Criteria Assessment Protocol Workgroup (CAP) Meeting

Wednesday, November 16, 2022
10:00 AM – 11:00 AM

Meeting Materials:
https://www.chesapeakebay.net/what/event/criteria-assessment-protocol-workgroup-november-2022-meeting
This meeting was recorded for internal use to assure the accuracy of meeting notes.

ACTIONS

- ✓ **ALL, by December 9, 2022:** Review for approval Virginia's proposal on modification of the CB6 & CB7 designated use boundaries per recent analysis findings supporting the update to the boundaries (please see email sent 11/29/22 for proposal).
    - Please provide any comments to: Peter Tango (ptango@chesapeakebay.net) Chair CAP WG, Amy Goldfischer (agoldfischer@chesapeakebay.net) CRC STAR Staffer, and Tish Robertson (tish.robertson@deg.virginia.gov) VADEQ Lead on the boundary condition assessment

APPROVAL REQUEST PROCESS:

- Please review the designated use boundary proposal and provide any comments by December 9th.
- We will send out an email Monday December 12th requesting your approval on the proposal.
- Responses are requested by no later than COB Thursday December 15th. Non-responses will be deemed tacit approval of the proposal.
- Final results will be provided to the CAP WG membership by Monday December 19th.

MINUTES

Participants:
Amanda Shaver (VA DEQ), Amy Goldfischer (CRC), Breck Sullivan (USGS), Cindy Johnson (VA DEQ), Claire Buchanan (ICPRB), Doug Wilson (Coastal Ocean and Observing), Gary Shenk (USGS), Joe Wood (CBF), Juan Vicenty-Gonzalez (EPA), Katherine Bentley (EPA), Kaylyn Gootman (EPA), Leah Ettema (EPA), Mark Trice (MD DNR), Matt Stover (MD DNR), Melinda Cutler (MD DEP), Peter Tango (USGS), Qian Zhang (UMCES), Rebecca Murphy (UMCES), Renee Karrh (MD DNR), Richard Tian (UMCES), Tish Robertson (VA DEQ), Tom Parham (MD DNR), Tony Timpano (VA DEQ)

10:00 AM **Welcome, Introductions & Announcements – Peter Tango** (USGS), Chair, **Amy Goldfischer** (CRC), Staffer

Melinda Cutler was introduced as a new member of the workgroup. Melinda works for the Maryland Department of Environment in the Water Planning Division and was formerly an intern but is shifting to be a permanent employee there. Kaylyn Gootman introduced herself as a somewhat new employee of the Analysis and Implementation Branch of the Chesapeake Bay

Program Environmental Protection Agency Office (EPA CBPO). Tony Timpano introduced himself as the new Estuarine Probabilistic Monitoring coordinator at Virginia Department of Environmental Quality (VA DEQ).

Conferences:

- Coastal and Estuarine Summit – December 4-8, 2022, New Orleans, LA.
- A Community on Ecosystem Services - December 12-15, 2022, Washington, D.C. Metropolitan Area.
- Maryland Water Monitoring Council Annual Conference – December 15, 2022, Linthicum Heights, MD. Registration closes December 1, 2022.
- A workshop on applying novel techniques to assess and forecast harmful algal blooms (HABs) in Chesapeake Bay to protect fisheries, aquaculture, and human health – January 18-19, 2023, Virginia Institute of Marine Science, Gloucester, Virginia. BY INVITATION ONLY.
- National Water Quality Monitoring Council's 13th National Monitoring Conference - April 24-28, 2023, Virginia Beach, VA.
    - This conference is still looking for volunteers to assist in planning activities and events.
- Species on the Move – May 15-19, 2023, Everglades National Park, FL.
- Interagency Conference on Research in the Watersheds (ICRW8) – June 5-8, 2023, Corvallis, Oregon. Abstracts due December 15, 2022.
- CERF 2023 Conference: Resilience & Recovery – November 12-16, 2023, Portland, Oregon. Abstracts due May 10, 2023.
- Citizen Science Association conference, C*Sci 2023 - May 22-26, 2023, Arizona State University campus in Tempe/Phoenix, Arizona.

- Peter Tango (USGS) announced that of $5.3 million of funding need identified in the PSC monitoring report recommendations to fill 5 years of priority monitoring needs, funds have been identified and committed to meet nearly all this need. Funds have been committed by the Environmental Protection Agency (EPA), United States Geological Survey (USGS), National Oceanic and Atmospheric Administration (NOAA) and various states. Peter thanked everyone for the years of work setting up for this program maturity address well understood needs of the community.

Today's Goals –

- Highlight issues that will require documentation – prioritize efforts
    - **Action:** Request - Quarterly meetings this next year to work on CBP needs.
- Presentation on recent issues needing your input, being addressed in the CBP
    - **Action:** Suggestions for consideration on proposals for changing locations of long-term monitoring sites in Rappahannock TF habitat

- CB6/7 & Mobjack Bay designated use modifications
    - **Action:** Moving towards approval and publication by CBP to support WQ Standards attainment assessment updates

10:10 AM **Issues on the docket: Overview for awareness of what lies ahead** - *Peter Tango (USGS)*

- Water temperatures are rising – do we need "temperature adjusted criteria" going forward? (Is there such a thing?)
    - We see significant long-term change, rising temperatures. Should we be accounting for climate change affects (impacting oxygen saturation and availability to living resources)?
    - Peter highlighted two important publications – Mechanisms Controlling Climate Warming Impact on the Occurrence of Hypoxia in Chesapeake Bay, and Nitrogen reductions have decreased hypoxia in the Chesapeake Bay: Evidence from empirical and numerical modeling
    - Do we need something more than we already have when it comes to open water instantaneous minimum criterion related to sturgeon protections? Peter said he has been working with San Francisco Bay area researchers looking at multiple lines of evidence. Here, though, in the Chesapeake Bay, it seems like the ranking process for sensitive species isn't changing. That said, we will discuss whether we need something more.
    - Peter Tango gave an update on the 4D Interpolator assessment: part of the 4-D interpolator has been to address the short duration criteria gap we've had since 2003. Gary Shenk put together a conceptual model showing how it would look to use the interpolator. The long-term temporal patterns have been modeled, and the next steps are looking at spatial structure and short-term temporal variability.
- CB6/7 boundary layer for designated uses – the power the of the data, updated habitat distributions
- SAV satellite-based assessment? Status of progress, documentation of evolving methods, recognition of steps that remain to go from research to operation
    - None has been fully documented for approval. Evolving protocols.
- Assessing CHLA criteria baywide –
    - Are NOAA tools available sufficient now for quantifying HAB risks and giving substance to assessing the narrative criteria (USEPA 2003)?
    - Published paper on a satellite-based time series of baywide chlorophyll conditions, can we adopt the methods for baywide chlorophyll a assessment, status and trends?
    - Paper out of NOAA National Center for Coastal Ocean Science (NCCOS 2022)

    - Chesapeake HABs meeting in January – opportunity for assessment and discussion of new work.
- Assessing Water Clarity criteria – state of the science to support shallow water habitat assessment. Are we there yet? What is needed if we are not.
- Dissolved oxygen criteria assessment – gap filling, the need to document our new methods
    - Hypoxia monitoring network investment will support high temporal frequency measures that have been missing from the standards attainment assessment.
        - Station locations are rolling out in phases
    - Bay Oxygen Research Group –
        - 4-D interpolator development – requires documentation of methods underpinning the approach
        - Outline of the expected method of using output in a protocol assessment
    - EPA Regional ORD Applied Research program (ROAR) proposal –
        - Shallow water data assessment, sampling design integration
    - Recent work by Maryland Department of Natural Resources (MD DNR) and University of Maryland Center for Environmental Science (UMCES) on sampling design options deserving documentation and review complementing previous sampling design guidance (e.g., USEPA 2003, Bever et al references)
- Significant digits in our assessment – when we do the analysis for our criteria assessment, we've never rounded. There's some concern whether we're being true to the data and whether we should acknowledge significant digits.
    - This question is for our indicator, but also for our standards.
    - There is a 10% curve we take our observations through. Even if we get 0.9999… as attainment score, it is not deemed a 1.
    - However, Modeling WG uses some rounding.
    - Do we establish a rounding rule in line with 2-3 significant digits? Is there precedent within EPA?
    - Qian Zhang and Richard Tian have tested this and compared results without rounding vs with rounding. With rounding, we no longer see a continued decline in the 2019-2021 period. Instead, there is a reversal in 2019-2021 from 2018-2020. Also, our record high (2015-2017) changes from 42.2% (without rounding) to 47.5% (with rounding).
    - Comparing 3 year periods, without rounding we see a big decline in DW-DO from 33.9% to 10.7%. With rounding we see a big improvement in DW-DO from 33.% to 40.7%.

Discussion:

- Gary Shenk (USGS): On the modeling side, the modeling does not determine attainment. The monitoring group determines attainment. The modeling is only looking into

attainability of the standards. Attainment is what we see in the Bay, attainability is what we expect in the future if we implement certain management practices. When we're making decisions about the TMDL and how much we have to reduce nutrients going into the Bay, we acknowledge there is uncertainty in the modeling and we don't want to overshoot our implementation plans because it's expensive. We try to get within 1% and then we'll round it to try to implement to get to 1.49% of achievement. If we make these changes in the watershed, we'll have new models saying we have to get a little further to get 1.49%. As far as rounding in general, I think of it from the other direction – what about those places that are at 0.99999…? I don't think we're any more sure these places are missing it than other places are meeting it. I see rounding as a one-sided approach of where can we get more attainment vs where are places in danger of not attaining. I found it interesting that deep water was showing up as where it made a big difference, because deep water is where we have a biologically based assessment curve (PT note – we have a deep channel bioreference curve published, however, we do not have an open water or deep water bioreference curve published yet), which is placed so all of the areas with a BIBI of 1 or 2 fail, and 3-5 pass. If you are missing that reference curve, even by a little bit, you're consistent with areas that have a BIBI of 1 or 2. If you're just making it, you're at a 3.

- Peter Tango: Are there any state rules on this that could add direction?
- Tish Robertson (VA DEQ): Gary's point is well taken. If we say a segment is meeting criteria, and it's actually a marginally impaired water body, if we're coming up with the incorrect assessment, what is the risk? We'll still be implementing the TMDL, it's not like we're walking away from that segment in terms of assessment since we'll still be monitoring. If it's marginally impaired I'd say you'd see that segment flip flop. I hear what Gary is saying but think we can consider there isn't much of a cost to us to round. The benefit of rounding is that it would be more in line with how states calculate exceedance frequencies, which is usually a whole number. We're comparing our exceedance frequencies to 10%. However, I'm not sure what number of significant figures, but I know rounding would be justified to some degree.
- Peter Tango: Qian probably illustrates which segments are flipping on his R shiny app that provides a variety of comparative assessments across space and time.
- Qian Zhang: The context here is when I see the new segment results every year, in the last several years CB7PH has been driving our status of whether it's getting better or worse, and it's because of very small deficits in the CB7PH dw. That has not always been the case, however, and it's always been at 1 (attaining) except the last few periods it's not been 100% attaining from Richard's results. That has been causing fluctuations in terms of results of what we release on Chesapeake Bay Progress and whether we see degradation or improvement. It's become frustrating. We want to say something about the trajectory. If the trajectory we report year after year is only because of this mild deficit, and it is a large surface area causing a big change in our score, it doesn't change

things in the long term but when we communicate things on Chesapeake Progress, I don't know if it's so meaningful to say this is degradation, this is improvement.

- Peter Tango: We won't decide this today. It may be indicator only, or it may be how we tackle standards assessment and formal use of assessment. Please follow up over email if you didn't get a chance to add your comments today.

10:25 AM Station change considerations on the tidal fresh Rappahannock – issues of nonstationarity in the ecosystem - Assessment impacts? - *Peter Tango (USGS), Cindy Johnson (VADEQ)*

Cindy Johnson (VADEQ) has highlighted important changes in the bathymetry of the tidal fresh Rappahannock River affecting conditions at two long-term water quality monitoring stations. Peter will provide a few slides from Cindy's considerations about future operations of the stations. Some initial comments from recent input from other CBP workgroups will be presented. We look forward to your input and considerations.

Discussion:

- Peter Tango: We've rarely had to end stations and start new stations over the years. Two sites in the tidal fresh are getting increasingly shallow. It's located on a growing bar. What if we adopt a change in location to new stations that have greater depth? Considerations are given to the inputs nearby whether a new site would retain the same influences.
- Would it be better to remain at current sites and continue to obtain surface and bottom samples 1 meter apart? OR would you prefer a deeper site that would provide additional DO data at depths that were historically available to sample but are no longer there?
    - Suggestions so far: 1-year co-located assessment to evaluate impact of possible change, similar to Nontidal Network protocols.
- Mark Trice: There's been some discussion about changing a nontidal station in MD that's been sampled from a bridge and that bridge is under construction. We've never done duplicate sampling but went upstream but that was only for a few months. That information would be contained in the metadata. To my knowledge we've never moved a tidal station.
- Peter Tango: Mike mentioned one over by Choptank, Eastern Shore side.
- Mark Trice: Potentially EP5.0.
- Cindy Johnson: Would the co-located assessment include samples, like nutrients, or just field data?
- Peter Tango: That would be up to us to decide. Definitely field data as key to habitat segregation. I didn't ask the last group about nutrients vs no nutrients. At minimum, DO, salinity, temperature.

- Rebecca Murphy: Elgin was the one who mentioned that. He was thinking about in terms of analyzing any shift in the values due to the movement it's useful to have that overlap of data. He's done that before for other problems at other changes, method changes and such. I'm pretty confident he would say everything, but that's just the ideal. Particularly, anything you're concerned about at that station. I'd personally be concerned about nutrient values shifting at that location.
- Richard Tian: At this point when we do the criteria assessment we include a lot of citizen science data. This is not stable and sometimes short lived. Given that re-location is not too far away, in a sense it's tolerable given a lot of other things are changing already.
- Peter Tango: Thank you for your input and we'll come back to you.

10:40 AM **Designated Use Modification TSD for CB6PH, CB7PH, and Mobjack Bay – Update** - *Tish Robertson (VADEQ)*

Tish Robertson (VADEQ) has developed analysis and worked with the Modeling Workgroup regarding supporting results for Designated Use modifications in portions of the lower Chesapeake Bay. Codifying the modification will affect dissolved oxygen criteria evaluations for the future.

- CB6 and CB7 are the largest segments by area and volume in VA's portion of the Bay. CB6 is frequently in non-attainment of the open water 30-day mean criteria, and CB7 never has attained the open water 30-day mean criteria. These are obtained from Qian's indicator app. CB6 and CB7 are sandwiched between CB5 and CB8, which are nearly always in attainment of the open water criteria.
- Why is this?
- Back in 2019 there were simulations of climate change and WIP 3 loadings for 2025, 2035, 2045 and 2055 – and the model predicts full attainment of open water criteria in the vast majority of our segments even with climate change. However, the exceptions are CB6 and CB7 which are predicted to not attain and in fact grow worse. This is puzzling and not what we expect to see.
- What makes these two segments different? Is there a natural condition that's sensitive to climate change? What makes these two segments different is how we have the designated uses laid out. Designated use is a fancy way of saying habitat in the context of the Chesapeake Bay. We have criteria that we use to protect those habitats. The entirety of CB5 is designated the same, as deep channel/deep water/open water designation. CB8 is uniformly designated as open water. However, CB6 and CB7 have more than one designated use. These designated use boundaries are important because they determine which DO criteria apply and when they apply.
- Tish showed a diagram that demonstrates how the different designated uses exist with respect to each other. The open water habitat is found everywhere in the Bay by default. In the summer, the open water use exists in the surface layer above the pycnocline, so you would apply 5 mg/L to that portion of the water column. Then below

or within the pycnocline, you have the deep water habitat, where you would apply 3 mg/L. Deep channel also has its own DO criteria. The open water criterion is more stringent than the deep water criterion. It's important to get the boundaries for the deep water habitat correct because if it's not correct, you could apply overly stringent criteria to water bodies. The river could also be where you apply under percent of criteria. All of this is referenced in our water quality standards regulation for VA, MD and DC. We reference the same documents. Understanding of the Bay designated uses is laid out in 2003 technical support document which is where I pull these definitions from. This is the scheme we currently use for designated uses – in a 2004 publication. This is what we use for criteria assessment and understanding the model output in the context of DO.

- Is the nonattainment of open water DO criteria in CB6PH and CB7PH due to stratification in the lower portions of these segments that we're currently not accounting for in our water quality standards?
- The key clause of the 2003 document for determining deep water habitat is: tidally influenced water located in areas where the measured pycnocline, in combination with bottom bathymetry and water circulation patterns, presents a barrier to oxygen replenishment of deeper water. We'd look for: deep bathymetry, stratification (persistent pycnocline), hypoxia within and below the pycnocline. I've been looking for these in CB6 and CB7.
- First, the bathymetry. We do have data for this going back to 1998. The lower portions of CB6 and CB7 are sufficiently deep to be considered for the Deep Water use designation and there are deep stations in there. However, we also see deep water stations in areas of CB6 and CB7 that are NOT designated for Deep Water. When you look at the range of depth in the deep water boundaries vs those outside, they're all similar in range. The bathymetry in the undesignated portions of CB6 and CB7 are sufficiently deep to be considered.
- For stratification: Looking at CB6.2, which is at the edge of the deep water boundary, as our guide of deep water stratification. We see what we expect to see in deep water habitat. A relatively well mixed surface layer, a pronounced pycnocline, and a small bottom layer that's pretty well mixed. This is what you'd expect to see in a shallow stratified estuary. In CB6.3 and CB7.2, we see the same features of stratification. CB7.2 is 22m deep, you see a substantial bottom layer. The upper boundary of the pycnocline is a very important measure since it determines which criteria apply where. Looking at CB6.4, we don't see a pronounced pycnocline, but we do see a density gradient.
- At CB7.3, it is close to the mouth of the Bay, but you do see a pycnocline and well mixed surface and bottom layers. This tells me the circulation pattern of the lower portion of CB6 and CB7. It's complicated; just because you're close to the moth doesn't mean you have a well-mixed water column. Right at the mouth, you do have a well-mixed water column. It is stratifying but it is weakly stratified on average.

- Tish showed density gradients of all stations outside of the boundaries (slide 13).
- Hypoxia is the last thing to consider for deep water designation. Pycnocline presence is a binary yes/no meaning when we went out, we saw a pycnocline or not. Most of our stations you see a persistent pycnocline in the summer, with exceptions at CB7.2e and CB7.4 in. The x axis is deep water hypoxic layer thickness, or the portion of the water column within and below the pycnocline with DO less than 5 mg/L. I chose 5mg/L as threshold because it corresponds to 30 day open water minimum. The bigger the red bar, the more the water column was hypoxic. X's indicate very low DO events with DO less than 3 mg/L. Going from north to south you see a lot of hypoxic layers right at stations closest to that deep water boundary. As you go further south the frequency of those layers decreases as well as the frequency of very low DO. CB7.2 is interesting because the frequency of the hypoxic layers may not be as high as what you see at CB6.2 or CB6.3 but you have a substantial amount of the water column that is hypoxic at this station. CB7.4 is the oddball because there is weak stratification and no hypoxia at all. Note that in none of these stations does hypoxia occur in the surface layer; only in the deeper waters under the pycnocline.
- We are able to say that deep water habitat exists in the lower portions of CB6 and CB7.
- Where do we re-draw the boundary? My proposal has changed since a few months ago. My proposal now is a boundary to cover pretty much all of CB6 and most of CB7, stopping right at the mouth of CB7. We're going big with this proposal because we've had to revisit the deep-water boundary in CB6 in the past and we don't want to have to revisit it again. But there is also empirical support for drawing the boundary this way.
- We can lean on the long term monitoring data, and also the probabilistic monitoring data is useful for mapping out where the boundaries should be. Mike Lane (ODU) helped me acquire the DO data here. When we go out and collect benthic samples we also take a bottom DO measurement.

At this point the audio cut out due to technical issues.

- Peter: Any time there are significant improvements to the science and our understanding we try to codify that in technical documentation that improves our protocols, improves our habitat boundary information. That's been part of the workgroup's work since the mid-2000s. As part of the process usually try to get concurrence from this group on proposals.

Discussion:

- Cindy Johnson: Re Rappahannock: Our new monitoring plan starts January 1st. We'd have to approach them if that's what the Bay program decides.
- Tish Robertson: Our timeline may not be realistic if we want to initiate rulemaking by end of the year. We were hoping to have technical support document finalized so that we could reference it in our notice of intended regulatory action. We can wait to issue

that notice until it's finalized, as long as it's finalized within the next few months. I shared with Peter and Lew the technical support document which contains what I just presented. If anyone in the CAP workgroup wants to take a look at it I can send it out or have it be part of the materials.

- Peter: Ask for comments by close of year?
- Tish: Earlier would be ideal – within next couple of weeks. We have shared it with our Region 3 colleagues, who were on the call earlier, and they're reviewing it. We were hoping it would be an EPA publication. I appreciate all the help I got from Richard Tian, Gary Shenk, Qian Zhang, and Mike Lane!

11:00AM Adjourn