Progress of the Phase 7 Main Bay Model (MBM) and Multiple Tributary Models (MTMs)

Water Quality Goal Implementation Team
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CBPO Modeling Teams
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Overview of the Main Bay Model (MBM) Workplan

- The MBM cooperative agreement runs for 6 years: 2022 to 2027.
- The MTMs have yet to be started and may be initiated in 2023.
- For both the MBM & MTM the CBP Modeling Workgroup gives technical direction and the WQGIT and other CBP decision-making groups will give management and policy direction to MBM practitioners.
- MBM and MTM development in five main phases:
    - Initial Development (2022 – 2023)
    - Interim Development (2023 – 2024)
    - Final Development (2025)
    - Review and Application (2026-2027)
    - Ongoing Tasks.

Overview of the Main Bay Model (MBM) & Multiple Tributary Model (MTM) Workplan: Initial Development Phase

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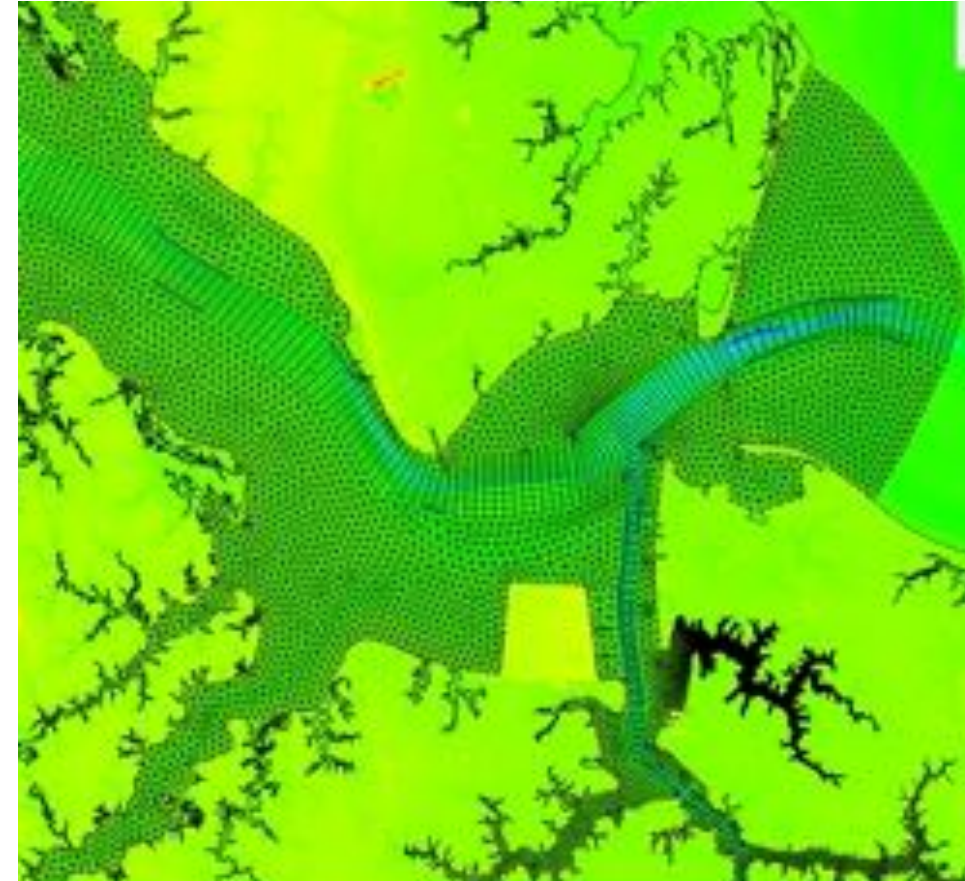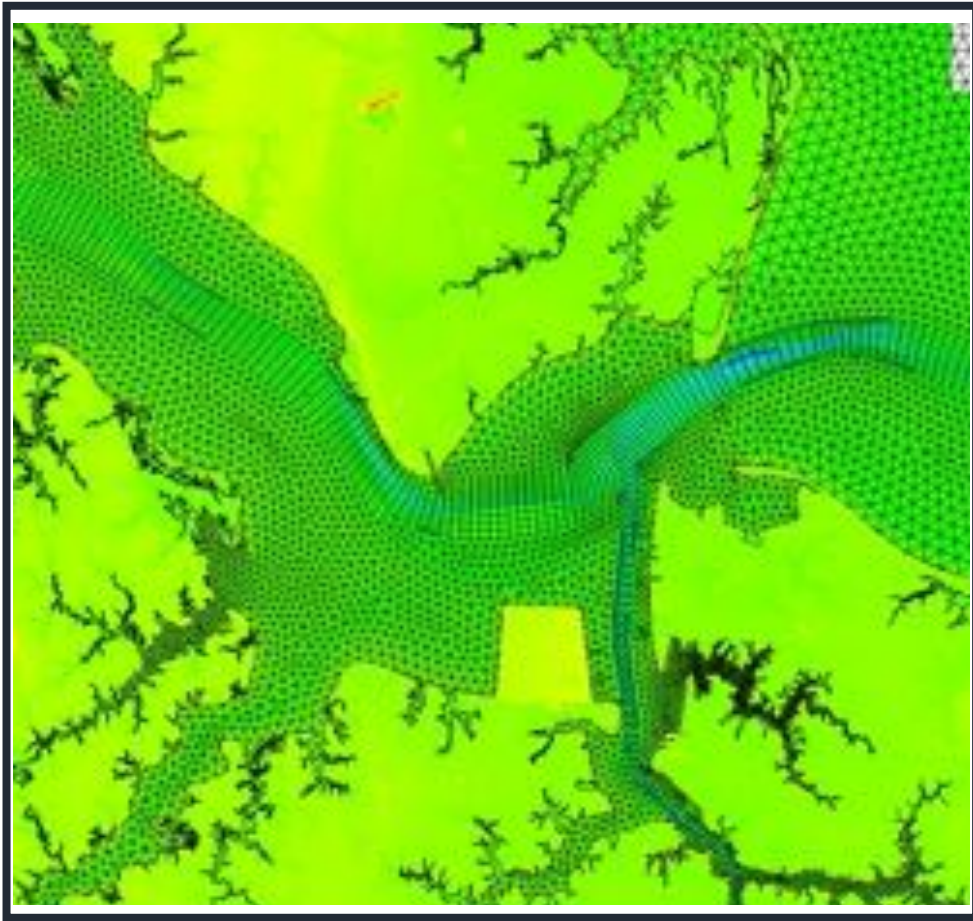|		2022			
Calendar Year					
Calendar Quarter		Q1	Q2	Q3	Q4
Project Year		Year 1			
Task 1. Initial MBM-MTM Development (2022 – 2023)	Task 1	█	█	█	█
1-1. Kick-off MBM meeting, with follow-up CBPO Quarterly meetings (Q1-Q2: 2022).	Task 1.1	▨	▨		
1-2. Integrate the latest ICM changes into MBM (Q1-Q2: 2022).	Task 1.2	▨	▨		
1-3. Revise the current MBM mesh as needed to achieve best scale-performance tradeoffs (Q1-Q3: 2022).	Task 1.3	▨	▨	▨	
1-4. Revise MBM mesh to account for channels in MBM and MTMs (Q1-Q2: 2022)	Task 1.4	▨	▨		
1-5. Performance tuning of MBM to achieve 1991-2000 simulation in one day (Q1-Q3: 2022).	Task 1.5	▨	▨	▨	
1-6. Work with watershed, airshed, hydrological modeling group's inputs (All Qs: 2022-2023).	Task 1.6	▨	▨	▨	▨
1-7. Develop boundaries of MBM, WSM, and tidal wetlands (Q1: 2022).	Task 1.7	▨			
1-8. Quantify how boundaries of MBM, WSM, and tidal wetlands will change with SLR (Q2: 2022).	Task 1.8		▨		
1-9. Develop SAV simulation approach: explicit beds or bounded seed in every mesh (All Qs: 2023).	Task 1.9				
1-10. Establish MBM-MTM boundary interfaces for all MTMs (All Qs:2022).	Task 1.10	▨	▨	▨	▨
1-11. Develop MTM grids in anticipation of MTM teams (All Qs: 2022).	Task 1.11	▨	▨	▨	▨
1-12. CBP decision makers to finalize 5 MTMs (Q2-Q3: 2022).	Task 1.12		▨	▨	
1-13. Link with initial P7 WSM hydrology (Q4: 2022, Q1: 2023).	Task 1.13				▨
1-14. Link with initial P7 WSM sediment load estimates (1Q-Q2: 2023).	Task 1.14				
1-15. Link with initial P7 WSM nutrient load estimates (3Q-Q4: 2023).	Task 1.15				
1-16. Expand temporal domain of MBM to focus on 1991-200 and other key years (All Qs: 2022-2023).	Task 1.16	▨	▨	▨	▨
1-17. Initial work to improve shallow water dynamics in MBM (All Qs: 2022-2023).	Task 1.17				
1-18. Initial work to improve shallow water dynamics in MTMs (All Qs: 2023).	Task 1.18				
1-18. Initial work on basic living resource linkages of refined chlorophyll, wetlands, & SAV (All Qs: 2022-2023).	Task 1.19	▨	▨	▨	▨

Model Implementation in the James River

- Unchanged channel arc's
- Refined shoals and sub-tributaries

- #63 boundary nodes

- #17,305 nodes, #25955 elements (32% of phase I)
- Maximum #32 vertical layers (62% of phase I)

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Initial Development Task (2022 – 2023)

1-1. Kick-off MBM meeting with follow-up CBPO Quarterly meetings to decide tasks to be completed, priority model activities and improvements, and finalize the schedule for progress reporting (Q1-Q2: 2022). **Completed**

1-2. Integrate the latest ICM changes into MBM (Q1-Q2: 2022). **Ongoing**

1-3. Revise the current MBM mesh to achieve best scale and performance tradeoffs (Q1-Q2: 2022). **Ongoing**

1-4. Revise MBM mesh to account for channels in MBM and MTMs (Q1-Q2: 2022).

1-5. Performance tuning of MBM to achieve 1991-2000 simulation in one day (Q1-Q3: 2022). **Ongoing**

1-6. Work with watershed, airshed, hydrological modeling groups to ensure the coupling, scale, and the interface mechanisms are properly executed, including climate change (CC) input information (All Qs: 2022-2023). **Ongoing**

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Initial Development Task (2022 – 2023)

1-7. Develop boundaries of MBM, WSM, and tidal wetlands (Q1: 2022). **Ongoing**

1-8. Quantify how boundaries of MBM, WSM, and tidal wetlands will change with SLR (Q2: 2022). **Ongoing**

1-9. Develop SAV simulation approach of explicit beds or bounded seed in every mesh (All Qs: 2022-2023). **Ongoing**

1-10. Establish MBM-MTM boundary interfaces for all MTMs (All Qs:2022). **Ongoing**

1-11. Develop MTM grids in anticipation of MTM teams (All Qs: 2022). **Ongoing**

Modified Tidal Shoreline in Blackwater area
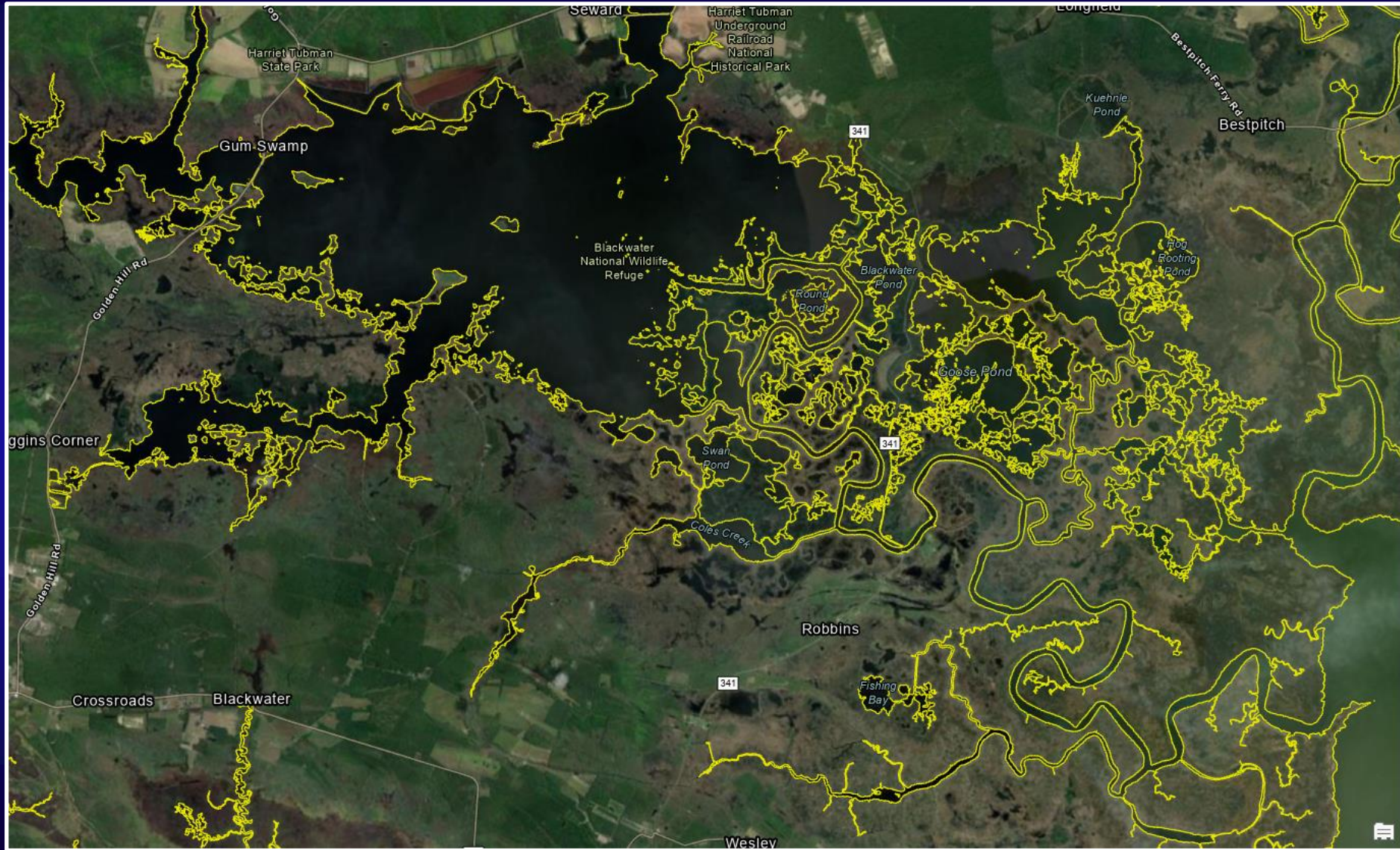
Initial Development Task (2022 – 2023)

1-12. CBP decision makers to finalize 5 MTMs (Q2-Q3: 2022).

1-13. Link with initial P7 WSM hydrology (4Q: 2022).

1-14. Link with initial P7 WSM sediment load estimates (1Q: 2023).

1-15. Link with initial P7 WSM nutrient load estimates (3Q: 2023).

1-16. Expand temporal domain of MBM to focus on 1991-200, 1993-1995, recent years for good calibration data, and the full 1985-present for coastal eutrophication research (All Qs: 2022-2023).

1-17. Initial work to improve shallow water dynamics in MBM (All Qs: 2022-2023). **Ongoing**

Initial Development Task (2022 – 2023)

1-18. Initial work to improve shallow water dynamics in MTMs (All Qs: 2023). **Ongoing**

1-18. Initial work on basic living resource linkages of refined chlorophyll, wetlands, & SAV MBM & MTM (All Qs: 2022). **Ongoing**
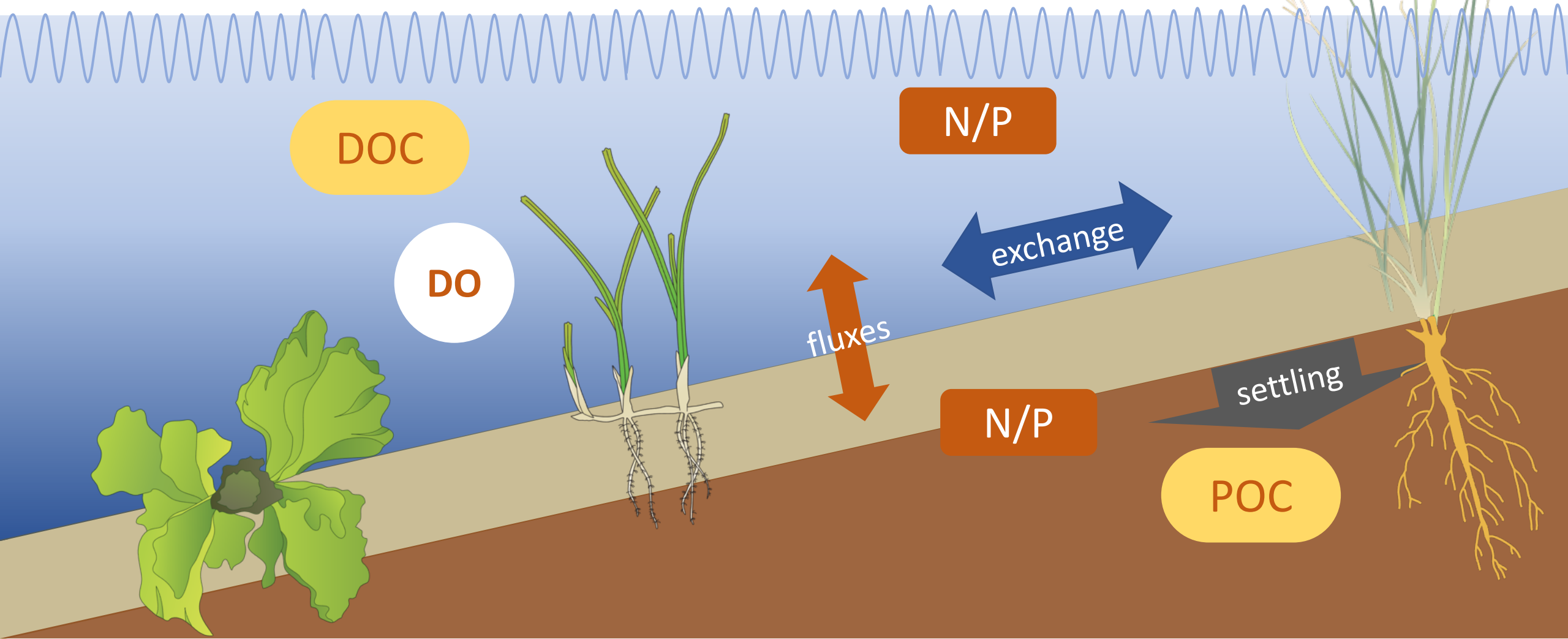
1-19. Initial work on potential linkage to higher trophic levels MBM & MTMs (All Qs: 2023).

1-20. Initial work of using MBM and MTMs to better resolve CBP problem segments (All Qs: 2023).

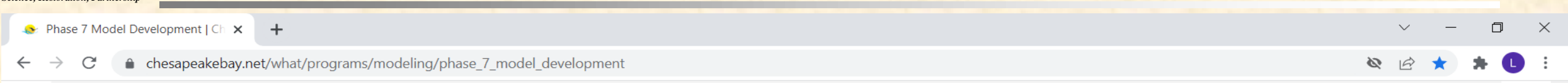1-21. Initial work on examining CC influence on SAV, shallow water, and phenology of CC watershed loads and tidal Bay processing MBM & MTM (All Qs: 2023).

Overview of the Main Bay Model (MBM) & Multiple Tributary Model (MTM) Workplan: Initial Development Phase

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Phase 7 Model Development | Ch ×   +

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Watershed Modeling

CBPO Lead – Gary Shenk

The watershed model underlying the CAST calculations is being updated for better representation of physical processes, improved nutrient application calculations, and variable-scale modeling.

View the current planning spreadsheet >

Estuarine Modeling

CBPO Lead – Lewis Linker

A new estuarine model is being developed for the entire tidal Chesapeake (the Main Bay Model) incorporating the latest techniques. Multiple Tributary Models will also be developed as testbeds for improved overall model performance.

View the current planning spreadsheet >

Criteria assessment

CBPO Lead – Peter Tango

The estuarine water quality criteria assessment procedures are being considered for revision based on climate change considerations. A separate effort looks to create a new Bay interpolator using vertical profiler data which can evaluate criteria which could not previously be evaluated.

MBM_Tasks__Time....xlsx   ^

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