Modeling Workgroup Quarterly Review

October 8, 2019

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

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

10:00 Announcements and Amendments to the Agenda – Dave Montali, Tetra Tech and Mark Bennett, USGS

10:05 Phase 6 Climate Change Model Development – Gary Shenk, USGS-CBPO

Gary will review the plan and schedule for the 2019 Phase 6 development and simulation of future climate risk in the Chesapeake watershed and tidal Bay. The climate change presentations today and tomorrow will have an associated request for approval by the Modeling Workgroup for inclusion into the 2019 CBP climate change assessment. Gary will review (1) phosphorus loss in agricultural and natural lands, (2) BMP effectiveness changes, and (3) land to water and stream to river under climate change conditions and (4) estimated loads from tidal flood inundation.

Discussion:

Soil P APLE model slide discussion:

- Lew asked about the definition of stormflow.
  - Gary responded that it referred to nonground water, and in HSPF referred as surface flow.
- Tom Schueler asked if temperature sensitivity test included in the soil P which means that higher temperature influences the nutrient uptake. Gary responded no.

Delivery effect slides

- Norm pointed out that in the documentation currently CBP has no way to address climate change effect on stream to phosphorous.
  - Gary responded that the model does not have climate related variables built into stream delivery.
- Carlington asked if there is a plan of performing the analyses that we are not doing in this around of documentation.
  - Dave responded that for BMP performance, currently CRWG informed us that there is no information ready for us to include in the model, same with sunny day flooding.

DECISION: The WG approve the section of 4.5.1, 4.7.5, 4.6, and 5.1.5.

10:30 Estimated Nitrogen Speciation Changes Under Future Climate Hydrology – Isabella Bertani, UMCES

Isabella will review an approach to estimate the response of nitrogen speciation, characterized as the ratio of NO_3/TN, to climate change driven changes in hydrology and TN loads.

Discussion:

- Norm asked how this will be estimated for each LRSG since we don't have NTN stations at each LRSG.
- Gopal responded that new regression is fitted at stations but will be applied everywhere in the LRSG.
- Norm recommended adding several examples in the documentation.

DECISION: The WG approved the section of 4.7.1 and recommended adding several examples in the documentation.

11:00 Estimated Changes in Nitrogen Export Under Future Climate Hydrology – Isabella Bertani, UMCES

The multiple lines of evidence for the percent change in nitrogen delivery relative to percent change in flow will be reviewed.

Discussion:

- Norm pointed out the one red dot on slide 17 which is Patuxent.
  - Gary responded that that is related to the wastewater treatment plan.
- Dave added that for the natural land, the atmospheric deposition is the only input of nitrogen which explains why the total nitrogen is sensitive to nitrate. For Ag land, the atmospheric deposition is a negligible part compared to other inputs. He added that this explanation should be added to the documentation.

DECISION: The WG approved the section of 4.4

11:30 Estimated Changes in Phosphorus Export from Developed Land Under Future Climate Hydrology – Isabella Bertani, UMCES

The influence of climate change-driven changes in hydrology on TP loads from developed land uses using both a literature review of small-scale studies that have simulated flow and TP loads under climate change scenarios in predominantly developed watersheds and an empirical analysis of data from the National Stormwater Quality Database will be examined.

Discussion:

- For slide 12, Norm argued that the relationship between %Flow and %TPLoad is not 1 to 1.
  - Isabella responded that there is a lot of uncertainty in the data.
  - Norm argued that the slide 12 shows there is a different climate response for impervious land and pervious land.
- Tom asked if Isabella had looked into the impervious/culvert category. Isabella responded that she did look into that but the uncertainty is relatively high.
- Norm pointed out that for high percentage impervious area, the % change in stormflow to % change in flow is really high, which is important for BMP sizing.
- Tom asked about the percentile of the table and Isabella added that it is for the percentile of the land segment.
- George added that documentation should include caveat information such as "current best estimate"

DECISION: The WG approved the section of 4.5.2

12:00 Estimated Atmospheric Deposition Inputs for 2019 Climate Assessment – Gopal Bhatt, Penn State and Jesse Bash, EPA-ORD

The estimated changes in wet and dry deposition of nitrogen under future climate change conditions will be reviewed.
Discussion:

- Dave pointed out that Chesapeake watershed is already in the Chesapeake Airshed and should be careful when taking the average of the sensitivity and you are giving more weight to the NADP wet deposition.
- Jesse pointed out there is uncertainty with the numbers in the slide 14.
- Norm asked why we don't see dry deposition increases and he added that documentation of the reason is needed in the documentation.
- The group recommended that in the text should be added that 0.8 and 1 with this table. Add in the documentation that is to implement the sensitivity of Wet Nitrate sensitivity as 0.8 and Wet Ammonium as 1 in the model with this table included.

DECISION: The WG approved the section of 3.1, and implemented the sensitivity of Wet Nitrate sensitivity as 0.8 and Wet Ammonium as 1 in the model.

12:30 **Blue Sky Flooding in Tidal Regions – Margaret Mulholland, Old Dominion University**

The combination of sea level rise and sinking coastlines in Chesapeake tidewater regions contributes to frequent temporary inundations of low-lying developed areas during exceptionally high tide events. Efforts being initiated to quantify the nutrient loads associated with blue sky flooding will be discussed.
Discussion:

- Dave asked difference in loading with or without blue sky flooding, and is this a timing effect? Marjy added that it is a timing thing. Norm added that the amount of time the water sits on the land is the key. Tom what is the typical duration and does it go beyond one tidal cycle. Marjy responded that typically three to four tidal cycle, and also depended on the water. Greg asked if there is any adaption efforts to against this. Marjy responded not yet because of awareness level is low.
- Lew asked if there is a mechanism to estimate the the loading per flooding and where we have blue sky flooding.
- Tom pointed out that this could be a negative co-benefits of living shoreline BMPs.
- Kacey added that Hampton roads USGS is actively monitoring 12 sites.

1:50 **Scenario Optimization Tool for CAST – Daniel Kaufman, CRC**

Danny will provide an update of the ongoing development and improvement of a CAST BMP optimization tool. A second Beta version of VICO will be reviewed and plans for a further Beta version in January 2020 will be discussed.
Discussion:

- Danny asked if the lower bound option would be preferable. Dave responded that this is a question for the jurisdiction.
- Bill added that dropping BMP is a necessary option for optimization as well if it would cost a lot more.
- James recommended keeping two optimization approaches available. James asked why used linear solution as an approximation for nonlinear solution.

- Danny responded that most cases linear solution is very similar to nonlinear solution except some very high load reduction scenarios.
- Gary added that the goal is to have the results that VICO returned to be exactly the same as CAST.

2:10 **Evaluating the Impacts of BMPs on Water Quality Using Privacy-Protected USDA BMP Data in a SPARROW Model -- Olivia Devereux, Devereux Consulting and Andrew Sekellick, USGS**

Olivia and Andrew will present preliminary results on the estimated influence of USDA BMPs on the water quality using the 2012 SPARROW Regional Model. The methods, results, and considerations for future work will be discussed

Discussion:

- Gary pointed out that the coefficient for point source is off and Scott confirmed that they need to investigate on this issue.
- Scott added that high VIF terms suggest correlation between the terms.
- James asked how this approach is capable of detecting a signal of BMP effects in stream monitoring data since this approach use SPARROW. Scott responded that the data we look at is the annual data in 2012 in SPARROW. It is an empirical estimate of the effect based on stream chemistry data. James asked if there is value in looking into broader scale of data.
- Jeremy suggested putting wetland into high impact category.
- George asked if there is a plan to investigate finer scale HUC and DC is currently investigateing the performance of BMPs at HUC 16 to flush out performance.
    - Olivia responded that NHD plus is a really small scale and there is no need to go to fine scale if the results are the same.

Meeting Participants:

Dave Montali
Gary Shenk
Isabella Bertani
Norm Goulet
Hassam Mirsajadi
Carlington Wallace
Cuiyin Wu
Lew Linker
Richard Tian
Gopal Bhatt
Danny Kaufman
Ariana Johns
Jeni Keisman
Olivia Devereux
Yeonjeong Park
Bhanu Paudel
Rebecca Murphy
Tom Schueler
Marjorie Friedrichs

Clifton Bell
Clinton Gill
Jesse Bash
George Onyullo
David Wood
Marjorie Zeff
Xie Xia
Mark Bennet
Ted Tesler
Bill Ball
Jeremy Hanson
Michael Carlo
James Davis Martin
Wes Stone
Muktar Ibrahim
Greg Bush
Scott Ator

Modeling Workgroup Quarterly Review

October 9, 2019

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

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

10:00 Announcements and Amendments to the Agenda – Mark Bennett, USGS and Dave Montali, Tetra Tech

10:05 Estimated Tidal Wetland Loss with Future Sea Level Rise – Carl Cerco, Attain

The approach used to estimate the influence of tidal wetland loss with sea level rise on nutrient and sediment loads will be reviewed.

Discussion:

- Raleigh pointed out the rate the sea level rise is not considered.
  - Lew added that in the model tidal wetland self incretion rate and rate of sea level rise are built into the model.
  - Carl added that he will go back to check the time scale.
- Norm pointed out that the developed areas may also included turf and grass which can be inundated. Most of coastlines is parks and residential which is classified as developed areas.
  - Gary added that developed area definition is from the national Land cover data which is more than 25% impervious areas.
- Dave asked for clarification for future analyses.
  - Lew responded that key scenario is 2025 other scenarios are for sensitivity test.
- Dave pointed out that for 2025 condition total wetland acreage is not too different, but Carl added that location of the wetland could change.
  - Lew added for scenarios beyond 2025 would be different.
  - Lew would ask for wetland workgroup for confirmation if they see increase in wetland acreage from monitoring.
- Mark added that CRWG expressed concerns with SLAM model. The concern is mainly with no consideration with local level subsidence, and sediment source that help wetland to keep up the incretion.
- James asked the date for 0 increase in SLR and the 0 increase in SLR in the model. Richard added that they are both in mid nineties.

DECISION: The WG approved Section 5.1.1 with the recommendation that changes be made to the documentation for clarity

- **Specify that the SLAMM scenarios end in 2100 which might tend to underestimate wetlands loss**
- **Developed land (NLCD developed with at least 25% impervious)**
- **Mention that there is future expected work from USGS**

10:30 Impacts of Sea Level Rise on Chesapeake Hypoxia: A Multiple Model Intercomparison Project – Lew Linker, EPA-CBPO

Lew will summarize the work Pierre St-Laurent (VIMS) presented last meeting on a multiple model intercomparison project will be presented comparing the WQSTM results to the results of other models with equivalent sea level rise (SLR) projections, as well as to evaluate them relative to what would be expected with theory.

Discussion:

- Mark commented that there is no fatal error in the Bay program model compared to other models.
- Marjy added that SLR is causing the bottom temperature to decrease, but Pierre is still looking into this. Pierre did additional analysis on the transect along the bay.
- Marjy summarized that the model is working reasonably well compared to other model.
- Larry asked if SLR is the only change to the model. Marjy confirmed.
- Dave asked about the final report date.
    - Marjy responded it is October 30th and Pierre is working on publication a manuscript.

11:00 Tidal Water Column Response of Temperature Under Climate Change – Richard Tian, UMCES

The simulation of the response of water column temperature changes under estimated future climate conditions will be described.

Discussion:

- Marjy pointed out from Kyle's result, the ocean temperature increases dramatically at the ocean boundary and even faster than the air temperature.
- She added next step is to perform more analyses at the ocean boundary. She added that new forcing product.
- Marjy commented the underestimation of warming of the surface water.

DECISION: The WG approved the section of 5.3.2.

11:30 IDF Curve – Tom Schueler and David Wood, Chesapeake Stormwater Network

Tom and Dave will provide an overview of work directed toward maintaining the resiliency of stormwater management and restoration practices with future climate change. The first year's work will lay the foundation for a multi-year effort by the Chesapeake Bay Partnership to develop engineering and management solutions to maintain and enhance the pollutant reductions from these practices.

Discussion:

- Gary added Susquehanna portion report will be coming out by the end of this month.
- Lew added that this is not a one and done effort.
- Norm agreed that it is a pilot project to get this effort started and sets a standard procedure for other parts of watershed.

1:00 **Potomac Tributary Assessment – Jeni Keisman, USGS**

An initial assessment of coastal plain nutrient and sediment loads and their influence on Potomac water quality will be presented.

Discussion:

- James suggested having a slide of how source changes associated with land use change.
- James added a bar for each category of percentage implementation of phase III WIPs.
- James suggested adding nutrient management as a grouping for urban and ag.
- Dave pointed out the adding the stream banks restoration.
- Dave asked if any of the context is related to wastewater. Greg agrees that wastewater is good story for implementation.
- James suggested instead of only having the beginning of 1985 but adding 2009 as a beginning of TMDLand mid point year and the most recent progress year makes most sense.
- Greg added that the narrative of 3-year dry year help SAV revive is an important part of the story.
- James needs information on revision on his management strategy, answering questions such as "what I have done" and "what I need to change". Tool as an adaptive management would be more important for jurisdiction reps. Focus on places that aren't doing great.
- Dave pointed out that the chla is degrading but if it is within the limit. Bruce suggested using "ecological significant"
- Larry added that for overall characterization of Potomac, put it in the context of the bay watershed.
- Bruce suggests adding SAV where plenty data are available. James suggests aiming at broader audience with elements such as healthy watershed added.
- Greg suggested when posted the pdf make the data sources accessible so that more investigation can be done from users end.
- Lew added that a possible comment from WQGIT may what kind of practices could get the phosphorous load under what level.
- Dave asked if the longterm plan is updating it every year? Jeni responded that the graphs are all done but the text part is very consuming

1:30 **Developing County Level Load Time Series – Robert Sabo and Emily Trentacoste, EPA, Qian Zhang, UMCES with Cuiyin Wu and Breck Sullivan, CRC**

A project that will develop county level time series of nutrient and sediment loads for all counties of the Chesapeake watershed will be presented.

Discussion:

Link to the factsheet here.

- Norm suggested to avoid talking to local government director and not publicizing at the county scale. Only show information that we have that are absolutely sure about. He added that instead of showing urban fertilizer but showing the acreage of turf grass.

- Lew recommended that having plenty explanation right next the graphs.
- James suggested the team communicating this work to LGAC, and LGWG.
- George suggested that scale is in the right direction but downscaling with climate change.
- Dave recommended showing the intro text to WQGIT and not showing the graphs.
- James commented that for VA, his county manager would focus more on urban nutrient management.
- Robert commented that once the intro paragraph is ready he would ask James and Dave to review the intro paragraph.

Meeting Participants:
James Davis Martin
Dave Montali
Marjy Friedrichs
Raleigh Hood
Rebecca Murphy
Greg Bush
Gary Shenk
George Onyullo
Ariana John
Carl Cerco
Mark Bennet
Hassan Mirsajadi
Muktar Ibrahim
Clifton Bell
Isabella Bertani
Norm Goulet
David Wood
Carlington Wallace
Richard Tian
Cuiyin Wu
Larry Sanford