Modeling Quarterly Review Meeting

April 1st and 2nd, 2014

http://www.chesapeakebay.net/calendar/event/21418/

UPCOMING MEETINGS

As part of the Modeling Workgroup Communication Strategy, the group has decided to add **2-hour Monthly Modeling Workgroup Conference Calls**

- Purpose: Identify and make key decisions related to modeling on the workgroup priorities.
- These conference calls will NOT occur during months where there is a Modeling Quarterly and will ONLY occur if WG members are needed to make key decisions.
- On monthly conference calls, as in the Quarterlies, we work for consensus with all. But major decisions are voted on by members only.
- Dates: 1st Thursday of the month 10AM – 12PM, or scheduled as needed.

July Modeling Quarterly Review
Date: July 22nd and 23rd, 2014
Time: 10:00AM – 3:00PM
Location: Joe Macknis Memorial Conference Room (Fishshack) CBPO 410 Severn Avenue Annapolis, MD
Conference Line: 1-866-299-3188 code 410-267-5731
Adobe Connect: https://epa.connectsolutions.com/modeling (enter as guest)
Event webpage: http://www.chesapeakebay.net/calendar/event/21646

ANNOUCEMENTS

- The Chesapeake Community Modeling Program's Chesapeake Modeling Symposium May 28-29, 2014 Annapolis, MD
- Conference on Ecological and Ecosystem Restoration July 28th – August 1st, 2014 New Orleans, LA

MINUTES APRIL 1st, 2014

Oyster Restoration, Aquaculture, and Nitrogen Removal – Cornwell

Attachment A – Presentation
Journal Article
Related STAC Report

Jeff Cornwell described studies examining the roles of on-bottom and float aquaculture as well as Harris Creek sanctuary restoration in nitrogen removal by oysters (*Crassostrea virginica*).

Discussion

- Prospective bay wide modeling of oysters and potential oyster restoration and aquaculture habitats.

- Aquaculture and oyster restoration is expected to increase in Maryland. It is important to understand the potential benefits and impacts to the industry, as well as water quality. There is also interest in looking at different types of aquaculture and the difference between restoration efforts vs. aquaculture.

- The Chesapeake Bay Program is interested in crediting oyster reef restoration as a best management practice (BMP). STAC produced a report (click here). Research is still needed and must be replicated in other areas. In order for new information to be incorporated, it must be vetted through a BMP panel most likely under the WQGIT or STAC. The Modeling WG's role is to make sure the CBP Models are not double counting.

Review of Modeling Workgroup Priorities – Currey-Montali
Attachment B

A review of the Modeling Workgroup priorities with associated timelines and why the various elements are important to the Workgroup was presented. In addition, a Virginia Tech proposal that could provide a vehicle for modeling issues that the Modeling Workgroup needs to have addressed was described.

Modeling Workgroup Work Plan (updated January 23, 2014)

Communications Strategy

- Weekly Modeling Team Meetings – Discuss Scenario Builder and Phase 6 Issues and identify decisions that must be made by the partnership.
- Monthly Modeling WG conference calls – Identify and make key decisions related to modeling on the workgroup priorities.
- Monthly Updates to STAR and WQGIT – Meeting minutes briefing prepared for STAR/WQGIT to communicate progress on Midpoint Assessment priorities.
- Quarterly two day review – Provide a briefing to the partnership on all Modeling WG priorities.

Discussion

- In regards to the Airshed Model updates, are the agriculture issues being considered? For example, alum addition in poultry houses.
    - Reductions such as application of alum are considered a best management practice, which is incorporated into Scenario Builder inputs.
    - In 2013, nitrate reductions were considered and applied. This has not been done for ammonia.
        - **ACTION**: The Modeling Team will discuss with Robin Dennis and the WQGIT the potential of repeating the study for ammonia. Note: There is also the potential to create a panel to discuss this issue instead.

Watershed model schedule – Shenk
Attachment C

Gary presented an updated development schedule with key links to the Midpoint Assessment schedule.

Discussion

- What type of STAC Reviews will be performed?
  - The Modeling WG/Team will keep STAC up-to-date on the changes to the model.
  - The unofficial review within the partnership has already begun and will continue through most of 2017.
  - The official review for the entire partnership (including STAC) will be announced in early 2016.
  - STAC should be treated as a regulatory model peer review.

- If the rainfall simulation is changing, is the hydrology review for Phase 5 of the model still applicable to Phase 6?
  - The Phase 6 model will use the same HSPF application of hydrology that was used in the Phase 5 model.
  - The peer review panel is independent of the CBP and could ask specific questions on the XYZ method vs. NLDAS.

- Historical representation of BMPs will have to be re-worked by the states. The model was calibrated based on adjustments to loads based on historical BMP application. Why are BMPs included in the calibration?
  - There are many reasons for including BMPs in the calibration. For example:
    - Since BMPs change over time during the calibration, it is important to include them.
    - In order to apply annual BMPs, such as cover crops, we have to know what was in the calibration in order to subtract it out of what we have now.
  - The re-work of historical BMP data is part of the WQGIT's tasks.
  - The new calibration method has not been agreed upon yet.
  - Due to lag times and other factors, what happens on the ground does not have a one-to-one relationship to the water quality data.
    - **ACTION**: Request a presentation on lag time modeling by Ciaran Harman for the July Modeling Quarterly.

Phase 6 Prototype – Bhatt-Shenk
Attachment D

Gary presented Gopal Bhatt's work on a prototype of the Phase 6 Watershed Model based on the HSPF PQUAL simulation and with an updated precipitation input dataset, hydrology, and sediment simulations.

Objectives

- Replace Phase 5 precipitation and meteorological data with NLDAS-2.
- Replace AGCHEM based simulation of nutrients with PQUAL.
- Refine calibration methodology and improve operational aspects.
- Establish and demonstrate incremental changes starting with Phase 5.3.2 as base.

Next Steps

- Incorporate nutrient sensitivity in the Phase 6 framework.
- Test developed framework on "key" scenarios.

Discussion

- Based on the provided information, the new model calibration method seems to perform worse at high concentrations, than the old model.
    - It seems that what is probably driving the load is north of the 90th percentile. Ross Mandel will discuss the potential to look at this based on different flow regimes later during this meeting. We must make sure that while we are trying to produce better results at the lower concentrations, that the load calculation isn't degraded.
    - Also, we must consider the scale. If the underestimation is, 10 – 30 mg/L TSS and the Conowingo is producing 1000 mg/L during high flow events, this may not be a sufficient issue, but should be looked into further.
    - Still need to include the 1996 storm.
    - These results will change with the new calibration method.
    - The workgroup will also be working on reservoir and scour decision rules, as well as the snow melt calibration, which will change these results.

- A comparison of MODIS and WRTDS load estimates will be performed.

- This analysis looked at Total P and Total N – Was this also broken down into particulate and dissolved?
    - WRTDS and Estimator consider nitrate, phosphate, total nitrogen, and total phosphorus, so the CBP Modeling Team could break this down by those constituents.

Phase 6 Calibration Decision Rules – Mandel
Attachment E

Ross described proposed refinements for the Phase 6 river calibration method and for PQUAL parameter selection.

Proposed Revision in River Calibration Methodology

- Link parameter changes to explicitly bias in flow-based concentration statistics:
    - Concentrations by flow percentile bins.
    - Concentrations by fraction stormflow/baseflow (as determined by PART).

Benefits

- Better alignment of parameters with calibration data.

- Synchronization of river calibration by flow regime.

Current Status

- Code operational on ICPRB computer.
- Installing operation version at CPBO.
- Baseflow parameter adjustment method implemented with PART statistics.

Next Steps

- Test current version.
- Explore alternative statistics for parameter adjustment.

Discussion

- Considering different flow regimes could operationally be beneficially when incorporating lag times.

- Each calibration station where PART would be used would have a storm-flow and base-flow separation. Does the upstream analysis affect the downstream analysis?
    - A separated PART analysis is conducted at each station, therefore it is considered an isolated view in regards to space.

- Settling rate and relative depth are both important factors.

Further Analysis of Phase 6 Nutrient Sensitivities – Yactayo
Attachment F

Guido described an analysis of SPARROW nutrient export sensitivities to input loads and provide an initial look at an equivalent SWAT analysis.

Summary

- In spite of different inputs and approach to assess water quality, SPARROW showed almost the same output than P532 at 9 USGS stations in the year 2002.
- CEAP coefficients fall within the SPARROW and p532 coefficients range.
- Suggested a coefficient of 0.255 and 0.225 in PQUAL to calculate fertilizer and manure nitrogen losses, respectively.
- Suggested a coefficient of 0.1 in PQUAL to calculate both fertilizer and manure phosphorus losses.

Next Steps

- APLE phosphorus model
- FLCM model (a MODIS approach to predicting stream water quality in forest)
- Phase 6 prototype including PQUAL sensitivity recommendations.

Discussion

- How will this be incorporated into the Phase 6 Model?
    - This depends on what the CBP partnership decides. For example, if for fertilizer nitrogen on crop land, the partnership choose to go with the median value (0.255) for the sensitivity, then for every additional pound that is applied 0.255 pounds would runoff after the calibration. And every reduced pound is a 0.255 pound reduction.
    - The Modeling Team will continue to bring back these analyses to the Modeling WG for decisions and new analysis requests.

- In the former analysis by Richard Tian, differences were seen in loading rates, but did not see difference in sensitivities geographically or reaction to application.

- What management action does this influence? This would affect manure and fertilizer transport. Also, it depends on what is decided for application of fertilizer, since the partnership is deciding whether to use sales data or fill in the gaps. It would also affect outputs when scenarios are run with different animal counts.

- Alisha Mulkey is working on the APLE phosphorus model, which will likely be incorporated into the Phase 6 Model. There is communication between the Modeling WG and Alisha Mulkey about the progress of this work.

- John Rhoderick, Chris Brosch, and William Keeling expressed concerns about the phosphorus 0.1 coefficient, but agreed to use these suggested numbers for the Phase 6 prototype, with the idea that these will be revised based on information provided by other models and analyses, such as the APLE phosphorus model.

- **ACTION**: Use the median values for the Phase 6 prototype as a place holder. The Phase 6 prototype (conceptual model) and management implications will be presented at the July Modeling Quarterly.

Relative Importance of Upland and In-Stream Sediment and Nutrient Sources – Fraley-McNeal, Christianson, and Law
Attachment G – Presentation
Attachment H – Technical Memo (3-25-14) - Analysis of Stream Sediment Monitoring
Attachment I – Technical Memo (3-25-14) - Analysis of Stream Sediment Studies

Lisa Fraley-McNeal, Reid Christianson, and Neely Law described the results of an empirical analysis of in-stream sediment loadings from urban, headwater streams. The results suggest that urban streams are a potentially significant and variable source of total watershed sediment loads.

Summary

Total Watershed Sediment Yield	Literature review	200 – 1,500 lbs/ac/yr
	Monitoring Data Analysis	100 – 900 lbs/ac/yr (to 4,600 lbs/ac/yr with PGC)

Sediment Yield from the In-Stream Sources	Literature review	<300 lbs/ac/yr
	Monitoring Data Analysis	<450 lbs/ac/yr (<3,800 lbs/ac/yr with PGC)
% Contribution from In-Stream Sources	Literature review	20% – 40% for source (average 55%)
	Monitoring Data Analysis	-7% – -30% for sink (average -19%)

Recommendations and Next Steps

1. Analysis of stream bank erosion rates.
2. Determine the sources of TP and TN loading.
3. Similar analysis of stream sediment in agricultural watersheds.
4. Improved characterization of headwater streams to identify landscape characteristics affecting the source-sink function.

Discussion

- It could be useful to conduct further analysis of particular MS4s (i.e. Carroll County).
- If the CBPO is to use this type of analysis and incorporate it into the model, the instream storage (-) and instream sources (+) are needed.
- The analysis is switching from being driving by what data is available, to what can data be used for.

TMDL Models and Hypoxic Volume: A Long-term Modeling Approach – Brady and DiToro
Attachment J

Damian Brady presented an analysis directed at the question, "Can the trend in hypoxic volume be reproduced by the current TMDL models or are other, as yet unappreciated, factors at work?"

Discussion

- Carl Cerco will contact Damian Brady and Jeremy Testa offline to work on the incorporation of this analysis into the current modeling efforts.
- Ping Wang has worked with the CH3D model analyzing the effects of different wind directions. It could be beneficial to conduct simulations of hydrodynamics before the regime change. Then, conduct the modeling to see if it could better explain the historic data if the wind is corrected.
- William Ball will contact Damian Brady offline to discuss this analysis. It would be useful to use Rebecca Murphy's stratification and Malcolm Scully's wind direction work to further this analysis.

- The Modeling Team at the CBPO expressed interest in continued communication in order to work towards incorporating this information into the CBPO modeling efforts.

MINUTES APRIL 2nd, 2014

Implementation of Expert Panel Recommendations – Shenk
Attachment K

A suggested approach for implementation of Expert Panel recommendations for the simulation of management actions in the Phase 5.3.2 Models was described.

Discussion

- These principles are designed to hold the integrity of the models, while incorporating the results from the expert panels.

- The main point is that when the expert panels recommend a change in the parameterization in the model, the model must be recalibrated and how to do that must be a conversation between the Modeling Workgroup and the specific Expert Panel.

- For the land-use recommendation, ratios rather than absolute numbers would easier to implement. For example, for nitrogen forest is half of the loading rate of urban (not an actual ratio, just for example purposes).

- **ACTION**: The "Implementation of Expert Panel Recommendations" will be revised based on today's discussion and presented to the WQGIT at their next meeting.

Examination of Watershed Phosphorus Simulation Approaches – Kleinman
Attachment L

Peter Kleinman of USDA/ARS presented information on phosphorus simulation approaches that can be used to update the Phase 6 agriculture simulation.

Discussion

- There is a difference in the modeling allocation and actual water quality goals in the TMDL.

- When incorporating this type of information, the CBPO must consider that there are fundamental differences in different areas of the watershed (i.e. Virginia Coastal Plains).

- How does the CBP Model legacy nutrient issues?
    - The subroutines that handle phosphorus are similar to the SWAT model.
    - The CBP is currently looking to incorporate the APEL model.
    - Export function of input vs. storage.

WQSTM Oyster Simulation – Cerco
Attachment M

Initial work on model simulations to assess the influence of oyster filter feeders on water quality, with increased aquaculture and sanctuary development was described.

Discussion

- Carl Cerco (USACE) will contact Arthur Butt (VA DEQ) offline for information.
- Should assess the difference between oyster sanctuaries vs. aquaculture.
- The Chesapeake Bay Program is interested in crediting oyster reef restoration as a best management practice (BMP). STAC produced a report (click here). Research is still needed and must be replicated in other areas. In order for new information to be incorporated, it must be vetted through a BMP panel most likely under the WQGIT or STAC. The Modeling WG's role is to make sure the CBP Models are not double counting.

WQSTM Shallow Water Simulation – Cerco
Attachment N

Carl presented preliminary work on a refined shallow water simulation using the Water Quality and Sediment Transport Model (WQSTM).

Discussion

- CBP Modeling Team is interested in dividing the work in order to support this effort and speed up the process. Carl Cerco will contact Lewis Linker with items.
- May want to take a hybrid approach, such as the representation of ICMs in smaller segments than are currently represented in shallow water and empirical approach (for example, refraction of waves).

Multiple Model Assessment of Shallow Water Systems – Linker
Attachment O

The objective of the RFP is to improve the CBP assessment of the open-water DO and clarity/SAV water quality standards in shallow through the use of a multiple model assessment. The principal investigators for the work have been selected. The next steps will be completion of final work plans and the selection of field/simulation sites from among the entire mix of shallow water monitoring (SWM) sites including tidal fresh, mesohaline, and polyhaline monitoring sites.

Discussion

- This is a two year effort with four teams of PIs for Shallow Water Modeling.

- **ACTION**: The Modeling WG Conference Call and the PIs for shallow water multiple modeling site selection approval.
    - The site selection is important in order to begin working on this project.
    - All PIs will be modeling the same site.

- The Chesapeake Modeling Symposium will be used as a discussion forum on this topic.

- The CBPO Modeling Team will also need to provide boundary conditions.

Progress on Lower Susquehanna Dams – Linker
Attachment P

The progress made on the simulation of the Lower Susquehanna Reservoirs was described.

Discussion

- Watershed sediments vs. scoured sediments on a per mass basis?
    - No. There have been analyses conducted in regards to this. Since it is a deterministic model, so the amount of nutrients associated with scour is a known quantity as well as the nutrients from the watershed.

- The Lower Susquehanna River Watershed Assessment (LSRWA) report will be sent to initial reviewers including the Modeling WG in June 2014.

- The TMDL is set up to meet the water quality goals, so any addition could send an area into nonattainment. The absolute problem may not be increased that drastically. Also, 1% nonattainment of the water quality goals means different levels of effort in different areas (i.e. CB4 deep channel vs. other open water or shallower areas).

Modeling Laboratory Action Team Update – Bennett

Mark presented the Modeling Laboratory Action Team Management Board presentation for comments and recommendation.

Discussion

Report Edits
- Table of all of the options in one place
- Edit to make clear that the Modeling Laboratory will focus on more than water quality.
- Adding a Chesapeake Bay Program structure diagram, in order to show where the Modeling Laboratory would fit.
- The “Proposal” section will be deleted.

- Amanda Pruzinsky will send out the next version of the Modeling Report to the Modeling Workgroup.

- Mark Bennett is currently involved in discussions with Nick DiPasquale about how to bring this back to the Management Board.

James Chlorophyll – Butt

The status of the James River chlorophyll analysis was reviewed.

Discussion

- April 11th, 2014 is the next Science Advisory Committee Meeting.
- This study will also be part of the Chesapeake Modeling Symposium May 28th - 29th, 2014.
- The data flow issues may be an issue that the shallow water and the James chlorophyll PIs could collaborate.
- Arthur Butt will continue to update the Modeling Workgroup on the progress of the James Chlorophyll study.

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