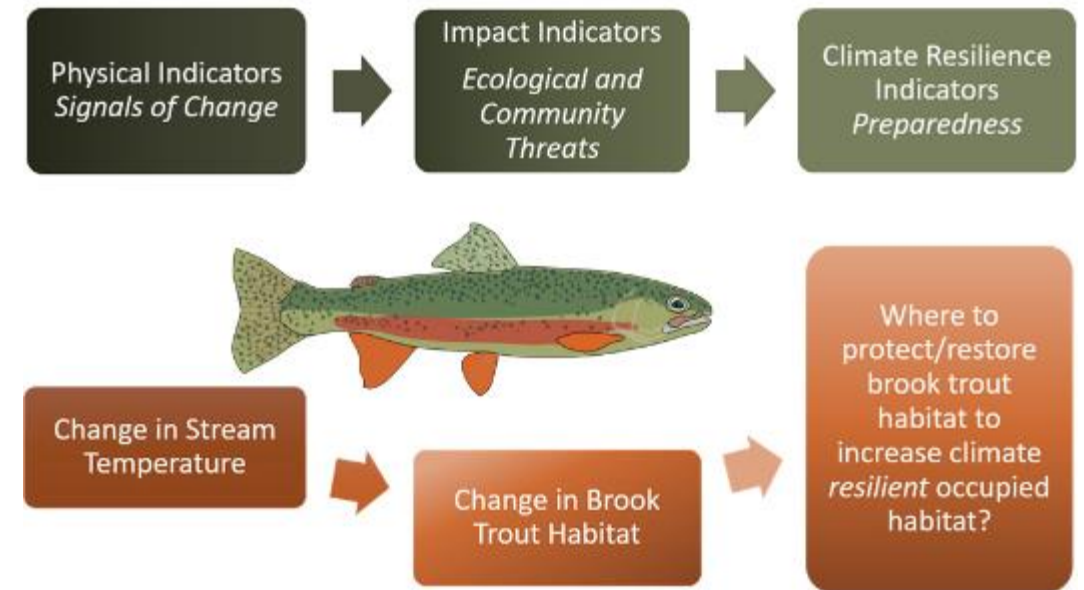
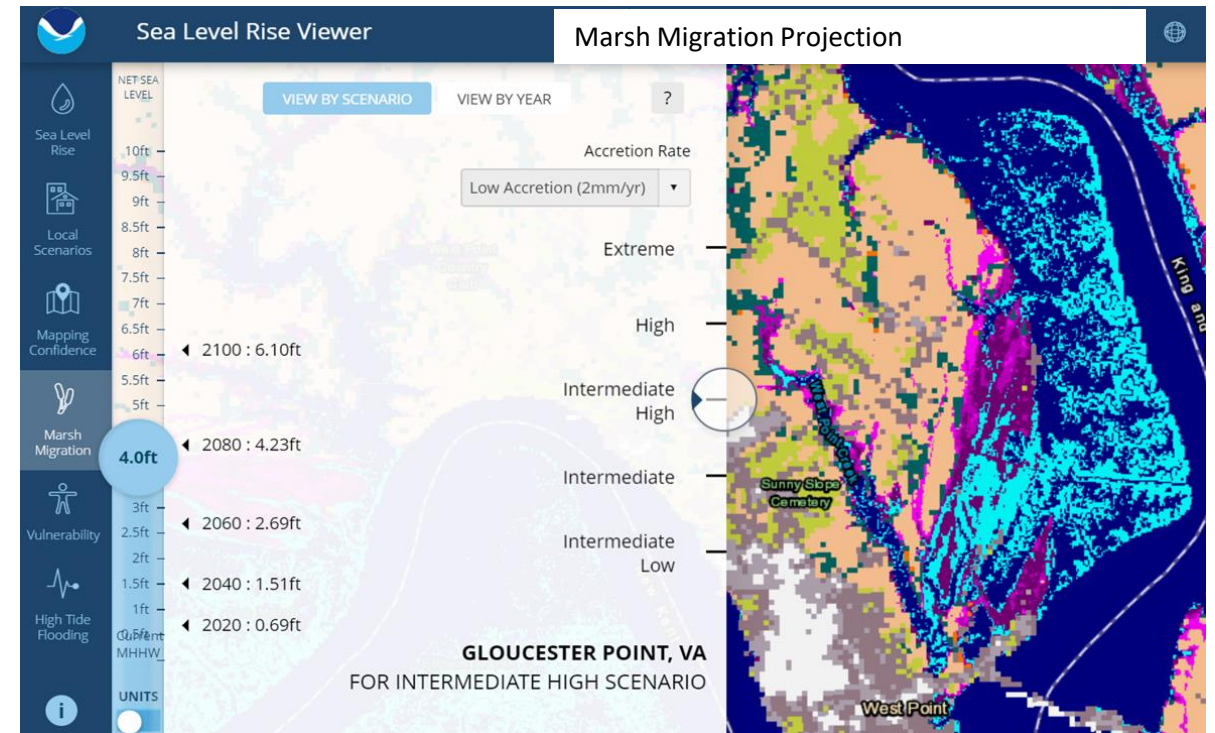


Image Credit: Nora Jackson, Healthy Watersheds  
Jane Hawkey, Integration and Application Network, University of Maryland Center  
for Environmental Science ([ian.umces.edu/imagelibrary/](http://ian.umces.edu/imagelibrary/))



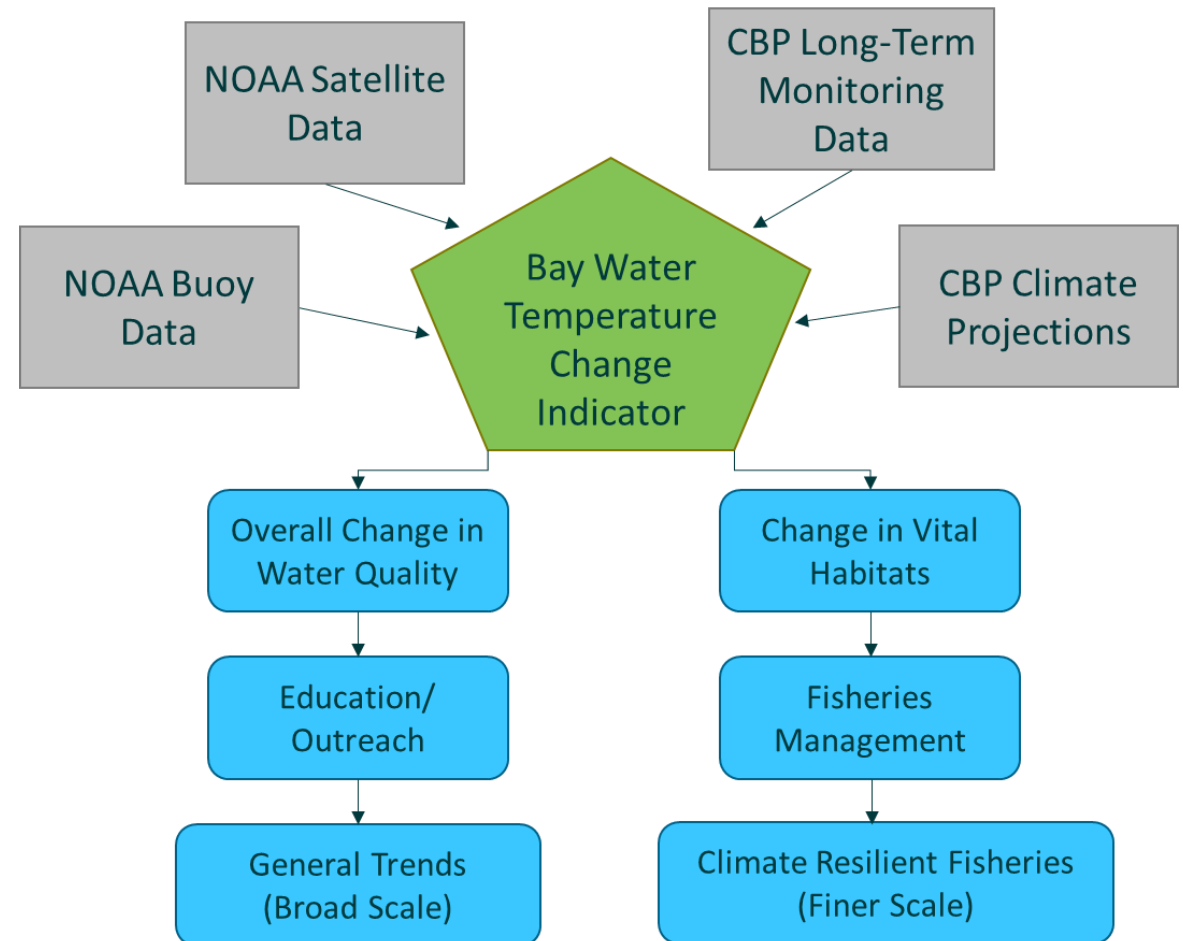
# Cross-Workgroup Collaboration – Sea Level Rise

- Revise **sea level rise** indicator – relate to tidal wetland change (exploring location-based option)
  - Net wetland extent – consider losses (conversion to open water) and gains (migration potential related to adjacent land-use)
  - Wetlands Workgroup and CRWG collaboration: FY20 GIT-Funded Project, “Synthesis of Shoreline, Sea Level Rise, and Marsh Migration Data for Wetland Restoration Targeting”



# Cross-Workgroup Collaboration – Tidal Bay Water Temperature

- Develop **Bay water temperature change** indicator – relate to habitat and living resources
  - Supported by multiple workgroups (STAR, Modeling, Integrated Trends Analysis, Status and Trends, Water Quality, Fisheries, and Habitat GITs)
  - Above workgroups and more participating in developing STAC workshop proposal, “Rising Watershed and Bay Water Temperature – Ecological Implications and Management Responses



# Summary: Proposed Climate Change Indicators for CRWG to Focus Efforts On

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- **Stream Temp Change**
  - Adaptation Utility: Connect with identifying & protecting resilient brook trout habitat
- **Tidal Bay Water Temperature Change**
  - Adaptation Utility: Connect with optimal temperature thresholds for fish and SAV habitat to inform adaptive management decisions
- **Relative Sea Level Rise**
  - Adaptation Utility: Connect with tidal marsh extent/migration corridors to inform targeting of wetland restoration efforts
- **Average Air Temp Increase and Total Annual Precipitation Change**
  - Utility: General trends for education/outreach purposes (e.g., Bay Barometer) – update every 3 years



# Proposed Indicators Related to Climate Change – Focus/Interest from Other Workgroups

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- Tree canopy in urban communities (Forestry Workgroup – developing tool)
- Forage fish abundance related to warming (Forage Action Team – FY20 GIT-funded project)
- Proportion of hardened shoreline (Fisheries GIT)
- Water quality changes – DO, salinity, nutrient loadings, freshwater flow changes (Integrated Trends Analysis Team)
- Coastal flooding related to sea level rise (U.S. EPA Indicator Team)
- Upstream flooding related to precipitation changes (USGS – updates currently not available; archive)
- SAV distribution composition (FY20 GIT-Funded SAV climate change modeling project)
- Bird species ranges related to seasonal shifts in air temperature
- Spread of invasive species
- Extent of local policies and practices for better stormwater management
- Occurrence of harmful algal blooms
- Ocean Acidification related to increasing carbon dioxide