



TMAW - Umbrella Criterion Action Team (UCAT) Spring Workshop

Shallow Water vs. Offshore Water Dissolved Oxygen Criteria

April 4th, 2013, 10AM – 3PM

<http://www.chesapeakebay.net/calendar/event/18988/>

MINUTES

OBJECTIVES:

- 1) Evaluate the need to separately assess dissolved oxygen criteria in near shore habitats vs. offshore habitats and develop recommendations according to findings that highlight the management and monitoring implications
- 2) Finalize a recommendation related to the validation of the umbrella criterion assumption when evaluating the 30-day mean dissolved oxygen criteria and the 7-day mean.

ACTION ITEMS:

LEADERSHIP:

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PRESENTERS:

Peter Tango	USGS	ptango@chesapeakebay.net
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PARTICIPANTS:

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Shallow Water Workshop Introduction: Developing Case Options and Implications for Assessing the Open Water Designated Use (Peter Tango-USGS/CBPO)[Presentation](#)

The first Ambient Water Quality Criteria document, which was published in 2003, stated that insufficient information was available regarding differences in dissolved oxygen dynamics between offshore and shallow, nearshore habitat to support separating the two habitats into their own designated use assessments. P. Tango reviewed the UCAT's previous shallow water characterization of dissolved oxygen behavior and confirmed the vast amount of information now available to make valid recommendations. Three assessment options for assessing the open-water designated use segments:

- OPTION 1: Keep shallow water embodied within the open water designated use
- OPTION 2: Separate shallow water as a dissolved oxygen based sub-segment in the open water designated use.
 - a) Setting the offshore/nearshore boundary – what separates shallow water from offshore water for dissolved oxygen assessments?

b) Same criteria, separate criteria – what are they and why?

c) Applicable seasons and definitions

d) Monitoring

e) Assessment

- OPTION 3: Only assign sub-segmentation of shallow water habitat in special cases

Summary of Discussion

Monitoring programs and the understanding of shallow water habitat

- The presentation shows a conservative estimate of the percentage of shallow water habitat in the Bay because segments that are not supported by monitoring programs are not included in this analysis.
- South, Severn and Magothy Rivers have a level of monitoring that could fill some monitoring gaps.

Discussion about the three assessment options for Open Water designated use

OPTION 1	OPTION 2	OPTION 3
<u>PROS</u> <ul style="list-style-type: none">• Living resources considered in setting criteria, apply to common organisms in both habitats.• Daily changes can be significant; however those changes may not be observed on a monthly and/or seasonal scale.• What would happen to the open water	<u>PROS</u> <ul style="list-style-type: none">• Geomorphology and physics vary at different depths• Groundwater sources from smaller creek systems are increasingly important, and affect shallow water more directly than offshore water• Creeks and sub tributary	<u>PROS</u> <ul style="list-style-type: none">• Cannot see issues in the smaller tributaries without separating the two nearshore and offshore. In specific areas.• Would allow for better restoration targeting

<p>assessments if the nearshore was removed? (collecting only two times a month)</p> <ul style="list-style-type: none"> • Preliminary work show that the two uses are similar 	<p>improvements are used for restoration grant funding for organizations, and can be demonstrated if monitored independently from open water</p> <ul style="list-style-type: none"> • DO dynamics in places that are vegetated vs. not vegetative are quantitatively different • Lower diel swings offshore within SAV beds (K. Moore 2004) • With the current structure, CBP is underestimating shallow water habitats, many are intimately connected with the land, therefore CBP may be underestimating their impact (i.e. tribes of tribes) • Could help get non-profits and citizen science involved 	<ul style="list-style-type: none"> • Better evaluate storm water effects on near-shore shallow water
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	<ul style="list-style-type: none"> • Cannot see issues without breaking out the shallow water 	
<u>CONS</u> <ul style="list-style-type: none"> • Has there been enough work done to make a decision as to whether they are truly similar. 	<u>CONS</u> <ul style="list-style-type: none"> • The nearshore and open water follow a similar pattern, two separate criteria aren't necessary for progress analysis. Higher resolution data would suffice. 	<u>CONS</u>

OPTION 2: Management and Monitoring Implications:

- What are the proper metrics to use in comparing the nearshore vs. offshore data? Could they use the same criteria and be assessed separately?
- If they are separated, would there be failure in one habitat and not fail in another?
- MD DNR-500 cruises taking shallow water data
 - Currently the criteria evaluated are SAV and Clarity; if new priorities are phytoplankton and DO, adjustments to the monitoring program are needed
- If separating the near-shore and off-shore shallow water segments, where is the boundary?
 - Oyster monitoring data available (key for permitting locations for Oyster Restoration)
- SUGGESTION: Use a 1-Day mean for shallow water criteria
- What size area of shallow water habitat per segment is significant for assessing separately?

NEXT STEPS:

- **ACTION:** Perform more thorough examination of offshore surface water and nearshore surface water through a comparison of percent nonattainment levels using nearshore continuous monitoring sites and offshore high frequency data streams.
 - South River by Diana Muller and Andrew Muller

- Patapsco by Mark Trice
- York River by Tish Robertson
- Patuxent by Elgin Perry
- NOAA buoy's can be used for the offshore surface water DO measurements (10 total, 6 in MD)
- Explore nearshore vs. offshore duration of low DO events
 - Is there a difference in failure rates?

The Rules for Comparing % nonattainment levels nearshore and offshore using high frequency data streams:

Season

- *June through September, of the best available year(i.e. quality assured data)*

Data Targets

- *The data should consist of a full month of data when possible in order to compare a 30-day means and weekly means.*
- *3 sets of paired comparisons (Monthly mean, 7-day mean, seasonal total instantaneous nonattainment) between nearshore and a neighboring offshore site.*

Definitions

Nearshore = *Continuous Monitoring sensors with high frequency measurements.*

Offshore = *High frequency data collection site including vertical profilers in MD and VA, NOAA Buoy data sets maintained by MD DNR and VADEQ.*

Depths = Surface Water by SAV standards is less than or equal to 2 meters. Study should use sensor data from a depth between 0.5-2m.

Month = *the first 30 days of the month*

Note: If possible, highlight the approximate distance between the continuous monitoring sensors to the matched offshore site as a good piece of auxiliary data.

Comparison Study Guidelines

1. 30-day mean % nonattainment based on the HIGH FREQUENCY DATA (we are not worried about the differences in long term sampling approach for this exercise). Ideally for the season. Report nonattainment by month and Average non attainment for the full summer season.
2. 7 day means within the month. Start on day 1 of the month. Use the first 28 days in 7-day intervals. Compare the 7-day means to the criterion. We can report % nonattainment for the summer again onshore and offshore. Out of 4x7=28 weeks, what proportion is out of attainment? Report nonattainment by week, average nonattainment by month, average nonattainment for the summer.
3. Compute the “instantaneous” attainment rate for the full summer data. Report a % nonattainment for the summer season.
4. A Summary Table should look similar to:

Nearshore Continuous Monitor

Year	Location	Method	Seasonal Mean	June Mean	July Mean	August Mean	Sept Mean	Seasonal: % Non-Attainment	June % Non-Attainment	July % Non-Attainment	Aug % Non-Attainment	Sept % Non-Attainment
2005	Beards Creek, South River	Instantaneous	6.72					3				
		7D-Week 1		9.01	6.18	6.36	N/A		0	6	11	N/A
		7D-Week 2		7.55	7.49	7.17	N/A		1	1	4	N/A
		7D-Week 3		5.70	6.53	6.02	N/A		19	12	10	N/A
		7D-Week 4		6.88	7.39	5.19	N/A		2	3	18	N/A
		30-Day		7.24	6.81	6.14	N/A		14	14	28	N/A

Offshore Site

Year	Location	Method	Seasonal Mean	June Mean	July Mean	August Mean	Sept Mean	Seasonal: % Non-Attainment	June % Non-Attainment	July % Non-Attainment	Aug % Non-Attainment	Sept % Non-Attainment
2011	Annapolis Buoy	Instantaneous	6.23					3				
		7D-Week 1		7.83	5.9	4.9	5.7		0	6	18	2
		7D-Week 2		7.73	5	5.8	4.6		0	23	12	17
		7D-Week 3		7.41	7.6	5.3	6.4		0	0	15	0
		7D-Week 4		6.91	6.4	4.6	7.7		0	4	28	0
		30-Day		7.41	6.4	6.4	6.1		1	8	53	26

Follow-up 30-Day Umbrella Criterion validating the 7-Day Mean with a presentation on Potomac Con Mon Data based on two fixed point estimations – E. Perry

Background: During the Umbrella Criterion Assessment analysis, E. Perry compared the 30-day to 7-day mean by sequentially dividing the year into 30 day segments and 7 day segments, then he compared the means where the segments overlapped, looking for patterns of deviation. This additional study was conducted to determine if the actual 30-day mean was unknown but based on two fixed point observations (as the current monitoring program allows), how would this frequency of data influence the opinion of the 30-day mean being representative of the 7-day mean?

The analysis E. Perry conducted can be found on page 7, Table 2, estimating the of risk of violating the 7-day criterion given the monthly mean estimate (column 1) and four levels of sampling variation (columns 2-5). Column 1 assumes near true weekly deviations, column 2 assumes variation the average of 20 small sample estimates, column 3 assumes variation at the minimum of 20 small sample estimates and column 4 assumes variation at the maximum of 20 small sample estimates. This study concludes that when as the uncertainty of knowing the monthly mean increases, the risk of assuming the 30-day mean is protective of the 7-day mean increases. Based on the evidence that the monthly mean threshold of 6.22 which insures that violations of the 7-day criterion is less than 10% is far above the 30-day criterion of 5.0, the 30-day criterion is not an umbrella for the 7-day criterion when the monthly mean is estimated by a sample size as small as two.

Questions, Concerns, and Discussion

- If this computation was based on offshore data, would the findings be similar?
 - ACTION: Repeat this exercise with offshore data.
- The UCAT group discussed recommending an “Umbrella Threshold” instead of an “Umbrella Criterion” given the variability of the monthly mean when close to 5 mg/L.
- **ACTION:** Perform a follow up study to examine if the 30-Day mean is protective of the true 30-Day mean (E. Perry)
- Would it be more effective to monitor fewer segments at a higher frequency of data collection or would more spatial variability be more representative of the Bay?
- Do the analyses completed to this point provide sufficient information to finalize the recommendation (30-Day mean protective of the 7-Day mean)?
 - Could be helpful to the group to target sites that are near attainment, for further information
 - Could be helpful to compare small creeks to the adjacent Mainstem segment. Currently the creeks are assessed by the results in the adjacent Mainstem segment, but may not capture the true dissolved oxygen dynamics of the small creeks.
 - *For example:* If the Pagan river was assessed separately from the James mesohaline, the Pagan would be listed as impaired but not as attached to the James River.
 - *Issue with assessment methodology:* The Chesapeake Bay Interpolator grabs data from tributaries of tributaries, when assessing segments because it doesn’t recognize land barriers.
- Smaller tributaries of Bay tributaries regularly do not meet water quality standards. They are heavily impacted by loads to the Bay but are not assessed separately in the annual analyses.
 - The separation of the smaller tributaries would be an additional driver for the case of separating nearshore shallow water from offshore shallow water.

FOLLOW-UP CALL on July 12, 2013

