A Tidal Water Model for the Assessment of 2035 Climate Change Risk to the Chesapeake TMDL

Modeling Quarterly Review

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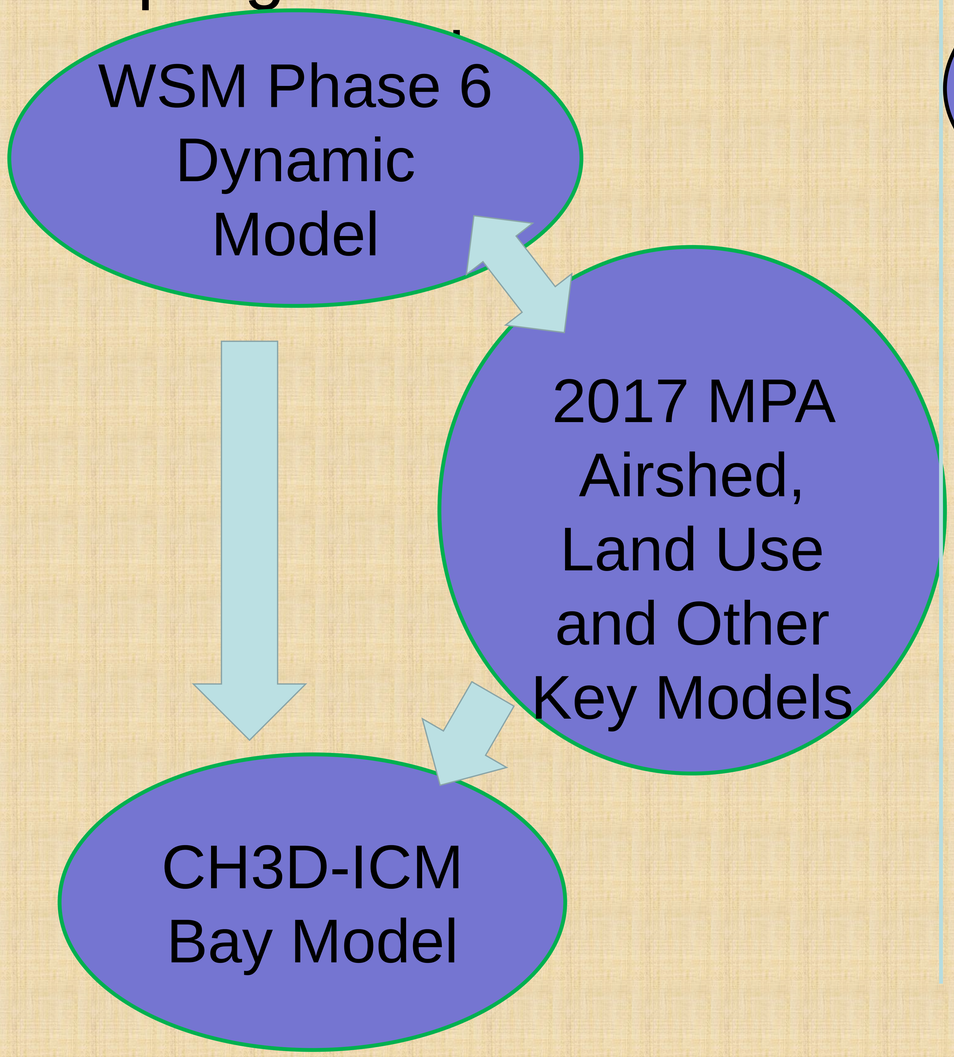
Chesapeake Bay Program

Science, Restoration, Partnership

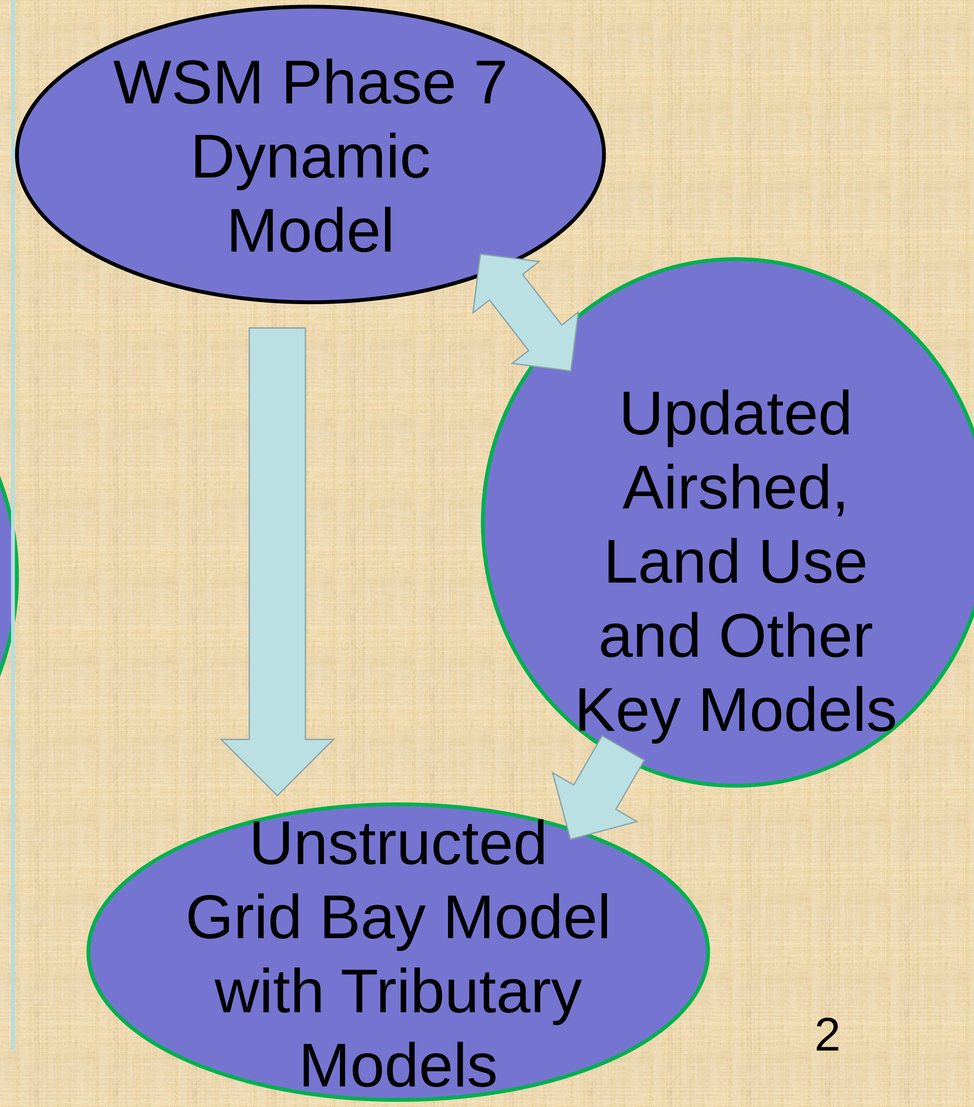
CBP Bay Model Products

Bay Model for
1) allowable estuarine loading and carrying capacity for Bay TMDL,
2) ancillary Bay model studies,
3) ancillary model tools (N-P exchanges), and 4) information/ collaboration with CBP research community.

CBP Phase 6 model application from 2017 Midpoint Assessment (MPA) to 2025 assessment of progress with 2025

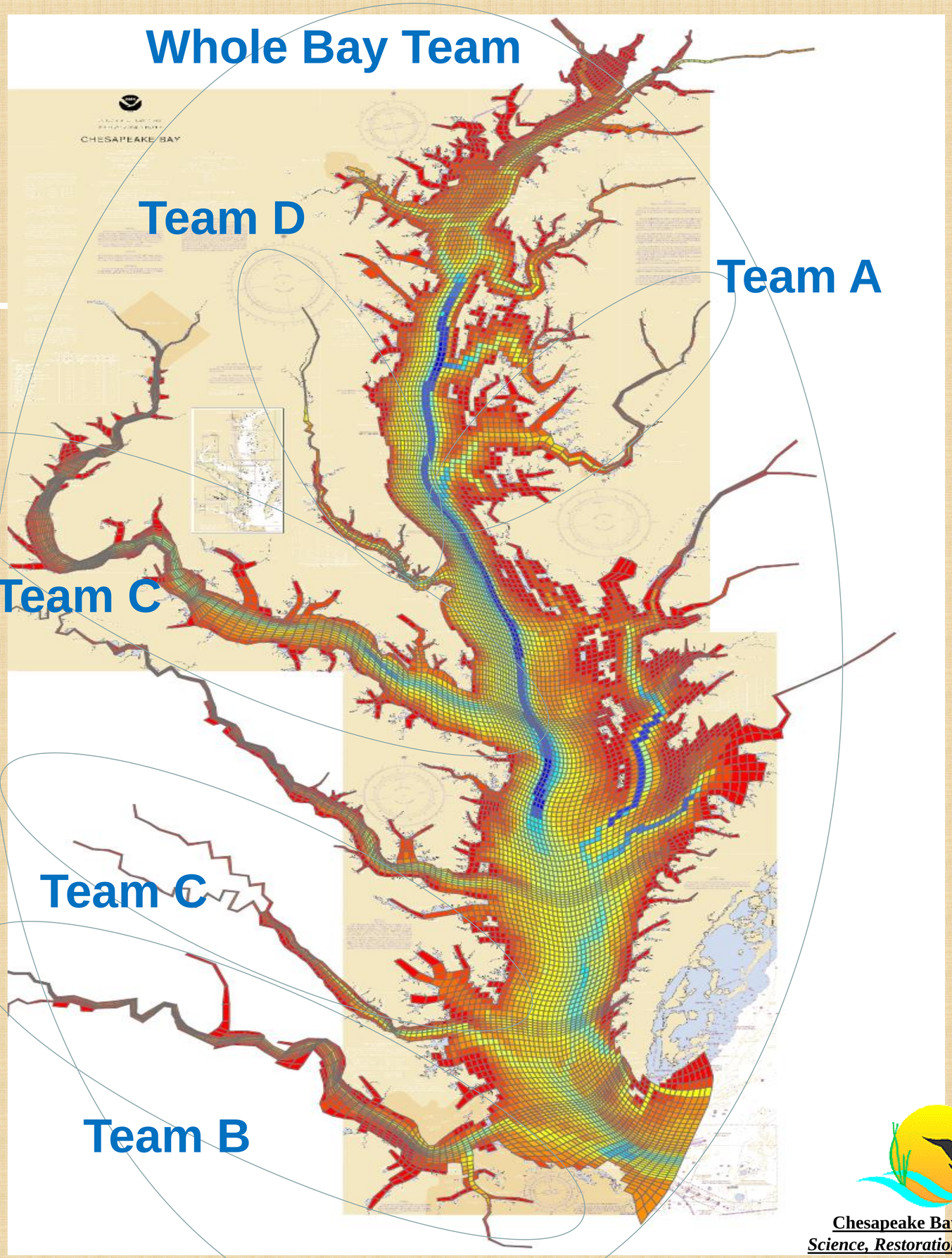


Application of Phase 7 in 2025 for 2035 Climate Change Risk Assessment to CB water quality standards and TMDL.



How an Unstructured Grid Model in the Chesapeake with Multiple Model Teams Would Work

- Main Bay Model (MBM) of all tidal waters used for integration of tributary model findings and for management scenarios.
- Multiple Tributary Model (MTM) teams working in tributaries and collaboratively sharing information with all model teams on a regular basis.
- Similar to CMAQ multiple model approach.



Chesapeake Bay Program
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Timeline: 2021 to 2022

2021
RFA Completed for Main Bay Model (MBM). MBM Team begins work.

- Get initial CBP Main Bay Model (MBM) structure in place with Main Bay Model *Request for Assistance* (RFA).
- Initial work begins on shallow water DO, clarity, and chlorophyll simulation.

2022
RFA Completed for Multiple Tributary Models (MTMs). MTM Teams begin work. Link MBM and TMT model development.

- 2022 RFA for MTMs complete. Main and Tributary model structure and boundaries determined.
- Decision rules for regulatory model calibration established.
- Begin Multiple Tributary Model (MTM) work on shallow water DO, clarity, and chlorophyll simulation.
- Semiannual MBM and MTM PI meetings begin.
- Examine use of linked watershed to tidal water hydrology inputs from Phase 7.

Timeline: 2023 to 2024

2023
Refine shallow water DO, clarity/SAV, chlorophyll for WQ standard assessment

- Use Phase 7 WSM inputs of hydrology, sediment, and nutrients. (Phase 7 Model complete and fully operational in December 2023).
- Continue semiannual MBM and MTM PI meetings.
- Demonstrate improved simulation of shallow water DO, clarity/SAV, chlorophyll with unstructured grid MBM and MTMs.
- Demonstrate sea level rise and tidal wetland simulation. capability.

2024
Unstructured Grid Bay Model fully operational December 2024

- Adjust for input load changes from hydrology, sediment, and nutrients due to final reviewed version of Phase 7 model.
- Continue MTMs and semiannual Trib Model PI meetings.
- Complete shallow water DO, clarity/SAV, chlorophyll refinements
- Unstructed grid Bay Model (MBM and MTMs) fully operational December 2024.

Timeline: 2025 to 2026

2025
Apply Unstructured Grid Bay Model to 2035 climate change risk to Chesapeake water quality standards

- Apply the 2025 MBM & MTMs to 2035 climate change risk.
- Determine the carrying capacity the Bay has for nutrient loads under conditions of 2035, 2045, 2055 and beyond.
- Examine in detail Open Water DO, clarity/SAV, and chlorophyll water quality standards under scenario conditions for Bay and tidal tributaries.
- Develop nitrogen/phosphorus tradeoffs for tidal waters.

2026
Confirm and support CBP decision makers with 2035 climate change risk assessment

- Develop tributary and local tidal water assessments as requested by CBP Partners.
- Update local tidal water TMDLs, e.g., James Chlorophyll TMDL as requested by CBP.
- Main Bay Model “frozen” until 2035 but continue MTMs and semiannual Trib Model PI meetings through 2025 and 2026.

Next Steps

- By June the RFA was completed and reviewed by CBPO and sent to EPA Region 3 Grant Offices. The RFA Evaluation Team was formed.
- In the third quarter of 2021 the RFA will be released.
- The period of RFA response, review of proposals, selection of Main Bay Model team, RFA documentation, selection review, and approval of selection will cover the third and fourth quarter of 2021. Also, writing of MTM RFA begins.