



## Integrated Trends Analysis Team Meeting

June 1, 2015, 10:00AM-3:00PM

Location: USGS Water Science Center, Conference Room A

5522 Research Park Drive, Baltimore, MD 21228

Event webpage: <http://www.chesapeakebay.net/calendar/event/22725>

**As a reminder, presentations and presentation topics are posted to the ITAT webpage. The speaker has the option to include whatever portions of the presentation that will be shared.**

### **Lessons Learned from Comparing Watershed Model Results with Observed Trends in Load – Joel Blomquist, USGS**

#### [Attachment A](#)

- Joel began by reviewing a comparison of observed changes at nine river input monitoring stations using WRTDS with outputs from the CBP Watershed Model (WSM). This was done to better understand the uncertainty in the estimation of these loads, evaluate changes, and hopefully elucidate some of the drivers of observed changes.
  - The comparison used WRTDS flow normalized loads for the period studied.
- There is relatively little uncertainty in comparing streamflow and the graphs of constituents look similar to results found when completing SPARROW analyses. The standard deviations of different constituents between the two models are remarkably similar.
- How well do the mean fluxes for the calibration periods of the two modeling frameworks compare?
  - For nitrogen, there is a range of  $\pm 24\%$  in the load prediction of WRTDS with WSM loads, and there are much lesser variations for both phosphorus and sediment. It is a challenge to do direct load comparisons with an individual site prediction of loads between the two models, but does not preclude studying the trends in load at particular sites.
- The total yield changes and loads delivered for the output of the WSM and the WSM with BMPs were also compared with the WRTDS expected output.
- Further work reviewing changes in phosphorus are being studied using long term data.
- Since 2008, all of the largest peaks of flow have been captured at Marietta, with the exception of the peak of Tropical Storm Lee, due to safety concerns. However, several samples were taken in the immediate aftermath.
  - The intent in this work is to address missed sampling like this occasion, by bringing in the two competing hypotheses, possibly through the workshop format offered by ITAT.
- Additional comparisons of source sector load drivers for different rivers were shown for the different time periods under study.
- How are changes in atmospheric deposition taken into account?
  - In this case, the CBP modeling team provided model runs with actual atmospheric deposition rather than a standardized value. This was incorporated into the progress with BMP scenario, so it was not separated out in the comparison which will require further work.
- **Follow Up:** More work needs to be done on the Susquehanna River to tell a story that better encompasses the effects of the entire watershed and is not limited to only explaining impacts of the Conowingo. There is also a need to better determine if the outperformance in the

Susquehanna watershed load of nitrogen reductions are driven by atmospheric deposition or if the drivers are manifold.

## **Decade-scale patterns and trends in the transport and transformation of oxygen, carbon, and nutrients in Chesapeake Bay – Jeremy Testa, UMCES**

### **[Attachment B](#)**

- Jeremy presented findings related to changes in Chesapeake Bay hypoxic volume, linking seasonal and regional shifts with long-term trends.
- There is an emphasis that a tool is needed to examine both transport and transformation trends, done through a box model, which is essentially a diagnostic, mass balance calculation accomplished by dividing up the Bay into nine regions and performing salt and water balance.
- The box model allows for a diagnosis of the bay on both seasonal and regional scales.
  - Volume-weighted Box concentrations can be used to compute total chlorophyll, nutrients, and oxygen regionally and bay-wide.
- Analyses using this tool indicate that there may be a late summer oxygenation trend, as evidenced by increasing bottom-water oxygen and nitrate (and perhaps nitrification) during the august to September period, and reduced ammonium concentrations. These trends are supported by box model-computed net nitrate and ammonium production rates.
- In terms of integration, is there something that from a flow or loading perspective could be done to look at coincident changes? How to dig into a shift in the loading perspective, question from Joel
- When thinking about carbon budgets, are carbon loads from the watershed an important part of the story?
  - Not really, some model simulations have been completed where DOC loading has been altered significantly but the response in oxygen levels of the mainstem Bay has not varied much. This could potentially be due to particulate carbon getting tied up with ETM in the upper Bay, but there is still a possibility that DOC could have significant local impacts in the tributaries.
- Participants should also keep in mind opportunities to share past and current research that may be tied to the work being completed by ITAT.

## **Reduced Complexity Models as an Alternative Approach for Ecosystem Analysis – Mark Brush, VIMS**

### **[Attachment C](#)**

- Mark showed recent examples of work being done regarding estuarine responses to nutrient loading, climate change, restoration, and agriculture.
- Box models have been staged online, and can be run very quickly.
- Work has been done to develop with a reduced set of biological parameters and state variables while utilizing spatial resolutions through box models discussed by Jeremy. This essentially defines the reduced complexity intermediate model.
- Several methods were used to ensure that outputs of the reduced complexity model matched well with the results from more complex models.
- Papers can be sent out to ITAT members who are interested in further details.
- Mark also discussed several cross system comparisons made with points along the East Coast and the York River, and also reviewed climate scenarios for the York River.

- These cross-system comparisons can be completed fairly easily, and outputs can be completed with oyster restoration efforts, clam aquaculture, and other details.
- The online model runs in a matter of minutes, and support easy user inputs that produce simple comparative graphs in the output.

### **Linking Nutrients, Algal Blooms, and Impairments in the Tidal Fresh Segment of the James River Estuary – Paul Bukaveckas, VCU**

#### [Attachment D](#)

- Paul outlined some of the issues facing the James River Estuary associated with persistent elevated chlorophyll values, and the fate of increased algal production
- Responses to declining nutrient concentrations have been seen, though responses in algal abundance have yet to definitively materialize.
- A box model output was also outlined for determinations of nutrient retention.
- Appreciable amounts of particulate nitrogen and DON are found in the warm seasons in the James. Much of what is being retained does not include the dissolved inorganic fraction.
- The model also considers biomass removal by grazing in order to better quantify the nutrient attainment rate; with less grazing, a lower nutrient cap to reach attainment is possible and a lesser amount of nutrient reduction is needed to reach the target. What is the total grazing loss to all consumers of the system?
  - There are not sufficient numbers of planktivorous fish in the system to effectively remove the chlorophyll content associated with algal populations in the James River.
- A study commissioned by the Commonwealth of VA is assessing (in addition to other points) whether current chl-a standards are protective of aquatic life designated uses.
- Almost all cases involved a co-limitation of nutrients (N and P), and possibly a quarter showed limitation by nitrogen alone.

### **Delmarva Whole System Regional Conservation Partnership Program (RCPP): From Field to Stream – Kathy Boomer, TNC**

#### [Attachment E](#)

- Kathy discussed key knowledge gaps affecting the capacity to make decisions about watershed management, highlighting ideas about collaboration and how to address those knowledge gaps.
  - The framework through which this was discussed was the recently provided by the NRCS Regional Conservation Partnership Program. There is a long list of partners that TNC is working with on this project.
- Management actions being taken include infield actions, wetland restoration, and riparian buffers, among others.
- The model being used identifies points that could be home to management actions, assesses the quality of sites, and provides a performance assessment of nutrient reductions.
- As opposed to random implementation of BMPs, targeted implementation with the modeling tool suggests that approximately 30% of the TMDL reduction goal could be met with management actions that it selects.
- Further work will hopefully foster collaborations that examine the tool as it compares to models apart from the CBP WSM.
- The work to align research of management actions is intended to advance a more synthetic understanding of how agricultural BMP performance varies both spatially and temporally.

- How is the information passed on from NRCS down to a field level and then moved to those that implement management actions?
  - The most promising strategy involves partnering with agribusinesses, who farmers were shown to trust most according to a survey conducted in the Midwest. Conservation groups were shown to be the least trusted group. Once a couple of landowners adopt practices, others are likely to follow as well.
- The timescale of the simulation efforts will be three years (the length of the project) with opportunities to renew. There is a need to leverage modeling efforts that are already developed.

### **Synthesis Workshops Explained**

- The goal of the proposed synthesis workshops is to bring people together, understand what studies are being undertaken, and identify opportunities for synthesis that better explains observed trends across the watershed.
- The ITAT leadership is looking for specific workshops that can also be directed to other groups for collaboration opportunities
- Topics are needed that are very relevant to current management needs.
- A proposed topic would be focused and would not exceed ten people for a specific choice of study. Commitment from participants is needed to see the project through.
- The central idea of the workshop is to really explore and understand trends to inform system response for management actions.
- A high value is placed on topics that emphasize TMDL related management trends work and 2-3 teams would be the launching point.
- Should topics address a short term need or work on taking on a long term project?
  - It is a good idea to select topics that can provide some quick output, but may not preclude tougher topics that would take greater time commitments to produce some sort of response.
- Cost of hotels, facilities, travel, and per diem would be covered as well as other potential funding needs to get past barriers (i.e. data storage, GIS needs, and other unanticipated costs)
- Short term projects could involve the MPA. Hybrid approach for short and long term anent the MPA
- All ITAT participants should add Jeni Keisman and Kyle Hinson to all correspondence concerning workshop ideas with the ITAT chair and vice chair.
- The intent of these workshops is to not only share the work that has been done by workshop participants, but to produce real output as a result of the workshop
- Suggestion about examination of 45 years of SAV trends
- It is also important to include a diverse array of workshop participants that cross multiple agencies and are involved with management actions.
- The proposal document is to be out by early July, and a deadline for proposals will be set for the end of July. An anticipated first workshop would be held in the fall.

### **Wrap-Up**

- For all those who wish to share their work regarding trends, please reach out to the ITAT contacts so that the work can be shared with those not specifically working in their own fields.

### Participants

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