

Proposal for Responsive STAC Workshop: Chesapeake Bay Program Climate Change Modeling 2.0

Steering Committee

*Confirmed

Chair: Mark Bennett (USGS)*: CBP Climate Resiliency Workgroup Co-Chair and Director of the USGS VA/WV Water Science Center, which conducts research related to water resources

Zoe Johnson (NCBO)*: Coordinator of the CBP Climate Resiliency Workgroup; extensive expertise in adaptation planning and policy at federal, state, regional and local levels.

Don Boesch (UMCES)*: Lead/contributing author and editor of National Climate Assessments and Chair of the Scientific and Technical Working Group of the Maryland Commission on Climate Change

Marjy Friedrichs (VIMS)*: Studies climate change impacts on biogeochemistry and water quality in Chesapeake Bay, and how future climate change will impact whether TMDL nutrient reductions will result in desired estuarine outcomes/goals and water quality standards.

Maria Herrmann (Penn State) (STAC)*: Marine biogeochemist with expertise in carbon and nutrient biogeochemistry of the Chesapeake Bay.

Raleigh Hood (UMCES)*: Founder/leader of the Chesapeake Community Modeling Program; extensive expertise related to factors that influence biogeochemical and ecological variability in Chesapeake Bay.

Tom Johnson (USEPA) (STAC)*: Hydrologist at the U.S. EPA Office of Research and Development; expertise with model-based studies of climate change impacts, vulnerability and adaptation; scenario analysis; risk management.

Lewis Linker (EPA CBPO)*: Chesapeake Bay Program Modeling Coordinator who works with colleagues throughout the Chesapeake Bay Program to develop linked models of the airshed, watershed, estuary, and living resources.

Andy Miller (UMBC) (STAC)*: Professor of Department of Geography & Environmental System, with expertise related to hydrology, geomorphology, water resources, and the urban environment.

Gary Shenk (USGS CBPO)*: Lead CBP watershed modeler who focuses on the synthesis and application of model and monitoring analyses to management questions in coastal watersheds.

CBP Manager/Decision Maker 1 (TBD):

CBP Manager/Decision Maker 2 (TBD):

Description of the Workshop

A two-day workshop that will bring together experts in climate change, estuarine and watershed sciences to undertake a focused examination of the current results of the Chesapeake Bay Program's (CBP) Midpoint Assessment climate change modeling efforts, assess lessons-learned and recommend next steps. The motivation for the workshop stems from the Principals' Staff Committee decision to develop a framework for addressing climate change impacts in the Phase III Watershed Implementation Plans (WIPs), recognizing that further work is needed to have the CBP jurisdictions account for additional nutrient and sediment pollutant loads, due to 2025 climate change conditions, in their 2-year milestones beginning in 2022. The goal of the workshop is to develop recommendations for new and/or refined methods and modeling techniques to be completed and fully operational by 2019, to assess future impacts of projected climate change on watershed loads and estuarine processes, including the methodology for developing jurisdiction-specific nutrient pollutant loads due to 2025 climate projections.

Background

The incorporation of 2025 climate change projections was one of the more significant refinements applied to the Midpoint Assessment modeling effort, which included both Phase 6 Watershed Model (WSM) and the Chesapeake Bay Water Quality and Sediment Transport Model (WQSTM) components. In December 2016, the Partnership agreed to the assessment procedures for determining projected mid-term (2025) climate impacts on the watershed streamflow and pollutant loads (nitrogen, phosphorus and sediment) and estuarine water quality.

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The assessment, which took over two years to complete, explicitly resolved projected changes in atmospheric carbon dioxide, air temperature, and precipitation (volume and intensity), as well as sea level rise, loss of tidal wetlands, and changes in water temperature and salinity at the estuarine mouth.

Recommendations culminating from two STAC Workshops (*Development of Standardized Climate Projections for Use in Chesapeake Bay Program Assessments* (March 2016) and *Monitoring and Assessing Impacts of Changes in Weather Patterns and Extreme Events on BMP Siting and Design* (September 2017)) plus findings of three STAC Peer Reviews (*Chesapeake Bay Program Partnership's Climate Change Assessment Framework and Programmatic Integration and Response Efforts* (2017), the *Phase 6 Watershed Model* (2017) and the *Water Quality Sediment Transport Model* (2017)) guided much of the data, methods and modeling techniques of the Midpoint Assessment modeling effort. Final Chesapeake Bay Watershed (WS) and Water Quality Sediment Transport Model (WQSTM) 2025 climate change modeling results were presented to the Partnership in early December 2017. Relative to the estimated 2025 Watershed Implementation Plans without simulated climate change influence, basin-wide nitrogen and phosphorus loads would need to be decreased by 9.1 (4.6 percent) and .49 (3.4 percent) million pounds, respectively with climate change influence.

Management Relevance

In December 2017, the CBP Principals' Staff Committee (PSC) directed the CBP to update the methods, techniques, and studies and revisit existing estimated loads due to climate change to determine if any updates to those load estimates are needed. It is expected that jurisdictions will account for additional nutrient and sediment pollutant loads due to 2025 climate change conditions in a Phase III WIP addendum and/or 2-year milestones beginning in 2022. The provisions, adopted by the PSC, direct that "In 2021, the Partnership will consider results of updated methods, techniques, and studies and revisit existing estimated loads due to climate change to determine if any updates to those load estimates are needed." Modeling for this decision needs to be complete by the end of 2019. A STAC Workshop is an effective forum to bring together experts in climate change and estuarine and coastal watershed modeling to develop a synthesis of the current state of the science with subsequent recommendations for CBP climate effects modeling.

Questions

The workshop will be strategically designed for the purposes of evaluating the final (December 2017) CBP climate change modeling results; documenting the current understanding of the science; identifying research gaps; and developing recommendations for new and/or refined methods and modeling techniques to better assess potential impacts of the 2025 and longer-term projections on the watershed and the estuary. Information on how the nutrient and sediment loads due to 2025 climate change conditions were developed, and the data and assumptions behind those calculations will be presented along with a synthesis of recommendations of previous STAC workshops and peer review panels. Using this foundational information, workshop participants will explore the following questions:

- How does the CBP Watershed Model (WSM) and Water Quality Sediment Transport Model (WQSTM) response to future climate forcing compare to other comparable modeling efforts and frameworks?
- What additional or different climate change approaches and methods should be incorporated into the WSM and WQSTM?
- How can CBP modeling efforts account for potential impacts of larger landscape-level changes (e.g., changes in land use or agricultural systems) on nutrients and sediments loads?
- What ranges of inputs should be used for the WQSTM for water column temperature and ocean boundary changes?
- How does the relative rate of increasing precipitation, temperature, and sea level rise influence

Chesapeake water quality in 2030, 2035, 2040, and other future years? In other words, are trends in the impacts of climate change increasing or changing going forward beyond 2025?

- What new and/or refined methods and modeling techniques could be used to better assess projected impacts on watershed loads and estuarine impacts for a range of future scenarios?
- What improvements could be made to the methodology used to develop jurisdiction-specific nutrient pollutant loads due to 2025 climate change conditions and beyond?
- What are the remaining research gaps and highest priority information needs (e.g., data, research, modeling methods and techniques, programmatic efforts)?

Detailed description of workshop product and identified delivery date

The primary products will be a two-day workshop and an associated final workshop report. Draft workshop deliverables will be prepared by the steering committee for review and comment by workshop participants within 60 days of the final workgroup session and a final workshop report will be completed within 90 days of the final session.

Anticipated Attendees

Workshop attendees will include Workshop Steering Committee members, the CBP Modeling Team and regional experts in climate change, estuarine and watershed science and modeling. STAC Peer Review Panel (*Chesapeake Bay Program Partnership's Climate Change Assessment Framework and Programmatic Integration and Response Efforts*, the *Phase 6 Watershed Model* and *WQSTM Model* members will also be invited and encouraged to attend. The workshop will be invite only and limited to no more than 25 participants.

Anticipated Speakers

Jordan Fischbach, Rand Corp.; Jonathan Butcher, Tetra Tech; Lewis Linker, EPA-CBP; Gary Shenk, USGS-CBP; Maria Herrmann, Penn State (Chair, STAC Peer Review: Chesapeake Bay Program Partnership's Climate Change Assessment Framework and Programmatic Integration and Response Efforts); and Marjy Friedrichs, VIMS (STAC Peer Review: WQSTM Model)

Logistics

Given the deadline for model completion by the end of 2019, the two-day workshop will be conducted as soon as feasible, likely in the summer or early fall of 2018. A portion of the budget will be dedicated to cover travel expenses for key participants. The location of the one-day workshop sessions will be in proximity to Annapolis, MD.

Budget - Venue: \$2500; **Catering:** \$2000; **Travel for invited participants:** \$2500.

Total Requested from STAC: \$7000

History of previous STAC-funded Climate Resiliency Workgroup workshops

- *Development of Standardized Climate Projections for Use in Chesapeake Bay Program Assessments* (March 2016)
- *An Analytical Framework for Aligning Chesapeake Bay Program (CBP) Monitoring Efforts to Support Climate Change Impact and Trend Analyses and Adaptive Management* (March-April 2017)
- *Monitoring and Assessing Impacts of Changes in Weather Patterns and Extreme Events on BMP Siting and Design* (September 2017))