CHESAPEAKE BAY SHORELINE EROSION FEASIBILITY STUDY PHASE II: CHESAPEAKE BAY MODEL PACKAGE ENHANCMENTS

PREDICTING AND QUANTIFYING ENVIRONMENTAL RESTORATION IN THE NEAR-SHORE REGIONS OF CHESAPEAKE BAY

Feasibility Study

- Led by Baltimore District USACE and Maryland Department of Natural Resources with significant contribution from USEPA Chesapeake Bay Program.
- Commences 2013 and concludes 2016.
- CBP interest is in having an improved model in place for 2017 Midpoint Assessment.
- This improved model *must* be in place by December 2015.

Extend Present Simulation through 2011

- A primary objective of the extension is to make use of the observations that have been collected in recent years, especially in shallow water.
- CBP will complete the watershed modeling and run CH3D for the additional years. Tasks required to execute CH3D include:
  - Assemble data for model forcing functions and for model validation
  - Create model input decks
  - Execute an independent wind-driven surface wave model
  - Estimate bottom shear stress from waves and currents
  - Validate model and compare to previous results
  - Create and store hydrodynamic outputs to drive the eutrophication model

Extend Present Simulation through 2011

- ERDC will complete the water quality modeling. Required tasks include:
  - Assemble data for model forcing functions and for model validation
  - Estimate shoreline erosion
  - Create model input decks
  - Validate model and compare to previous results
- This task will produce a revised system-wide eutrophication model with calibration and application through 2011.

Oysters and Menhaden

- Living resource restoration was not considered in the present TMDL, and prospects for restoration have changed since the last examination.
- The oyster model will be revised as necessary to incorporate aquaculture operations. Current and projected data on biomass distribution and abundance, including oyster harvest sanctuaries, will be mapped onto the current computational grid and various combinations of restoration and load reductions will be examined.

Oysters and Menhaden

- Menhaden activity will be moved to the current computational grid and their role will be reassessed based on current estimations of ambient conditions and loads and projected load reductions.
- Products of this task will include a set of scenarios addressing effects of menhaden on water quality and a revised oyster module incorporated into the eutrophication model.

Climate Change

- The CBEMP will be used to examine the impact of climate change on projected water quality.
- The first issue to resolve is to frame the future climate-change scenario.
- The WSM will be employed to predict flows and loads from the watershed based on the projected conditions.

Climate Change

- New hydrodynamics will be required based on projected flows, sea level, and shoreline geometry.
- Eutrophication model runs will be made based on the projected conditions and management plans including the TMDL.
- This task will produce a set of model scenarios which address impacts of climate change including sea level rise and temperature increase.

Wetlands and Shallow-Water Processes

- The first step will be a comprehensive examination of present model performance, based on observations collected through 2011.
- Wetlands are known to influence model performance in portions of the Bay where they are extensive. We propose to develop one or two simplified models which will describe crucial processes. We propose to participate in the development of a community model which will be shared among Bay models and modelers.

Wetlands and Shallow-Water Processes

- The CBEMP incorporates a mechanistic SAV model originally implemented for the 2000 version of CBEMP. Since then, significant knowledge has been acquired regarding the processes which determine SAV abundance in the Bay. We will revisit the formulation and calibration of the SAV model following consultation with community scientists.
- This task will produce an independent shallow-water processes module which will address water quality impacts from wetlands and shoreline erosion. The module will be incorporated into the eutrophication model.

2017 Midpoint Assessment

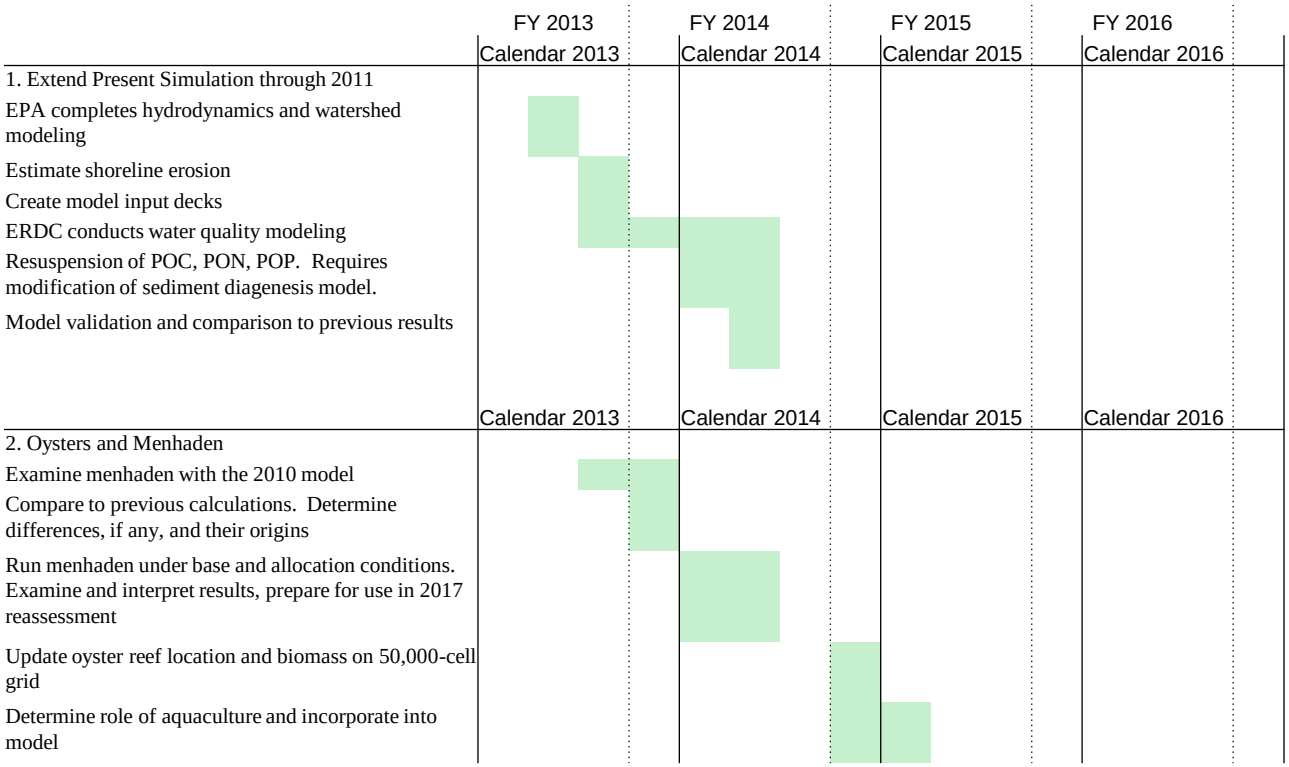
- The reassessment will commence in January 2016 at which time all model enhancements must be completed and available.
- The reassessment will be based on Phase 6 of the WSM.
- The CBP may wish to complete a new set of CH3D hydrodynamic simulations based on computed runoff from the Phase 6 WSM. In that case, the new runs must be completed in the first quarter of 2015 and both revised hydrodynamics and loads will be implemented in the eutrophication model.
- The state of the model calibration will be assessed and adjustments will be made such that the revised model performs as well as, or better than, the existing CBEMP.

2017 Midpoint Assessment

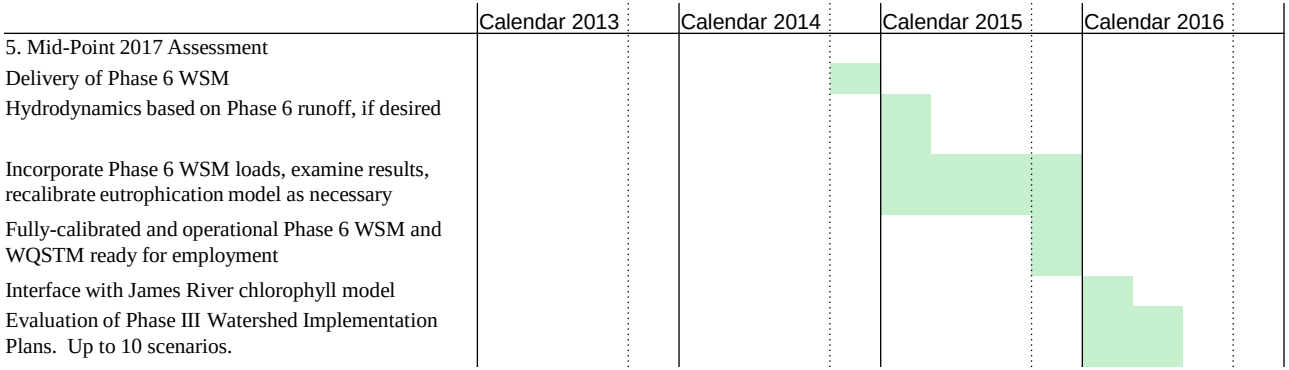
- The Commonwealth of Virginia is sponsoring an independent hydrodynamic and eutrophication model of the James River.
- The Commonwealth and the CBP may wish to rely on results from the enhanced James River model in place of the James River as represented in the CBEMP.
- We will work with the James River model team to develop an interface procedure and exchange information necessary to complete the 2017 Midpoint Assessment.

2017 Midpoint Assessment

- Phase III Watershed Implementation Plans (WIP's) will be examined using the new CBEMP commencing in January 2016.
- We anticipate executing ten management scenarios between January and June 2016.
- Final Phase III WIP's will be completed in January 2017.


FY 2013
FY 2014
FY 2015
FY 2016
Calendar 2013
Calendar 2014
Calendar 2015
Calendar 2016
1. Extend Present Simulation through 2011
EPA completes hydrodynamics and watershed modeling
Estimate shoreline erosion
Create model input decks
ERDC conducts water quality modeling
Resuspension of POC, PON, POP. Requires modification of sediment diagenesis model.
Model validation and comparison to previous results
Calendar 2013
Calendar 2014
Calendar 2015
Calendar 2016
2. Oysters and Menhaden
Examine menhaden with the 2010 model
Compare to previous calculations. Determine differences, if any, and their origins
Run menhaden under base and allocation conditions. Examine and interpret results, prepare for use in 2017 reassessment
Update oyster reef location and biomass on 50,000-cell grid
Determine role of aquaculture and incorporate into model


Calendar 2013
Calendar 2014
Calendar 2015
Calendar 2016
3. Climate Change
What is our future climate scenario? What conditions?
Sea level change. How to handle?
Temperature change.
Flows and loads from watershed.
New hydrodynamics based on projected flows and sea level
Living resource impacts
Submerged aquatic vegetation
Climate change scenarios
Calendar 2013
Calendar 2014
Calendar 2015
Calendar 2016
4. Wetlands and Shallow Water Component
Reconsider SAV model
Compare shallow-water data with WQSTM through 2011
Empirical or simplified models of wetland processes
Beach and shoreline Processes
Shoreline erosion
Revisit waves in small creeks?
Interface with LRR model, bay model


Calendar 2013
Calendar 2014
Calendar 2015
Calendar 2016
5. Mid-Point 2017 Assessment
Delivery of Phase 6 WSM
Hydrodynamics based on Phase 6 runoff, if desired
Incorporate Phase 6 WSM loads, examine results, recalibrate eutrophication model as necessary
Fully-calibrated and operational Phase 6 WSM and WQSTM ready for employment
Interface with James River chlorophyll model
Evaluation of Phase III Watershed Implementation Plans. Up to 10 scenarios.