Ambient Water Quality Criteria for Dissolved Oxygen, Water Clarity and Chlorophyll a for Chesapeake Bay and its Tributaries.

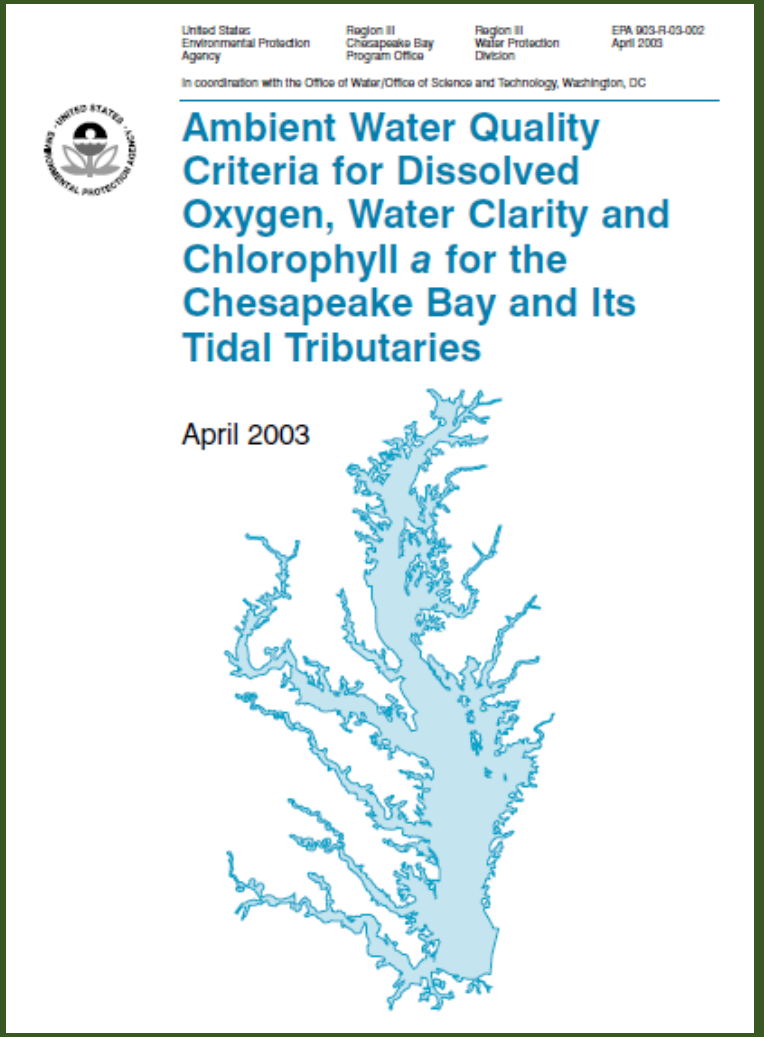
- Today: Introduction to the new 2016 water quality technical addendum review by STAC.

Peter Tango 2/15/2016

(and the cast of thousands of state, federal, local, academic, interstate river commission, consultants and nonprofit colleagues that have contributed over the years!)

In the beginning… USEPA (2003)

- The foundation document defining Chesapeake Bay water quality criteria and recommended implementation procedures for monitoring and assessment

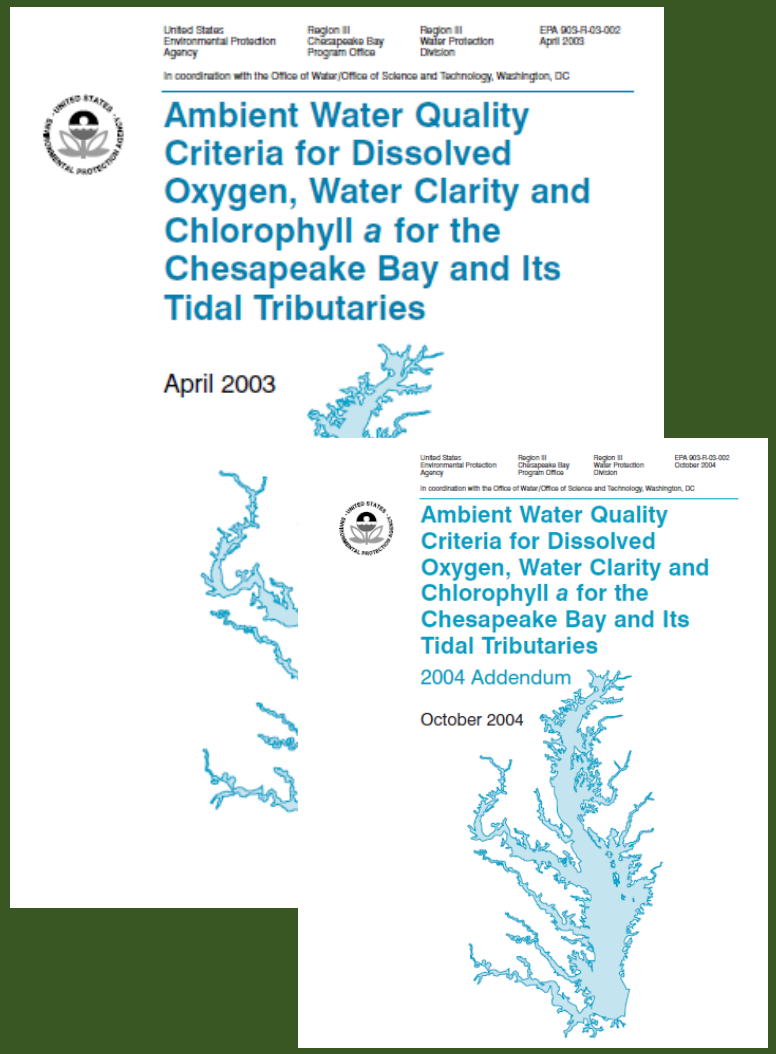


Designated Use	Dissolved oxygen Criteria Concentration/Duration		Temporal Application
Migratory fish spawning and nursery use	7-day mean ≥ 6 mg/L tidal habitats with 0-0.5ppt salinity		February 1 – May 31
	Instantaneous min ≥ 5 mg/L		
	Open water fish & shellfish designated use criteria apply		June 1 – 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 Salinity: (0-0.5ppt)	Year-round
		≥ 5 mg/L Salinity: >0.5ppt	
	7-day mean	≥ 4 mg/L	
	Instantaneous min ≥ 3.2 mg/L		
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 F & S applies		October 1 – May 31

Dissolved Oxygen Criteria

Publication of the 185,000 acre goal

- The basis, derivation, revision and adoption of the 185,000 acre bay-wide submerged aquatic vegetation (SAV) acreage goal and associated assessment protocols is established in 2003 and 2004.
  - Documentation: U.S Environmental Protection Agency Region III's April 2003 publication of *Ambient Water Quality Criteria for Dissolved Oxygen, Water Clarity and Chlorophyll a for the Chesapeake Bay and its Tidal Tributaries (Regional Criteria Guidance)* and accompanying volumes of technical support documentation, e.g. U.S. EPA 2004.

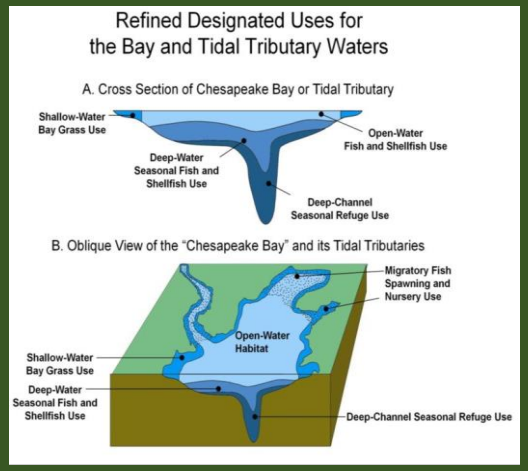


USEPA 2003: Narrative CHLA Criteria

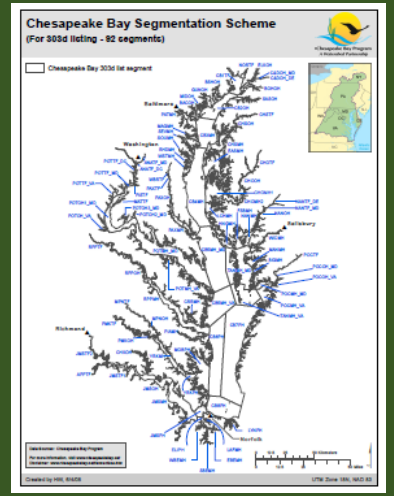
- *Concentrations of chlorophyll a in free-floating microscopic aquatic plants (algae) shall not exceed levels that result in ecologically undesirable consequences—such as reduced water clarity, low dissolved oxygen, food supply imbalances, proliferation of species deemed potentially harmful to aquatic life or humans or aesthetically objectionable conditions—or otherwise render tidal waters unsuitable for designated uses.*

Subsequently, there have been updates and refinements in addenda to USEPA 2003.

- USEPA 2003 October: Tech support for identification of five water designated uses to be protected
- USEPA 2004b, 2005, 2010 DU refinements

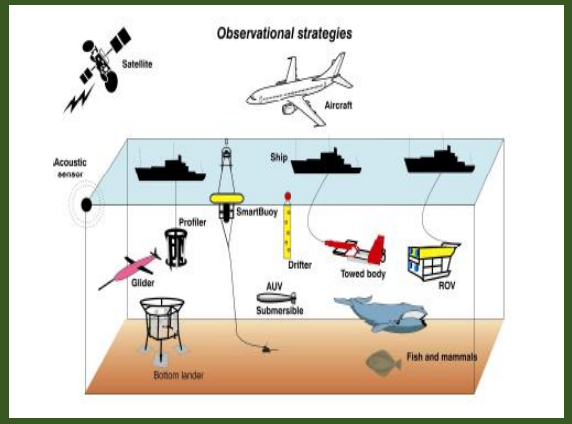


- USEPA 2004b, 2005, 2008. Bay segmentation described and updated



- USEPA 2004a, 2007a, 2008, 2010:

Criteria attainment assessment procedures and updates

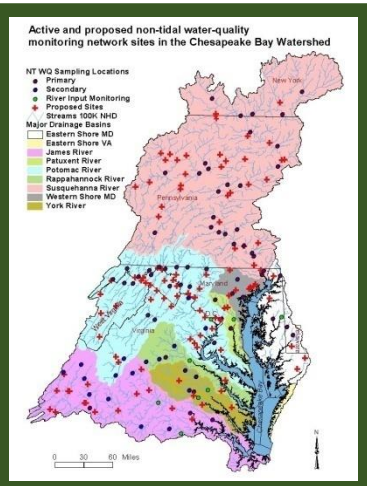


- USEPA 2007b, 2010:

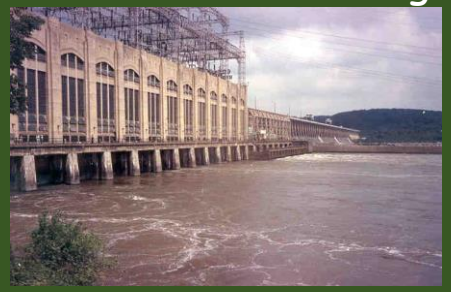
Numerical Chla Criteria and updates

How Water Quality Standards Attainment is Assessed and Reported for Chesapeake Bay

Assess Status and Tracking Change:
Chesapeake Bay Program Monitoring Networks



Watershed Monitoring



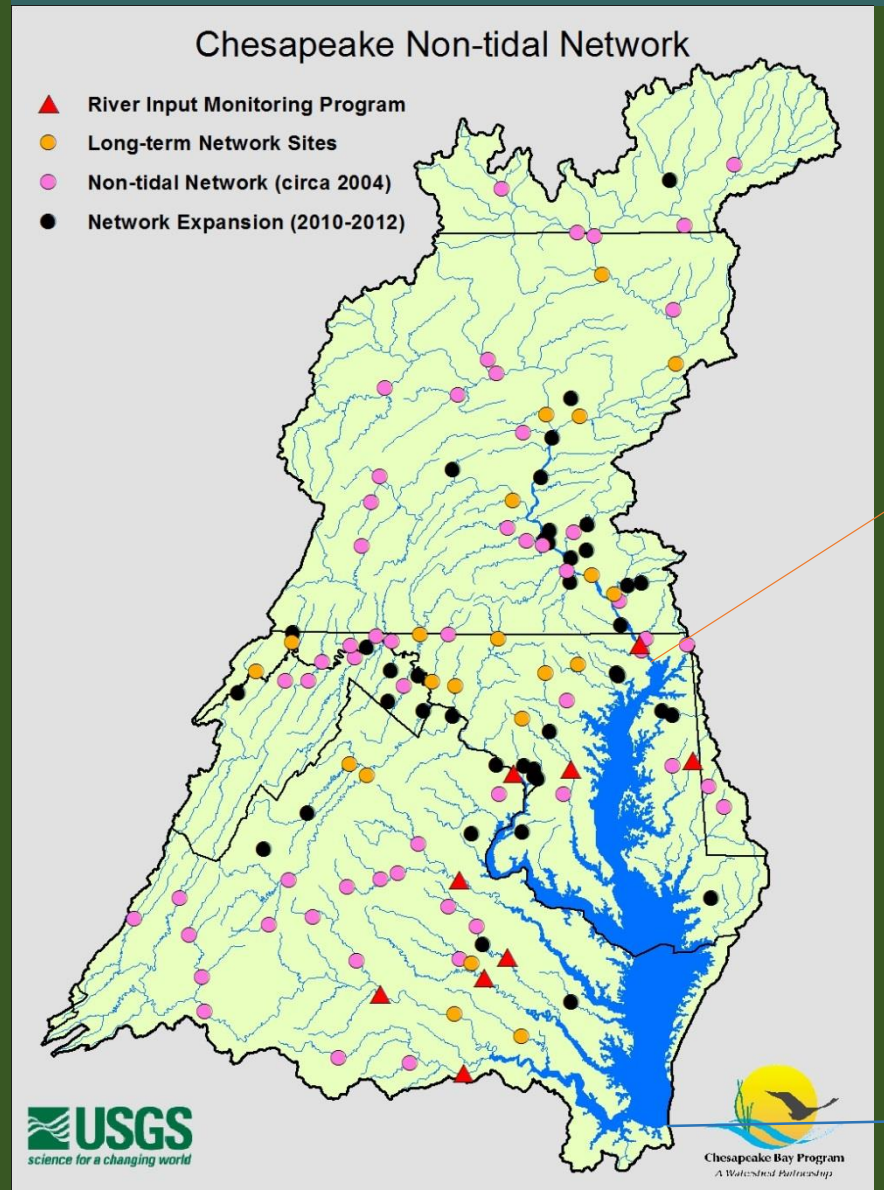
Shallow Water Habitat

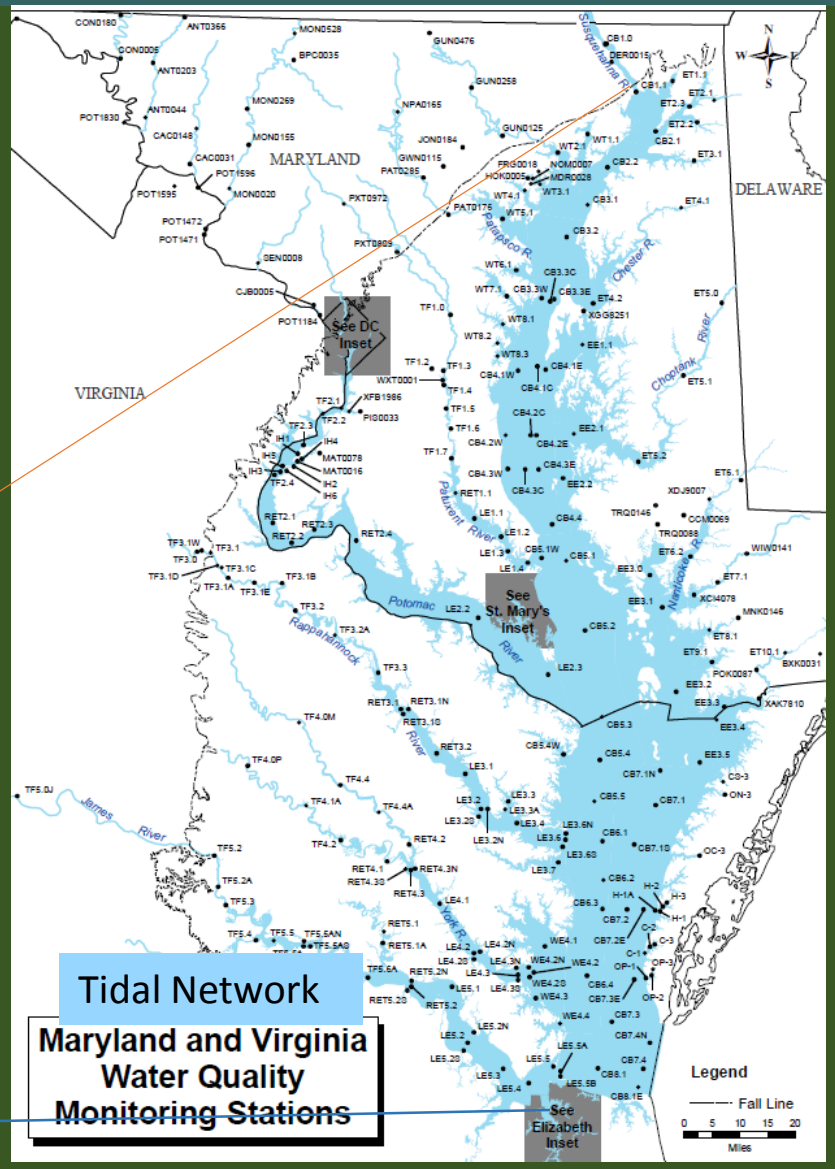
Bay Water Quality Monitoring

Living Resources Monitoring

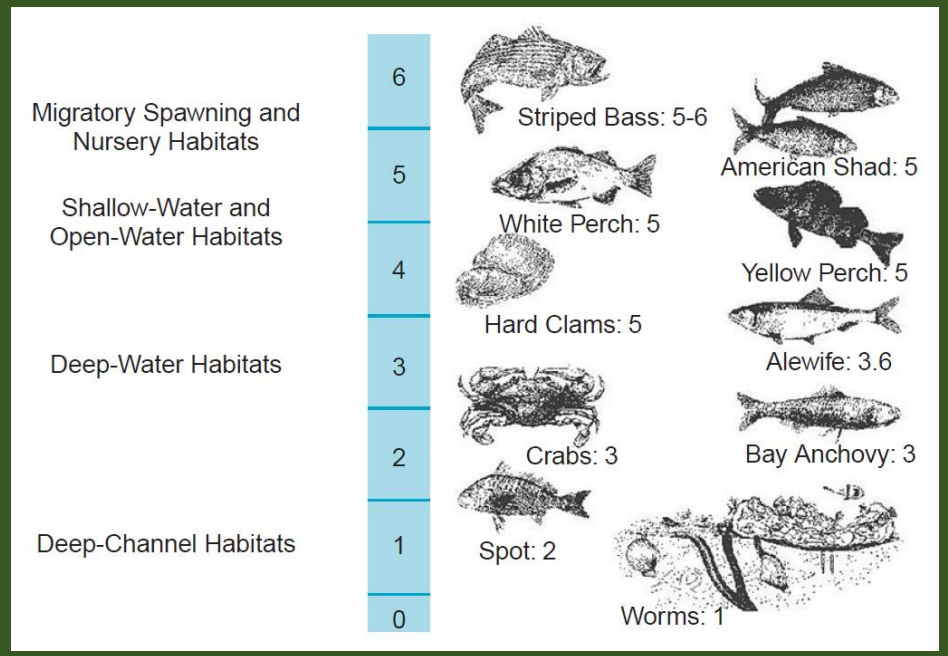
Using Monitoring Data To Measure Progress and Explain Change

Foundation: Monitoring networks



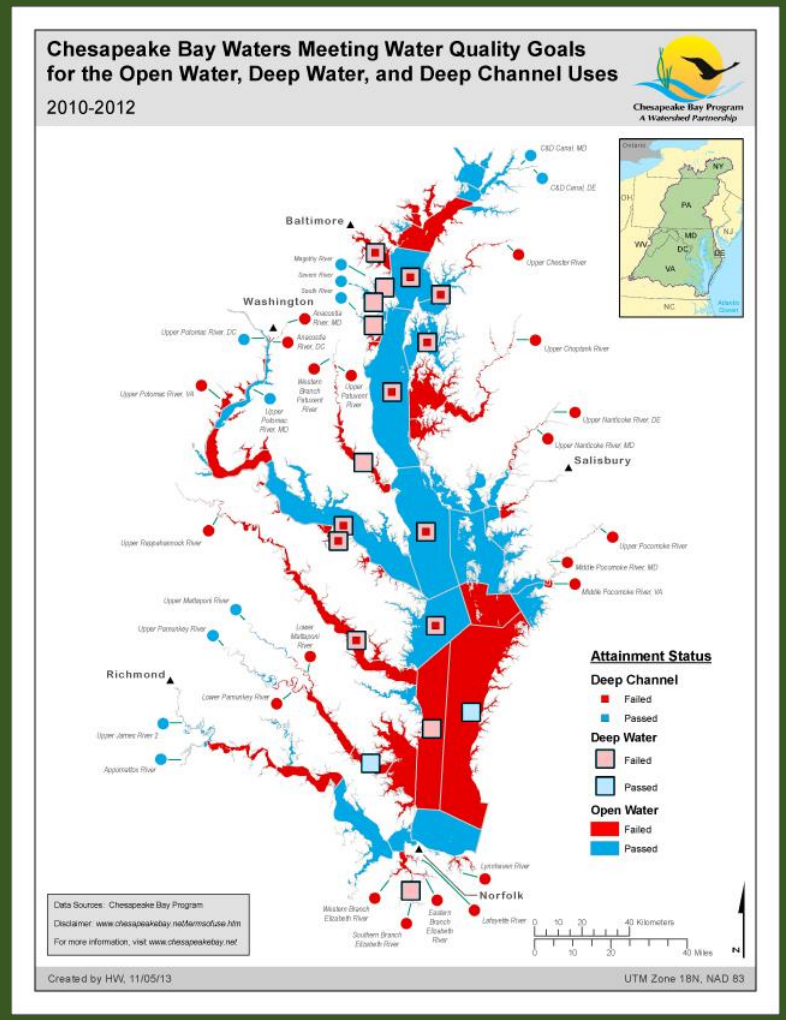


Bay Health Status – Spatial Snapshot



USEPA 2003

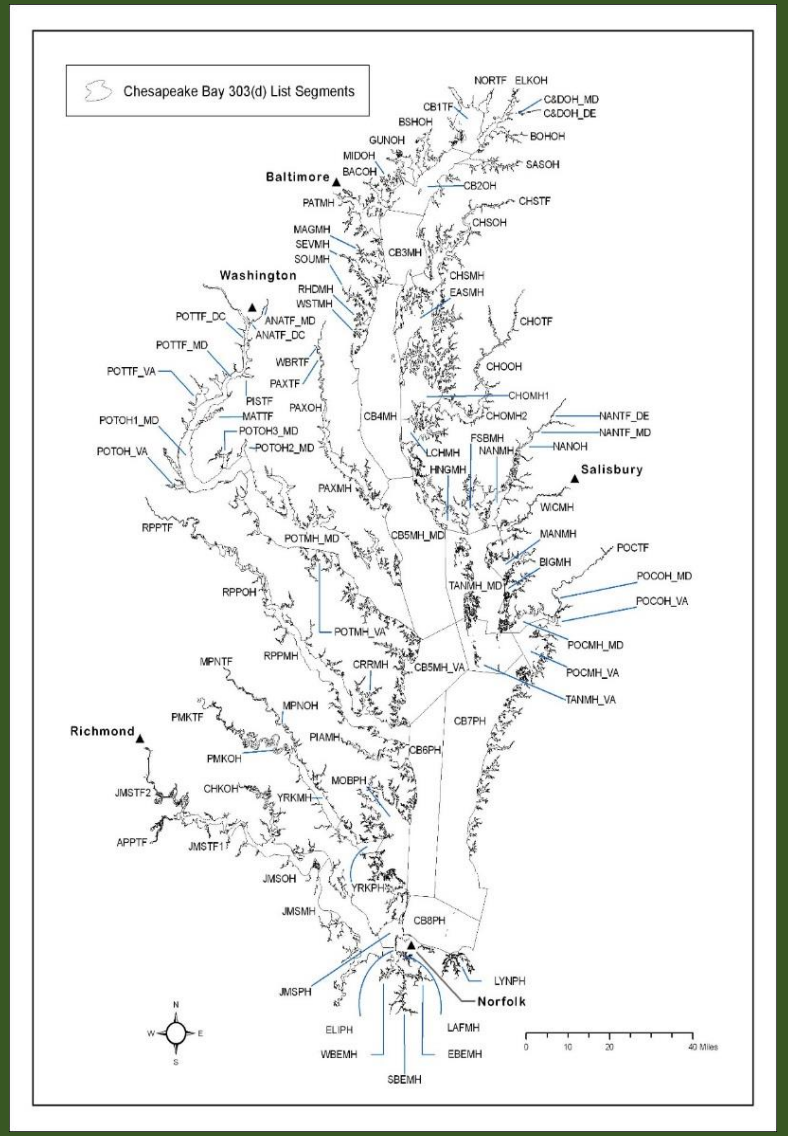
The Dissolved Oxygen Criteria Yardstick:
Science-derived species requirements for
Protecting survival, growth and reproduction
In different Bay habitats.



Status – water quality meets or fails standards

Chesapeake Bay Segmentation Scheme

- Segments are compartments in the Bay; subunits based on selected criteria
- Segments help organize data collection, analysis and presentation of environmental results



Monitoring and Assessment – as easy as baking a cake!

Collect the ingredients

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Follow the Recipe as the rules for Creating a cake

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Collect the ingredients

Follow the Recipe as the rules for Creating a cake

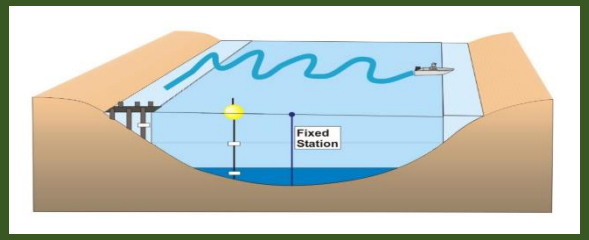
Create a layer, and then another, …

Voila! Assemble into the finished product!

Finally – the interpretation of the results. Bring in the taste tester!

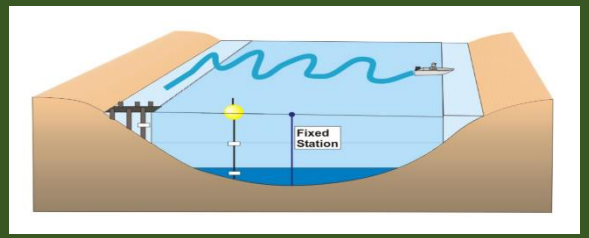
Geeky translation: Water Quality Criteria Assessment

Water Quality
Data Collection

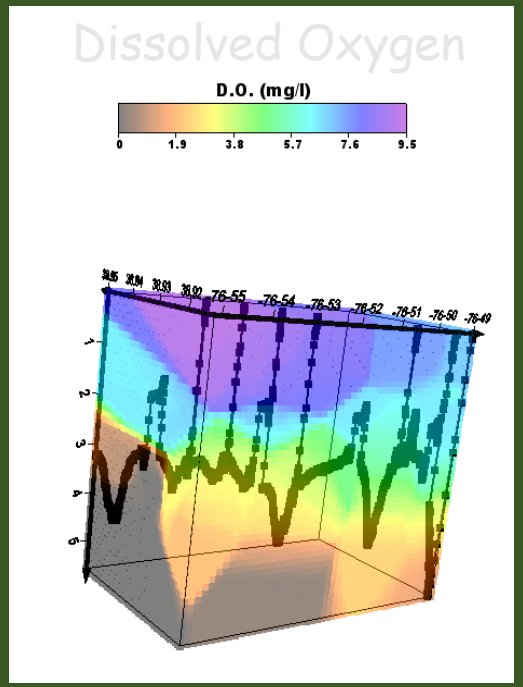


Water Quality Criteria Assessment

Water Quality Data Collection



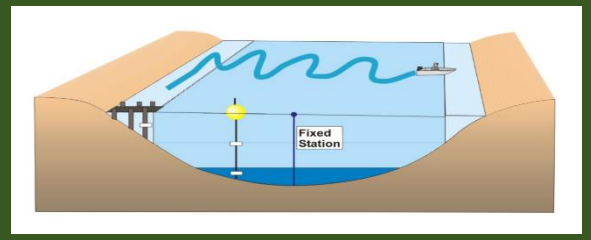
Interpolation of Water Quality Monitoring Results



Picture courtesy of A. Muller, USNA

Water Quality Criteria Assessment

Water Quality Data Collection



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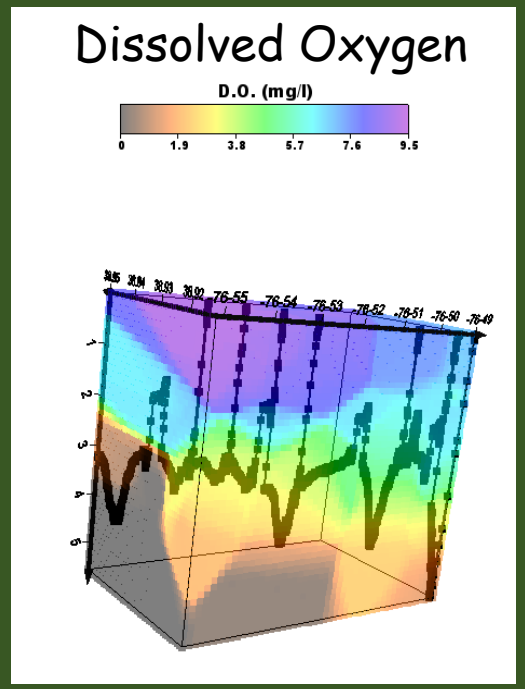
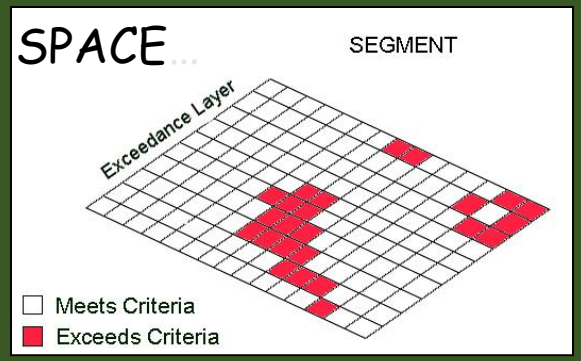
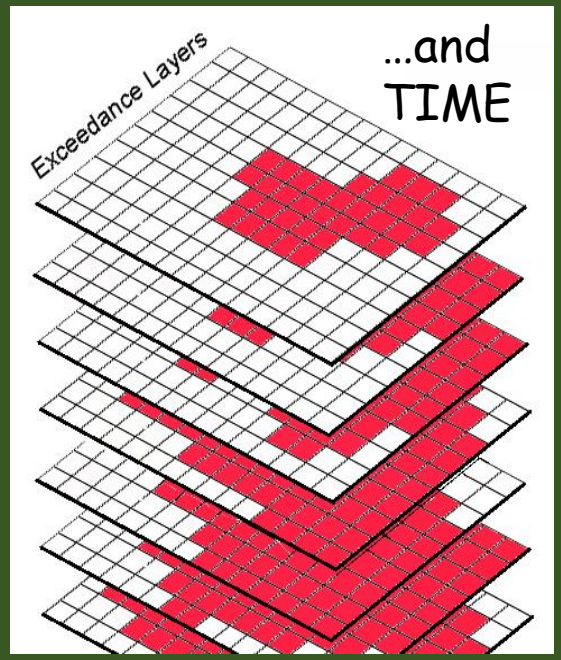


Picture courtesy of A. Muller, USNA

Single month Criteria assessment

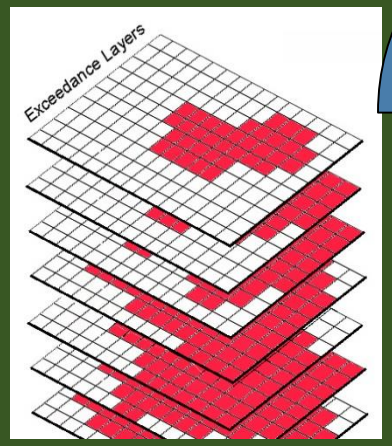


Season x 3-year Criteria assessment

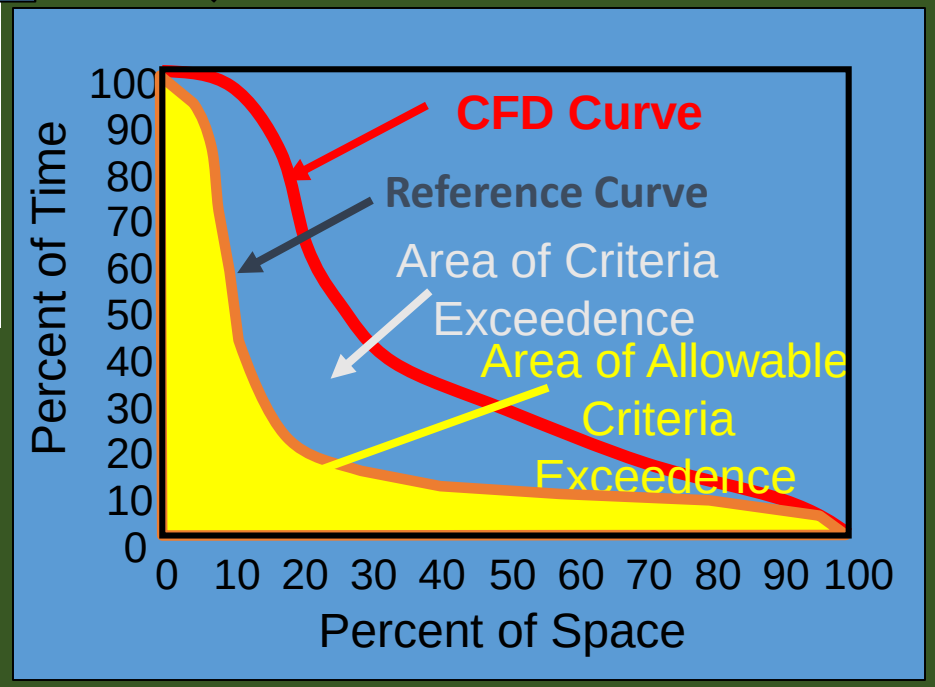


Water Quality Criteria Assessment

Translate data layers into a graph
to evaluate water quality standards attainment

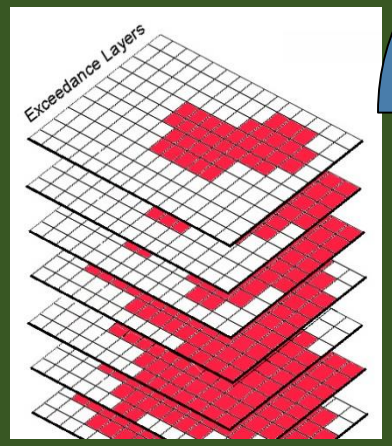


Monitoring Data
1 segment
over time



USEPA 2003

Water Quality Criteria Assessment



Monitoring Data
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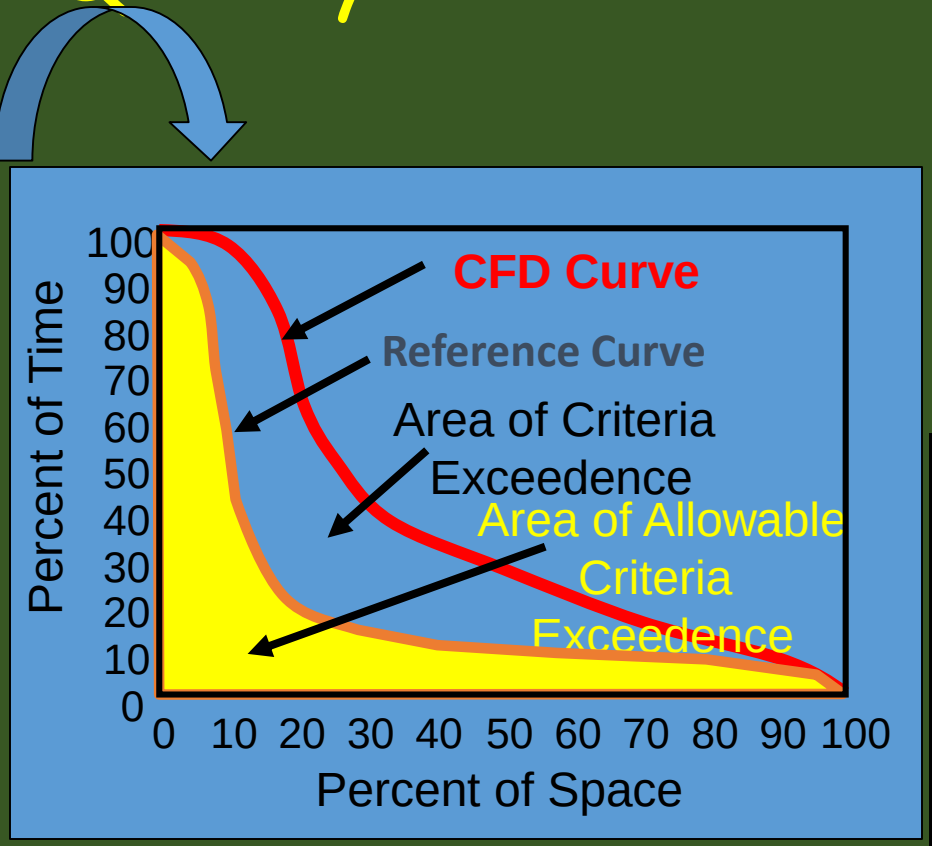


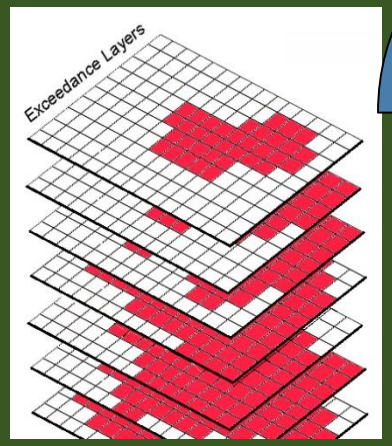
USEPA 2003

Pass or Fail Assessment
1 segment

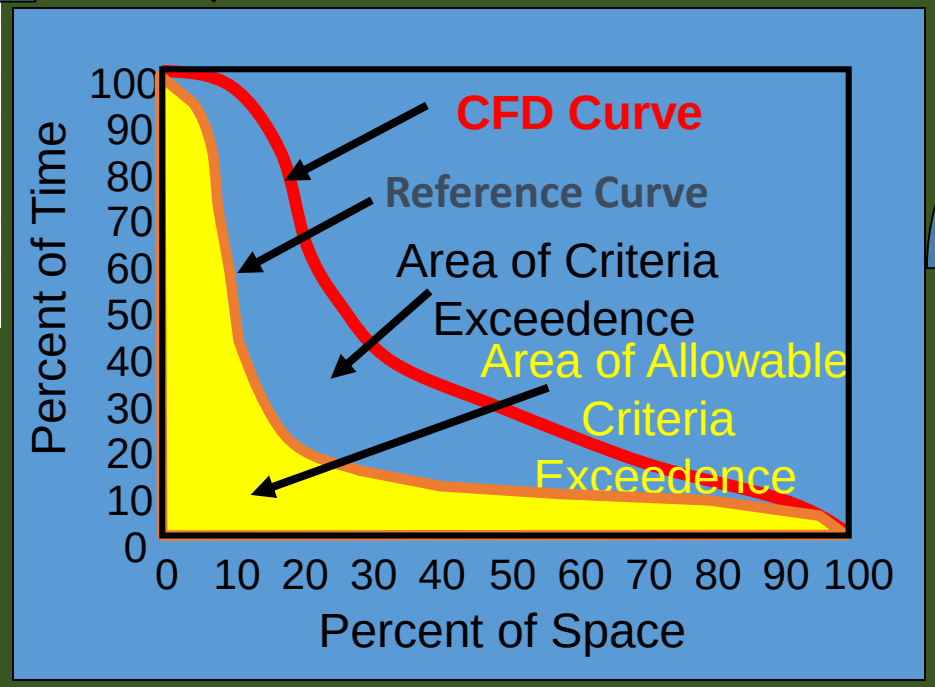
Water Quality Standards Attainment

"Either you're in or your out!"

Water Quality Criteria Assessment



Monitoring Data
1 segment
over time

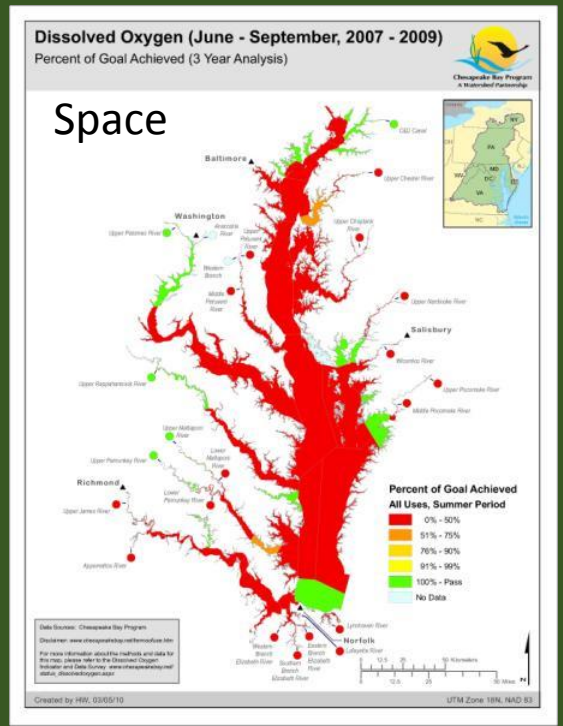


USEPA 2003

Pass or Fail Assessment
1 segment

Water Quality Standards Attainment

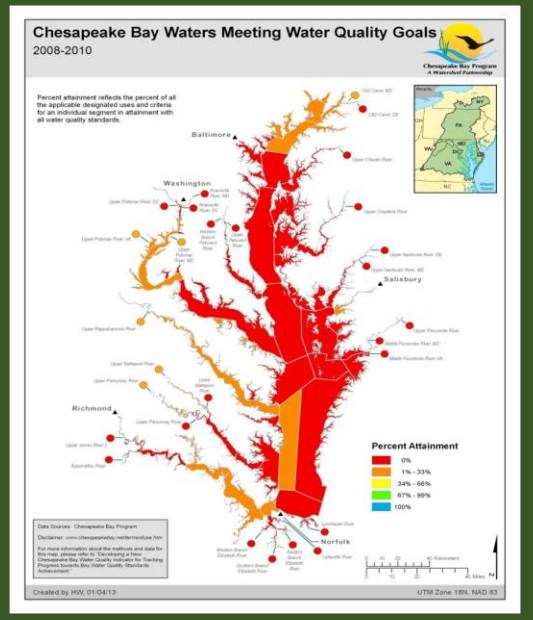
92 segement Baywide Assessment Summary



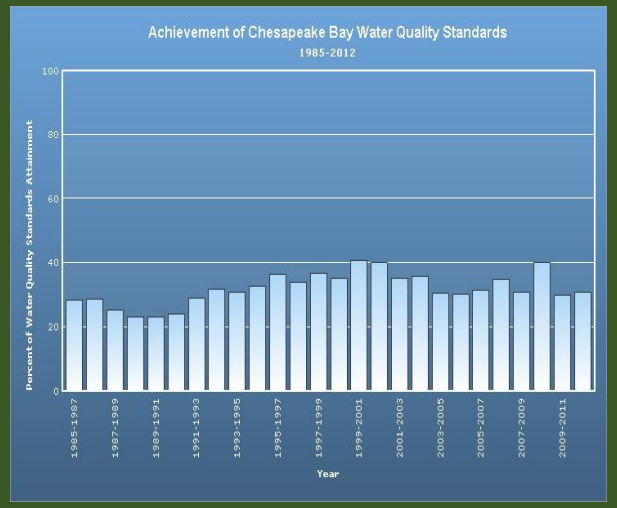
Multimetric Water Quality Standards Indicator for Supporting Progress Tracking in Bay Restoration

- Provide a composite status measure of water quality standards attainment results for DO, water clarity/SAV and chlorophyll a.

- Communicate progress to the public, managers and decision-makers.



STATUS



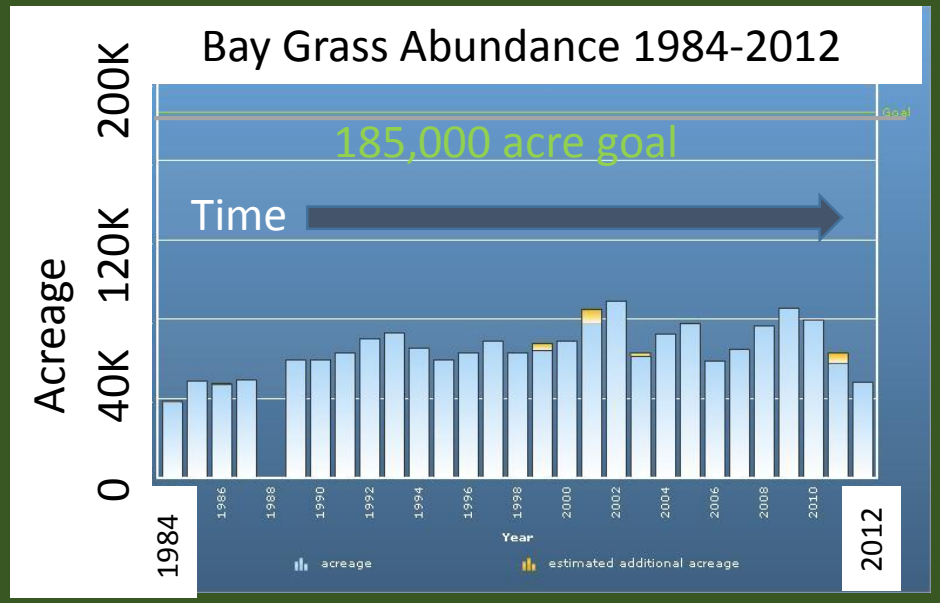
TIME SERIES TRENDS

The 1985-2011 Baywide assessment of Water Clarity based on Secchi depth measurements illustrates degrading conditions. Submerged Aquatic Vegetation peaked in 2002 and remains below goal conditions.

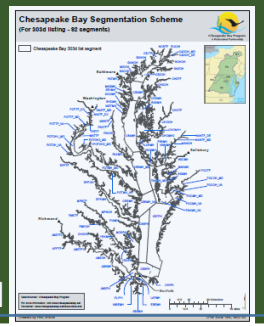
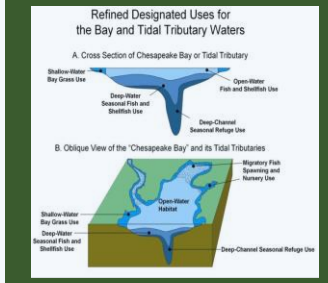
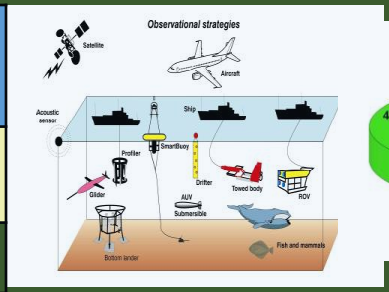
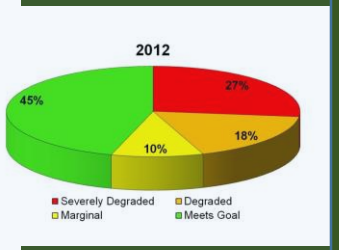
- Bay Grasses ground-truthing for the annual assessment

- SAV abundance peaked in 2002

  (1984-2012). (Regulatory assessment)

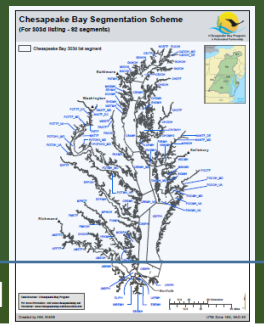


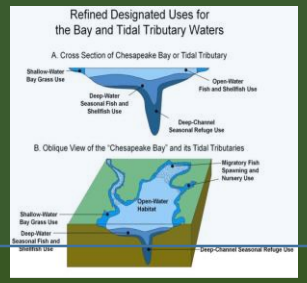
The Water Quality Standards Framework

Standard	Bay segmentation	Designated Uses	Water Quality Criteria			Assessment Protocols	Communicating Status & Change
			**Designated Use**	**Dissolved oxygen Criteria Concentration/ Duration**	**Temporal Application**		
			Deep channel seasonal refuge use	**Instantaneous min > 1 mg/L**	**June 1 – September 30**		
				Open water F & S applies	**October 1 – May 31**		
D.O.							
Water Clarity /SAV							
CHLA							
Aq. Life							

The Water Quality Standards Framework and the new Water Quality Criteria Technical Addendum

Standard	Bay segmentation	Designated Uses	Water Quality Criteria	Assessment Protocols	Communicating Status & Change
D.O.	Chap 3 Volume of WBRTF resolved supporting assessment and listing	Chap 2. Short duration DO Criteria Assessment Subseg options	-	Chap2. DO guidance and Chap 6. Nontraditional partners DO criteria assessment guidance	Chapter7. Multimetric Water Quality Index to track progress in attaining water quality standards
Water Clarity /SAV		Chap 4. SAV goal acreage alignment	-	-	
CHLA		-	-	-	
Aq. Life		-	-	Chap 5 Interim BIBI rule: Category classification for outliers	-





Designated Use	Dissolved oxygen Criteria Concentration/ Duration	Temporal Application
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