Modeling Workgroup Conference Call
November 5, 2020
Thursday, October 22, 2020
9:30 AM – 12:30 PM

Event webpage:
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This meeting will be recorded for internal use to assure the accuracy of meeting notes.

AGENDA

12:30 Announcements and Amendments to the Agenda – Mark Bennett, USGS and Dave Montali, Tetra Tech

- The Water Quality Standards Attainment and Monitoring Outcome is going through the Strategy Review System. The Logic & Action Plan has action items the Modeling Workgroup will be interested in following for the next two years such as monitoring and analysis of co-benefits, nutrient limitation research, vertical profile of continuous dissolved oxygen monitoring, and the tributary reports.
- The Modeling Workgroup will host a joint meeting on December 9th with the Urban Stormwater and Climate Resiliency Workgroups focused on Chesapeake Bay climate change response and IDF development.
- Bruce Michael gave an update on the hypoxia report for the summer. They had the second least amount of hypoxia this summer on record, and only one cruise had above average hypoxia. This was the late July cruise, and it was the hottest July on MD record. Here is a Press Release from the Chesapeake Bay Program (CBP).

12:35 **Outline of Sediment Simulation in the Regional Hydrology Model – Gary Shenk, USGS.**
Overall development and approaches of the sediment simulation in the CBP Regional Hydrology Model (RHM) will be discussed.

Discussion:

- Lewis Linker asked if cover is going to be a vegetated canopy plus what is on the soil? How does it work in their application of RUSLE?
    - Gary Shenk stated the 10-meter model is a static model, so it has no seasonality. When it goes to the dynamic model, they vary the cover seasonally.
    - Lewis Linker followed up with asking if the 10-meter basis would be varied cover to fit the static cover on an annualized basis.
    - Gary Shenk agrees, but there is opportunity to think about it more. Peter will present on this topic.
- James Martin asked when they state RUSLE is it the revised or the revised version 2 that the NCRS recommends using.
    - Gary said it was explained to him that RUSLE has different versions, and they are always using the most updated version of the coefficients. RUSLE 2 is a piece of software.
- Lewis Linker said they have the stream delivery ratio and the reservoir effect for attenuating sediment so do they need to start putting in their plans information about local depressions. Peter Claggett said he is going to talk about it in his presentation.

1:05 **Generation and Transport of Sediment on the Land – Peter Claggett, USGS**
Approaches to simulating the generation of a sediment load and its subsequent transport on land surfaces to adjacent Chesapeake streams, rivers, and tidal waters will be presented.

Discussion:

- Lewis Linker mentioned there are so many ponds and many of them more recently could be stormwater ponds. He wondered if it would be overwhelming to capture what is stormwater and what is natural. He asked if one sorting mechanism would be using an old data set of stormwater management data.
    - Peter Claggett said it could be done, but he doesn't suggest it because they don't have a complete 1980 vintage set.
- Gary thinks there are brand new data sets, and they are not going to be able to do the best job of understanding what they mean right away. It may be a decade or more of understanding it and incorporating it. In the next few years, it will be their job to figure out what the data means for the things they are trying to

predict and how can they make the best estimates in the time before releasing a new version of the model.

  - Peter Claggett said it would be helpful if the workgroup identified areas using tools they already have where they might be off. They can then use the higher resolution data to hopefully explain what they see in monitoring data.
  - Gary Shenk said rather focusing on one area, they will look holistically at a model if it is relating watershed characteristics to delivery potential or other hydrologic characteristics.
  - Lewis Linker said there is new information, and they know there are local areas of catchment like a pond or wetland that are a point of capture for the sediment and nutrients. They will need to make generalized estimates.

- Guido Yactayo stated to Gary Shenk that he shares his concerns about satellite-derived products. They are getting better and finer. Unfortunately, they cannot say the same about monitoring. He asked how they are going to calibrate the new thousands of segments for hydrology, sediment, and nutrients. He believes there is not a comprehensive monitoring program in the CB watershed that monitors small tributaries, not where they are increasing resolution. Monitoring should be discussed in future meetings.
  - Gary Shenk responded that Guido is correct that they don't have small-scale monitoring to calibrate at the fine scale. Models like SPARROW use spatial statistical modeling using relatively sparse monitoring data to infer the effect of different sources and landscape features on loads. Perhaps they can develop statistical models that, for instance, relate observed hydrograph peaks to the density of ponds in the watershed. They could then use that information to develop calibration metrics for a process model.
  - Guido responded it is always good to hear they have a plan. He's sure they'll see more on calibration and monitoring in the future.
  - Gary said more like a plan for a plan. Got to figure out how to get it done.
- James Martin asked if any of the methods help identify areas of legacy sediment and increase potential yields from those areas.
  - Peter Claggett said Greg Noe will cover this with a tool called FACET. It has potential to identify areas of stream incision and trenches.
- Lewis asked if the Verification Workgroup was interested in this information.
  - Peter Claggett said they are interested in the information about impervious surfaces and removal, tree planting, and riparian buffer restoration.

- Dave Montali stated the work being done to identify the chicken houses may help the Verification Workgroup. Dave asked if someone could get a data file of the chicken houses.
    - Peter Claggett said yes. It will be done next summer.

1:45 **Sediment Fate and Transport Simulation in Rivers and Streams – Greg Noe, USGS**
Estimates of the interaction of channel and floodplain erosion and aggradation will be presented and a path forward to the simulation of sediment fate and transport in the Chesapeake watershed will be discussed.

Discussion:

- For the graph of USGS Chesapeake and Delaware Floodplain Network: long-term bank and floodplain fluxes, Lewis Linker asked how much variation would be seen in the river depending on the sample.
    - Greg said there are moderate amounts of variability everywhere, even sites that have low floodplain deposition. They stratified the measurement locations within each site to encompass the geomorphology of the floodplain. He stated the standard deviation is moderate to high, but they averaged it out for the presentation.
- Greg Noe said they can make sediment budgets of any of the NHD catchments and drainage areas of the Chesapeake.
- Lewis Linker asked if Emily Trentacoste and Jeni Keisman knew about this graphic because they are doing outreach to watershed groups. He asked if it is straight forward to create the graphics, and what is the status of this type of outreach?
    - Greg Noe said from the graphic side, it was hand made through PowerPoint so they would need code to mass produce it. They need to communicate the availability of these outputs. All the metrics they predict are publicly available on ScienceBase. It would be beneficial to have a collaborative effort to create graphics for this information. He also mentioned that Emily Trentacoste and Jeni Keisman are not aware of how far along they are in the project so he asked Lewis to share it with them.
- James Martin asked if they implement best management practices that reduce the upland erosion and reduce the stream bank erosion, do the other variables stay constant?
    - Greg said no, but there is not a dynamic model to do that yet.
- Carl Friedrichs said stream bank erosions always occur to some degree so why are they suddenly getting really wide now.
    - Greg said every stream isn't getting wider. Also, streams go through natural background rates of bank erosion, one bank erodes, and one

bank will deposit so they are in balance. In the past 100 years in the Chesapeake, they are widening where there is agriculture and development upstream with changes in runoff process and sediment loading. He stated the streams are out of equilibrium now because of land use changes.

- Lewis Linker asked if there is anything missing to move forward with what he is presenting to get a sediment calibration.
    - Greg Noe said one thing missing from their sediment budget is the effect of reservoirs and ponds. Reservoirs on streams and rivers is not currently included in the budget. There is a need to include more ponds in the uplands in the modeling approach. The next biggest issue is hydrographic scale. People can download NHD2+ scale 1:100K, but if they wanted high resolution, his random forest predictions would have to be completely redone for that scale.
- Gary Shenk said they need to know the sensitivity to scenarios. He commented that if the land use is changed but there is no prediction on how the morphology would change in the model than maybe he would only get half the story for scenarios.
    - Greg Noe said he thought about it, but it wasn't implemented because they didn't have a way they felt comfortable with to integrate such a dynamic model.
- Lewis Linker asked if Reservoir Managers knew about this information.
    - Greg Noe only to a degree due to their partners at the Smithsonian.

2:30 **Putting It All Together – Gopal Bhatt, Penn State**

Putting together the various elements of sediment simulation into an approach for the fine scale simulation of erosion and sediment transport with an eye toward extending the approaches to a fine scale nutrient simulation will be reviewed.

Discussion:

- Lewis Linker commented they have a Chesapeake hydrology from 1991 – 2000 and that is the average hydrology decisions are made on in the Bay. The '91 – '20 sets the hydrology for the static model, and it sets the 10-year loads. The '93 – '95 sets the targets. Could they address the problem of dated hydrology by adding more years? Could they have a static hydrology from 1991 – 2010?
    - Gopal Bhatt said it is a tough question for him to answer because there are some management issues to it. From a static model point of view, if they understand what the relevance of hydrology on the nutrients is, they can develop relationships between different hydrology conditions. If

they have a hydrology response for a longer period, they can downscale the nutrient response to a smaller scale.

- Lewis Linker asked if there were any roadblocks for working on this effort.
    - Gopal Bhatt said for the hydrology and the sediment he does not see any roadblocks. He said there are a lot of pieces to put together, but the roadmap ahead looks good.
- James Martin stated it seems these changes are significant changes to the modeling framework so he asked if these types of changes should be changes in CAST versus phase changes in the model.
    - Lewis Linker said phase changes are appropriate for it.
    - Gary Shenk and Dave Montali agree that it would be a phase change as in Phase 7 model.

3:00 ADJOURN

Participants: Breck Sullivan, Dave Montali, Gary Shenk, Lewis Linker, Gopal Bhatt, Peter Claggett, Greg Noe, Isabella Bertani, Arianna Johns, Bhanu Paudel, Bruce Michael, Carl Friedrichs, Cassandra Davis, Cathy Wazniak, Lisa Beatty, George Onyullo, Gregorio Toscano, Guido Yactayo, Karl Berger, KC Filippino, Kyle Hinson, Marjorie Zeff, Mukhtar Ibrahim, Neil Kamal Ganju, Norm Goulet, Richard Tian, Sebastian Hernandez, Ted Tesler, Richard Tian, Sam Merrill, James Martin, Denise Wardrop, Chris Spaur