Criteria Assessment Protocol Workgroup

November 18, 2020
1:00 p.m. – 3:00 p.m.

Webinar*:
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Meeting Materials:
https://www.chesapeakebay.net/what/event/criteria_assessment_protocol_workgroup_november_2020_meeting

Location: Conference Call

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

Action Items

- ✓ Peter Tango will work with Tish Robertson before the next meeting to prepare her material and work on the outline for the path forward on who needs to be involved or approve it.
- ✓ Matt Stover will come back in the spring to follow up on the discussion.
- ✓ Peter Tango will give his presentation on the STAC proposal for developing a recommendations for adoption to advance Bay water criteria monitoring and assessment at a future meeting.

AGENDA

1:00 **Welcome, introductions & announcements** – *Peter Tango, Chair Criteria Assessment Protocol workgroup, USGS@CBPO*

• Maryland Water Monitoring Council Annual Conference, December 3 – 4, 2020. Virtual. Free registration by November 25th at noon or until they meet their capacity, whichever occurs first.

• National Monitoring Conference, Providence, R.I. April 20 – 22, 2021.

Bruce Michael recently had a conversation with the fiscal officers, and they are hoping the Conowingo Settlement Agreement gets approved soon by FERC. If it

does there will be funding for bay restoration and freshwater mussel propagation. Mussels are not approved best management practice from the CBP, but it is something the agreement calls for in it.

Tish Robertson commented on Designated Use revision for Segments CB6 and CB7. In Virginia, there is empirical evidence to shift the current boundary of the deep-water use. It goes a little into CB6 and CB7, and they think it should be lowered down a bit more to include areas that are deep, hypoxia, and underdo strong stratification. Tish said she does not really know the hierarchy for this issue. She knows that she wants CAP to look at the data she has gathered at a meeting. In VA, they would need to adopt something in their regulation if there was a use change so that they could reference it. Lewis Linker suggested an addendum to the CBP Water Quality Standards on changing the designated use.

Peter Tango will work with Tish Robertson before the next meeting to prepare her material and work on the outline for the path forward on who needs to be involved or approve it.

1:10 **Dissolved oxygen Criteria and Climate - Do criteria need to change as a function of temperature increases in our region? An initial discussion - Peter Tango (USGS)**

Water temperatures are rising in the bay. Temperature affects dissolved oxygen saturation which relates to oxygen resources available to aquatic life. The Modeling WG scenarios with future climate projections have shown temperature is the largest climate factor influencing attainment of water quality standards. A question has been raised as to whether we need to consider climate-adjusting DO criteria. An initial discussion here should reflect on how dissolved oxygen criteria were established and give consideration on impacts of changing criteria associated with the TMDL.

Climate has many influences on the Chesapeake Bay Watershed such as sea level rise, rise in temperature, and an increase in precipitation. Multiple assessments show water temperature changes in the Bay and all show evidence in rising water temperatures. Recognizing the momentum of the rise in temperature, and what is happening with the shifts occurring in assessing temperature, Peter raised the question of if the Chesapeake Bay water quality criteria should be adjusted for shifting temperature (and other important) baselines?

The Chesapeake Bay currently has criteria for dissolved oxygen set up for multiple species. This criteria may be different to change because temperature is built into defining designated uses. There are four most sensitive species that drive the DO needs for threshold setting. The criteria setting process relies on species DO needs. Unless a sensitive species goes extinct, there is no living

resource basis for changing DO criteria. There are also temperature influences on SAV, water clarity, and chlorophyll-a (CHLA) which may require adjustments to those criteria. Warmer temperatures are introducing new species which may have different light requirements or backfill where other species once occupied. Warmer temperatures also prevent water from mixing, allowing algae to grow thicker and faster.

Lewis Linker asked what are the four key species. Peter said he recalls sturgeon and striped bass. He does not recall the other two. The four species have the greatest influence on the criteria setting. They seem to be sensitive to the DO/Temperature squeeze. The challenge is that they are setting criteria in the estuary which is an ever-changing system with species that are adaptive.

Gary said it is a good point that the species in the estuary will remain in the estuary. Gary said the species are more sensitive to the percent saturation than the absolute concentration which will be influenced by temperature. Peter said they haven't proposed that as an alternative. Gary stated it would be a major change to percent saturation, but because of the rising temperature, the fish are reacting to DO levels differently. The DO criteria would than change based relative to the change in percent saturation. Tish asked if the modeling team could look at percent saturation in conjunction with concentration. Richard said they do look at it for some examples. He said under the climate change of 2025 water temperature increases one degree Celsius making the saturation decrease at 0.1 – 0.2 mg/L. The criteria they use is 5 mg/L so the change is minimal. Peter said it seems there is a translation available to talk between percent saturation and concentration.

Lewis Linker is concerned if there is widespread non-attainment in shallow waters. As temperatures rise, do they need a new designated use for shallow waters (2 meters or less) and the designated use be less stringent. He said this is something they may want to consider.

Matt Stover said if the critters they are trying to protect are not going extinct, and unless we know how adaptable they are, it would be a big lift to change the DO requirements. He would hesitant to change the criteria because temperature is already incorporated and the critters they are trying to protect isn't changing. Maybe they should be striving for more implementation and reduce nitrogen and phosphorus more to reduce stress on them.

Tish Robetson said Lewis Linker's ideas about shallow waters are interesting. The issue is when a use is created and the use is not as protective, it is difficult to get it through completion. Tish Robetson said the shallow water should have DO

criteria along with the SAV and water clarity criteria because it is a different type of habitat.

Peter Tango stated an initial piece to work towards is thinking from a fish physiology standpoint the response and expectations of sensitivity to acquiring the DO that the species need when accounting for temperature. Another item to consider is the idea of an alternative shallow water use

Julie Reichert-Nguyen asked how are the seasonal designated use applications worded. Do they set which months? That may shift with changing climate.

Tish Robetson commented on the seasonality to the criteria. She said it is something else the group should consider because it is broken up between summer and non-summer. With rising temperatures, it may be better to not go by calendar months and it may not correspond to the critical period. Peter Tango said this would be in line for what is being done to account to species' response and the impact of temperature.

Richard Tian stated a challenge for the designated use is monitoring. At this point n terms of time resolution for the criteria assessment is monthly so they wouldn't see a difference moving it one month. The monitoring is biweekly in summer so this would be a challenge if they would want to capture the change in seasonality. They would need a higher frequency of monitoring data because it is unlikely to see it in two weeks.

1:35 **MD DNR - Assessing Short-duration criteria: Pilot study discussion - Matt Stover and Becky Moynihan (MDE)**

MD DNR is pursuing a monitoring effort to address short duration DO criteria assessment. Questions for the group surround issues of the type of monitoring and how to assess the criteria once we have higher temporal frequency data.

Maryland is strategizing how to fully assess a Bay segment. All of the tidal waters are either listed as impaired or shown as having insufficient information to assess for DO. They suspect that not every segment is impaired due to results of trends in Maryland. The goal of this effort is to pick 1 – 2 segments to use enhanced monitoring (ConMon) and possibly conditional attainment assessment techniques to assess the full suite of designated uses and applicable DO criteria in the entire Bay segment. They want to develop a pilot process for assessing the full DO criteria for all segments. This will require picking candidate segments, developing a three-year monitoring plan, execute the monitoring plan, and assess the data using all available tools.

The segments they are considering are Fishing Bay Mesohaline (FSBMH) and Northeast River Tidal Fresh (NORTF). Both of the segments met the Open Water DO criteria for summer and non-summer. They are looking from help with the workgroup by learning from VA's experiences in the York River, gaining guidance and recommendations from the experts in the workgroup, and having CBP staff support in running the interpolator using ConMon data in the assessment.

One open question they have is what spatial coverage is needed. They do not have the spatial and temporal coverage to assess the criteria everywhere.

Tish Robetson said what VA did with the York. Virginia Institute of Marine Science (VIMS) got the ConMon going and VA Department of Environmental Quality (DEQ) was able to use the datasets. It was useful to assess the short duration criteria, but all the segments they assess did not meet their short duration criteria. They could not meet the instantaneous minimum. She said she could help them with resources to assess the data. She has code that will run on all the criteria for the short duration criteria that she can share with them.

Richard Tian asked Tish Robetson when she used the ConMon data for the assessment did she use an interpolation. She said for the short duration criteria, they do not do any spatial interpolation. They look at the raw data. For the 7 – day mean, they apply a 10% rule looking for any exceedance of the 7-day criteria. If they went above 10%, they would say the segment did not meet that criteria. For the Instantaneous minimum criteria, they used the recommendations in the 2017 Addendum.

Matt Stover asked Tish Robetson if it makes sense to have discrete sampling in the lesser flushed areas more so than having a ConMon device. She said she sees the

benefit of a discrete monitoring device since a ConMon device is expensive. There is not an added benefit to put in a ConMon device on top of having a discrete device.

Peter commented the zone information is an option to subsegment out areas for areas to delist with focused monitoring in those areas. Tish Robetson evaluated to say in a well mixed area the representativeness took care of it, so she didn't go into the zoning. This allows Matt Stover to not subsegment every area.

Peter said he would like them to come back in the spring to follow up on the discussion.

2:05 **Exploring satellite image assessment for SAV surveys in Chesapeake Bay - Preliminary STAC workshop findings - Brooke Landry (MDNR)**

For 2018, multiple factors significantly affected normal aerial survey coverage for SAV in Chesapeake Bay. Satellite imagery was evaluated and used to fill some of the gaps in data collection. From 2019-2020, Brooke Landry and Peter Tango co-chaired a 2019-2020 STAC Workshop exploring the lessons learned from that gap filling work by VIMS, the options, availability and cost for satellite data, protocols for acquiring, and accessing satellite data, and options for enhancing data interpretation between the existing program approaches and AI/Machine learning algorithm interpretation of imagery. A final report has been drafted and preliminary findings of the workshop will be provided.

The Chesapeake Bay SAV Monitoring Program is the most successful large-scale, consistent, long-term SAV monitoring program in the world. Unfortunately, in recent years, there was an increase in price, weather is becoming more difficult to survey due to clouds and rain, and there are an increase airspace restrictions. To accommodate a shift in surveying, they hosted a Scientific and Technical Advisory Committee (STAC) Workshop to conduct a thorough review of the science and technology associated with the use of satellite imagery for the SAV survey. In the workshop, they found out that not all satellite data is created equal due to resolution, orbital paths, and private vs. public. The good data is hard to get because most free online data is obscured by cloud cover or turbid conditions. They will need to request data for the survey. VIMS analysists verified that given a good satellite image, they can map the SAV just as they do from aerial imagery. The Chesapeake Bay Program will work with the EPA to get the satellite imagery. Algorithms and machine learning will eventually automate mapping, but there's significantly more work to do before algorithms are ready for the Chesapeake Bay. With funding, algorithms could be ready in 3 – 5 years. Test-tasking suggest they will not be able to get the whole Bay with satellite, so they will still rely to an extent on small plane over-flights. If they do you satellite imagery, they many are not able to publish the imagery itself. They will only be able to publish the derived product. Ultimately, there will always be problems associated with cloud cover, turbidity, etc. but illumination issues may be solved with satellite.

Next steps in 2020 are to continue aerial data acquisition with satellite backup to determine flexibility. In 2021, they will continue it, and it will be the check-in point for success or failure. They will potentially transition to full Bay SAV mapping with satellite in 2022 – 2032, and they will incorporate AI to automate mapping.

The final produce of the STAC workshop is a report – and – guidelines document laying out the information and steps necessary to integrate the use of satellite data and imagery into the Chesapeake Bay SAV monitoring program. The report is due in December, and it will be ready early 2021.

2:30 **Hypoxia Monitoring 2019-2020 GIT funded project using vertical profiling technology - update on testing and results - Doug Wilson.**

2020 saw a successful two-deployment test of a new, cost effective vertical water quality monitoring array operating in the challenging open water habitats of Chesapeake Bay. This form of data collection is needed to better support short-duration (i.e., instantaneous minimum, 1-day mean, 7-day mean) dissolved criteria assessments. Such data would provide further research value and model calibration and verification support. Doug is preparing a report on profiler performance, costs for investment and lessons learned in the deployments.

The project needed to meet the CBP and partners' data needs which consisted of a provision of desired parameters (i.e. DO concentration), adequate quality initially and over the whole seasonal deployment, vertical resolution, and easy and dependable real-time data delivery.

There are two basic ways to acquire a vertical water column profile either by moving a sensor package repeatedly through the water column, or by locating sensor packages at multiple fixed depths, with vertical sensor spacing adequate to meet observational requirements. Dough took the approach of fixed depths. He chose this due to the reliability and flexibility of the fixed sensors, and it met the data needs of the program. They found that with six sensors, they could capture the profile accurately.

He showed results of the two different deployments with the parameters DO, temperature, and salinity. There is also a real-time webpage which allows direct access to the data and shows results in different graphs.

Lewis Linker said he thinks this is the direction the program needs to go towards. If they had funds available today, what would it take to get two to three monitors out in the bay by summer 2021. Doug Wilson said they can recreate a full profile with a small number of sensors. He thinks six sensors can do a 40-meter depth which means $35,000 for six sensors. He did stress there would need to be some planning time because they are dealing with three small businesses, and they did invent the technology only last year.

Gary said as they get to the STAC Workshop on monitoring, the work that Marjy and Erik did look at hypoxic volume. The CBP is trying to look at evaluation of criteria and studying dynamics to improve the models. When they go to decide how many they need to put in the water, then they should be looking at criteria assessment and ask people who build models where they need to understand dynamics.

Bruce Michael stated to Gary that is a good point. They are working closing with Marjy on a bay wide hypoxia report instead of just a Maryland hypoxia report. This is probably going to supplement the long-term monitoring program because they look at the full suite of parameters. This is great step forward, but it doesn't replace the long-term monitoring program.

2:45 **Developing the roadmap for updating the tidal monitoring and assessment program - a STAC Workshop Proposal outline - Peter Tango (USGS)**
Limited new resources for traditional monitoring support have been stable or declined, support and infrastructure costs have increased and 17 years since the publication of Chesapeake Bay water quality criteria we have not adapted the program to effectively account for the monitoring and assessment needs to address complete water quality standards attainment assessments. However, new data streams and new assessment tools have matured to assist assessment of Chesapeake Bay water quality criteria. Peter will present an outline that provides at least six lines of inquiry for establishing recommendations that, when adopted, should update monitoring investments, update assessment approaches, update interpretation and reporting of results. Peter will ask for community discussion and input on these and other lines of inquiry that should be addressed in the workshop proposal to produce effective recommendations that address gap-filling data needs of assessing the dissolved oxygen, water clarity/SAV and CHLA criteria for completing our water quality standards attainment assessments.

Due to time restraints, Peter Tango was unable to present.

3:00PM Adjourn

Next Meeting Future Topics:
Results of the next update to the Water Quality Standards attainment indicator assessment.
Designated Use revision for Segments CB6 and CB7
Deeper dive into the method behind derivation of dissolved oxygen criteria
Review proposal for final comments on the STAC Workshop call in early 2021
Other approaches for using satellite – derived data to assist bay water quality assessment
Water temperature indicator – who needs it and what form of output do you need to inform management?

Participants: Peter Tango, Breck Sullivan, Amanda Shaver, Brook Landry, Carl Friedrichs, Cindy Johnson, Claire Buchanan, Doug Austin, Dave Parrish, Doug Wilson, Gary Shenk, Lew Linker,

Mark Trice, Matt Stover, Qian Zhang, Rebecca Murphy, Renee Karrh, Richard Tian, Steve Hummel, Thomas Barron, Tish Robertson, Tom Parham, Julie Reichert-Nguyen