Overview of Recommendations from STAC Workshops and Reviews

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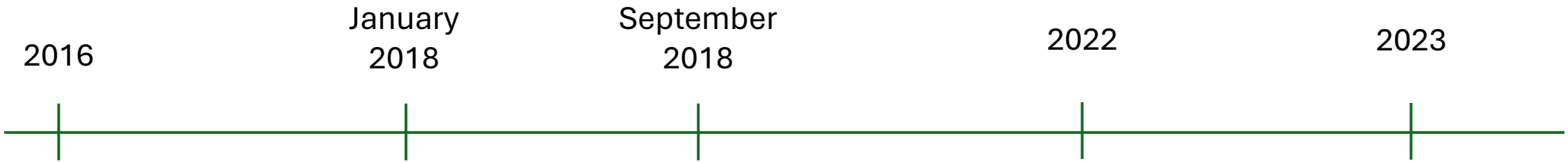
CBP Climate Change Modeling 3.0: Post-2025 Decisions

Arlington, VA

May 7-9, 2024

Background

Between 2018 and 2023, 3 STAC workshops and 2 review reports documented a series of recommendations for advancing CBP modeling capabilities with respect to addressing climate change



STAC workshop

Development of Climate Change Projections in CBP Assessments

STAC workshop

Chesapeake Bay Program Modeling in 2025 and Beyond: a Proactive Visioning Workshop

STAC workshop

Chesapeake Bay Program Climate Change Modeling 2.0

Report

A Systematic Review of Chesapeake Bay Climate Change Impacts and Uncertainty: Watershed Processes, Pollutant Delivery, and BMP Performance

STAC report

Achieving Water Quality Goals in the Chesapeake Bay: A Comprehensive Evaluation of System Response

2016 Workshop: Background

Workshop goal:
To conduct a review of GCMs, scenarios, downscaling techniques, and historical observation data for the purposes of helping the CBP assess the applicability of available climate data and establish a framework for climate analysis in the CBP models.

Specifically, Identify:

1. Climate change variables of greatest concern
2. Most relevant and useful climate variable characteristics (i.e. spatial and temporal resolution) at regional, state, and local levels.
3. Approaches to select climate change scenarios for CBP assessments.
4. What climate change scenarios that meet CBP decision-making needs for 2017 Midpoint Assessment and for longer term management decisions and programmatic assessments.

The Development of Climate Projections for Use in Chesapeake Bay Program Assessments

STAC Workshop Report
March 7-8, 2016
Annapolis, MD

Johnson, Z., M. Bennett, L. Linker, S. Julius, R. Najjar, M. Mitchell, D. Montali, R. Dixon. 2016. The Development of Climate Projections for Use in Chesapeake Bay Program Assessments. STAC Publication Number 16-006, Edgewater, MD. 52 pp.

2016 Workshop: Recommendations and Adoption

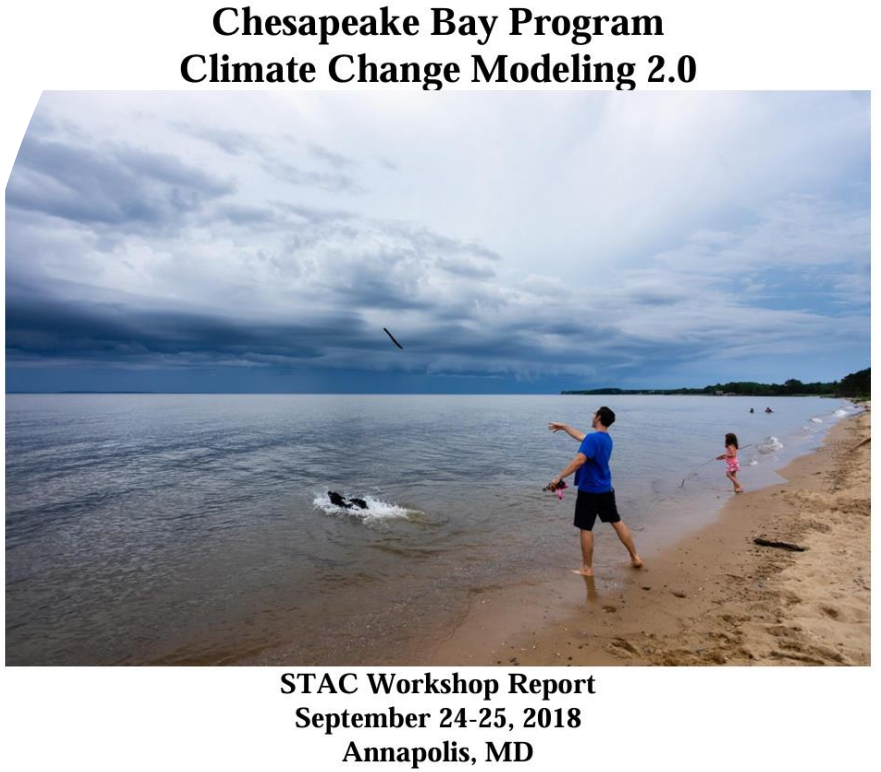
1. Use of consistent climate scenarios
2. Use historical (~100 years) trends to project short term trends
3. Carefully consider calculation method for evapotranspiration
4. Beyond the 2050 timeframe, use GCM ensembles
5. Beyond the 2017 Midpoint Assessment, use 2050 projections for BMP design, selection, and performance estimation
6. Select a system to access GCM downscaled scenario data

2018a Workshop: Background

Workshop goal:
To provide guidance and expert advice on the models and the assessment framework used to assess the effect of climate change on the TMDL.

Specifically:

1. Are the P6 Watershed Model and Water Quality Sediment Transport Model outputs capable of capturing future climate realizations
2. Develop recommendations to support assignment of any additional load reductions in 2021
3. Recommend longer-term climate modeling goals for the partnership



Shenk, G., M. Bennett, D. Boesch, L. Currey, M. Friedrichs, M. Herrmann, R. Hood, T. Johnson, L. Linker, A. Miller, and D. Montali. 2021. Chesapeake Bay Program Climate Change Modeling 2.0 Workshop. STAC Publication Number 21-003, Edgewater, MD. 35 pp.

2018a Workshop: Recommendations and Adoption

Near term (by 2021):

1. Incorporate uncertainty into the decision process.
2. ✓ Include climate-related sensitivities in the watershed and estuarine models and characterize the relative importance of these effects on dissolved oxygen.
3. ✓ Enhanced quantification of uncertainties in model inputs:
    a. Use General Circulation Models (GCMs) rather than trend extrapolation for projections beyond 2025, incorporating seasonal changes
    b. Re-evaluate estuarine model forcing, particularly the magnitude of sea-level rise, open boundary conditions (specifically temperature), and the influence of wind.
4. Compare multiple existing estuarine model simulations, including the CBP's Water Quality and Sediment Transport Model, from 1985 through recent wet years.

2018a Workshop: Recommendations and Adoption

Longer term (by 2025):

1. Incorporate sources of uncertainty.
2. Continue development of climate-related watershed model capabilities with particular attention to BMP effectiveness.
3. Develop a new estuarine model with:
   a. An unstructured grid that extends onto the coastal shelf
   b. Updated biogeochemistry as appropriate for a future warmer climate
   c. A simulation of wetting, drying, and waves

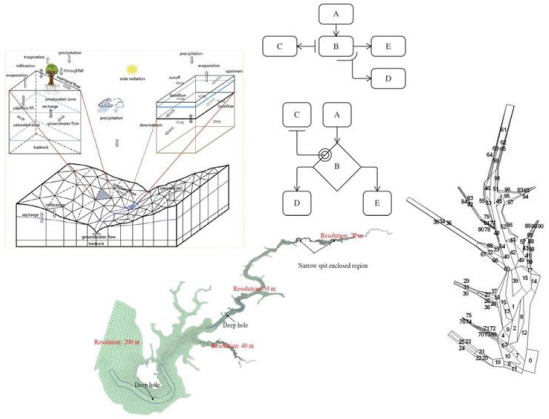
2018b Workshop: Background

Workshop goal:

To develop a vision for a for the Phase 7 modeling system.

Specifically:

1. Determine the scientific, computational, and data management challenges and needed changes to the CBP modeling system
2. Determine how information and recommendations from previous workshops and committee reports and organizations be brought to bear to address these needs?
3. Suggest how resources be used more efficiently and collaboration among government, private, and academic partners be maximized.



Hood, R.R., G. Shenk, R. Dixon, W. Ball, J. Bash, C. Cerco, P. Claggett, L. Harris, T.F. Ihde, L. Linker, C. Sherwood, and L. Wainger. 2019. Chesapeake Bay Program Modeling in 2025 and Beyond: A Proactive Visioning Workshop. STAC Publication Number 19-002, Edgewater, MD. 62 pages.

2018b Workshop: Recommendations and Adoption

1. ✓ Evaluate the approaches, processes, and parameterizations for estimating the impacts of climate change and sea level rise on the TMDL
2. ✓ Incorporate climate risks into land use and sea level rise scenarios, with population and employment projection trends

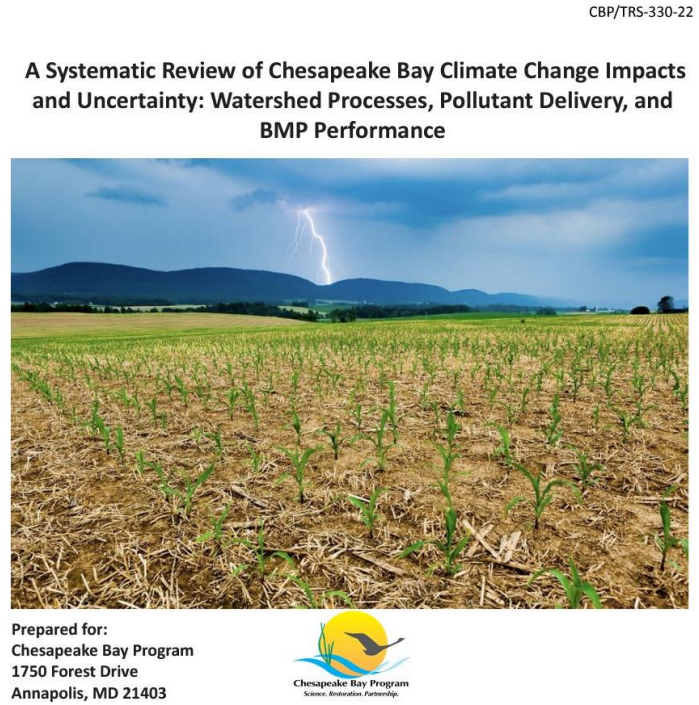
2022 Report: Background

Report Objectives:

To determine how nutrient and sediment loads are likely change in response to climate, and how BMPs being used to reduce nutrient and sediment loads them will function in future climates.

Specifically:

1. Determine how do climate change and variability is likely to affect nutrient/sediment cycling in the watershed
2. Qualitatively estimate how climate change and variability affect BMP performance
   a. By what mechanisms can climate change and variability affect BMP nutrient and sediment removal?
   b. How does climate change affect BMP performance variability?



Hanson, J., E. Bock, B. Asfaw, and Z.M. Easton. 2022. A systematic review of Chesapeake Bay climate change impacts and uncertainty: watershed processes, pollutant delivery and BMP performance. CBP/TRS-330-22. Available: https://bit.ly/BMP-CC-synth.

2022 Report: Recommendations and Adoption

1. More mechanistic BMP modeling studies
2. Leverage adaptive management to establish an agenda for research and science needs related to BMPs and climate change, with priority on communication of “no-lose” directions
3. Develop mechanisms of quantifying BMP efficiency uncertainty under climate change
4. Expert elicitation to determine alterations to BMP efficiencies

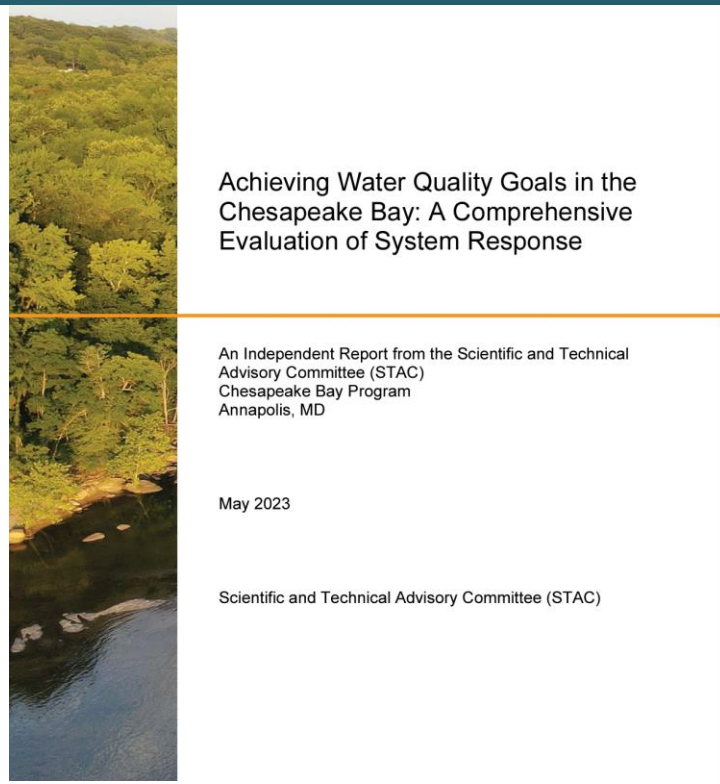
2023 Report: Background

Report Objectives:

Evaluate progress toward meeting the TMDL and water quality standards. Suggest how progress can be accelerated.

Specifically:

1. Evaluate the effectiveness nonpoint sources management efforts
2. Understand how nutrient and sediment reductions translate into water quality responses in the estuary
3. Assess how living resources respond to changes in water quality



Achieving water quality goals in the Chesapeake Bay: A comprehensive evaluation of system response. 2023. Stephenson & Wardrop, Eds. STAC Publication Number 23-006, Chesapeake Bay Program Scientific and Technical Advisory Committee, Edgewater, MD. 129 pp.

PSA: Upcoming STAC Synthesis Project RFP

General concepts:

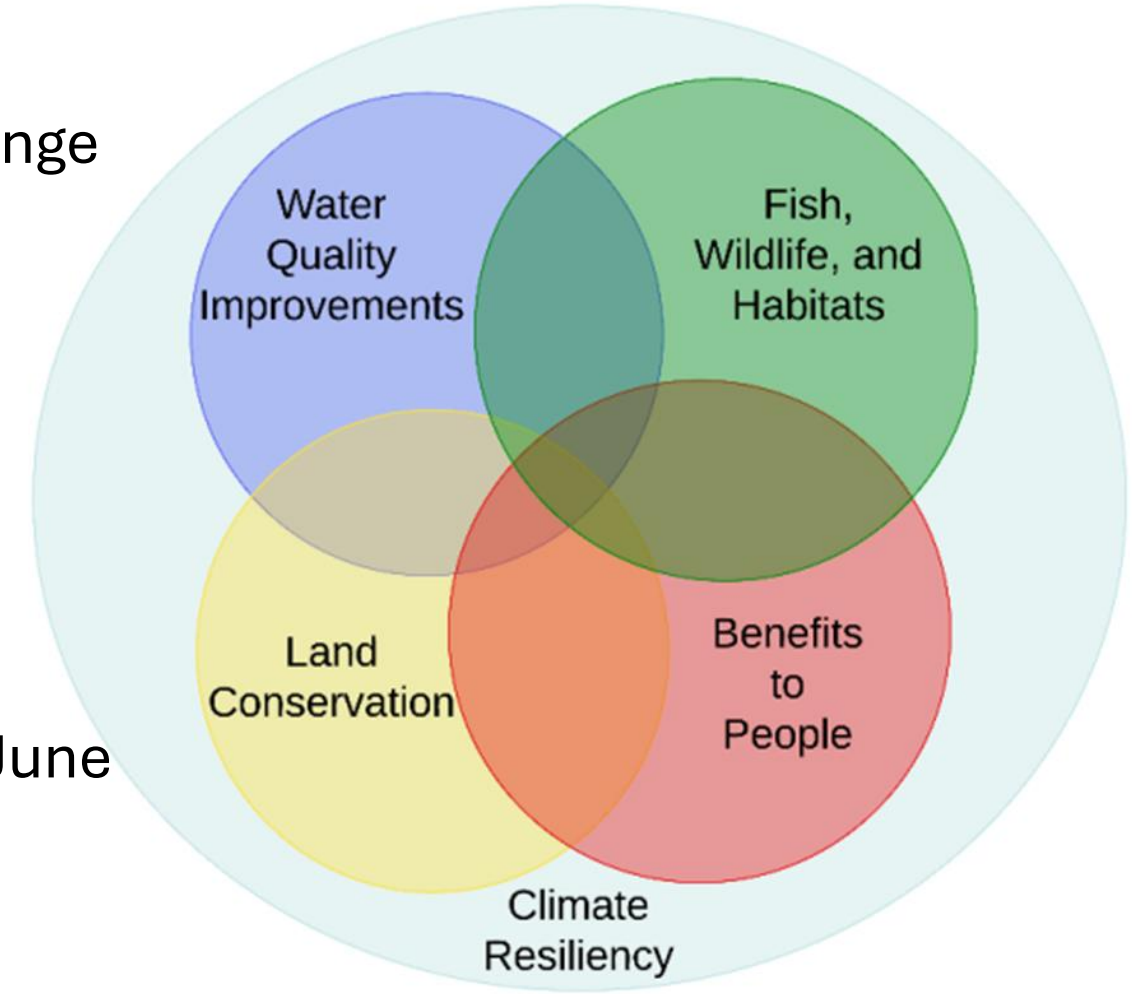
- Effectively managing in the face of climate change
- Addressing issues related to impacts on

Specific topic is still being refined

- Will likely encourage synthesis at the nexus of multiple priority issues

STAC will finalize the RFP at their meeting in June

- RFP will be released soon afterward (mid-late June 2024)



Recommendation follow-up in progress – RAND project

CC2.0 workshop:
Continue development of climate-related watershed model capabilities with particular attention to BMP effectiveness.

2022 report:
More mechanistic BMP modeling studies;
possibly develop mechanisms of quantifying BMP efficiency uncertainty under climate change