Updated 8/24/18

Scientific and Technical Advisory Committee Workshop

Chesapeake Bay Program Climate Change Modeling 2.0

September 24-25, 2018
Crowne Plaza Hotel, Annapolis MD
Arundel C Ballroom

Workshop Webpage: http://www.chesapeake.org/stac/workshop.php?activity_id=289

Workshop Motivation and Goals

- The motivation for the workshop stems from the decision of the Chesapeake Bay Program (CBP) Principals' Staff Committee to develop a framework for addressing climate change impacts in jurisdictions Phase III Watershed Implementation Plans (WIPs). The CBP Partnership recognizes that further work is needed to have jurisdictions account for additional nutrient and sediment pollutant loads, due to anticipated 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 the potential impacts of 2025 and longer term climate change on watershed loads and estuarine processes, to characterize and manage the risk of climate change impacts to CBP goals.

- In addition, guidance is sought in formulating a long-term plan of study, including field sampling and data analysis, monitoring and modeling that will improve understanding of long-term climate change impacts, vulnerability and risk management in the Chesapeake watershed and estuary, which could be considered in the conceptual framework in the next phase of CBP model development.

Day 1: Monday, September 24

8:30 Sign-In for Attendees, light breakfast (provided)

9:00 Welcome – Lee Currey, MDE

9:20 Plenary: Global Perspectives on the Effects of Climate Change on Coastal Eutrophication – Don Boesch, UMCES
A state-of-the art overview of efforts to model the effects of climate change on hypoxia and ecosystem conditions will be presented. What are the "big things" that we need to get right?

9:50 Introduction and Purpose of Workshop – Mark Bennett, USGS

10:00 Overview of Climate Impact Assessment Framework and Implementation - Gary Shenk, USGS-CBPO
Short description of the models and analysis methods used in the climate change impact assessment completed by the CBPO in 2017. Linkages between models and key sensitivities to climate inputs.

10:30 Findings of the Phase 6 Watershed Model – Gopal Bhatt, Penn State and Gary Shenk, USGS-CBPO
Key findings of the Phase 6 Watershed Model under the estimated 2025 climate change conditions and details of the simulation method relative to climate will be presented. In addition, the influence of the relative rates of increasing precipitation and temperature on watershed on flow and loads to the tidal Chesapeake in 2035, 2045, and 2055will be estimated.

10:50 Findings of the WQSTM – Richard Tian, UMCES and Carl Cerco, Attain
Key findings of the CBP Water Quality and Sediment Transport Model (WQSTM) under the estimated climate change conditions and details of the simulation method relative to climate will be presented. The influence of the relative rates of increasing precipitation and temperature on watershed flow and loads to the tidal Chesapeake in 2035, 2045, and 2055 will be estimated.

11:10 DISCUSSION / Q&A (Moderator - Lew Linker, EPA-CBPO)

What additional or different climate change approaches and methods should be incorporated into the **Phase 6 Watershed Model** for the 2019 Climate Change Assessment?

What additional or different climate change approaches and methods should be incorporated into the **WQSTM** for the 2019 Climate Change Assessment??

What additional or different climate change approaches and methods should be incorporated into **potential next generation CBP watershed and estuarine models** for climate change assessment?

12:00 LUNCH (provided)

1:00 Round Table: Management Actions in Response to Climate Change – Adel Shirmohammadi, UMD; Tony Buda, PSU; Jon Butcher, Tetra Tech
Anticipating longer growing seasons, crop rotation changes, and changes in BMP efficiencies, the panel will consider important features in the simulation of watershed loads under climate change conditions that are currently unaddressed in the current CBP climate change assessment framework.

What management approaches that address climate change in developed land, agricultural land, and undeveloped (natural) land should be included in **future CBP modeling**?

2:00 Instructions for Breakout Groups
Participants will be divided into the following groups:

(1) Simulation of Climate Change Processes and land management in the Phase 6 Watershed Model Influencing Chesapeake Water Quality
(2) Simulation of Climate Change Processes in the WQSTM Influencing Chesapeake Water Quality
(3) Assessment of the overall CBP framework of climate change analysis

Breakout Session I

Each breakout will have a leader/facilitator, and a recorder. The goal of the afternoon is for each breakout to produce 2 items:

1. *List of draft recommendations. These should be only the top consensus priorities - descriptions should fit on a single slide*
2. *Longer list of thoughts and notes from discussion, for inclusion in workshop report*

2:15 Breakout Round-Robins
Informal; each member should come prepared to share with their thoughts and ideas on the previous large group discussion in regard to their breakout topic and in consideration of the Breakout Questions below - discuss resource and data needs, advantages and disadvantages for each.

3:15 Break (15 mins)

3:30 Focused Breakout Discussion
Discuss alternative development strategies in detail. The goal of the focused breakout session is for the breakout members to fully understand the questions and proposed solutions.

5:00 Recess

Day 2: Tuesday, September 25

8:00 Light breakfast (provided)

Breakout Session II

8:30 Prioritizing Breakout Recommendations
Breakout groups reach consensus on draft recommendations from the previous day that can be communicated to the plenary group on a single presentation slide. Also begin work on longer descriptions of the draft recommendations.

10:30 Break (30 mins)

11:00 Plenary Presentation of Breakout Proposals (20 mins per breakout group)
All participants will reconvene and each breakout group leader will briefly present the single page of recommendations

12:00 LUNCH (provided)

12:45 Compiling Recommendations & Cross-Cutters Response
Facilitated discussion of final recommendations presented before lunch focused on compatibility between proposed components with a view toward formulating a realistic and unified vision for future CBP modeling. 'Cross-cutters' will present their perspectives on the consensus recommendations and their major takeaways.

1:45 Looking Ahead: STAC Science Synthesis
Engage participants in a discussion on potential topics for a 'deeper dive' synthesis effort through STAC, based on findings and recommendations of the workshop.

2:30 Wrap Up Discussion

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 in 2019? In a future 2025 assessment?

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 for the 2019 CBP Climate Change Assessment (e.g., data, research, modeling methods and techniques, programmatic efforts)? For climate change assessments in 2025 with the next generation of the CBP models and assessment methods?

3:00 Adjourn

3:15 Convene Steering Committee for Workshop Documentation

Updated 8/24/18

Questions for Breakout Groups to Consider:

(1) Simulation of Climate Change Processes and Land Management in the Phase 6 Watershed Model Influencing Chesapeake Water Quality

How does the CBP Watershed Model (WSM) response to future climate forcing compare to other comparable modeling efforts and frameworks? What are the "big picture" watershed processes that deserve particular attention when assessing climate change?

What are the most sensitive drivers and assumptions that the WSM should incorporate?

What additional climate change approaches should be incorporated into the WSM?

Is the flow response to climate reasonable?

Is the sediment response to flow reasonable?

Is the nutrient response to climate, flow, and sediment reasonable?

Are the changes in nutrient speciation appropriate?

What is the uncertainty envelope going forward and how can that be best quantified and communicated?

What are the remaining research gaps and highest priority information needs (e.g., data, research, modeling methods and techniques, programmatic efforts)? What could be a potential focus of a future synthesis effort?

Climate effects on land management

How should CBP modeling efforts account for potential impacts of larger landscape-level changes, e.g., changes in land use, agricultural cropping systems, expanded growing seasons, etc. on nutrients and sediments loads?

Which are the most sensitive drivers (e.g., increased precipitation volume, precipitation intensity, temperature, longer growing seasons, and increased risk of drought intensity and duration, etc.) affecting these projections and how should the framework address them?

How can the sensitivity of and improvements in BMP effectiveness in response to climate change be incorporated in the modeling framework?

What are the socio-environmental changes likely in response to changing climate that could have significant consequences on water quality attainment and how might these be included in the framework? For example, a rapid transition to renewable energy; changes in agricultural

production, cropping, irrigation, soil carbon, biofuels and acreage; urban expansion and storm-water management for flood protection; and changes in the composition and dynamics of forested ecosystems

What is the uncertainty envelope going forward and how can that be best quantified and communicated?

What are the remaining research gaps and highest priority information needs (e.g., data, research, modeling methods and techniques, programmatic efforts)? What could be a potential focus of a future synthesis effort?

(2) Simulation of Climate Change Processes in the WQSTM Influencing Chesapeake Water Quality

How does the CBP Water Quality Sediment Transport Model (WQSTM) response to future climate forcing compare to other comparable modeling efforts and frameworks? What are the "big picture" estuarine processes that deserve particular attention when assessing climate change?

What are the most sensitive drivers that the WQSTM should incorporate?

What additional climate change approaches should be incorporated into the WQSTM?

What ranges of inputs should be used for the WQSTM for water column temperature and ocean boundary changes?

What is the uncertainty envelope going forward and how can that be best quantified and communicated?

What are the remaining research gaps and highest priority information needs (e.g., data, research, modeling methods and techniques, programmatic efforts)? What could be a potential focus of a future synthesis effort?

(3) Assessment of the overall CBP framework of climate analysis

Does the framework that the CBP used to assess climate change impacts on water quality in 2017 effectively account for the effects of climate change on the Chesapeake TMDL?

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?

Updated 8/24/18

What improvements could be made to the climate assessment framework used to estimate future climate risk in the Chesapeake watershed and tidal waters beyond 2025?

Which are the most sensitive drivers (e.g., estuarine temperature, runoff, nutrient loads and forms, sea level, etc.) and assumptions (e.g., flow-load relationships, extrapolation of offsetting load reductions, etc.) affecting these projections and how should the framework strengthen confidence in them?

What additional or different climate change approaches and methods should be incorporated into the airshed, watershed, estuarine, and ecological models?

What would be the broad scale social changes that can be anticipated going forward in the next several decades and how would the social response to climate change influence nutrient and sediment loads in the watershed?

What is the uncertainty envelope going forward and how can that be best quantified and communicated?

How should the framework represent the confidence placed on projections of impacts of climate change on water quality attainment and of load reductions needed to offset these impacts?

What are the remaining research gaps and highest priority information needs (e.g., data, research, modeling methods and techniques, programmatic efforts)? What could be a potential focus of a future synthesis effort?