Scientific, Technical Assessment and Reporting (STAR) Meeting

Thursday, November 21, 2019
10:00 AM – 11:30 AM

Conference Line: 929-205-6099 Meeting ID: 215-666-475
Webinar*: https://zoom.us/j/215666475
Meeting Materials:
https://www.chesapeakebay.net/what/event/scientific_technical_assessment_and_reporting_star_team_meeting_november_20
Location: Fish Shack
*If you are joining by webinar, please open the webinar first, then dial in.

AGENDA

Topic:
Bay habitat forecasting applications and coordination strategy on reporting habitat status (e.g., hypoxia)

10:00 **Welcome, Introductions & Announcements – Bill Dennison** (UMCES) and **Scott Phillips** (USGS)- STAR Co-Chairs, **Peter Tango** (USGS) and **Emily Trentacoste** (EPA), STAR Co- Coordinator

Upcoming Conferences, Meetings, Workshops, & Webinars-

- Maryland Water Monitoring Council Annual Conference, Dec 6, 2019. Linthicum, Maryland.
- Turning a New Leaf Conference, December 6, 2019. Harrisburg, PA
- Ocean Sciences Meeting, February 16 – 21, 2020. San Diego, CA.
- National Watershed and Stormwater Conference, April 14-17, 2020, Austin Texas
- Chesapeake Research Symposium (ChesR20), June 8 – 10, 2020.
- The National Conference on Ecosystem Restoration (NCER), August 2 – 6, 2020. Portland, Oregon.
- World Seagrass Conference & International Seagrass Biology Workshop, August 9 – 14, 2020. Annapolis, MD. Session and Workshop abstracts due December 1, 2019.
- The National Coastal and Estuarine Summit, October 4 – 8, 2020. Providence, RI. Call for Proposals opens in January 2020.
- A Community on Ecosystem Services (ACES), December 14-17, 2020. Bonita Springs, FL.

Announcements:

- Peter Tango gave an update on the Hypoxia GIT Funded Project. The sensors were not available to get out in the Bay so there will be a spring deployment.
- The Chesapeake Research Symposium sessions are due the day after Thanksgiving, November 29th. Please email Shirley Chu (shirley@greenfinstudio.com) for a week extension to Friday, December 6, 2019.
    - Scott asked if anyone was putting in a proposal.
        - Bill Dennison is submitting one for Science Communication.
        - The Modeling team is submitting one for a topic around next generation of models.
    - Scott is going to reach out to the Fisheries GIT to see if they would like to submit a proposal to connect to the new natural resource work USGS is doing.
    - Renee is working on a proposal that connects the healthy watershed metrics to stream health and how these relationships are being shown in the modeling and monitoring efforts.
        - Renee encourages staffers to think about how their work relates to any of the proposals submitted.
    - Gary asked Scott if USGS was putting in a proposal. Scott said he would need to check.
- Bill Dennison announced they completed the SAV factsheets which was part of the two-year SAV synthesis effort.
- Bill highlighted the "The Word's response to climate crisis: A roadmap for the future," event on December 3rd where four ambassadors from Europe are coming to Institute of Marine & Environmental Technology (IMET) to talk about climate change. Later in the evening, the movie "Paris to Pittsburg" will be showing. Registration is required for both events.
- Stuart Clark will be starting at UMCES as the Vice President for Strategic Initiatives.
- Bruce reminded everyone about the Water Monitoring Council on December 6th. The theme this year is "Where we've been, and where we're going."
- Megan Ossman, Habitat Goal Implementation Team staffer, worked on an analysis last spring while at Duke. She looked at the projected effects of climate change resulting in increased stream flow in the Southern Appalachian region, particularly in areas with a high density of mountain-top coal mining operations. An article based on this work was published in the Charleston Gazette.

Primary Topic: Reporting Hypoxia: It's all about The Dead Zone - Peter Tango (USGS)

In light of discussions today, recognize the state of a CBP communications strategy on communicating hypoxia, habitat condition and The Dead Zone. How

do we update our approach to meet public information needs? This will be discussed at a near-future STAR meeting.

Today's STAR meeting theme is about hypoxia forecasting and how outputs of forecasting may be used to improve fish and other living resource habitat condition assessments. Key questions:

1. What are the applications of these models and forecasts to fish and habitat decisions?

2. Are there enhancements that could be made to improve their utility for fish and habitat?

3. Are the specific applications of the models and products applicable to the Fish habitat assessment project?

4. Are there products that could be useful from the models for other workgroups?

Action: Following-up from today's discussion will set the stage for a meeting on coordinating a communications strategy for the Chesapeake Bay Program regarding the many hypoxia forecasting and nowcasting results given nearly year-round interest by the public in the condition of the Dead Zone.

10:10 **Hypoxia Forecast – Jeremy Testa** (UMCES)

Various partners and individuals within the EPA and academic institutions have made a forecast of the anoxic volume during two summer periods in Chesapeake Bay over the past decade. These forecasts have been combined with mean July hypoxia forecasts as part of a package of forecasting, web-based supporting resources, and a summer review of the forecast skill.

Three models have been used to forecast summer hypoxia and anoxia in the Chesapeake Bay from University of Maryland Center for Environmental Science (UMCES) which results in three forecast – July, early summer (June – mid July), and late summer (mid July to September). All models forecast hypoxia and/or anoxia based on winter – spring nutrient inputs. The anoxia models are regression based, and the hypoxia model is a modified oxygen sag model. IAN created a website for this information (https://ian.umces.edu/ecocheck/forecast/chesapeake-bay/2017/), but it has not been maintained for the past couple of years. NOAA initially gave funding to Bill (UMCES), Jeremy (UMCES), and Don (University of Michigan) to operationalize the Chesapeake Bay forecast, but NOAA dropped this and focused on the Gulf. The lack interest in the seasonal forecast by NOAA allowed the Chesapeake Bay Program partners to pick it up.

The timeline for these forecasts starts in early June with USGS providing the load data. Within 1 – 5 days later, UMCES and University of Michigan can generate forecasts. Then a press release is written, edited, and approved by participating agencies within approximately seven days.

A student at UMCES went through the news archives and quantized the news articles that mentioned hypoxia and forecasting. The amount of mentions in media have increased over the years. UMCES is having an impact of getting the information out to the public. However, there is a non-trivial amount of time devoted to media interviews in the week following the press release which can be a burden to those that do not have the time built into their schedule.

Jeremy stated there are multiple forecasts released. They have not contradicted themselves, but a single seasonal forecast may be better than multiple ones.

He also mentioned they used to do a "Summer Review" of how the forecasts played out. They saw this as a teaching and learning moment. It received far less attention than the forecast.

Kristin asked if the "Summer Review" was promoted in the media. She feels the review is to make sure the models are working correctly, but for the public they are assuming since it is based on science that the model information is right. Jeremy agrees that they didn't publicize the review as much as the forecasts. They used it more to check on the forecasts and to help explain what happened that the forecasts could not predict which speaks to the other factors that drive hypoxia.

10:25 **Short – term Hypoxia and Habitat Forecasts for the Chesapeake Bay – Marjy Friedrichs** (VIMS)
Marjy will present on the short-term (2 -3 days) hypoxia forecasts.

The short-term forecast is essentially a forecast of the habitat in the Bay. Stakeholders such as commercial fishermen and charter boat captains are interested in these short-term forecasts because poor habitat and low fish catches occur where DO is less than 3 mg/L. The funding for these forecasts currently comes from the Acidification Program within NOAA so they are working with hatchery operators to provide an early warning system for poor water quality. The model system to produce the forecasts, Chesapeake Bay Environmental Forecast System (CBEFS), is an implementation of ChesROMs with atmospheric forcing, riverine inputs, and coastal fluxes. They use two models, Simple Respiration Model and Estuarine Carbon Biogeochemistry model, and then use the mean result for the hypoxia forecast. The model runs every night to produce a nowcast (midnight) and 2-day forecast. The forecasts are displayed on the VIMS website

(https://www.vims.edu/research/topics/dead_zones/forecasts/cbay/index.php) and are easily viewable on phones because fishermen said they needed to access it while on the boat.

Marjy showed a Nowcast right before Hurricane Michael hit the Bay in October 2018 and a Forecast after the hurricane hit. The predicted forecast came true which shows how the short-term events can have a big effect on the hypoxia in the Bay which are often missed by the monthly and semi-monthly monitoring cruises.

Along with bottom oxygen, the forecasts also show bottom pH, bottom alkalinity, and mega forecasts. They also provide some zoomed in maps for particular tributaries.

Marjy and her team have reached out to stakeholders to get feedback on the forecasts and the ideas they plan to move forward with include adding the ocean side of the eastern shore, adding food availability and quality (HABs), showing climatological information, displaying depth where 3 mg/L occurs, and providing higher resolution in specific areas of interest. To improve on climatology, they have added a timeseries. Users can also see a depth profile at stations or maps of it to show where good habitat is located in the Bay.

Bill stated that Marjy showed depth at 3 mg/L and Jeremy had just showed 2 and .2 mg/L. He was wondering what was the rational of 3 mg/L. Marjy said 3 mg/L correlates to fish habitat because no one will find fish below 3 mg/L.

Peter asked if the Nowcasts and Forecasts are saved. Marjy said they do save them.

10:40 **Seasonal Hypoxia Forecast – Isabella Bertani** (UMCES)

Overview of one of the models used to generate seasonal forecasts of hypoxic volume in the Chesapeake Bay and proposed model updates in preparation for the 2020 forecast.

Isabella went over the University of Michigan model used to generate the seasonal forecast for the Chesapeake Bay hypoxic volume for only mid July. The model was adapted by the Streeter-Phelps Model for the Chesapeake Bay by assuming that the Bay is a big river and the Susquehanna is a point source of load. The model only has one driver which is the average load from the Susquehanna between January and May. Of course, the Susquehanna is not the only source to the Bay, but for the purpose of using a simple model, the Susquehanna represents a statistical proximation of the year to year variability of the overall load to the Bay. The load gets converted to an amount of carbon of

organic matter by using a Redfield Ratio, and then the organic matter is converted to biological oxygen demand. The model is calibrated to predict the average the July hypoxic volume which consists of the two monitoring cruises that happen in July as observation data. The model output is a longitude profile of dissolved oxygen concentration downstream of the Susquehanna and to convert that to hypoxic volume, the hypoxic length is calculated as the sum of all the segments where dissolved oxygen is predicted to be below 2 mg/L. Then an empirical relationship based on observation that relates hypoxic length to hypoxic volume is used to obtain the final output of hypoxic volume.

Along with the forecast a graph showing the track record of how well the model has done over the years is provided. For most years, the observed is within the 95% confident intervals of the model prediction. In the graph presented, the red bars indicate years where there was an extreme weather event affecting the hypoxic volume which the model could not have predicted because again the only driver is the load from the Susquehanna.

This year it was decided to revise the model before June 2020 because they have noticed using the calibration target of July will make the model fail if there is any weather disruptions. They are considering recalibrating the model by using different metrics of hypoxia such as summer average hypoxia or total hypoxia that enables them to compare between other models like the one Jeremy uses with UMCES. Another revision they are considering is incorporating multiple sources of information because there are multiple estimates of hypoxic volume available, both from observations and 3D models. As mentioned, the model is based on data from January to May, but based on recent analysis, other periods may be relevant to influencing hypoxia. As a result, they will try running the model with different periods. Also, they would like to include other nitrogen sources besides the Susquehanna to hopefully improve the model.

10:55 **Provision of Loading Data – Joel Blomquist** (USGS)
Joel will discuss the loads used to support the forecasting.

Joel's goal is to supply the estimates for the forecasts and provide the data that continues the exploration of the relation between inputs and responses. Things that control tributary nitrogen flux in any given year are total streamflow, timing of runoff events, location of events, and management actions. In the past, they used a simple estimator model based on a nine-year modeling window using time, discharge, and season. On an annual basis, they would take the new flows and use the proceeding nine-year model to predict that spring's fluxes. They now use the WRTDS model which is locally weighted on time discharge and season. In addition, the calibrations are from recent observations. The output is a time

series of the nitrogen load for the springtime period over many years with information on the daily observations and monthly summaries.

For the past five years, they have had a nitrate and turbidity sensor out to collect a 15-minute increment direct measurement of flux from the Susquehanna Potomac. It improves accuracy and helps to solve uncertainty related to storm tracks because storms from the north affect the load flux differently than a storm from the south.

In the future, they would like to include additional tributaries and add models for the unmonitored areas. One of their high priority next steps is to incorporate major wastewater loads because the long time series of wastewater have improved due to upgrades in treatment plants, but this not reflected in the modeling systems.

Bill asked what caused some of the variability on the real time sensored nitrate concentration graphs Joel presented. Joel stated nitrate is normally a dilution signal for events, and ammonia and organic nitrogen becomes mobilized with storms. As a result, there is competing changes in concentrations. The advantage of these instruments is that they can explain stories with continuous monitoring that cannot be explained with discrete monitoring.

Bill also stated that Isabella is looking to expand from January to May. Joel stated that they provide everything, so the data is available.

11:10 **Habitat Forecast – Bruce Vogt** (NOAA)

Bruce will discuss the linkage from the forecasts to fish and habitat needs. He will bring in references from ongoing research done by NOAA and the Fish Habitat Assessment work. He will also touch on building climate change scenarios and expectations for how that will affect hypoxia.

Bruce was unavailable due to health reasons, so the group started a discussion on a linkage from the forecasts to fish and habitat needs.

Aarron stated he is also working with VIMS to create fish habitat models and using the models to map and quantify the amount of fish habitats spatially throughout the Bay.

Bill asked if the model would extend into the shallow waters. Aarron said he doesn't think the model would be able to do that because it doesn't have the resolution to capture the shallow water diel-cycling hypoxia.

Marjy also commented that they have striped bass habitat available on their weblink. They do not advertise this information as much because it is not a

publicized model, but it tells based on salinity, temperature, oxygen, and other parameters where the good and bad striped bass habitats are in the Bay.

Kathy Boomer stated her concern with the resolution of the work being done because most of the work is done on the mainstem of the Bay, but there an increasing demand from the community in how the sub-estuaries and small tributaries are influencing habitat conditions.

Jeremy mentioned that using the shallow water data is a missed opportunity. He is hoping that the STAC proposal he is currently working on to look at the shallow water oxygen data to understand the prediction of the diel hypoxia may be useful in the future.

Tom Parham described some of the work MD DNR is doing. They are using their monitoring data and interpolator, and based on habitat thresholds, calculating the volume of areas suitable for species over a long period of time. They understand there is a lot of missing research for knowing the actual threshold for species, so they are using the result of fishing reports to verify that species are in certain areas.

11:25 **Communication strategy planning for reporting Hypoxia: Forecasts and Nowcasts. It's all about The Dead Zone - Peter Tango** (USGS)
Peter will circle back to the primary topic of the CBP reporting hypoxia.

11:30 **Adjourn**

Next Meeting Dates: TUESDAY, December 17, 2019, 9:30 AM – 12 AM

Participants: Rebecca Murphy, Marjy Friedchrichs, Arron Bever, Liz Chudoba, Olivia Wisner, Tom Parham, Joel Blomquist, Jennifer Starr, Bruce Michael, Peter Tango, Olivia Wisner, Scott Phillips, Morgan Corey, Mindy , Greg Barranco, Jennifer Greiner, Julianna Greensberg, Renee Thompson, Megan Ossmann, Kristin Saunders, Rebecca Chillrud, Isabella Bertani, Gary Shenk, Cuiyin Wu, Breck Sullivan, Jeni Keisman, Qian Zhang, Yeonjeong Park, Jeremy Testa, Kathy Boomer, Richard Tian, Sally Claggett