Recommendations Regarding the Question of Separating Shallow Water habitat from the Open Water Designated Use for Dissolved Oxygen Criteria Assessments

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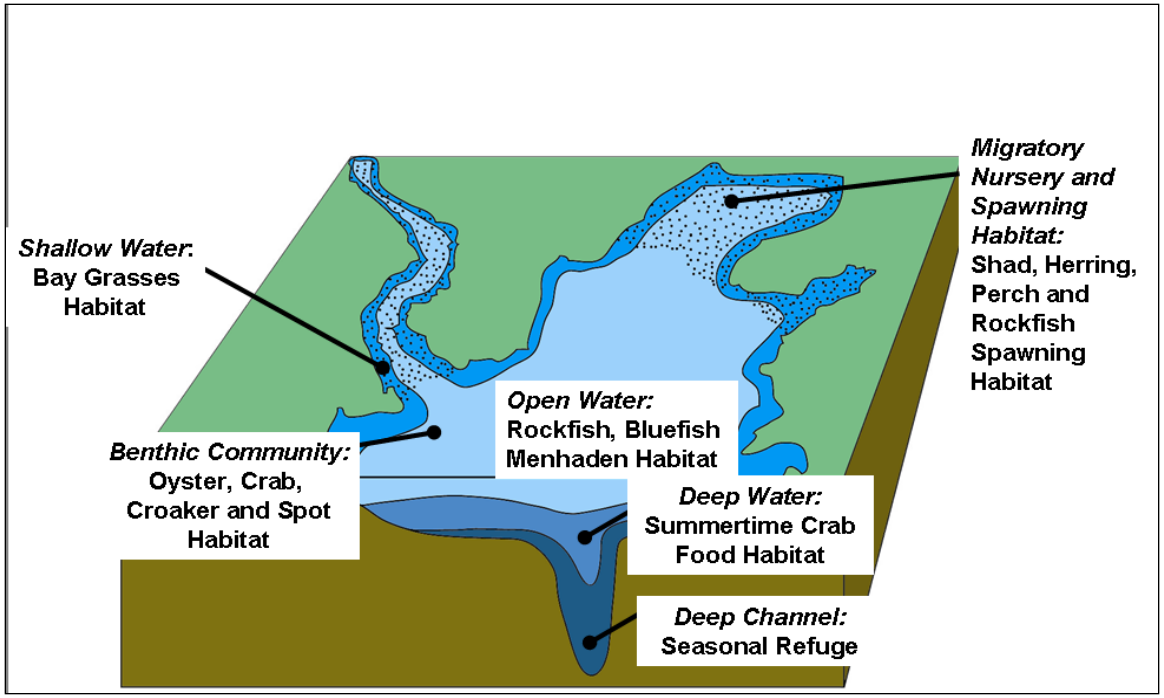
October 21, 2013 WQGIT meeting

Actions for November 2013

- Request approval at the November 2013 WQGIT meeting for the options regarding the Open Water designated use assessments to be accepted into the next U.S. EPA Ambient Water Quality Criteria Technical Addendum.

Summer Season
Open Water Designated Use

- *From June 1 through September 30 the open-water designated use included tidally influenced waters extending horizontally from the shoreline to the adjacent shoreline.*



Background

- Interest was expressed by the CBP community in possibly assessing shallow water habitat separately from offshore habitats for dissolved oxygen criteria attainment:
  - Monitoring Realignment (MRAT process)
  - Umbrella Criteria Assessment Team
  - CBP-STAC workshop 2011

U.S. EPA 2003

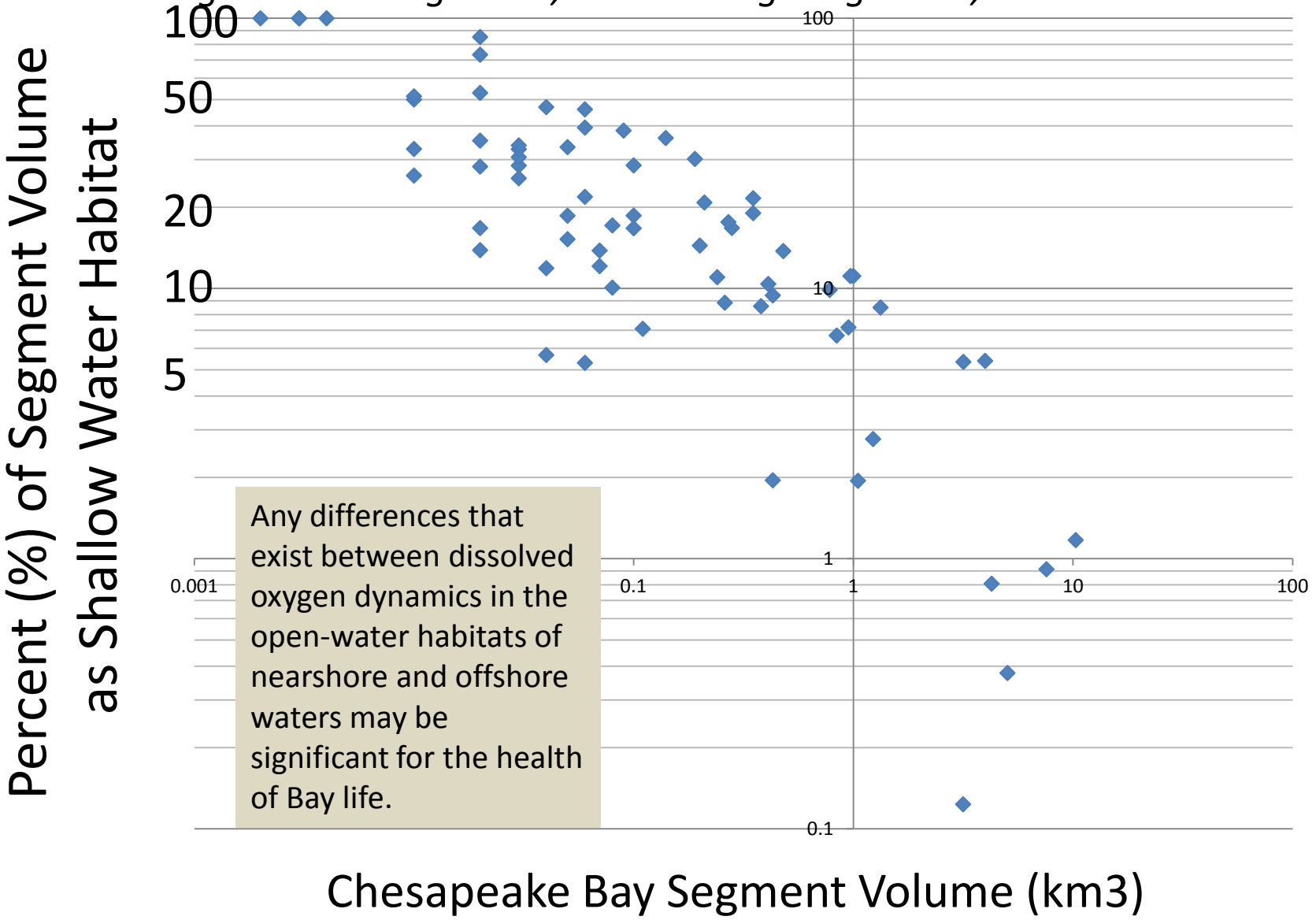
- Insufficient information was available regarding differences in dissolved oxygen dynamics between offshore and shallow, nearshore habitat to support separating the two habitats into their own designated use assessments.

The Chesapeake Bay Program has had a Continuing Interest in Understanding Shallow Water Habitat Conditions

- Batiuk et al. 2000 SAV Technical Synthesis
  - Includes synthesis of mid-channel to nearshore water quality comparisons
- CBP Water Quality Monitoring Programming Changes 2003-04:
  - Defunded Zooplankton Monitoring
  - Funded new Shallow Water Monitoring Program
    - Fixed site continuous monitoring
    - DATAFLOW
- USEPA 2007 comparison analysis

The Importance of Shallow Water in Chesapeake Bay

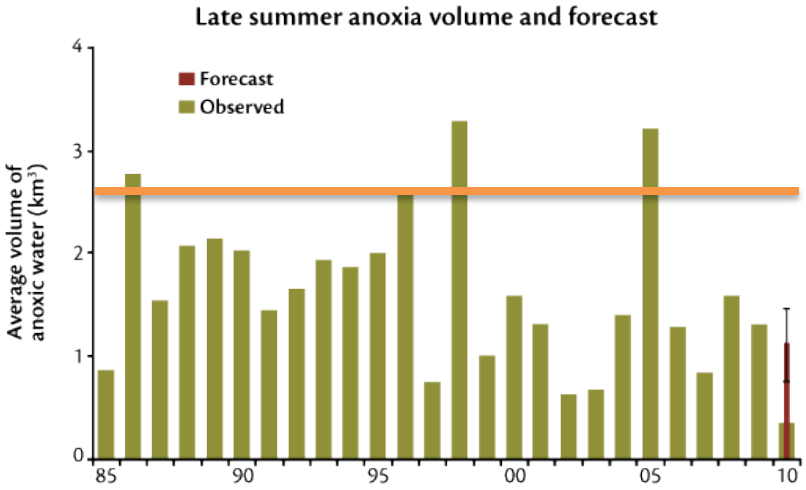
The percent of shallow water habitat is
large in small segments, small in large segments, overall abundant



Bay facts suggest there are at least 700,000 acres (2832.9 km^2) $\leq$ 6 feet deep (http://www.chesapeakebay.net/discover/bay101/facts).

• Therefore, the shallow water habitat of the Bay is approximately 24.4% of its surface area.

•Estimate for the volume of tidal shallow water habitat is estimated at 4.56% of the total Bay volume or 2.59 km^3.



Historic anoxic volume for late summer (mid-July to September) and the 2010 late summer forecast of anoxic volume.

April 2013 CAP WG Shallow water Workshop Challenge:

- Review available analyses comparing nearshore and offshore dissolved oxygen behavior. Conduct additional analyses if necessary and as time permits.
- Evaluate 3 potential cases for policy makers to consider in assessing shallow water habitat.

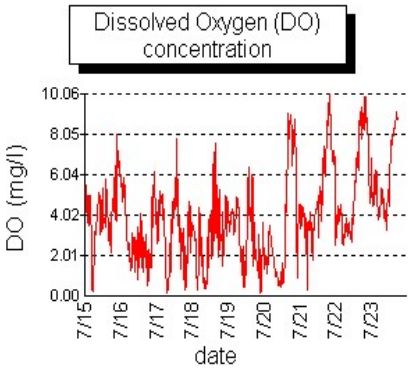
- Case I. Keep shallow water embodied within the open water designated use

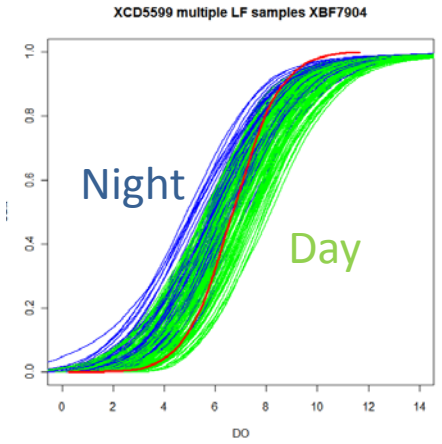
- Case II. Separate shallow water from the open water designated use Bay-wide as a dissolved oxygen based designated use.

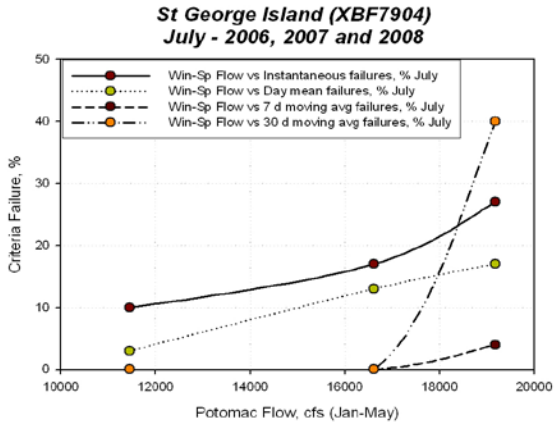
- Case III. Allow sub-segmentation of shallow water habitat in special cases.

Umbrella Criteria Assessment Team Shallow water Characterization of Dissolved Oxygen Behavior

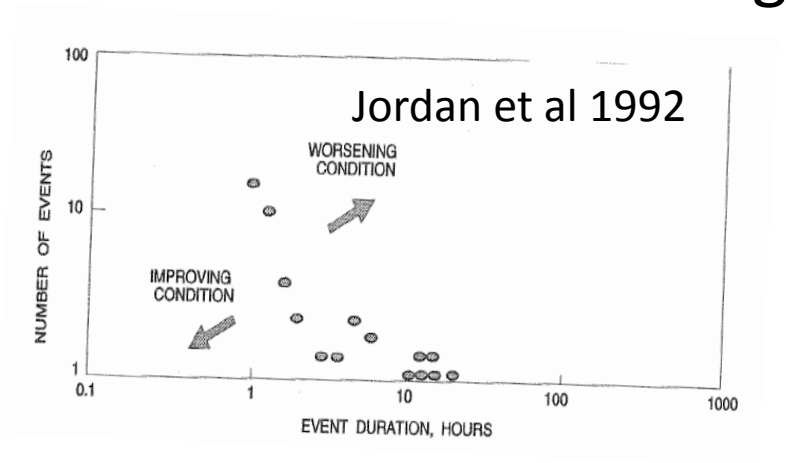
- Intrasite variability
  - Low DO events, Duration of events, day vs. night
- Intersite variability
  - Changes along condition gradients
- Seasonal variability
- External factors
  - River flow, eutrophication, temperature, solar angle

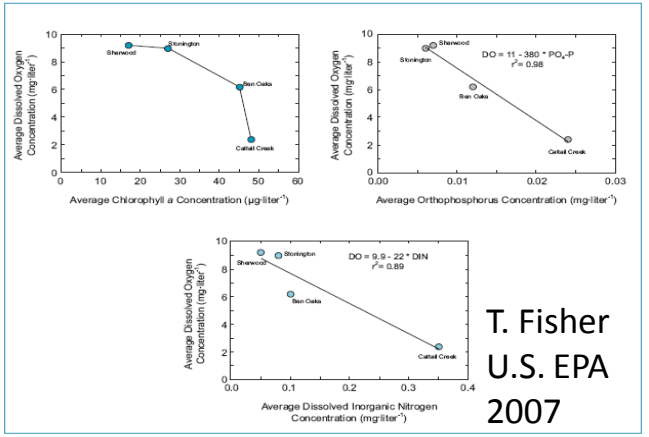






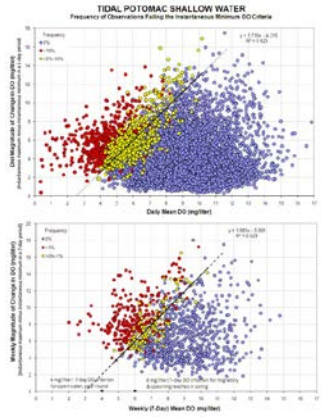
UCAT Findings:
Nearshore and Offshore DO behaviors may not be identical but appear parallel in response to stressor gradients



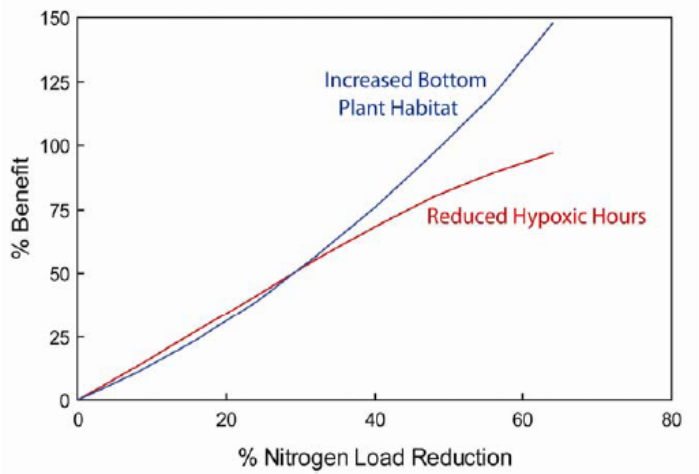


T. Fisher
U.S. EPA
2007

Figure IV-11. Significant relationships among average concentrations of the continuous monitoring surface chlorophyll *a*, orthophosphorous, and dissolved inorganic nitrogen data versus dissolved oxygen concentrations for the tidal Magothy and Severn rivers.



C. Buchanan:
UCAT 2012



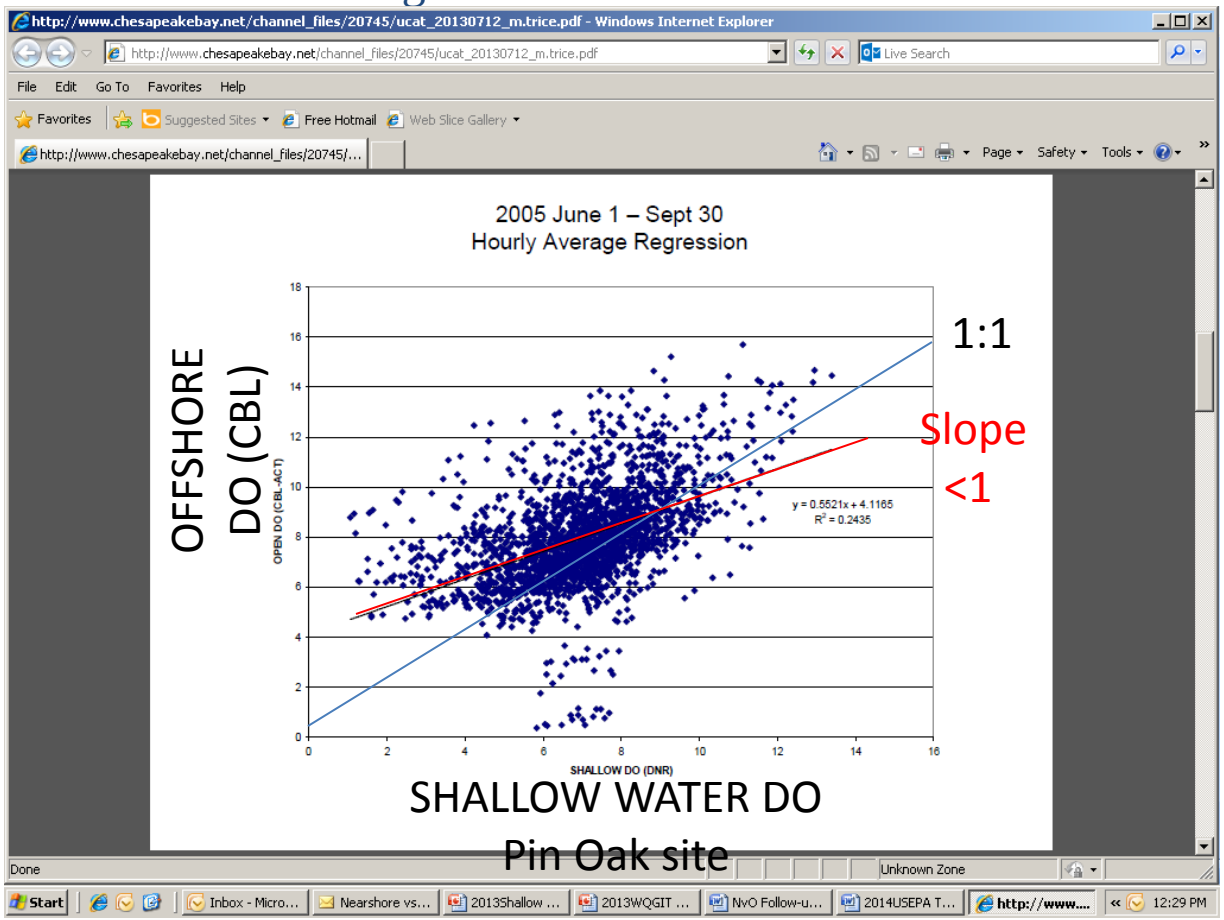
Boynton et al.

sensor depth	6	5	4	3
Monthly Mean DO	5.0058	5.6732	6.3407	7.0082
7 day criterion failure rate	16.6%	5.5%	1.5%	0.5%
rate of instantaneous criterion > 10%	47.6%	32.5%	25.3%	18.5%

E. Perry:
UCAT 2012

UCAT Findings

- Umbrella Criteria Analysis Team results showed high frequency shallow water dissolved oxygen measures can be biased low and offshore measures biased high relative to each other.
  - As a result we can find higher violation rates in shallow water than offshore water.



Recommendation: Part 1.

- Shallow water as a habitat for dissolved oxygen assessment remains within the open water designated use.
  - Data show parallel ecosystem response of dissolved oxygen to changes in water quality indicator gradients

Recommendation: Part 2.

- Continue to support the CBP partners option for assigning subsegmentation of shallow water habitat in special cases.
  - Umbrella Criteria Analysis Team results showed high frequency shallow water dissolved oxygen measures can be biased low and offshore measures biased high relative to each other.
    - As a result we can find higher violation rates in shallow water than offshore water.

Recommendation: Part 3.

- The UCAT does not support separating all shallow water as a dissolved oxygen based sub-segment from the open water designated use.

  - A Bay-wide separation of the habitats would require assessments that have not been a part of analyses to date such as:

    I. Determining if the SAV 2m boundary definition of shallow water in the Bay represents an appropriate Bay-wide dissolved oxygen habitat boundary.

    II. Are the same seasons and their definitions applicable if we separated the two habitats into different designated uses?

    III. Would we need to establish separate criteria – what are they and why?

    IV. Monitoring is done on a subset of segments each year – would our monitoring network be suitable for the annual Bay-wide assessment?

    V. Assessment procedures could need further revision.

Actions

- Share with the WQGIT during the first week of November 2013 the next Ambient Water Quality Criteria Technical Addendum draft chapter addressing questions regarding the Open Water designated use as a complete background to the recommendations.
- Request approval at the November 2013 WQGIT meeting for the options regarding the Open Water designated use assessments to be accepted into the Technical Addendum.