Criteria Assessment Protocol Workgroup

January 22, 2020
10:30 a.m. – 3:30 p.m.

Conference Line: 929-205-6099 Meeting ID: 687-282-497
Webinar*: https://zoom.us/j/687282497
Meeting Materials:
https://www.chesapeakebay.net/what/event/criteria_assessment_protocol_workgroup_january_2020_meeting
Location: Potomac River Fisheries Commission Building
222 Taylor Street Colonial Beach, VA 22443

*If you are joining by webinar, please open the webinar first, then dial in.

AGENDA

Action Items:

- ✓ Review the idea of VA using the 10% allowable frequency rule on 7-day DO means and bring comments and suggestions to the next meeting.
- ✓ Review the idea of the weight-of-(no) action and bring comments and suggestions to the next meeting.
- ✓ Dave will put together a more constructed outline of moving forward with the Kd regression and investigate new methods.
- ✓ If needed based on the follow up discussion of Kd regression at the next meeting, the group will consider submitting a STAC proposal to develop a new method.
- ✓ Emily and Peter will get a better understanding of what the workgroups need and sit down with Bruce to learn how MDNR is structuring their ConMon sites to hopefully link the two efforts together.

10:30 **Welcome, introductions & announcements** – *Peter Tango, Chair Criteria Assessment Protocol workgroup, USGS@CBPO*

- Water Quality Standard Indicator Discussion: In 2018 and 2019, there was record level flows coming into the Bay. Despite these occurrences, the 2016 – 2018 Water Quality Standards score is 5th best on record. The next discussion on the impacts of climate change and dissolved oxygen is based on two open water segments impacting the score because they failed for DO.
- Impacts of climate change on DO discussion: As temperature goes up, it lowers the capacity to hold oxygen. Will the phenomenon of Bay segments not reaching DO attainment continue? The Bay Program has applied climate change scenarios to the model, and there are now suggestions based on the model that attainment of open water DO

standards could be affected by climate change impacts. Peter would like to have future CAP WG discussions on if the workgroup should rethink the approach to criteria setting and protocol assessment. This will help the workgroup assess if they are detecting the impact of climate change on the ability to meet standards.

- Gary Shenk said climate change is affecting the surface mix layer the most because that is where the temperature is changing the most.
- Mark Tice said he is work with Jeremy Testa on a science synthesis through a STAC proposal on the effect of climate change on DO in the shallow waters. This study could help with this discussion.
- John asked if there is a criteria development workgroup that looks at the criteria setting and standards setting holistically because it tends to take more of a state approach to tackle regulations. Should it be more of a group effort?
    - Peter said it should be a group question.
    - John said having the Chesapeake Bay Program backing the work would make it a lot easier to enforce. The uniformity is important.
- Tish asked if some segments should have the deep water use because there are some segments that go through stratification that don't have that use. They are treated like open water, but it may not be true open water.
    - Peter said we should raise that issue for the community because it is important in the TMDL to show the correct designated use.
    - John said if the designated use changes then it is going to be a legal issue.
- Bruce mentioned that attempting to change criteria before 2025 is going to be very difficult since states are struggling to meet the current criteria. Bruce also mentioned that a criteria change doesn't happen in a year or two, so it is not too early to investigate these topics.
- Ken Moore said the most recent research states resources are still responding to the same standards, so they are not adopting to the new conditions of lower DO. He asked if there is consideration to investigate what is causing the lowered DO such as inputs.
    - Peter said the modeling group was able to give what was most influential based on sea level rise, flow and precipitation, but other influences would be welcomed to be investigated.
    - Gary said plan A is increasing management practices to restrict nitrogen and phosphorous to fight against

climate change. There may be parts of the Bay that cannot be restored, but the Bay Program is absolutely looking to do more implementation.

10:50 **An update of the James River CHLA Criteria and their implementation** – ***Tish Robertson (VADEQ)***

The proposed updates to the James River chlorophyll-a criteria summarizing work from a seven year study have been published to the Virginia register of regulations http://register.dls.virginia.gov/vol35/iss11/v35i11.pdf .

The Virginia State Water Control Board and EPA have approved amendments to the James River Chlorophyll-a (CHLA) special standard. The Amendments include:

- Modified magnitudes and frequency for the seasonal mean criteria
- Modified assessment methodology for seasonal mean criteria
- New Short- duration criteria

The criteria are seasonal so there is spring and summer criteria for the five segments. The updated criteria reflect recent monitoring data. It also reflects empirical relationships of CHLA with several response variables that have an impact on aquatic life. The updated criteria are much more explicit for what it is protecting. The frequency is the number of times the criteria can be exceeded before the water body is considered impaired. The frequency was a ridged 10% reference curve, and it is now a simple statement of not to be exceeded more than twice in a six-year period.

The new short duration criterion has a shorter duration than a season of three months. They are developed around harmful algal blooms (HABs). In the upper tidal fresh, there are no high CHLA values so there are no HABs. If HABs do develop there, a criterion will be developed for that segment. The duration is different depending on where in the estuary because different HAB indicators were used. The frequency for is 10% of time over a six year period during the summer. These criteria only occur during the summer when there might be HABs.

The modified assessment methodology for the criteria include no more spatial interpolation of monitoring data, no more CFD or 10% space-time curve, and a six-year assessment period as opposed to three-year. The updated CHLA standard is easier to attain than the original standard, but there is still room for improvement. The James is not meeting the updated criteria at the moment. The Draft 2020 Integrated Report assessment results were presented using the old criteria because the new criteria was not complete while drafting the results. Tish then showed the updated criteria results (2013 – 2018). These results show the James is meeting criteria in the spring, but in the summer, the James is not meeting criteria in the upper tributary.

Tish showed a graph that represents the stations the Dataflow cruises go to in the James. They realized that the three CBP stations at the top of the James (JMSTFU) did not cover everything so they added a station. The status of the tidal James with respect to the updated James River CHLA criteria will be presented in the 2022 IR.

Ken stated the seasons are getting warmer earlier and continues to stay warmer later in the year. He asked what the thoughts about seasons are since it is not a calendar date but temperature. Tish would propose getting away from the calendar month, but she was trying to stay true to the original criteria and with the regulations. John Kennedy said the current administration in VA is intent on dealing with the climate change issues and how it affects the regulatory rule making, but there is not regulation yet concerning how climate change is affecting the seasons. Hopefully it can be addressed before the VA administration leaves. Bruce said Maryland is not addressing this yet, but it is going to come up with how they deal with potential impacts of living resources and humans.

In terms of criteria, Elgin said he has been trying to push an idea called context sensitive criteria. If the bay was meeting its designated use of fishable and swimmable, it wouldn't be reaching the same amount of CHLA during a low flow then a high flow so why hold these two different types of years to the same criteria. The seasons could also fall in this type of criterial. This would make it a more responsive criterion. John said this is an interesting point, and it could account for the variances in the flows. John also mentioned they had a difficult time choosing a critical period in the year to enact the criteria for CHLA. Elgin suggests to report the distribution during a normally functioning Bay and then state what would be seen during a low, normal, and high flow. He said it would be like grading on a curve (distribution percentile).

11:40 **Dissolved Oxygen Criteria Assessment at Virginia's Chesapeake Bay Continuous Monitoring Stations** – ***Tish Robertson (VADEQ)***

Tish will summarize the assessment results to additional explorations in implementing short – duration criteria assessment.

The Chesapeake Bay designated uses relating to DO each has its own criteria depending on the living resource that uses that habitat. The 30-day mean is applied to the open water and deep water. The remaining criteria (short duration) is not currently being assessed. Tish believes the ConMon data can be used to help understand and assess these criteria. With the 2017 technical addendum, they made up different zones and applicable criteria assessment procedures to the individual zones.

There are different types of ConMon stations: NERR/VIMS (QAQC similar to the ones the Bay Program uses), SWMP/VIMS, and HRSD (Hampton River Sanitation District). There are other ConMon data sets such as the CBIBS buoys, but she needs to understand their QA better before using them. Carl said they can rotate the CBIBS instruments, but they are not identical to the other ConMon stations. VIMS does not handle the QAQC, but the group agrees that they could be a good resource. VIMS is discussing taking over the QAQC. Mark asked if CBIBS was considering dropping parameters. Carl said yes. They want to drop DO, but hopefully that will not happen. Bruce said maybe he can work with NOAA to work on consistency and having the same sensors as the other ConMon stations.

Tish assessed the following DO criteria from the VA Chesapeake Bay ConMon data:

- Year round, all salinities
    - Open Water 7-day mean (4 mg/L)
    - Open Water instantaneous minimum (IM) (3.2 or 4.3 mg/l depending on temp)
- Feb – May, low salinity
    - Migratory Fish Spawning Nursey 7 – day mean (6 mg/l)
    - Migratory Fish Spawning Nursey instantaneous min (5 mg/l)

Different stations received different criteria. The Pamunkey stations are the only stations with the migratory fish and spawning nursey use. Open water criteria are everywhere. For the 7 day mean criteria, if you have more than 10% violation rate over all monitored summer weeks then the criterion is not attained. IM criteria are attained if dataset shows no more than two consecutive days with +2.5 hours of violations during the summer days.

The Pamunkey stations met the criteria for the migratory fish spawning and nursery for the 7 day mean. They failed the IM criterion of 5 mg/l for the migratory fish spawning and nursery because there were more than two consecutive bad days observed. The results for the Open Water 7 day mean criterion for summer showed multiple stations meeting it and four stations failing (York and Layfette). Most stations in the York river are also not meeting the Open Water summer IM criterion while other stations in VA are meeting it.

Gary said that at the Pamunkey, Mattaponi, Pocomoke, the wetlands had to be included in the model to currently match what was happening in the rivers.

Tish asked the workgroup if they are comfortable with VA's use of the 10% rule on 7-day DO means? Tish thinks it is consistent with EPA's recommendation that conventional parameters be granted a 10% allowable frequency. The waters expected to not attain the Open Water 7 day mean criteria (the York and

Lafayette) violate this rule. Elgin asked what other method would be used than 10%. Tish said some people might say to not have any exceedance. Elgin said he is against having no exceedance because the more data collected, there will be more variation. Peter suggested using a different reference value compared to the deep water.

As stated before, stations in the middle of the York were not meeting the short-duration criterion. Tish was not shocked by these results. Carl asked why she wasn't surprised they failed that criterion. Tish said because they are consistently not meeting the 30-day criteria. She is not shocked by any of the results.

Peter asked how many stations were needed to establish an impairment. Could Tish use only one ConMon station? Tish said she is only using a station characterization and not extrapolating it to an entire segment. She said they do not know yet how far out they can extrapolate for a ConMon station.

Tish is interested in finding sentinel ConMons that could be represented for a segment. She said this could help financially. Bruce said this would need to be on a segment by segment basis. Tish asked the question, "Can ConMon data be used to determine whether a segment meets a short-duration criterion as opposed to just reporting when the segment fails?" In some areas, there was a great relationship. She looked for ideal ConMon stations for a sentinel station. Pamunkey would be ideal because the DO concentrations are similar vertically across the water column and with the mid-channel data. For the York, it is a fair sentinel segment because there is similarity, but the 6 meter depth is not coherent.

Tish also suggested to consider a weight-of-(no) evidence approach to short-duration criteria to elevate the ConMon datasets to the same level as the midchannel datasets.

Peter gave the suggestion of the weight-of-(no) as an action item for the next CAP meeting to give people time to read and review.

12:30 **Lunch**

1:30 **Next steps in Kd regressions for water clarity assessments** – ***David Parrish (CBNERR) & Mark Trice (MDNR)***

David and Mark will highlight the current Kd regression approach and discuss potential adjustments for modeling Kd as part of the water clarity assessments.

Dave started with the water clarity assessment methodology and then went into some of the issues with the Kd regression as a part of that methodology. MD and VA with partnership have created water clarity criteria. The dataflow cruises are conducted once a month and rotating track every three years. Dataflow from the monitoring cruise track is not used directly to find Kd. The first step is to do a spatial interpolation of all the variables used to find Kd – CHLA, Turbidity, and Salinity. This information is compared to a Kd Threshold for two designated depth zones to designate a pass/fail grade.

Dave went through some examples of Water Clarity Assessment Results. There is a lot of attainment in the James, but not in the York. Dave doesn't think there should be that big of a difference, and it is based on multiple issues. He discussed two of them. The ratio of the water clarity assessment goal to the total acres is based on the 2.5 times multiplier and sometimes it approaches the total acres of the bottom to assess. For example, the York polyhaline would need to attain 98% of the acres to reach attainment. The second issue is stemming from the regression with the ratio of the water clarity assessment to the water clarity assessment goal. Dave did a live demonstration of going through the regression to show how the York does not pass until the Turbidity (NTU) is 2. Dave would like to be involved in how to address these issues as the workgroup moves forward.

Elgin stated how it is interesting that the salinity sign is changing from positive to negative because he thought they would all be negative. Mark said there were also early instances when segments were grouped together, and they would have the same regression model. Ken said salinity improves the fit of the kd measurement at the station to the turbidity so it is needed but may be causing issues based on how it is incorporated. Dave thinks a good next step is to remove salinity.

Dave likes the idea of including CHLA because it deals with respiration. Tish asked if they would rather use the historical imagery acreage as the water quality clarity goal then applying the 2.5 multiplier to the SAV goal. Dave said the historical SAV was used to make the SAV goal so there would need to be more water clarity acreage to support that level of SAV. This is the idea behind the 2.5 multiplier. The 2.5 multiplier works accurately Bay wide, but when applied to the individual systems, it bumps it up so that all the available bottom would have to pass. Mark said they have some instances where they need to pass more than the available bottom. He also suggested using data to assess clarity within the SAV beds that are being accessible currently and apply the light attenuation to the rest of the shallow water to see how much is meeting it. Instead of using a 2.5 factor, it then requires reaching a certain percentage of the remaining shallow water to pass. Dave said there is a lot of error around these interpretations, but an idea is to use existing water clarity data in combination

with data on SAV beds and do a more % time from actual cruise data instead of interpolation to try and assess the entire area.

Based on the conversation, Tish suggested disconnecting the water clarity assessment from the SAV assessment, at least in terms with the frequency (one year out of three). When there is good water clarity it matters to SAV, but it is not accounted for in the assessment. Mark suggested having a weighted average on the earlier months.

Peter referenced the Giovanni dataset and asked if anyone has looked at Kd spatially. Jessie said it is 1 km resolution so its very course, but there has been efforts to do it with Landsat which is much clearer. Carl said if the water is not clear enough then SAV cannot be seen so that is why stream measurements are better.

The Kd approach was developed 20 years ago, and there is now better regression technology such as GAMs. Dave said there is some low hanging fruit to adjust in the methodology, so he asked if there is any problem with changing this process. Tish said in VA there is a technical addendum, but it only applies to the DO criteria and not the water clarity criteria. Therefore, in VA, she agrees updates should be made to the process. Peter said the criteria addendum is supposed to be used for guidance, but it is a state level question. He suggested to test other regression models to find better ways to fit the data. This type of work has always been supported in the past. Possible options to move forward with the work is with a Scientific Technical Advisory Committee (STAC) proposal or Goal Implementation Team (GIT) Funding proposal. Peter put forth the action of the group putting together a more constructed ask and outline of moving forward by the next CAP meeting. Dave will work on this action.

2:10 **Shallow water monitoring programming in relation to the cross-GIT outcome needs – *Emily Trentacoste (EPA) & Peter Tango (USGS)***

The Chesapeake Bay Program Goal Implementation Teams (GIT) have identified science needs for their outcome to recommend prioritization for those requiring resources. Multiple GITs listed “shallow water monitoring” as a science need. Emily and Peter will discuss how this science need is different across outcome groups and how interested parties recognize the possibility of coordinating future monitoring efforts to incorporate multiple needs beyond water quality.

The Bay Program developed the Strategic Science and Research Framework to better address and assess the science needs of the GITs/workgroups. One need various workgroups have mentioned is “shallow water monitoring.” When STAR discussed this with the groups, the definition differed among them. For example, Forage Fish is interested in shallow water forage fish species presence/abundance and nearshore habitat monitoring. The SAV workgroup is

interested in monitoring SAV at sentinel sites. There are current rotating shallow water quality monitoring programs by MD and VA, and they are finishing up recent rotations, so this is good opportunity for the CBP to state their needs. There is interest in strategizing and coordinating the shallow water quality monitoring.

At the Management Board when they hear shallow water, they think of the shallow water monitoring for water quality, but now it is moving to fish and habitats. Peter said there is a need to better define shallow water to meet the needs of Fish Habitat, SAV, Forage Fish, etc. This workgroup could help with how to use the ConMon data. Bruce said it is important to make that connection between shallow water monitoring data, water clarity, and living resources so they are not seen as separate factors.

Tish would like to go back and do the analysis she showed earlier to other VA stations. Some stations have data from 2005 so there is a lot of data for her to look at for attainment.

Emily asked if the NERR monitoring sites had other parameters besides water quality. Mike said NERR has biotic and wetlands information. Recently they have started to standardize the observations on the marshes but are looking to collect measurements that are widely used.

Peter asked based on Tish's presentation earlier if MD was considering investigating short-term duration criteria or using the new CHLA criteria. Bruce said he is not aware of MD adopting the CHLA criteria, but it might also be difficult due to the amount of money needed for over 8 years.

Emily and Peter will get a better understanding of what the workgroups need and then sit down with Bruce to learn how MDNR is structing their ConMon sites to hopefully link them together.

Emily asked how VA chooses sites for shallow water monitoring stations. Tish said it is mainly based on water quality criteria and assessment. While natural resources are an important aspect, it is very important to focus on the water quality for the state.

Emily asked if there was any other information available out there for shallow water monitoring. Tish shared the estuary ConMon program for the tributaries and the coastal survey with Peter. Ken mentioned Maryland has fish surveys in the shallow waters.

2:40 **Update on Assessing possible advances in SAV acreage assessment: STAC workshop proposal** – ***Brooke Landry (MD DNR, Chair of SAV Workgroup) & Peter Tango (USGS)***

Led by the SAV WG, a proposal was submitted for CBP-STAC consideration update the SAV monitoring program with the use of new satellite imagery and interpretation algorithms. In 2018 there were multiple program challenges to providing a full assessment including poor weather conditions and high turbidity/poor water clarity for effective aerial overflight surveys. Researchers are exploring the use of new, high resolution satellite imagery for improving the SAV survey. Brooke will give an update on the workshops held so far to explore satellite assessment for SAV and opportunities for other water quality measures to be assessed by satellite image interpretation.

The workshop objective is to review the science and technology essential to integrate satellite imagery into the Chesapeake Bay Program's SAV monitoring program. The workshop product will be a report-and-guidelines document laying out the information and steps necessary to integrate the use of satellite data and imagery into the SAV monitoring program. The workshop discussed possible data sources. There are over 2000 satellites, but there are only a few that are available for use. Aerial imagery available for the 2018 work was from the National Agricultural Imagery Program (NAIP), WorldView 2,3, and 4, and PlanetScope. There are still 2 years left on the existing contract so aerial imagery will still be used.

Fred suggested using green lidar bathymetry:
https://inport.nmfs.noaa.gov/inport/item/56297
Peter will talk with Fred offline more about this option.

John said that the options listed are private, so he asked if there are government options. Peter said NASA was at the workshop, and they mentioned their requirements are different than private companies to eliminate too much competition.

A challenge with commercial data sources is that satellite task requests can be bumped with priority, less than optimal times/places, raw images are protected which are typically not publicly available, derivative products are typically approved for public release, and commercial satellites may be decommissioned on short order.

Tom asked if land cover data could be used. The Conservancy Landsat was a onetime product.

Next workshop is in February to take the 25 questions in the presentation and figuring out how to operationalize it. There will be a final workshop in the spring

where everyone will be invited to learn about the work and discuss any potential future research ideas.

Next meeting topics:

- Update on CBP GIT Funding project to deploy vertical profiler
- Discussion on redefining seasons due to climate change
- Discussion on adjusting or modifying criteria based on climate change considerations
- Presentation on application of shallow water monitoring data; Is the CBP model adequately capturing the observed trends in open water for DO and Temp
- Consider Tish's decision rules for criteria

3:30 Adjourn

Participants: Peter Tango, Breck Sullivan, Elgin Perry, Tom Parham, Mike Trice, Carl Friedrichs, Bruce Michael, Cindy Johnson, John Kennedy, Tish Robertson, Amanda Shaver, Doug Austin, Ken Moore, Renee Karrh, Sandy Mueller, Greg Nolie, Fred Irani, Dave Parrish, Gary Shenk, Jessie Turner, Roberto Llanso, Lucretia Brown, Becky Monahan, Richard Tian, KC Filippino, Dianne McNally, Arianna Johns, Claire Buchanan, Cuiyin Wu, Jeni Keisman, Rebecca Murphy, Emily Trentacoste, Betty Neikirk