Chesapeake Bay Water Quality Indicator: Development and Utility

Chesapeake Bay Program
A Watershed Partnership

Tidal Monitoring and Analysis Workgroup Meeting
July 10, 2013
USFWS Chesapeake Bay Field Office, Annapolis, MD

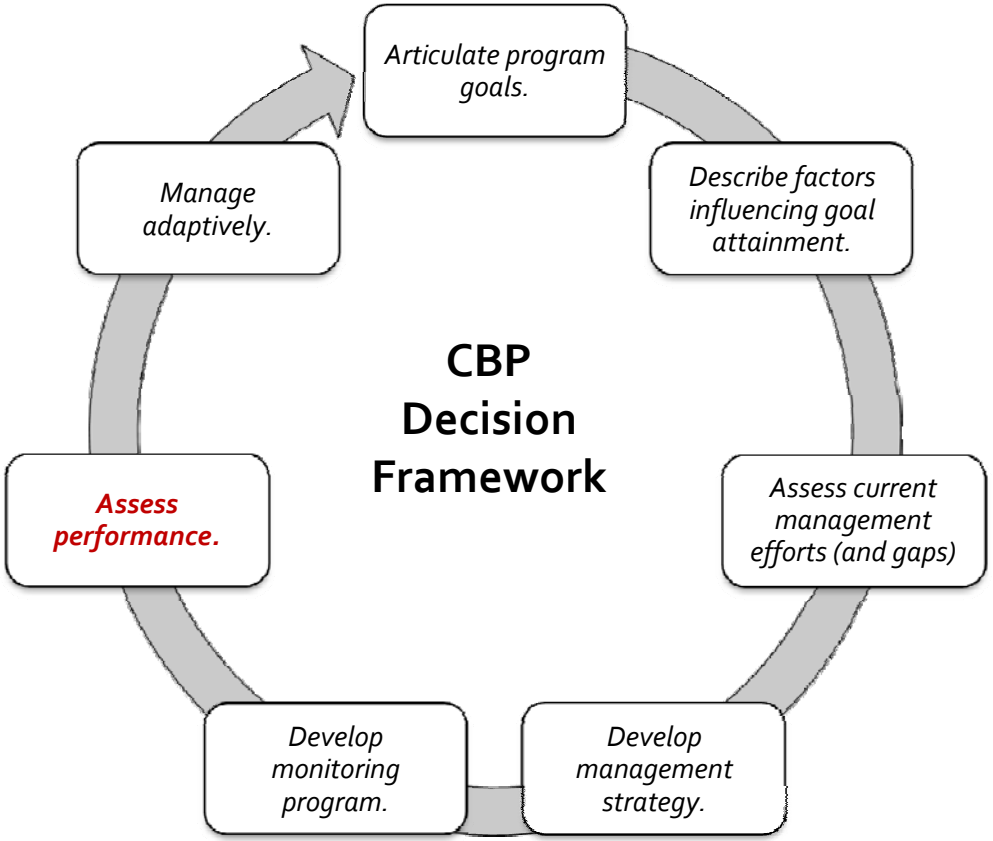
Liza Hernandez
University of Maryland Center for Environmental Science
USEPA Chesapeake Bay Program Office

Decision Framework

Applying the Decision Framework to Attaining Water Quality Standards in the Chesapeake Bay and Its Tidal Tributaries

CBP Water Quality Goal Implementation Team

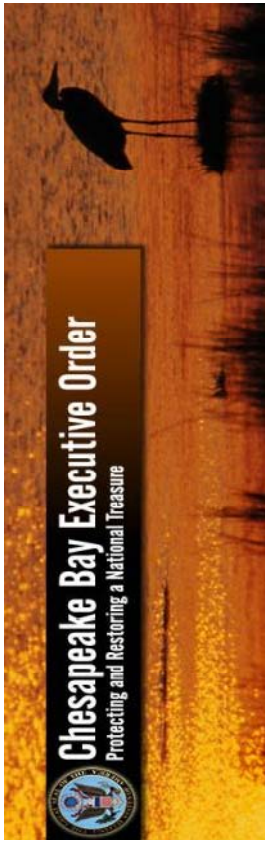
Published: July 16, 2012



http://www.chesapeakebay.net/publications/title/applying_the_decision_framework_to_attaining_water_quality_standards_in_the

Restore Clean Water

Goal:
Reduce nitrogen, phosphorus, sediment and other pollutants to meet Bay water quality goals for dissolved oxygen, clarity, chlorophyll-a and toxic contaminants.



OUTCOMES

Water Quality Meet water quality standards for dissolved oxygen, clarity/underwater grasses and chlorophyll-a in the Bay and tidal tributaries by implementing 100 percent of pollution reduction actions for nitrogen, phosphorus and sediment no later than 2025, with 60 percent of segments attaining water quality standards by 2025. *(Current condition: 89 of the 92 segments of the Bay and its tidal waters are impaired.)*

Assessing Performance

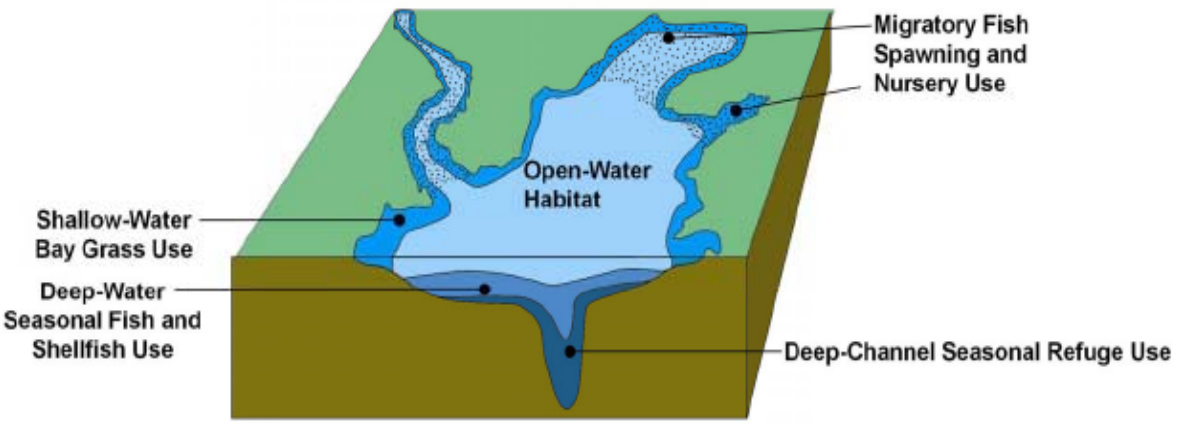
- Bay TMDL
  - 100% practices in place by 2025
- Executive Order
  - 60% of segments in attainment by 2025*
- Partnership Water Quality Indicator
  - Metric for monitoring desired outcome
  - Useful for establishing interim goals

** In tidal waters*

Water Quality Indicator

Purpose:
To measure progress toward the achievement of Chesapeake Bay water quality standards.

- 92 tidal Bay segments
- 291 designated-use segments
- Weighted, area-based approach



January 2013

- WQGIT recommends adoption of combined indicator to measure progress towards the achievement of the four jurisdictions' Chesapeake Bay water quality standards

Management Board

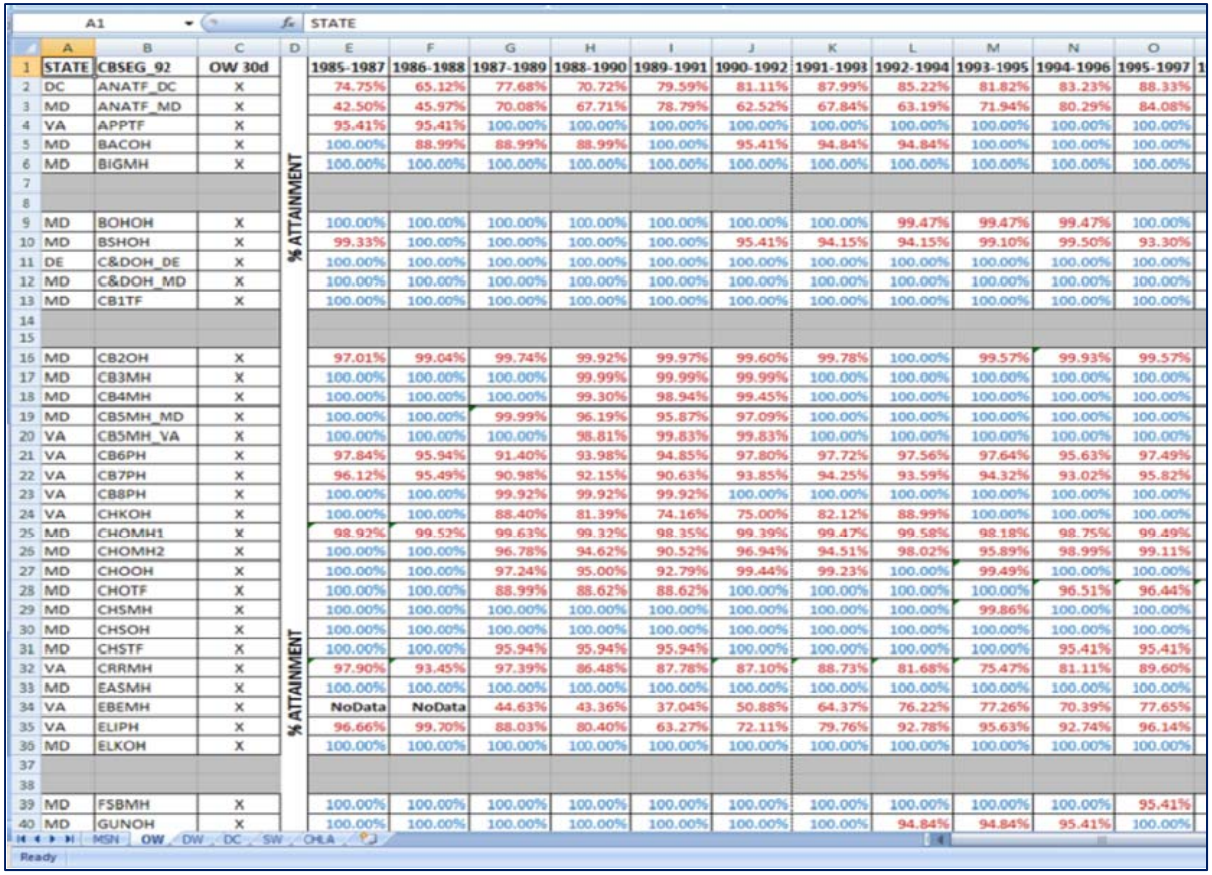
- April 2013
  - Introduction to water quality indicator
  - Requested further indicator development and subsequent progress update
- May 2013
  - Presented preliminary results of FY2018 interim target analysis
  - Requested feedback on next steps from WQGIT

Setting Interim Expectations

- Assume validation of the umbrella criteria
  - Fully assess attainment across all segments, uses, and criteria
- Interim value based on:
  - An evaluation of the 1985-2011 time series of criteria attainment
  - Driving towards 60% attainment by 2025 as the current end point

Analyses: 1985-2011

For each designated use, developed a comprehensive spreadsheet of attainment status for the rolling 3-yr periods for each applicable segment



	STATE	CBSEG_92	OW 30d		1985-1987	1986-1988	1987-1989	1988-1990	1989-1991	1990-1992	1991-1993	1992-1994	1993-1995	1994-1996	1995-1997
2	DC	ANATF_DC	X	% ATTAINMENT	74.75%	65.12%	77.68%	70.72%	79.59%	81.11%	87.99%	85.22%	81.82%	83.23%	88.33%
3	MD	ANATF_MD	X		42.50%	45.97%	70.08%	67.71%	78.79%	62.52%	67.84%	63.19%	71.94%	80.29%	84.08%
4	VA	APPTF	X		95.41%	95.41%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
5	MD	BACOH	X		100.00%	88.99%	88.99%	88.99%	100.00%	95.41%	94.84%	94.84%	100.00%	100.00%	100.00%
6	MD	BIGMH	X		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
7															
8															
9	MD	BOHOH	X		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.47%	99.47%	99.47%	100.00%
10	MD	BSHOH	X		99.33%	100.00%	100.00%	100.00%	100.00%	95.41%	94.15%	94.15%	99.10%	99.50%	93.30%
11	DE	C&DOH_DE	X		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
12	MD	C&DOH_MD	X		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
13	MD	CB1TF	X		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
14															
15															
16	MD	CB2OH	X		97.01%	99.04%	99.74%	99.92%	99.97%	99.60%	99.78%	100.00%	99.57%	99.93%	99.57%
17	MD	CB3MH	X		100.00%	100.00%	100.00%	99.99%	99.99%	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%
18	MD	CB4MH	X		100.00%	100.00%	100.00%	99.30%	98.94%	99.45%	100.00%	100.00%	100.00%	100.00%	100.00%
19	MD	CB5MH_MD	X		100.00%	100.00%	99.99%	96.19%	95.87%	97.09%	100.00%	100.00%	100.00%	100.00%	100.00%
20	VA	CB5MH_VA	X		100.00%	100.00%	100.00%	98.81%	99.83%	99.83%	100.00%	100.00%	100.00%	100.00%	100.00%
21	VA	CB6PH	X		97.84%	95.94%	91.40%	93.98%	94.85%	97.80%	97.72%	97.56%	97.64%	95.63%	97.49%
22	VA	CB7PH	X		96.12%	95.49%	90.98%	92.15%	90.63%	93.85%	94.25%	93.59%	94.32%	93.02%	95.82%
23	VA	CB8PH	X		100.00%	100.00%	99.92%	99.92%	99.92%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
24	VA	CHKOH	X		100.00%	100.00%	88.40%	81.39%	74.16%	75.00%	82.12%	88.99%	100.00%	100.00%	100.00%
25	MD	CHOMH1	X		98.93%	99.52%	99.63%	99.32%	98.35%	99.39%	99.47%	99.58%	98.18%	98.75%	99.49%
26	MD	CHOMH2	X		100.00%	100.00%	96.78%	94.62%	90.52%	96.94%	94.51%	98.02%	95.89%	98.99%	99.11%
27	MD	CHOOH	X		100.00%	100.00%	97.24%	95.00%	92.79%	99.44%	99.23%	100.00%	99.49%	100.00%	100.00%
28	MD	CHOTF	X		100.00%	100.00%	88.99%	88.62%	88.62%	100.00%	100.00%	100.00%	100.00%	96.51%	96.44%
29	MD	CHSMH	X		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.86%	100.00%	100.00%
30	MD	CHSOH	X		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
31	MD	CHSTF	X		100.00%	100.00%	95.94%	95.94%	95.94%	100.00%	100.00%	100.00%	100.00%	95.41%	95.41%
32	VA	CRRMH	X		97.90%	93.45%	97.39%	86.48%	87.78%	87.10%	88.73%	81.68%	75.47%	81.11%	89.60%
33	MD	EASMH	X		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
34	VA	EBEMH	X		NoData	NoData	44.63%	43.36%	37.04%	50.88%	64.37%	76.22%	77.26%	70.39%	77.65%
35	VA	ELIPH	X		96.66%	99.70%	88.03%	80.40%	63.27%	72.11%	79.76%	92.78%	95.63%	92.74%	96.14%
36	MD	ELKOH	X		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
37															
38															
39	MD	FSBMH	X		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	95.41%
40	MD	GUNOH	X		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	94.84%	94.84%	95.41%	100.00%

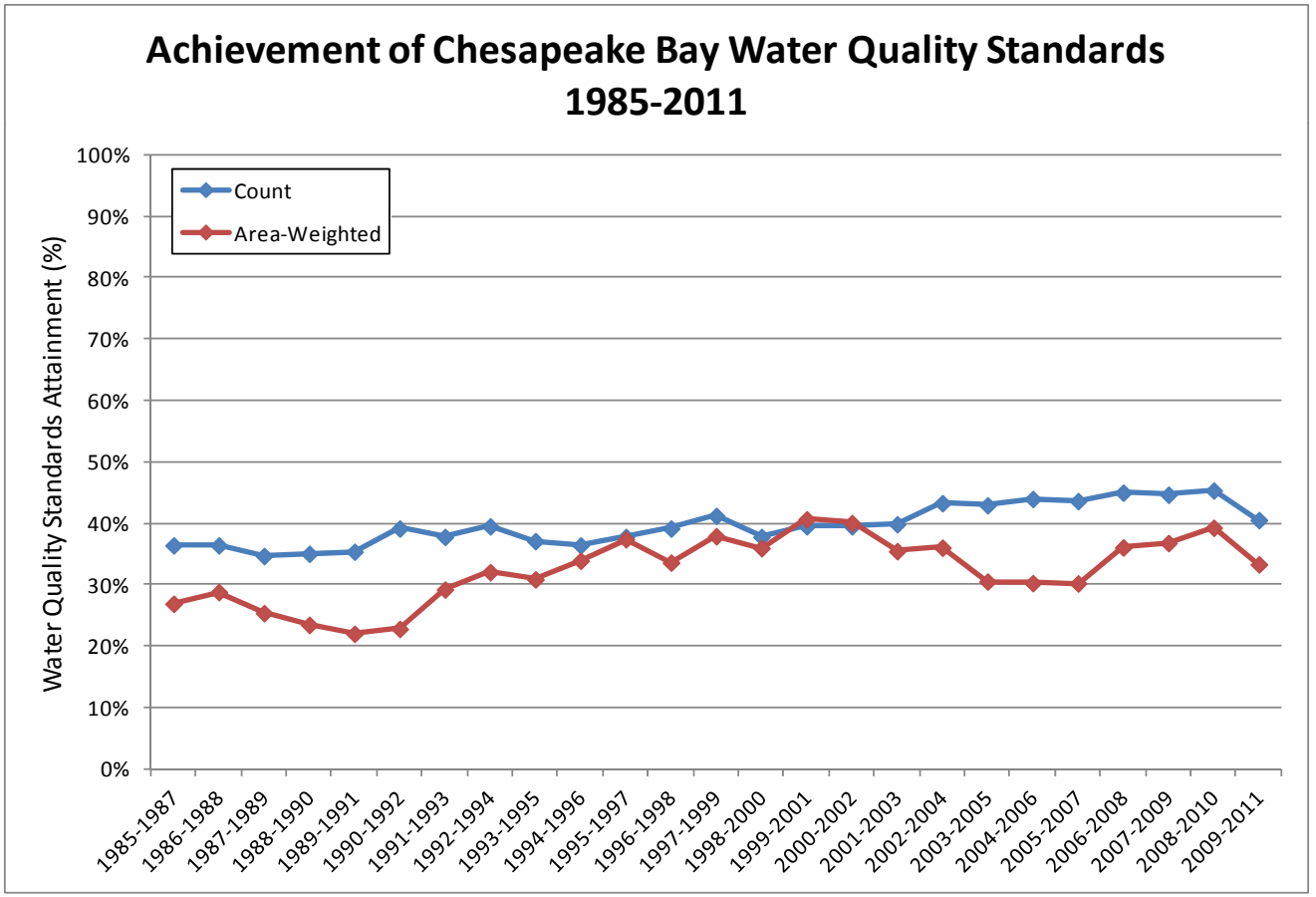
> 560,000 data points *per parameter*

Collectively:
> 28 million data points analyzed!

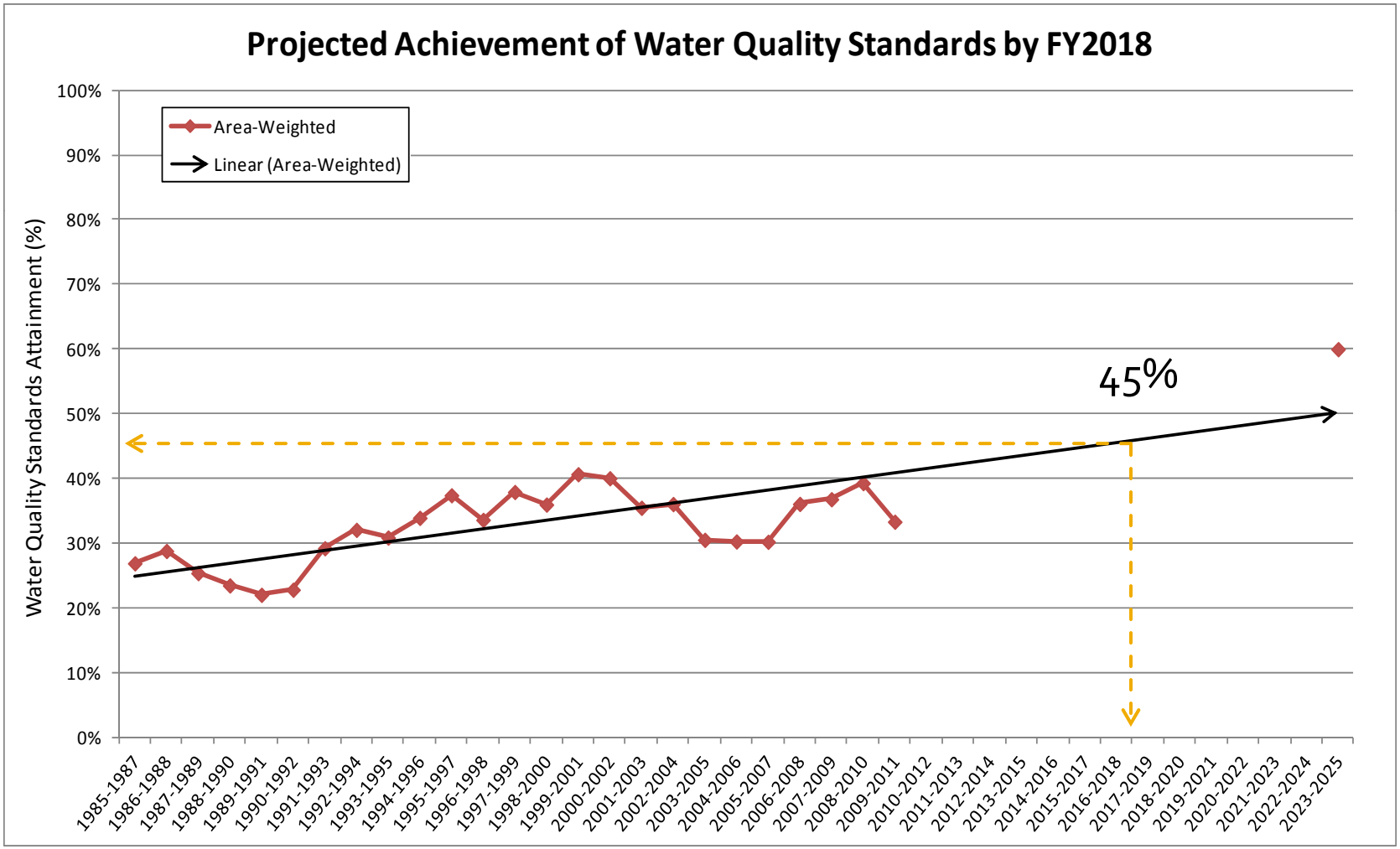
291 Designated-Use Segments

Baywide:

Total number of designated-use segments attaining their applicable criteria



FY2018 Target

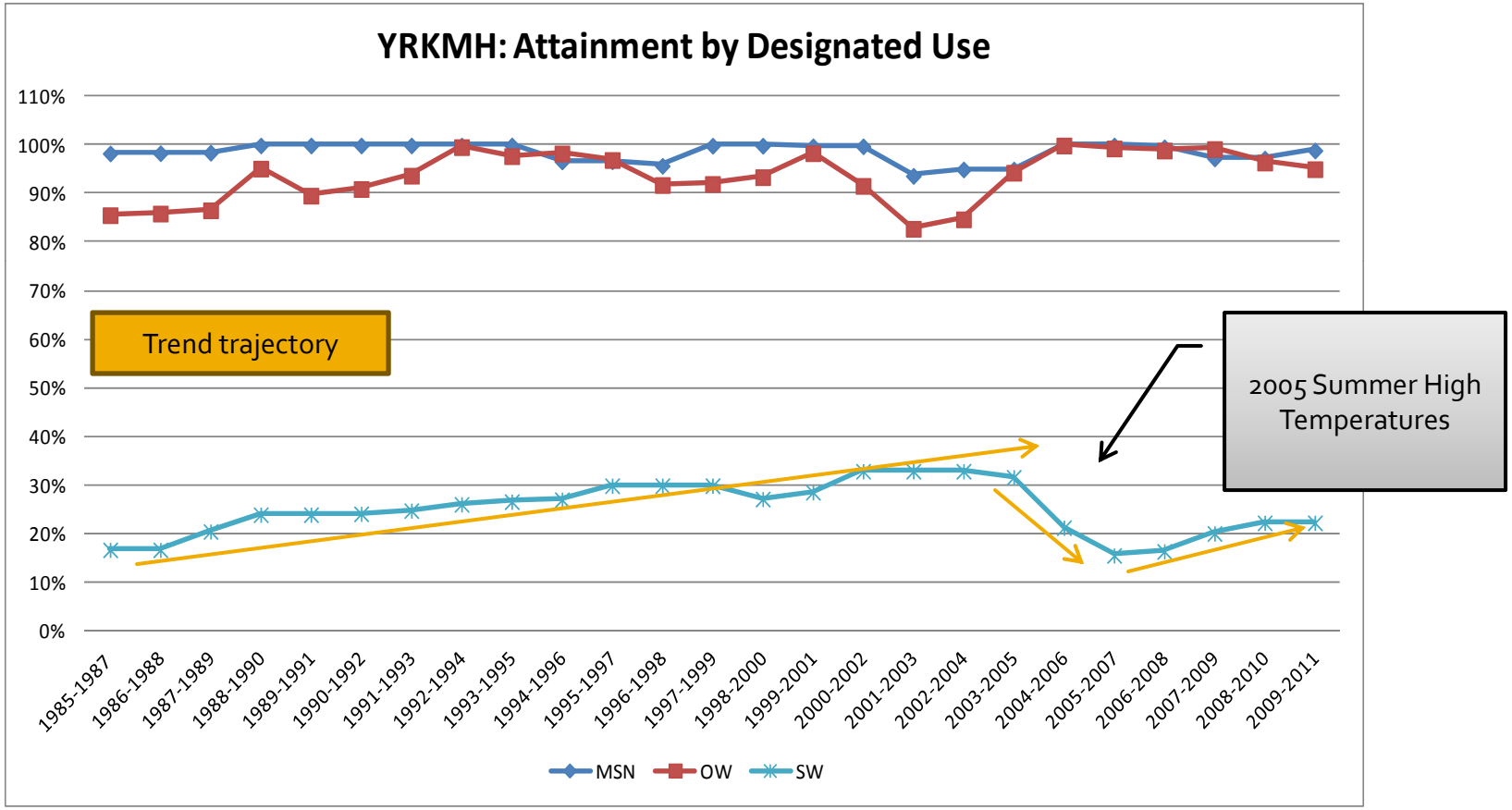


WQGIT Approved Next Steps

- June 10, 2013

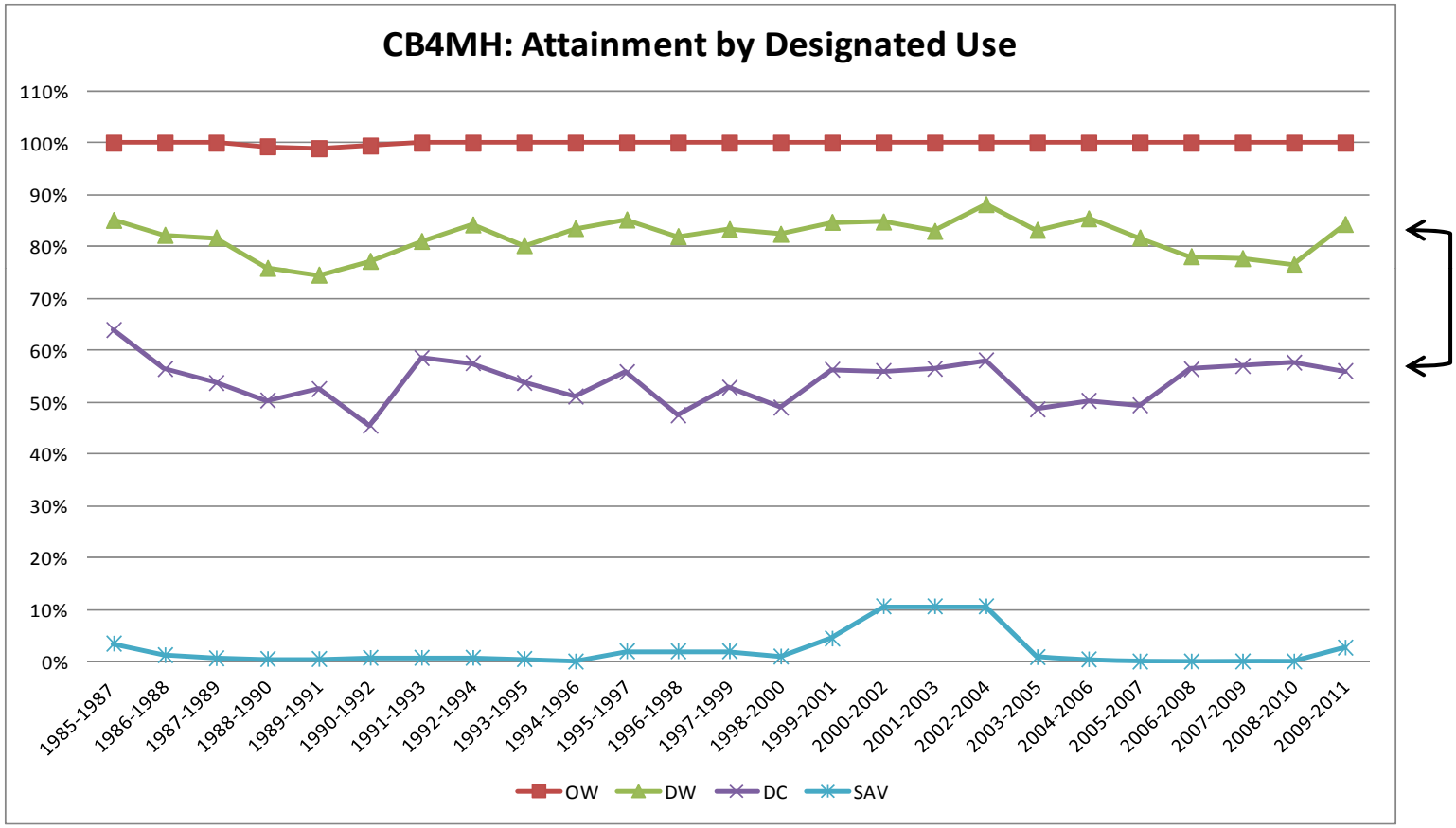
1. Further analysis of projected assessment data
   a. Which designated-use segments are expected to come into attainment by 2017? 2025?
   b. Which designated-use segments will not be attaining come 2025?

2a) Virginia Lower York River



Improving trend in shallow-water Bay grasses WQS attainment through 2005; then 2005 summer high temperatures depleted eelgrass populations, which have yet to recover fully years later.

2b) Middle Central Chesapeake Bay



No noticeable trends in deep water and deep channel designated use criteria attainment over time. Consistent with Bay WQ model scenario findings: need an additional 20-30+ mil. lbs more N reduction to effectively reduce abundant algal populations to enable oxygen to increase.

WQGIT Approved Next Steps

2. Further analysis of WQSTM scenario results
3. Evaluation of reductions while accounting for lag times
4. Further development of indicators measuring incremental progress
5. Re-evaluate the utility of our current tidal water quality indicators

Current Indicators

- Individually Reported
  - Dissolved Oxygen
  - Chlorophyll *a*
  - Water Clarity
- Not Standards Based *(except DO)*

Recommended Changes

- Continue CBPO reporting of dissolved oxygen indicator
- Discontinue CBPO reporting of water clarity and chlorophyll *a* indicators
- Further develop and report the Partnership's Water Quality Indicator once final approval is obtained from the Management Board

Action Requested

- Feedback on aforementioned recommended changes and potential next steps