Umbrella Criteria Workshop Update

March 15-16, 2011

Jeni Keisman (UMCES at EPA CBP)

The Umbrella Criteria Workshop Steering Committee

- Walter Boynton (UMCES-CBL)
- Claire Buchanan (ICPRB)
- Marjy Friedrichs (VIMS, STAC representative)
- Matthew Hall (MD DNR)
- Rick Hoffman (VADEQ)
- Jeni Keisman (UMCES-CBP)
- Mike Lane (ODU)
- Elgin Perry (consulting statistician)
- Tish Robertson (VADEQ)
- Peter Tango (USGS-CBP)

Umbrella Criteria Workshop Participants

- Denise Breitburg (SERC)
- Marjy Friedrichs (VIMS)
- Nagaraj Neerchal (UMBC)
- Walter Boynton (UMCES)
- Claire Buchanan (ICPRB)
- Matt Hall (MD DNR)
- Rick Hoffman (VADEQ)
- Mike Lane (ODU)
- Elgin Perry (Consultant)
- Tish Robertson (VADEQ
- Peter Tango (USGS-CBP)
- Jeni Keisman (UMCES-CBP)
- Fred Holland
- Steve Weisberg (SCCWRP)
- Andrew Muller (USNA)
- Mark Trice (MD DNR)
- Marcia Olson (Consultant)
- Aaron Gorka (CRC)
- Liz Van Dolah (CRC)
- Dave Jasinski (CRC)

Key Discussion Themes and Questions

Key Themes:

- The “Umbrella Criteria Assumption” and the Four Questions
- Related Topics of Importance, or “All the revisions we’d like to make, given sufficient resources and time”

Approach:

Day 1: Overview of Analyses conducted

Introduction of Summary Results Table

Day 2: Discussion

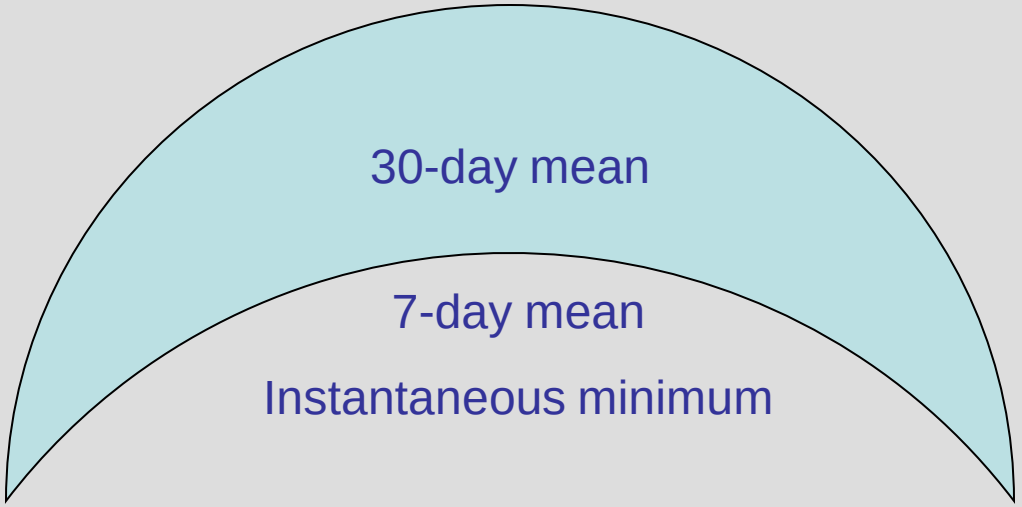
Roundtable: concluding comments and recommendations

The Dissolved Oxygen Criteria

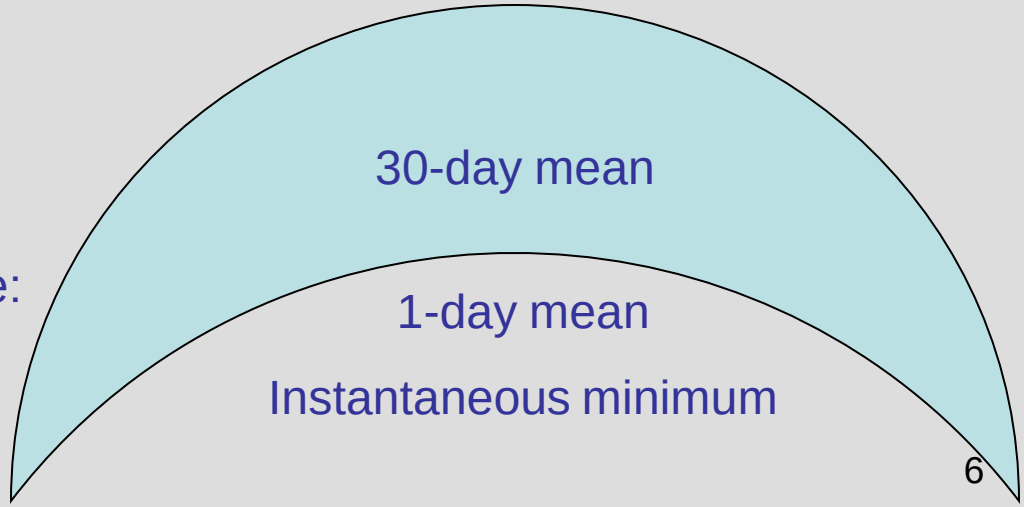
Designated Use	Dissolved oxygen Criteria Concentration/Duration		Temporal Application
Migratory fish spawning and nursery use	7-day mean ≥ 6 mg/L tidal habitats with 0-0.5ppt salinity		February 1 – May 31
	Instantaneous minimum ≥ 5 mg/L		
	Open water fish & shellfish designated use criteria apply		June 1 – January 31
Shallow water Bay grass use	Open water fish & shellfish designated use criteria apply		Year-round
Open water fish and shellfish use	30-day mean	≥ 5.5 mg/L for salinity = 0-0.5ppt	Year-round
		≥ 5.0 mg/L for salinity > 0.5ppt	
	7-day mean	≥ 4 mg/L	
	Instantaneous min ≥ 3.2 mg/L for water temp ≤ 29° C		
	Instantaneous min > 4.3 mg/L for water temp > 29° C		
Deep-water seasonal fish and shellfish use	30 day mean > 3mg/L		June 1 – September 30
	1-day mean >2.3 mg/L		
	Instantaneous min ≥1.7 mg/L		
	Open water Fish and shellfish designated use criteria apply		October 1-May 31
Deep channel seasonal refuge use	Instantaneous min > 1 mg/L		June 1 – September 30
	Open water fish & shellfish designated use applies		October 1 – May 31

The Umbrella Criteria

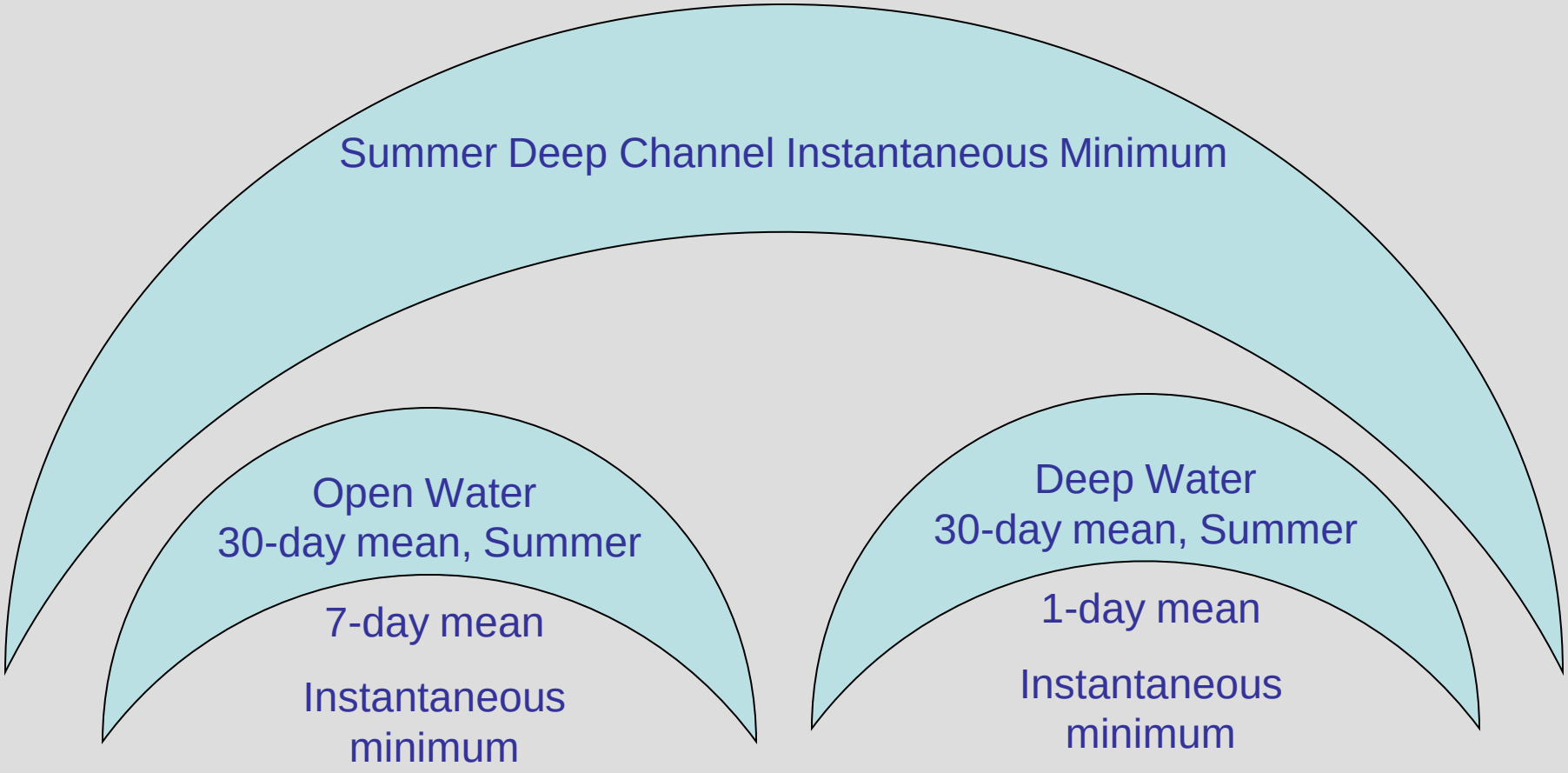
Open Water designated use:



Deep Water (summer) designated use:



The Umbrella Criteria



The Four Questions

From the proposal:

The objective of this workshop is to synthesize the findings of our partners in order to generate a report that details:

- *Under what conditions (i.e. for which criteria, and/or in which regions, and/or during which seasons), this assumption appears to be accurate;*
- *Under what conditions this assumption appears to be violated;*
- *For what conditions currently available data do not allow us to test this assumption*
- *The data that would be needed to test this assumption for all conditions*

Major Findings & Results of Discussions, Pt. I

1. In Open Water, the 30-day mean criterion is generally protective of the 7-day mean criterion, both mid-channel and in nearshore regions. However, the umbrella “is not a broad one.” In Deep Water, limited analyses suggest that the 30-day mean is protective of the 1-day mean. Further lines of evidence need to be developed.
2. In both Open and Deep Waters, multiple lines of evidence suggest that **the 30-day mean criterion can not be assumed to protect the instantaneous minimum criterion everywhere and/or at all times.**
3. We can generate results for all 92 segments with existing data; more data and analytical development would increase the *accuracy* and reduce the risk of *decision error*
4. Greatest data gap is vertical profiles in mid-channel and deep water regions
5. **Low-frequency sampling contributes more variability to distribution of synthetic datasets than does casting of short-term variability from different sites**

Major Findings & Results of Discussions, Pt. I

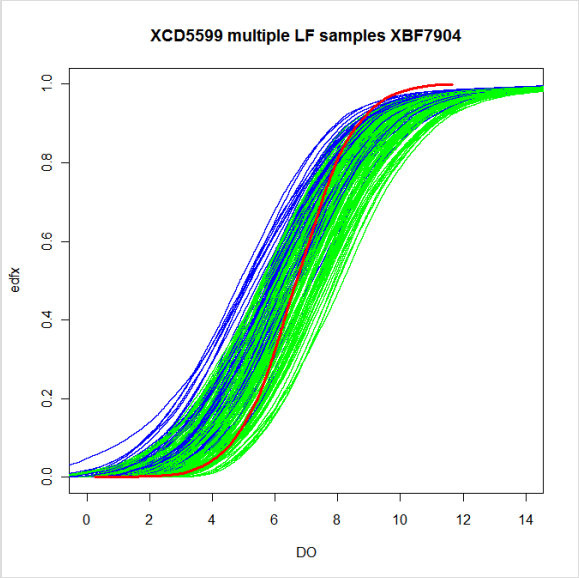


Figure 8. Variation due to multiple low-frequency samples from the receiving site with Fourier Series interpolation. The sending data set is held constant at one two-week interval. Blue curves synthetic data based on a series of night samples. Green curves are from a series of day samples. The red curve is the receiving site high frequency data.

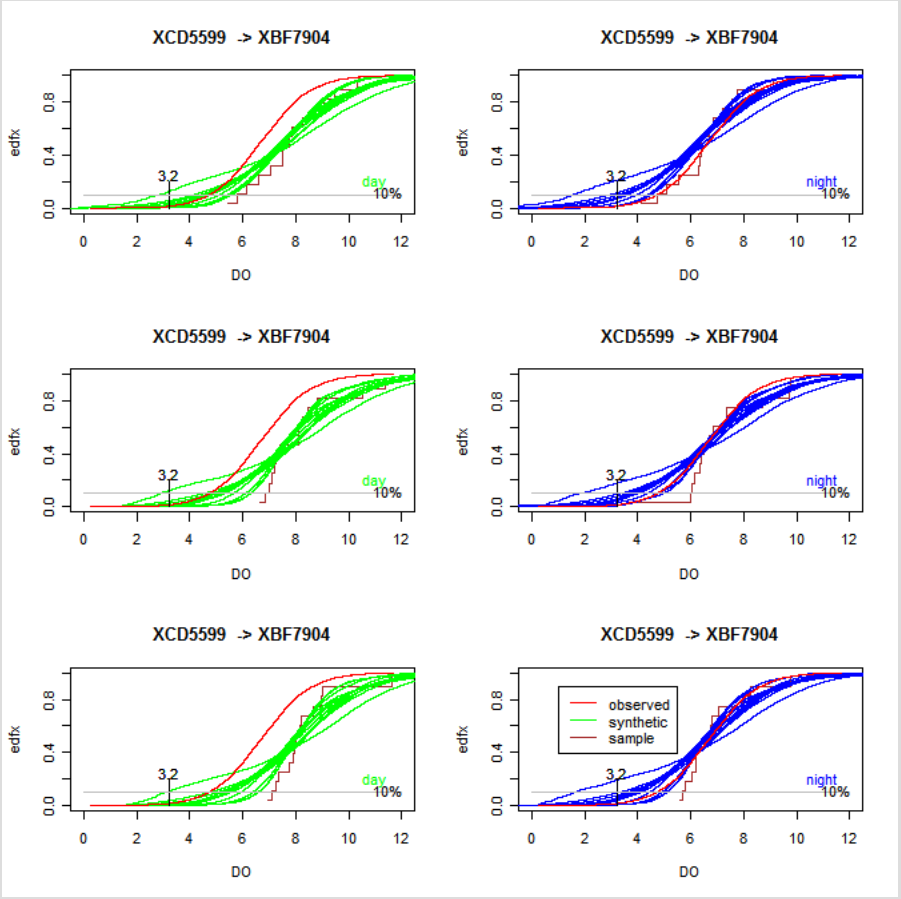


Figure 9. In each panel are the original receiving high frequency data (red) , the low-frequency sample (brown) and 12 synthetic data sets (blue or green) base on 12 sending data sets. Green curves use low-frequency data collected during the day. Blue curves use low frequency data collected at night. Each panel is for a different set of low-frequency data.

Major Findings & Results of Discussions, Pt. II

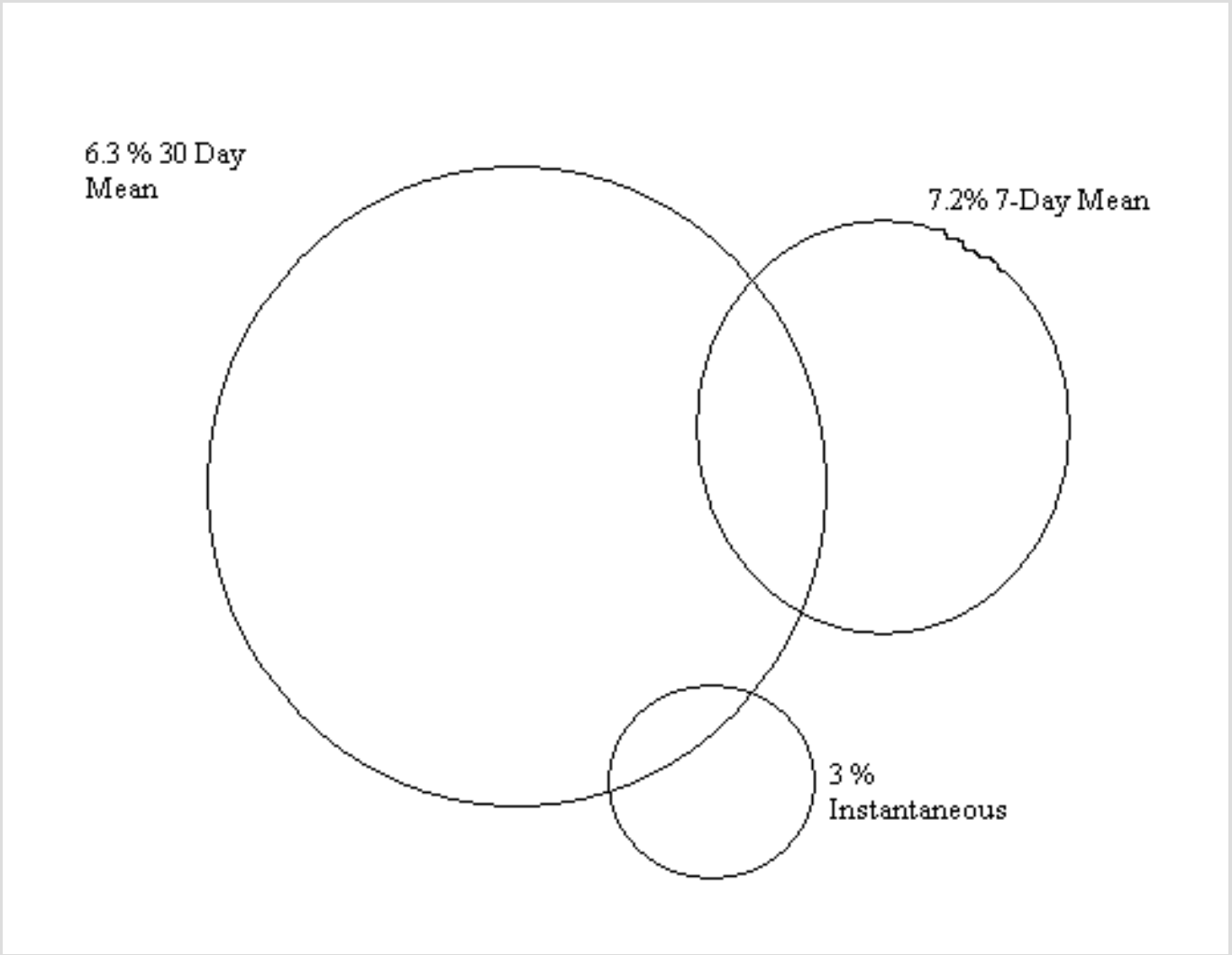
Related Issues of High Importance:

- Differences between nearshore, shallow-water dynamics and mid-channel dynamics
  - Is it appropriate to lump shallow-water and offshore volumes together for assessment?
  - Will a restored nearshore, shallow system with abundant SAV/benthic algae have diel-cycling hypoxia as a natural condition?
- As currently structured, DO criteria assessments do not consider the duration of hypoxic events. Most important when considering instantaneous minimum.
- Should day-night differences in DO concentrations be considered in assessments?
- How might characteristics of variability change along a restoration trajectory?
- In separating criteria assessment from modeling efforts, have we thrown the baby out with the bathwater?

Specific Recommendations

- “Uniformize the dataset”
- Adopt the “umbrella threshold” concept in contrast to the “umbrella criterion” concept
- For each segment-designated use, determine the observed data distribution and variability, and quantify: (1) the umbrella threshold; (2) the probability of violating each short-term criterion in any month, given the 30-day mean criterion
- Generate decision rules for targeting regions with high probability of passing 30-day mean – but of failing shorter-term criteria – for high-frequency sampling and criteria assessment.
- Collect more high-frequency vertical profile data in mid-channel and deep water regions. Use models to target regions where more versus less variability is expected.
- Generate a more precise definition of the instantaneous minimum for purposes of criteria assessment
- Quantify the decision error of all assessments (including “30-day mean”)
- Write code modules capable of conducting full regulatory CFD assessments of high frequency criteria
- Help the managers “take a sip of water from a firehose” – need to generate simplifying communication tools (e.g. venn diagram visual)
- Assess low-frequency subsample of WQSTM output

Specific Recommendations: Venn Diagram



Short-Term Next Steps (June – August 2011)

- Finalize Umbrella Criteria Report by end of June 2011
- Compile complete “uniform” dataset for future analyses
- Update quadrant/conditional probability analysis for all 92 segment-DUs
- Continue validation analyses: utility of spectral casting for generating synthetic datasets for short-term criteria assessment
  - Investigate importance of inter-annual variability
  - Clarify decision-rules for applying pycnocline
- Write Requirements document for code module(s) to conduct high throughput, short-term criteria assessment

Long-Term Next Steps (September 2011 and beyond)

- Request expert panel to review adequacy of spectral casting method for assessing short-term criteria
- Incorporate findings into targeting of high-frequency monitoring resources
- Explore Related Issues:
- Question of separate shallow-water assessments
- Investigate variability along restoration trajectory
- Investigate utility of simulation models for contributing information to criteria assessment?