Modeling Workgroup Quarterly Review

April 10, 2018

CBPO Conference Room - The Fish Shack
410 Severn Avenue Annapolis, MD 21403

For Remote Access:

Adobe Connect: https://epawebconferencing.acms.com/modeling (enter as guest)

Event webpage:
https://www.chesapeakebay.net/what/event/april_2018_modeling_workgroup_quarterly_meeting_day_1

Announcements:
Modeling Symposium-poster abstracts and proposals are still being accepted.

Modeling Workgroup Succession – Lee Currey, MDE and Dave Montali, Tetra Tech

The process of leadership succession of the Modeling Workgroup will be discussed.

- Lee Currey: We are moving away from the Phase 6 model and the MPA, and we are moving into future concerns, including climate change impacts in the Bay and the Phase 6 modeling tools. We have also been directed to investigate the science of management practices in the watershed. VA is looking at WQ standards in the James River, and we are trying to support the partnership in new practices like oyster aquaculture and other emerging implementation practices.
- Currey: I would recommend that Dave stay on as co-chair, and I would recommend Mark Bennett to take my position as co-chair. I intend to continue in the modeling workgroup as a member, but I need to step down as co-chair due to time constraints on my end.
- Dave Montali: We have two people who are willing to co-chair. We should give a couple weeks to take nominations. Is there anyone here today that wants to nominate anyone?
- Linker: We appreciate greatly Lee's and Dave's work and leadership through the development and guidance of the Phase 6 model and the MPA process.
- Currey: I do think it's a good idea to have state implementers and technical experts together in the leadership. Mark Bennett and Dave Montali would make excellent co-chairs. I will miss co-chairing the workgroup but I
- Linker: This is a good place to transition Modeling workgroup leadership after the June 1 PSC meeting where they will hopefully approve the new planning targets.
- Note: Lee will be leaving today's meeting early about 11:45.

ACTION: Cuiyin and Lew Linker will follow up via email to the Modeling Workgroup to remind the workgroup of the recommendation of Dave and Mark as co-chairs. Included will be a list of members and the Modeling Workgroup governance document in the email.

Model Team Activities – Gary Shenk, USGS-CBPO

Gary will describe Modeling Team tasks for this and the upcoming quarter including different tasks in support of WIP planning targets, climate change, model documentation, support for James River chlorophyll modeling, optimization, and more.

- Discussion of transitioning from the servers to the cloud and finalization of Phase 6—cleanup and share with the modeling community.
- Dave Montali asked about timing of when we start working on Phase 7.
    - Linker: The management community is busy with the Phase III WIPs and implementation, so we might want to leave some time before we bring Phase 7 up to the management community.
    - Currey: We should be working with the WQGIT to learn the applications of Phase 6 and CAST, and start to consider what is working and what is not, and what we want to start modifying and how best to start that transition to Phase 7.
    - Dinorah Dalmasy suggested working with the Modeling workgroup to bring Phase 7 timelines and discussion to the WQGIT in the near future.

MACA Climate Change Data – Ray Najjar, Penn State

Ray will introduce the downscaled, GCM data from MACA (Multivariate Adaptive Constructed Analogs). The data of MACA is taken from the historical (1950-2005) and future RCP4.5/RCP8.5 (2006-2100) daily outputs of about 20 available CMIP5 models. For daily outputs of the variables minimum/maximum temperature, precipitation, wind, humidity, solar radiation, and others. The possible advantages and tradeoffs for the incorporation of the MACA data set into the CBP 2019 Climate Change Assessment will be discussed

CHAMP Update – Ray Najjar, Penn State and Marjy Friedrichs, VIMS

Ray will review the progress of NOAA funded work on the Chesapeake Hypoxia Analysis & Modeling Project (CHAMP). The objectives of CHAMP are to 1) estimate the impacts of future changes in climate and anthropogenic nutrient inputs on Chesapeake hypoxia.

- Linker: with the 1/24th of a degree, we are discussing a 3 mile by 3 mile grid, and all the meteorological inputs we need, so we would have everything we need for a Penman-Monteith evaluation? (1:39:00) for evapotranspiration. That is a big gap in our current efforts, so we could certainly evaluate the applications of MACA in that area.
- Gopal: One advantage of MACA is downscaling and modeling evapotranspiration, two shortfalls of our modeling work. We can
    - Linker: As we prep for the STAC workshop, we can do some tests with MACA to see what impact it has on our simulation results.
    - Gopal: MACA uses the same GCM models that we do, but a different technique to downscale. So we will be able to test those effects of different techniques on the same source models between our models and MACA.
- Linker: Ray, we will have to have some more discussions with the CHAMP group on how best we can leverage this product in preparation for the STAC workshop.

- Larry Sanford asked about the increase in temp and incorporating seasonal variation rather than a uniform increase in temp across the board. Are we accounting for these cold late winters while the Arctic warms and so we have cold winters and hot summers?
    - Ray: The GCM does include and Arctic that warms faster than the rest of the globe. That's an active area of research about how the changes in the jet stream and polar vortex will impact variations in winter temperatures and seasonal variations with climate change.

CBP 2019 Climate Change Assessment – Lew Linker, EPA-CBPO

Initial steps in the development of the CBP 2019 Climate Change Assessment will be described.

- Karl Berger asked who is responsible for developing a better understanding of BMP responses to climate change.
    - Linker: That will be a Partnership effort, in the CCWG, the WQGIT, and we will provide support as we are directed.
    - Mark Bennett: the information about that to support has to come from the research community.
    - Bill Ball: We do need a strategy to go about this effort. There is a need for research funding to fulfill the strategic needs of the Bay Program. We did hope that we could form a strategic plan among the research institutions and the bay Program for that, but the political atmosphere is not good for that at EPA. That is a need that we have for something overarching as a vision and articulation of need that we currently are tackling piecemeal.
    - Linker: We may want to discuss a strategy for setting aside some resources to work on tackling that issue
    - Shenk: The CBP could provide some resources but they are very small compared to what is needed. STAR is collecting needs and the SRS process is moving forward with that effort to collect needs.
    - Ball: CRC's board should convene with STAR and the Bay Program and discuss how best to approach securing those resources.
    - Berger: Regardless of the resources available, we need to discuss what we can do within the TMDL timeframe with the WIP development out to 2025.
    - Linker: STAR provides scientific support services to the Bay Program. An effective strategy would also be to go to the managers and ask what they see as strategic needs.

James Chlorophyll Assessment – Tish Robertson, DEQ

Tish will describe the progress made on the James River chlorophyll assessment as well as the motivation for a 2005-2013 assessment period of the chlorophyll water quality standard.

Discussion:

- Lew: Is the data collection/boat track set a priori, same all the time? How is it sampled?

- Tish: The track is fairly consistent; cruises belong to same track. Collectors follow the trajectory by GPS on boat. May go off track sometimes depending on the nature of data being collected.
- Bill Ball: Someone at SERC works with human bias in data collection. Drones at SERC are programmed to use same tracks/grids for sampling. Human bias something to be cognizant of, aware of for future.
- Tish: VADEQ is able to smooth biases out in processing (take median of observations within a grid cell).
- VADEQ asks the Bay Program for 2005-2013 scenario loadings estimated by the bay watershed model.
    - Lew: CBP will comply.
- Gary: The purpose of the Criteria Assessment is to limit rare, really bad events. It seems like the rationale is changing from finding rare, bad events to evaluating averages. Your proposal is to use current conditions as the criteria, meaning that current water quality is generally in attainment.
    - Tish: correct. VADEQ moved toward using chlorophyll to indicate harmful water events, the criteria are based on current observations. Most of the WIPs have been implemented and the loads have been reduced.
- Dave Montali: method for getting number for red boxes on slide 20?
    - Tish: Started with baseline estimate. For each monitoring cruise, take composite value for a segment and do that through each season and take geometric mean of observations for each season/segment/year. Regarding the numbers in red box, are there harmful effects we can link to algae? VADEQ used conventional, statistical, empirical models to determine numbers that would be adequately protective against specific harmful effects of excess chlorophyll.

James Chlorophyll Scoping Scenarios – Jian Shen, VIMS

A range of key scenarios were used to examine James Chlorophyll Model performance over a wide range of loads. The scenarios ranged from high loads to low loads and were the 1) No Action Scenario, 2) 1985 Progress Scenario, 3) 1993 Progress Scenario, 4) 2013 Progress Scenario, 5) 2017 Progress Scenario, 6) scenario of the 2010 TMDL for Dissolved Oxygen (DO) Attainment, 7) the WIP II Level of Effort (LOE) Scenario, and 8) the E3 Scenario.

Oyster Aquaculture Influence on Water Quality – Richard Tian, UMCES and Carl Cerco, Attain LLC

Refinements to estimates of the influence oyster aquaculture has on Chesapeake water quality will be presented including an examination of local scale water quality influence and an assessment using Base conditions with full build-out aquaculture

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Scenario Optimization Tool for CAST – Daniel Kaufman, CRC

Danny will provide an overview of the ongoing development of an optimization tool for scenarios run in Phase 6 CAST. The current status will be described, as well as the major developmental steps anticipated for final development. In addition, a discussion will look into an exploration of the options available to the CBP partnership in order to best serve decision making at all scales from the state-basin to local levels.

Discussion:

- Lew asked about if the cost of the BMP implementation in the CAST is annual. Olivia responded that it is the private and public cost. Dave suggested the cost should be adjustable based on users' needs.
- Ted asked if there is a latest version of public cost profile in cast? Olivia said the cost profile is still the original cost profile.
- Dave asked that if the user option in the sand box in a default set mode? Danny responded that this is undetermined yet but is welcome opinions from all users. Olivia added that many CAST users are using it for various projects. They should not be predetermined.
- Lew asked about the medium-term product and what it would look like in an example. Danny responded that this would be a comparison between objective function and various cost profile. Lew asked if this will start at the county level. Danney responded county will be a good place to start with.
- Scott commented that to start with various setting such as ag land use and urban land use and see how they hold up in different setting. Lew agreed.
- Lew asked which County should we start with. Scott responded Lancaster County
- Lew asked Norm would be interested in urban setting. Norm responded that will try that later with nonregulated side.
- Alisha asked if the manure transport profile of each county in the medium-term product will be ready during the summer or later? Danny responded he would start working on this during summer.

Synthesis of Monitoring, Research and Modeling to Explain Chesapeake Basin Trends – Emily Trentacoste, EPA-CBPO

An approach to integrate monitoring, modeling, and research to inform management across the Bay watershed will be presented. Initial assessments will be presented with ideas for how to expand the assessment to basins throughout the Chesapeake watershed.

- Ted commented that this is very helpful however some of the assumptions Emily made are tricky and some of the items are abstract and difficult to quantify in terms of BMPs.
- Emily noted that she is working actively with local stakeholders in terms of making this product more available to the states

Rapid restructuring of the nitrogen cycle across the contiguous United States –Robert Sabo, EPA-ORD

An approach to examine the source and magnitude of nitrogen inputs and fluxes across the landscape in the Chesapeake region based on a quantification of the contiguous U.S. will be presented.

Discussion:

- Lew asked for the implications of the downward trend of nitrogen on the Chesapeake Bay region of the nitrogen management map. Robert responded that this is related to the nitrogen inventory.
- Alisha asked the sources of the fertilizer input data. Robert said it was generated from fertilizer sale data
- Scott asked if manure and commercial fertilizer both included in the fertilizer data. Robert responded that manure is also included in the fertilizer data but not including the manure transport data
- Scott mentioned the ITAT is a good platform to present to the stakeholders, and inform them.
- Dave commented that in order to influence WIP planning., this should be done as soon as possible.
- The mass balance fact sheet is more feasible and needs partnership to review before it finalizes.
- Gary is concerned with missing piece of manure transport. The inputs for the Chesapeake Bay program model are different from this one.
- Jeni commented that she received questions regarding manure transport at the Maryland Water Monitoring Council meeting. She used no action scenario. They are easy to compare with.
- Dave asked if they would do phosphorus inventory. Robert responded that they would analyze phosphorous using the dataset from the Bay program.
- There will be two case studies: North Fork Shenandoah and Choptank and develop template by July. This work will have Modeling WG support in further developing the product. ITAT will also collaborate with this work in terms of bringing empirical perspectives.

Problem Segments – Cuiyin Wu, CRC and Jeni Keisman, USGS-CBPO

Cuiyin and Jeni will describe an analysis of estimated DO water quality standard attainment results in Chesapeake Bay segments with the 2017 WQSTM that found that in a limited number

of Chesapeake Bay segments, poor dissolved oxygen conditions persisted even under scenarios of dramatically reduced nitrogen and phosphorous loads.
Jeni presented the methodologies and results of three segments (out of ten) that are not attaining the water quality standards: SBEMH, PAXTF, and GUNOH.

Discussion:

- Carl commented that shallow water is not stratified, and increasing chlorophyll a means DO would go up. For deep water and deep channel, relationship of chlorophyll a and DO is very complicated. Jeni agreed that this is a very complicated process and for this presentation, this graph is just as a reference. Gary commented that variance is also important aspect in this discussion. PAXTF is a good example. Lew commented DO saturated when DO concentration is greater than 8. The range of the DO value per year is closer than before.
- Lew commented for the water quality trend data, summer Chlorophyll a histogram and time series data should be used to match summer bottom DO graphs on the left.
- The GAM Chlorophyll a trend data increased by 45% and Carl asked if this match the Chlorophyll a monitoring data. Rebecca responded that the table has the last ten years but the GAM graphs show data since 1999. Jeni added that the Chlorophyll a trend data is represented station by station but for the monitoring chlorophyll a data is summarized for all station.
- Dave asked the approach and the goal of this study. Jeni responded that we are not making interpretations of the model accuracy and we can't say if this segment will be ok. Dave asked the implications for the WIP3 planning targets. Lew added that WIP3 loads should be added to loads graph for each segment.
- Dave asked why WIP2 is higher than previous progress for SBEMH. Gary responded that this local watershed is influenced a lot by the watershed. The slope of the regression for the station closer to the month is very similar to other station. We will take a closer look at this segment with Tish and Jian next Tuesday.
- Dave asked about the content of the summary paragraphs. Jeni responded that inferences will not be made. Lew said this will be only a scientific report but not a policy report.
- Dave asked if we need to add more BMP in the Elizabeth River, and when do we need to go to this point.
- Dave asked if local planning target, or DO Chlorophyll a standard for impaired local watershed.
- Maryland will have the discretion to BMP and waste treatment target for PAXTF. Gary added that for Maryland might do trading with other lower bay segments.
- Dave added that this is not a planning target issue. For the states, they can seek a different variance or not trust the model
- Dave asked about other segments and can we assume they are somewhere in between. Jeni responded South River deep water is also an interesting one to diagnose.

Meeting Participants:	
Alisha Mulkey	Kevin Asplen
Bill Ball	Larry Sanford
Carl Cerco	Lee Currey
Carl Friedrichs	Lew Linker
Cuiyin Wu	Mark Bennet
Clinton Gill	Mukhtar Ibrahim
Daniel Kaufman	Norm Goulet
Dave Montali	Olivia Devereux
Dinorah Dalmasy	Raleigh Hood
Emily Trentacoste	Ray Najjar
Gary Shenk	Rebecca Murphy
Gopal Bhatt	Richard Tian
Hassan Mirsajadi	Robert Sabo
Jeff Sweeney	Ross Mandel
Jeni Keisman	Scott Philips
Jeremy Hanson	Ted Tesler
Jesse Bash	Tish Robertson
Jian Shen	Xia Xie