Modeling Quarterly Review Meeting

January 14-15, 2015

http://www.chesapeakebay.net/calendar/event/22302

UPCOMING MEETINGS

January Modeling Quarterly Review (Part 2)
Date: January 28 and January 29, 2015
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/S=0/calendar/event/22305/

March Modeling Workgroup Conference Call
Date: March 5, 2015
Time: 10:00AM – 12:00PM
Location: Room 305A CBPO 410 Severn Avenue, Annapolis, MD
Conference Line: 1-866-299-3188 code 267-985-6222
Adobe Connect: https://epa.connectsolutions.com/modeling (enter as guest)
Event webpage: http://www.chesapeakebay.net/S=0/calendar/event/22433/

MINUTES: JANUARY 14, 2015

Review of Modeling Workgroup Priorities – Lee Currey, MDE - Dave Montali, WVDEP
Attachment A

The Modeling Workgroup priorities with associated timelines were discussed.

Chester Shallow Water Work – Richard Zimmerman
Attachment B

Dick Zimmerman discussed the impacts of water quality on shallow water resources. To date, the emphasis has been centered on SAV, but there are plans to expand the studied impacts of living resources to oysters and other benthic organisms. The work presented stems from an EPA request for proposals that focus on the development of a coupled hydrodynamic biogeochemical biological model which will allow for a simulation of relevant parameters in the shallow water environment.

Discussion

- Physical drivers are temperature and CO_2, physiological responses include the rates of photosynthesis in comparison with respiration.
- What is not being included in the model are the effects of increasing temperature on the sediment geochemistry, which may create problems for plants independent of the light environment.

- Nutrient loading is more of a stressor than a limiting factor in this projection as they increase the growth of light competitors, and is not modeled.
- Carbon cycling is not incorporated in the model, user provides CO_2 concentration which governs the instantaneous response of plant photosynthesis.
- Further long term research plans may include modeling organic carbon loading by sea grasses and O_2 pumping below ground to stimulate carbonate dissolution
- Assets that may be helpful for Chester River modeling include those from the Chester River Watershed Observatory (launching this spring). These include 3 meter resolution GIS land use data for the Chester River Watershed with LIDAR, 9 monitoring stations with 5 buoys being installed, 3 current meters, 5 NOAA DMAC data quality weather stations, current work with NASA on a 1 km resolution precipitation model for the entire watershed. All data is being forwarded to the MARACOOS website. In addition, seafloor mapping capabilities can also be brought to bear on SAV work. This work is being done by Doug Levin and Doug Wilson. Questions about the resources and labs can be directed to Doug Levin, Deputy Director of the Center for Environment and Society at Washington College, dlevin2@washcoll.edu.

Chester Shallow Water Work - Richard Tian
Attachment C

Richard Tian's work on developing a hydrodynamic and water quality model for shallow water environments within the Chester River was discussed. This specifically focused upon the spin-up process to reach equilibrium solutions after a period of five years. The simulation is still in progress.

Discussion
- Current model ends at 2005, this model extends that data further and helps determine how model is functioning in shallow water areas.
- Model being used incorporates some Phase 6 loads, water quality will be refined as well.

WQSTM Shallow Water Simulation – Carl Cerco
Attachment D

Carl Cerco presented plans concerning how to better represent shallow water in the WQSTM with current data monitoring stations, reviewing results of comparisons between the model and observations.

Discussion
- Accuracy of shallow water and main stem for DO is comparable between the model and measurements.
- Benthic algae resuspension may be an issue, huge variations in chl-A concentrations have also been observed at shallow water sites by MDNR.
- Comparison between shallow water and exclusively near-surface observations may help determine if there is a vertical or horizontal segregation issue.
- A 1999 report authored by Lee Karrh may be a relevant resource in answering some questions, its findings showed that nearshore vs. offshore stations had statistically

comparable water quality data when the stations were within 2 km of each other, and that the reliability of the comparisons decreased as distance between stations increased. For a copy of the report, please email Kyle Hinson, khinson@chesapeakebay.net.

- Particulate nutrients that are being modeled (N, P, and C) are especially low, which may potentially be amended by increasing the chlorophyll.
- The difference between total N concentration and particulate N may point to a lesser amount of dissolved N as well.
- The full extent of groundwater influences are relatively unknown.

WQSTM WQM Progress - Carl Cerco
Attachment E.1, *Attachment E.2*

Carl provided an update on the standing of the current Bay simulation and then addressed some of the issues being faced with bankloads by the model.

Discussion

- There is a consistent phosphate maximum that is not picked up by the model and a clear loading issue has been identified.
- Bankloads of sediment are not currently in the modeling framework, there may be significant amounts of refractory P that could alter the expected mass balance of nutrients from groundwater.
- To be discussed at a later date is the point of refractory loads being tackled by armoring the shoreline (appropriately refractory phosphorous) in order to allow credits for BMPs, made by a dissenting minority within the watershed technical workgroup.
- In current simulations when the bankloads are added, the anoxia moves much further downstream. It may be beneficial to examine this point with the inability of the model generate sufficient anoxia further downstream.
- Moving forward necessitates putting G3 phosphorous into the water column, making the best assessment of the amount of G2 or G3 phosphorous within the bank, and then calibrate the model as necessary.

Ongoing Conowingo Studies - Bruce Michael
Attachment F

Discussion of the LSRWA study's findings regarding the infill condition of the Conowingo Dam, and sources of sediments and nutrients. The presentation addressed enhanced monitoring and modeling efforts that will be coordinated with Exelon to determine Midpoint Assessment of TMDL with regards to Conowingo Dam.

Discussion

- Monitoring will continue through 2016 and Exelon has agreed to fund an enhanced monitoring effort.
- Sediment core information and greater sampling of water column sediments under different scenarios, especially during storm periods, is essential.
- Exelon wants to be able to characterize the entire loads coming into Conowingo, even on orders of single percentages of the nutrient loads.

- Questions about the study plan should be directed to Bruce Michael, bruce.michael@maryland.gov.

Conowingo Infill Studies – Jeff Cornwell and Jeremy Testa
Attachment G

Jeff Cornwell gave a presentation about the types of materials within the reservoir and how they have so far been processed. An emphasis was placed upon the reactivity of particulates in bottom sediments, their hydraulic characteristics, and their end location within the Bay.

Discussion

- Timeframe for the core and monitoring program. A large part of the sediment and water-exchange program is expected to be completed by the end of 2015. The anticipated beginning of the program and most data are expected to be ready by the spring of 2016. Early to mid-fall of 2016 is the expected release date of a draft report, and the project's completion is scheduled for the end of 2016.
- On average, the USGS predicts two large storm events per year, with flows reaching levels between 100,000 and 300,000 cfs.
- A goal of the studies also includes comparing the bioreactivity of bottom sediments with that of the suspended surface sediments that are passing over the dam.
- Size fractionation is being examined during storm events, finer sediments that are more likely to be associated with nutrients may be passing through the reservoir regardless of scour events.

MINUTES: JANUARY 15, 2015

Announcements and Amendments to the Agenda – Currey and Montali

Robin Dennis is retiring on February 28, his essential work with the Modeling WG has spanned over 20 years. Those wishing to attend his retirement luncheon on February 19 (the RSVP deadline is February 13) in RTP should contact Donna Schwede, schwede.donna@epa.gov, for further details.

CMAQ Air Scenarios – Jesse Bash and Robin Dennis
Attachment H.1, *Attachment H.2*, *Attachment H.3*

Robin Dennis and Jesse Bash gave three presentations: the first (Attachment H.1) examined new scenarios that will feed into the 2017 work and how it compares with the older work, the second (Attachment H.2) focuses on how recent trends in the past 15 years look relative to Chesapeake Bay deposition, and the last (Attachment H.3) provided an evaluation comparison of the CMAQ trend from 2002-2011 and how well it compares to data. Key aspects include the incorporation of bidirectional ammonia, studied by Jesse Bash, and the very strong representation of real data captured by CMAQ in the latest scenarios.

Discussion

- By 2025, ammonia is expected to dominate the nitrogen deposition, and the total N decrease is significantly greater in new simulations.
- Something to examine in the future may be the net flux of NH_4 into the bay during the winter and a net flux outwards during the summer.
- CAFO classification within the Environmental Policy Integrated Climate (EPIC) model is determined by animal numbers, not by permits.
- The ambient concentration resultant from the SO_x reduction can be tracked within the model and quantifiable benefits to human health and other points have been noted in the literature.
- Important to relate successes of N reduction and tell a story of how atmospheric deposition has been changing in the Bay Region. This is a point to be taken up with STAR.
- Further information on Region 3 air factsheets is to be made available very soon.
- Mass balance and fluxes of NH_4 within the Watershed Model and EPIC will be compared, to better determine future changes when modeling ammonia.

Impact of Warming and Sea Level Rise on Chesapeake Water Quality- Lew Linker and Ping Wang
Attachment I

The presentation focused upon Ping's work examining the impacts of climate change on water quality in the Bay. The components shown focus on the influence of an estimated 2050 condition of temperature, sea level rise, and rainfall intensity. Data presented use the latest downscaled IPCC projections for the Mid-Atlantic region.

Discussion
- Temperature increase is primarily resultant from an increased temperature in the seawater entering the bay, the increased temperature of water from the watershed is not accounted for but is part of the next step.
- May be helpful to examine not just bottom DO, but DO in the middle of the water column or hypoxic volume since the change from approximately zero DO in the bottom is not likely to decrease much and may explain why the two graphs showing the impact of temperature change are virtually the same.
- Greater relative rates of SLR are occurring at southern end of Bay, due to subsidence, than at the northern end which could prompt greater estuarine circulation. This may be a potential cause for greater rates of hypoxia in the upper Bay and a lesser amount in the lower portion of the Bay.
- It may be useful to determine whether or not there is a consistency in peak hypoxia occurring earlier in the year which matches recent literature.

Representation of Climate Change in the Chesapeake Watershed – Gopal Bhatt
Attachment J

Gopal presented a model setup that is similar to the watershed model setup in P 5.3.2, the objective being to run the model in a discovery mode using AGCHEM to help model some of the

physical processes. A Phase 6 AGCHEM version of the model was introduced, results were displayed, and a comparison of projected changes was also shown.

Discussion

- Concerns were voiced about problems with AGCHEM being used for the phase 6 management model, particularly with predictions for P with changing land uses. AGCHEM is not to be used for the Phase 6 management model, which will use multiple models. A mechanistic model that responds to temperature is needed for use as a base. Questions were posed concerning the influence of temperature on land use processes and whether AGCHEM properly handles temperature corrected rates. It is also important to determine what may be learned from using the AGCHEM model on the same land uses.
- Applying a temperature corrected rate to determine whether or not continuing to use AGCHEM 5.3.2 will be useful.

Representing Estimated Increased Storm Intensity in the 2050 Climate Change Simulation- Guido Yactayo
Attachment K

Trends of increasing precipitation intensity for representations of the Chesapeake Bay Watershed in 2050 were examined, specifically focusing on the upper ten percent quantiles.

Discussion

- Further steps would necessitate including more global climate models in analyses of precipitation intensities.
- Convective precipitation contributed by ET in the summer may necessitate an examination of spatial patterns of precipitation intensity as it relates to the atmospheric moisture contribution of ground vegetation.

Latest IPCC Downscaled Climate Change Scenarios – Venkataramana Sridhar and Choung Hyun Seong
Attachment L

Choung delivered a presentation concerning a comparison of climate models, an assessment of climate change impacts using the existing Chesapeake Bay Watershed Model, and a system for assessing hydrologic resources within the watershed.

Discussion

- ACTION: Gopal will make Phase 5.3.2 improvements available to Choung and Sri that utilizes NLDAS over snow catch efficiency.
- It would benefit the Modeling Workgroup to get the downscaled IPCC input used for the presentation.

James Chlorophyll – John Kennedy

John provided an update on James River chlorophyll analysis. A brief timeline was reviewed. The work plan was developed in 2011 and the years 2012-14 were devoted to the

enhanced monitoring development. In November 2014 a science advisory panel meeting was held which produced a draft of an empirical relationships report. This report looked at lines of evidence for examining existing chlorophyll standards in relation to aquatic life designated use and determining whether or not they were protected as well as examining HABs and the extent to which they may produce impacts to aquatic life and humans. The report is currently under review by VADEQ. For 2015, the science advisory panel will provide their overall findings and criteria recommendations for any amendments that they may propose. These amendments will address whether the standards are protective of the designated use, and will attempt to come up with an enhanced James River model simulation to provide more backing for scenario runs, simulations of chlorophyll concentrations, and attainability testing of the criteria. To this end, there is a meeting scheduled to determine model calibration verification. A decision is intended to be made this year regarding the protectiveness of any standards or amendments that will be submitted to the EPA. After model calibration verification, the James River model team will begin scenario development. In 2016, any regulatory proposals would continue through regulatory action opened in 2011. The regulatory process is expected to be completed in 2017. Key deliverables include: the empirical relationships report which is under review, the completion of all enhanced monitoring and laboratory experiments which should soon result in a submission, a submission to STAC, and the continuation of modeling efforts to the end of 2015 to incorporate 2011-2013 enhanced monitoring data for the calibration dataset. Any additional details concerning the reports may be found on the VADEQ webpage for water quality standards and nutrient criteria development.

STAC Workshops for 2015 – Lew Linker

- STAC has put out a call for workshops, the deadline for proposals is February 11, 2015.
- Proposed topics include studies on Conowingo infill and addressing climate change within the model. The WQGIT is considering model uncertainty for its proposal to STAC.