

## Supplementary Material

# Recognizing political influences in participatory social-ecological systems modeling

## A. Key Informant Interviews

The following is the protocol used for semistructured interviews of 12 key informants in this research, between April 4, 2022 and June 7, 2022. Key informants were identified through snowball sampling, with the seeds identified through meeting minutes (Parker et al., 2019). Once semi-structured interviews began to have significant overlap with previous interviews, we stopped the snowball sampling process. In total, we conducted interviews with 12 key informants. All interviews were conducted over Zoom (Zoom, 2023) and lasted between 30 - 60 minutes. The interviews were recorded and transcribed. After each interview, we used new content to revise interpretations of the timeline of events and themes, checking with subsequent interviewees that revisions were appropriate. Among the key informants were: CBP office staff, EPA administrators, at-large and appointed members of STAC, WQGIT, and MODWG, and one journalist who had attended and reported on many of the open meetings of the CBP.

The below protocol was approved by the authors' institutions (VT-IRB #19-873).

### Introduction

*Thanks for taking the time to speak with me today. As I mentioned in the introductory email, I am conducting research on the decision-making processes around computer model development in socio-ecological systems management, looking at the Chesapeake Bay Program's watershed model as a case study. Specifically, I am analyzing the events leading to the 2012 decision to implement a simplified version of the watershed model for Phase 6, from April 2008 ~ December 2012. To do this, I have mostly relied on document analysis of over 100 presentations, reports, and minutes documents from meetings of the Water Quality GIT and the Modeling Working Group from this time period. However, understanding and correctly interpreting these documents is challenging since they may be incomplete representations of the events. I am reaching out to you to help me add any additional understanding or context of this period that you can recall. For research purposes, it would be very helpful if I could record this interview. Is that ok with you?*

### 1 Background:

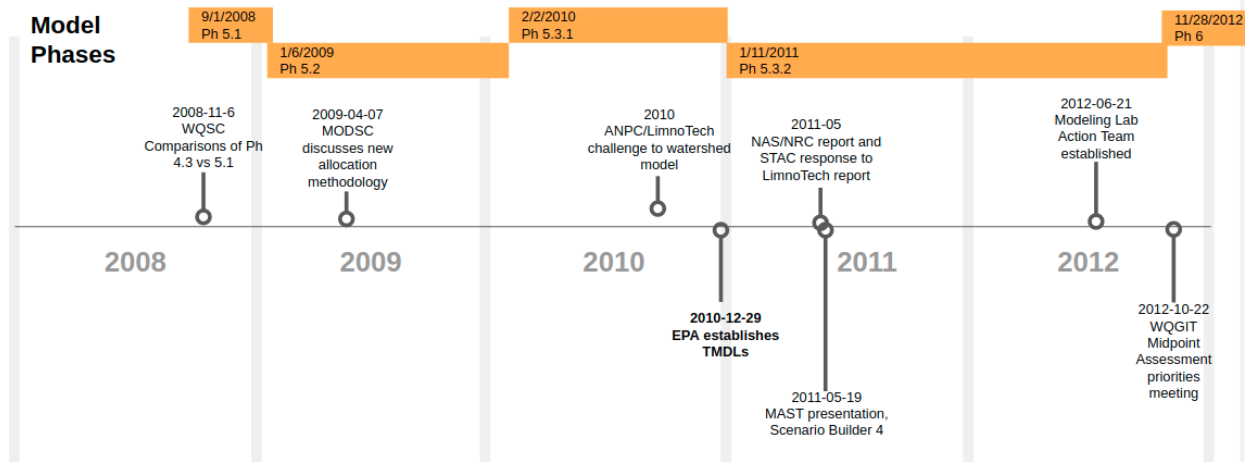
**1a: What was your role in the CBP between 2008 - 2013?**

**1b: Are you still involved in the CBP, and if so, how?**

### 2 Recalling significant events from the period preceding the 2012 decision to move to a more simplified approach to watershed modeling in Phase 6 (CAST):

To jog your memory of some of the events and discussions that were happening around the watershed model at the time, I have prepared this timeline. Please take a moment to look at it and try to recall what was happening at the time. [Show events that were occurring during this time period on a timeline]

## Timeline of major events



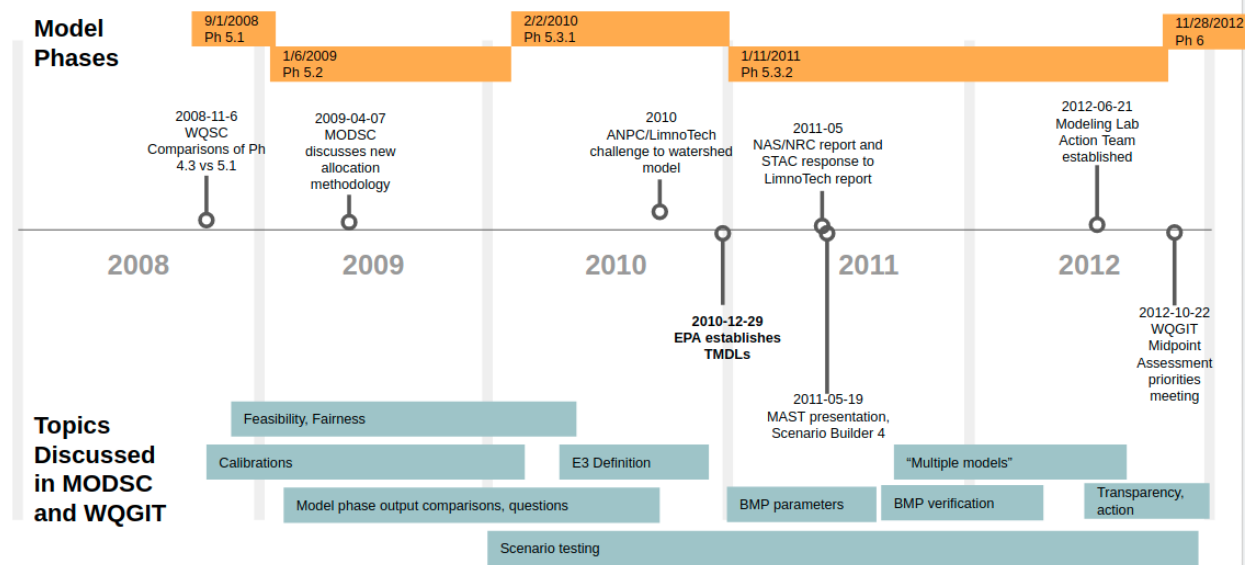
**2a: Firstly, from your perspective, was it surprising that for the Phase 6 model (CAST), the Bay Program decided to go with a simplified approach, given decades of increasing detail in process representation?**

**PROMPT:** Why or why not?

**2b: Do you recall any particularly influential events or factors that may have affected the decision to move to a more simplified form for the Phase 6 model?**

**PROMPT:** This is a timeline of events that were reconstructed from meeting minutes of the WQGIT and the Modeling Workgroup. Do you remember any of the topics shown in teal on the timeline being discussed? Or do any of these topics stand out to you as important to understand? How are they important?

## Timeline of major events



**PROMPT:** Are there any topics that are still being discussed today? How has the discussion of these topics changed?

**PROMPT:** Are there any topics or events you believe are missing from the timeline?

**2c: What were the main ways that changes could be implemented to the model during this period?**

**PROMPT:** From your perspective, who can make changes to the model, either directly or indirectly?

**PROMPT:** Do you recall any of the jurisdictions disagreeing about the way processes were represented in the model? How were those disagreements addressed?

**PROMPT:** How do members of the MODWG or the WQGIT currently propose making changes to the way the model works -- its functionality, scope, resolution? How is this different from in the 2008 - 2013 period?

**PROMPT:** How do members of the public (farmers, fishers, and taxpayers) currently propose making changes to the way the model works -- its functionality, scope, resolution? How is this different from in the 2008 - 2013 period?

**PROMPT:** What were the opportunities for members of the public to participate in the development of the model? Did members of the public take opportunities to participate?

**2d: In 2011 the National Academy of Science released a report evaluating the Chesapeake Bay program strategies and implementation. Among their recommendations was the establishment of a standalone Modeling Lab. Do you recall discussions about having a standalone Modeling Lab oversee all model development and application activities for the CBP? This idea ultimately did not move forward. What do you think would have happened had the Bay Program decided to move forward with this idea?**

*Thank you for your time!*

**B. Additional Information about E3 and No Action Scenarios**

**Figure S1** is a numerical expression of the final allocation policy approved by the Chesapeake Bay Program partnership and used in the TMDL following the allocation principles noted above. The vertical axis represents a level of effort between the No Action scenario and the E3 scenario for each jurisdiction/basin combination. For example, a value of 75% indicates an allocation equal to  $\frac{3}{4}$  of the way from the No Action load to the E3 load. The horizontal axis is an estimate of the effectiveness of nutrient loads arising from the jurisdiction/basin to modify dissolved oxygen in the Chesapeake Bay (Linker et al., 2013; U.S. EPA, 2010). A pound of nitrogen originating from an area with a score of 8 will have double the oxygen effect in the Chesapeake Bay as a pound originating from an area with a score of 4. There are separate lines for wastewater and non-wastewater sources. The specific policies supported by **Figure S1** were the result of much discussion and negotiation. In the end, the discussion about these scenarios included the following policies in the final TMDL: (1) basin-states in the upper half of wastewater effectiveness values must account for load reductions equal to 90% of E3; (2) basin-states with zero effectiveness must account for load reductions equal to 67% of E3 with a linear scale between zero and half effectiveness; (3) for the non-wastewater treatment plant (WWTP) line in **Figure S1**, the most effective basin must account for load reductions 20 percentage points higher than the least effective basin; and (4) the y-axis intercept of the non-WWTP line in **Figure S1** is placed such that the total loads resulting from the reductions to wastewater and non-wastewater sources will meet water quality standards.

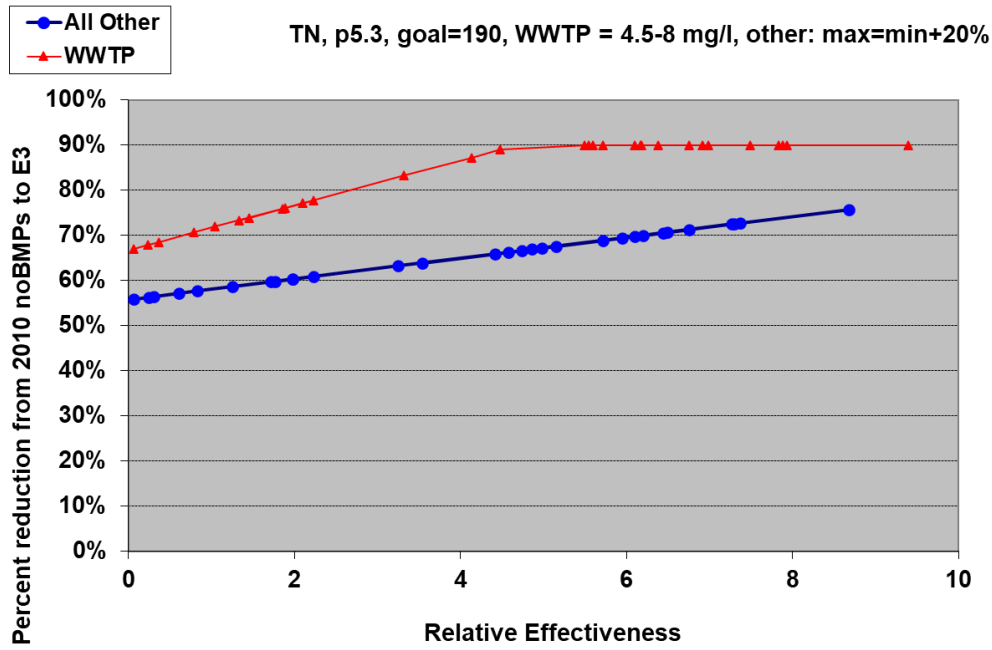


Figure S1. Allocation methodology example showing the hockey stick and straight line reductions approaches, respectively, to wastewater (red line) and all other sources (blue line) for nitrogen. Each point represents one basin-state in the watershed. Source: (U.S. EPA, 2010)

### C. Code Frequency Visualization from Document Analysis

The following shows the codes that were applied, summarized by the year of the document using Dedoose (Dedoose, 2021). Note that while code frequency can be an indicator of the importance of a particular topic or theme, we did not directly interpret code frequency in this study because code frequency is highly sensitive to the size of chunking and individual-specific speech and language patterns, which varied considerably from meeting context and over time.

