

Water Quality Standards Attainment Analysis: *Updates related to cruise-list*

Integrated Monitoring Networks Meeting
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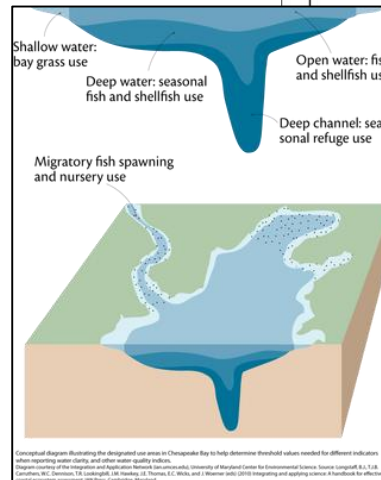


Water Quality Standards Indicator

All individual criteria

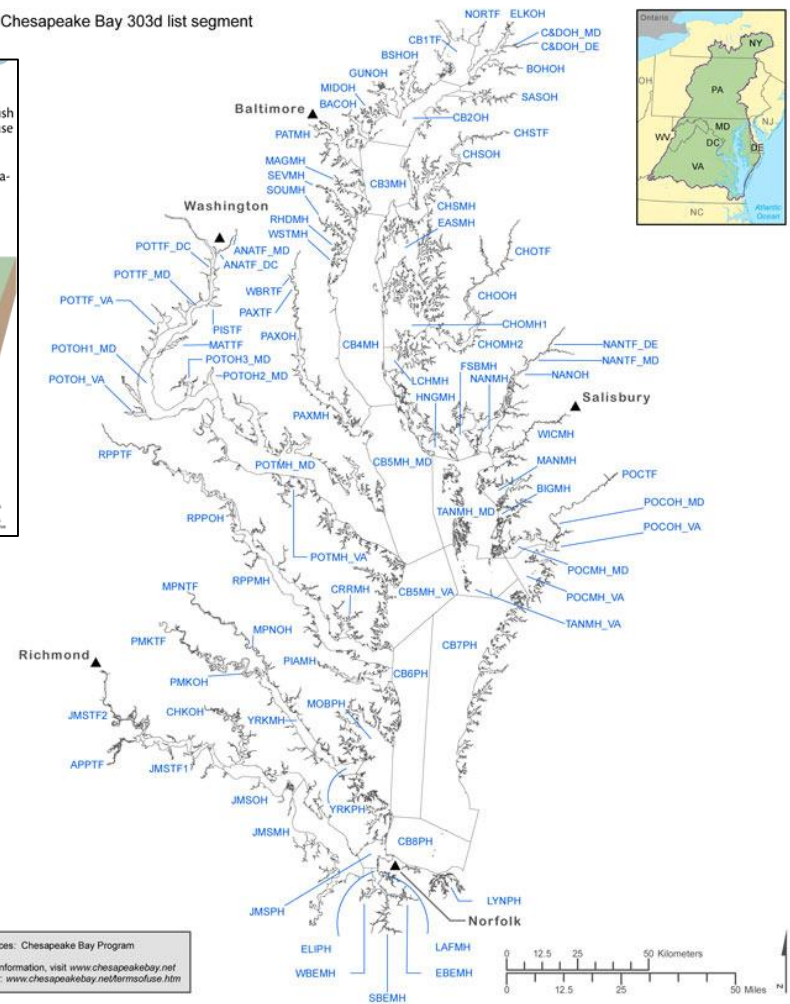
- DO designated uses
 - Deep Channel (11 segments)
 - Deep water (25 segments)
 - Open water (91 segments)
 - Migratory fish spawning and nursery ground (73 segments)
- Chlorophyll (Spring 5 segments, Summer 7 segments)
- SAV and clarity (98 segments)

Combined indicator: A Bay-wide fractional attainment indicator computed on a surface-area basis for all designated uses

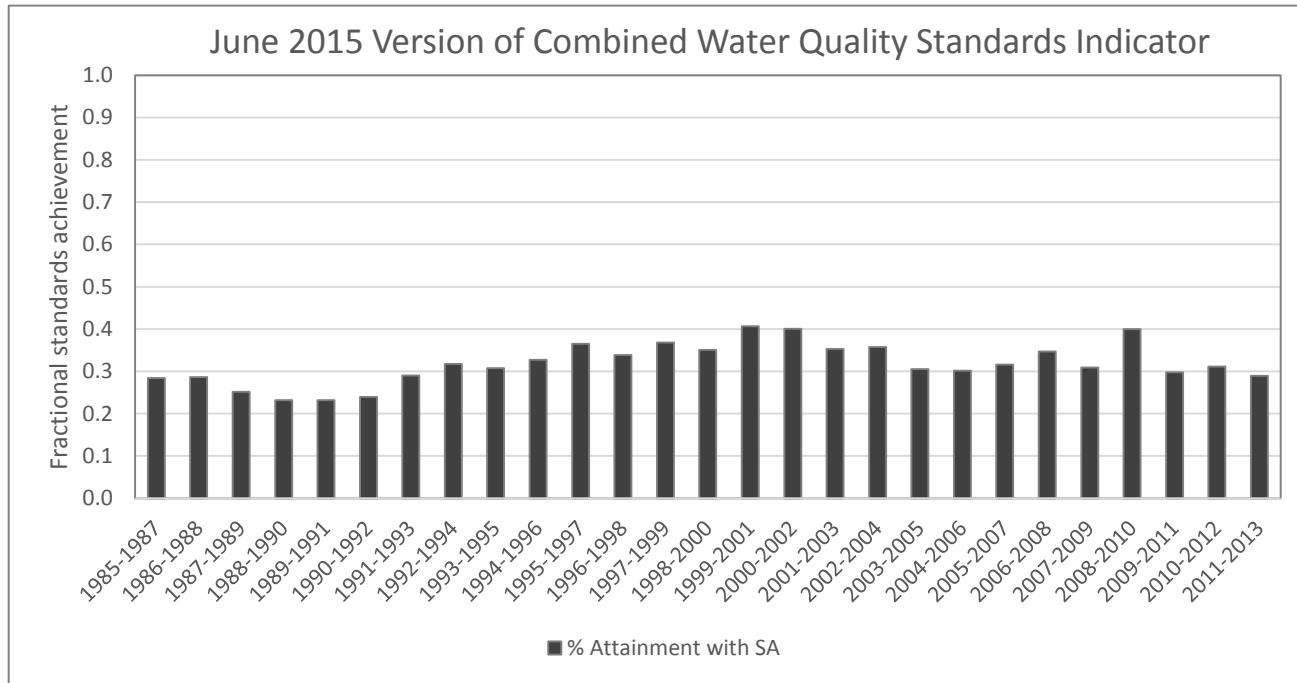


Chesapeake Bay Segmentation Scheme (For 303d listing - 92 segments)

Chesapeake Bay 303d list segment

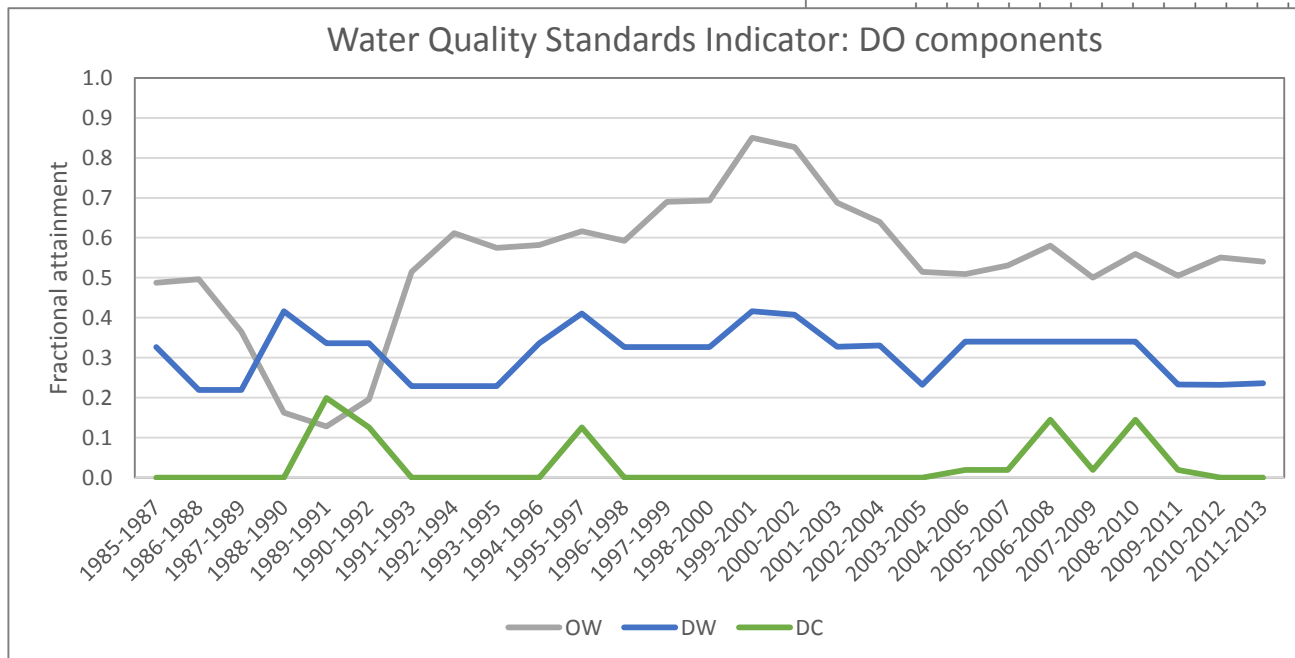
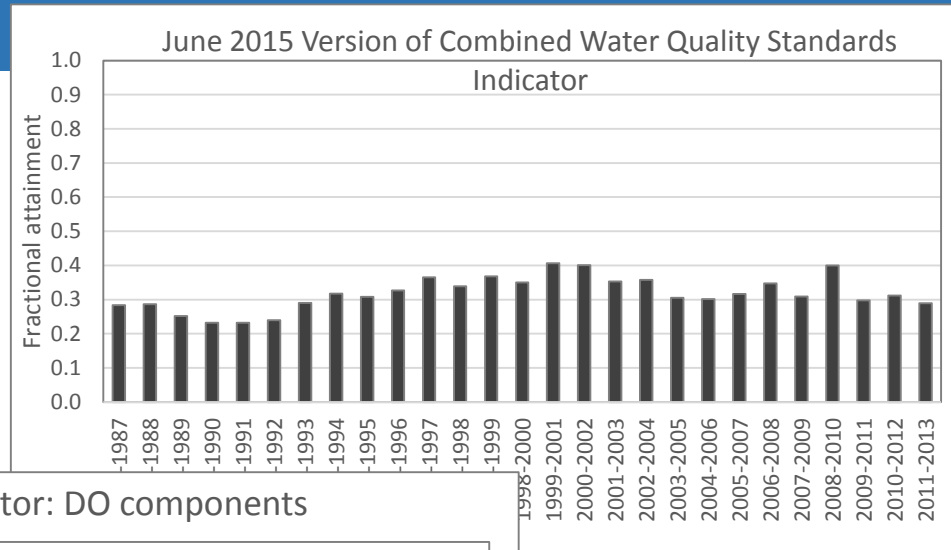
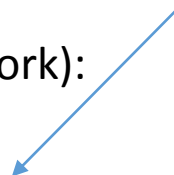


Combined Indicator (Version June 2015)



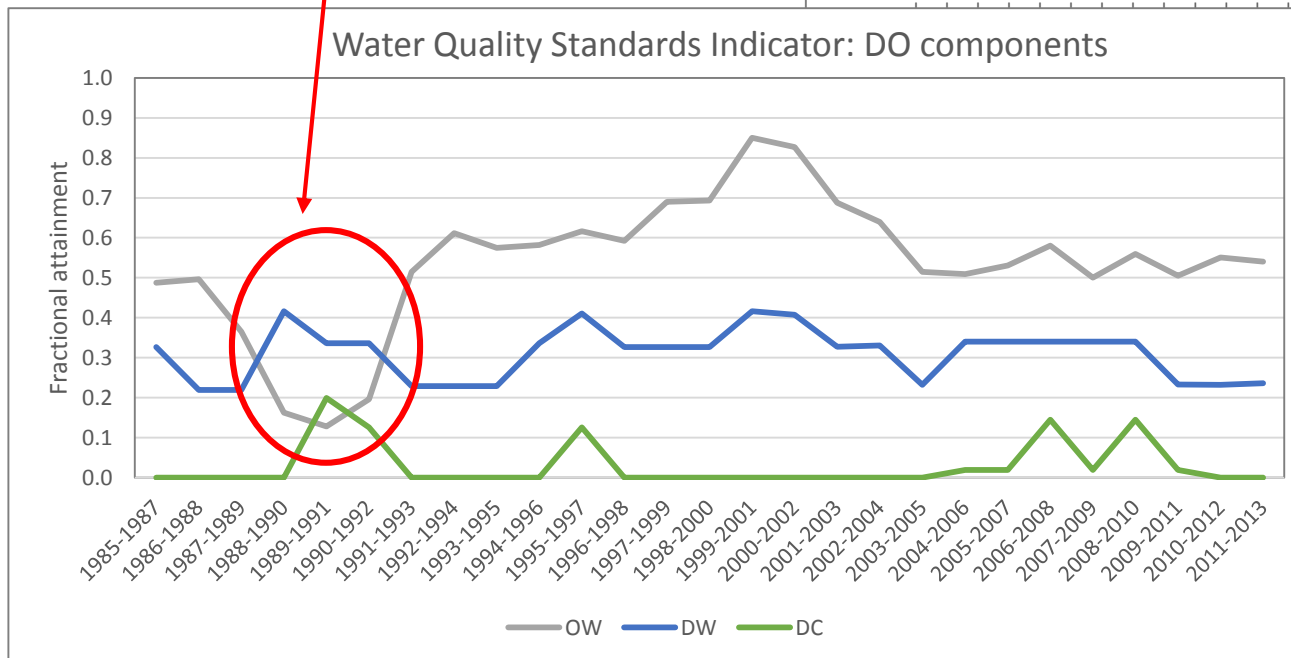
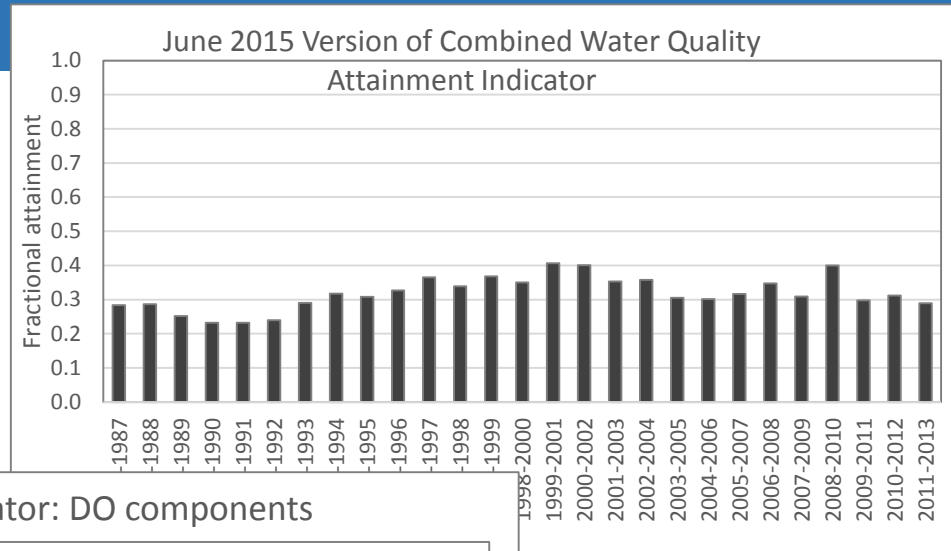
Combined Indicator (Version as of June 2015)

If you break it down
into its dissolved oxygen (DO)
components (Mindy's recent work):



Combined Indicator (Version as of June 2015)

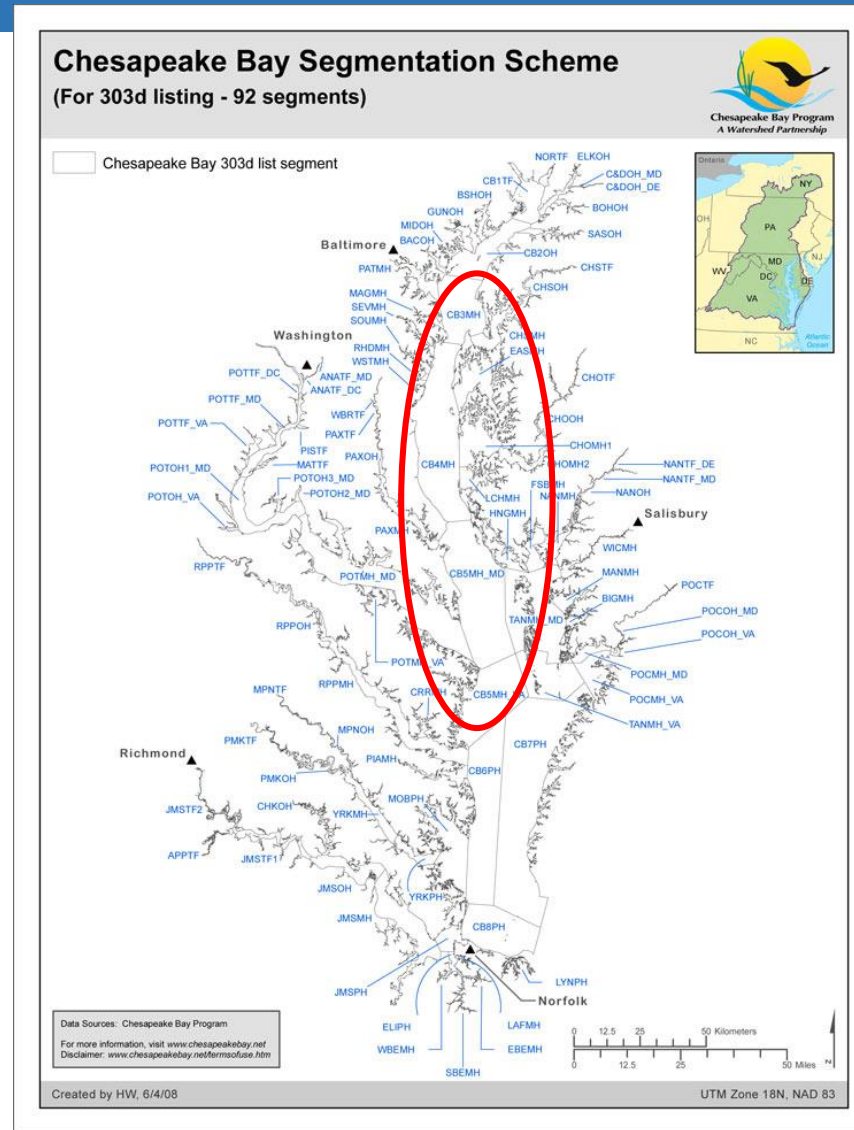
This dip in Open Water (OW),
with corresponding
peaks in DC and DW
centered on 1990
was suspicious



Why is there a dip in 1990 Open Water?

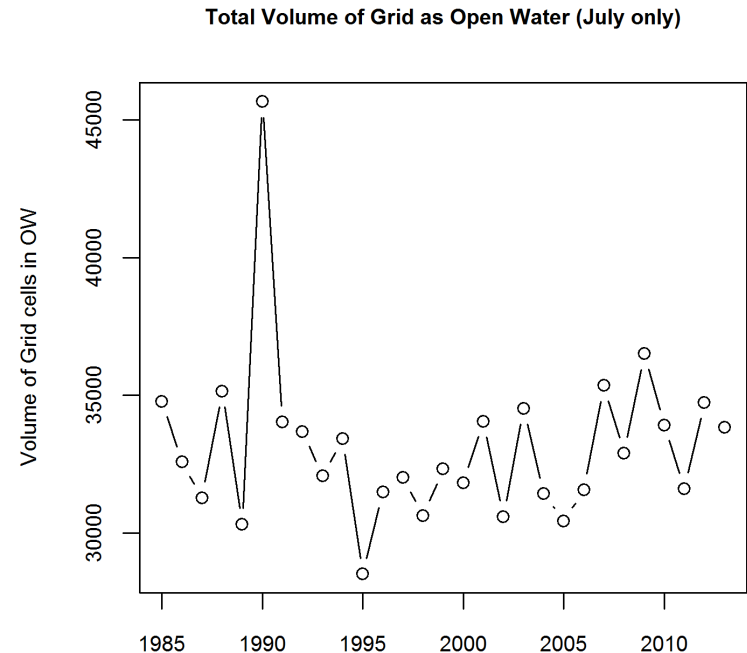
- DO in segments CB3MH, CB4MH, and CB5MH met the OW criterion for every period except:
 - 1988-'90, 1989-'91, 1990-'92 *
- These segments together make up 24% of the total OW surface area
- So when they don't meet the criterion, it really impacts the OW (and total) pattern

*and CB5MH_MD for 1987-1989



Why is there a dip in 1990 Open Water?

- Analysis steps:
 - Group the data into “cruises”
 - Use the vertical density data to separate the water column into the DO designated uses (layers)
 - Spatially interpolate the DO collected within each layer
 - For OW, get monthly DO averages, then 3-year groups to use in CFD curve
- In the summer, all 3 DUs occur in the middle mainstem... but:
- For July 1990, the entire water column was assigned to OW in these 3 big mainstem segments



Why is there a dip in 1990 Open Water?

- July 16-18 and July 30-Aug 1 were July 1990 mainstem sample dates
- For ease in our computations, we had begun to separate the 2 cruises in each summer month by the 15th of the month... this meant that both sets in July 1990 were grouped in the 2nd July cruise
- Impact →
 - Erroneous pycnocline interpolations in 1st July cruise meaning a lot of very deep, low-DO water was grouped into OW
 - The DO was so low in “OW” that it bumped these segments out of OW-30 day attainment for all 3 years periods covering July 1990

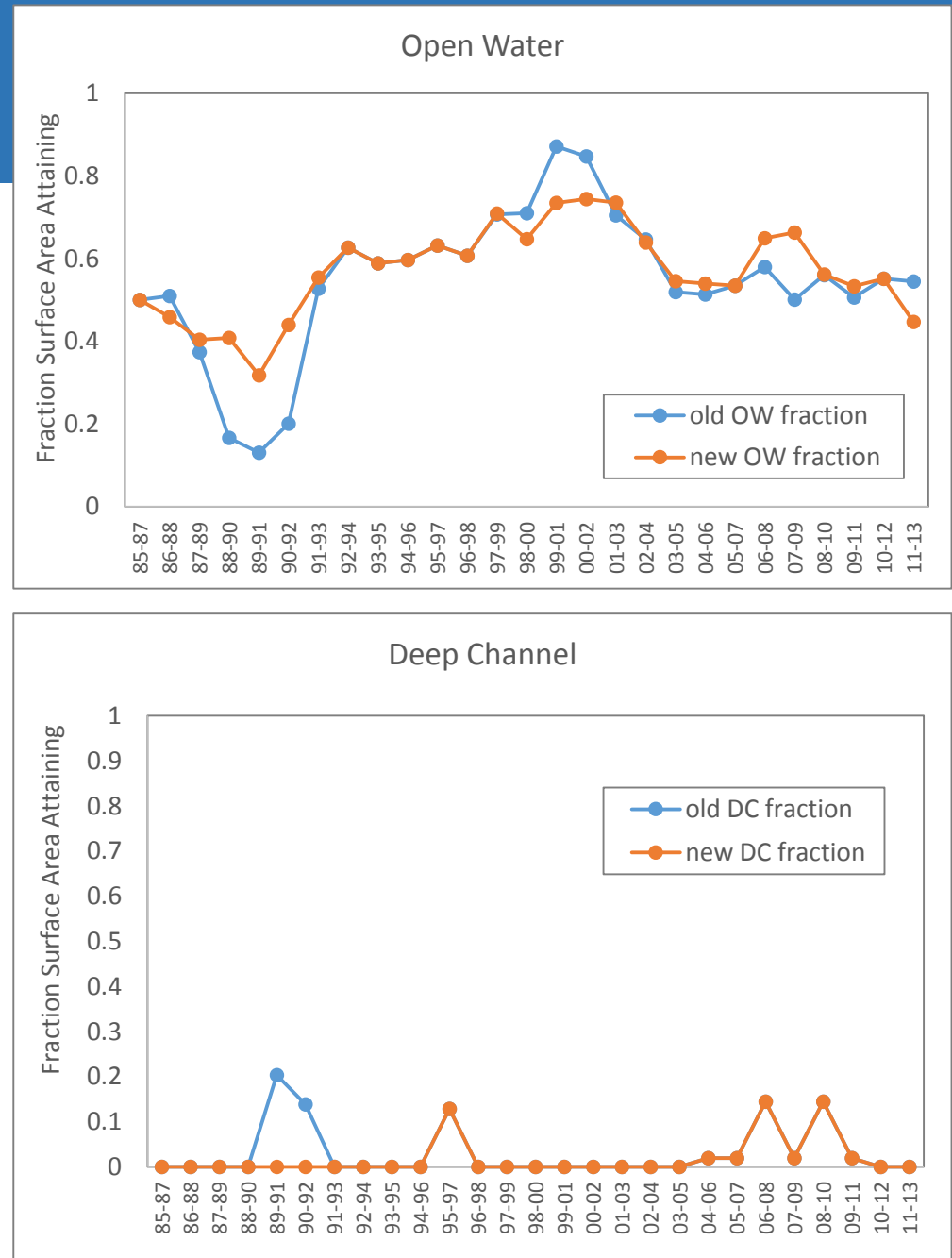
The fix: 3 changes to the cruise list used

1. If the actual dates of the mainstem sampling for the 1st or 2nd cruise crossed the 15th of the month, the cutoff date between cruises was adjusted to be between the 2 cruises
2. All days of the year are now included to capture more samples
3. If a months' cruise extended a day or two into the next month, that day in the next month was included

Results

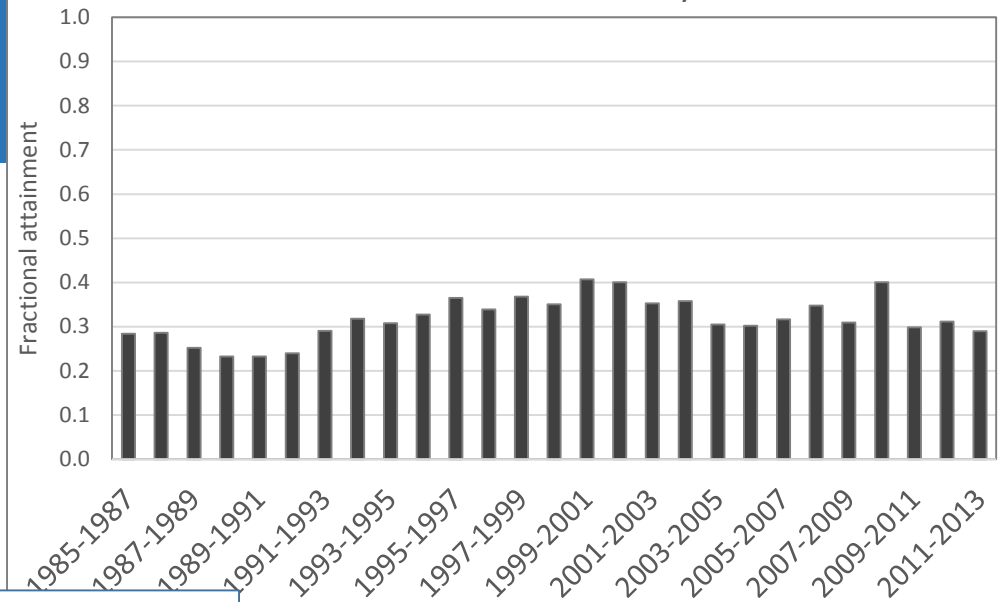
- For 1990 CB3MH, CB4MH, and CB5MH :
 - All 3 segments went into OW-attainment in the 3-year periods that cover 1990*
 - CB5MH_VA went out of DC-attainment in '89-91 and '90-92; RPPMH in '89-91
- Other major changes
 - '99-01, '00-02 –CB7PH going out of OW-attainment. Makes it consistent, due to more data
 - 2007 – POTMH_MD OW into attainment (more data)

*Except CB5MH_MD in 1989-1991

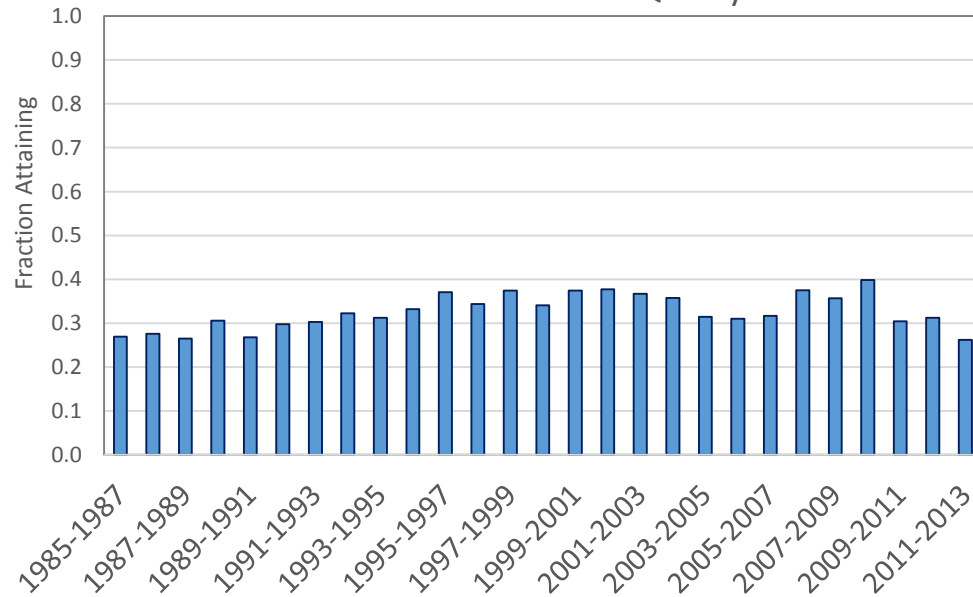


Changes in Combined

Old: Combined Water Quality Indicator



Corrected: Combined Water Quality Indicator

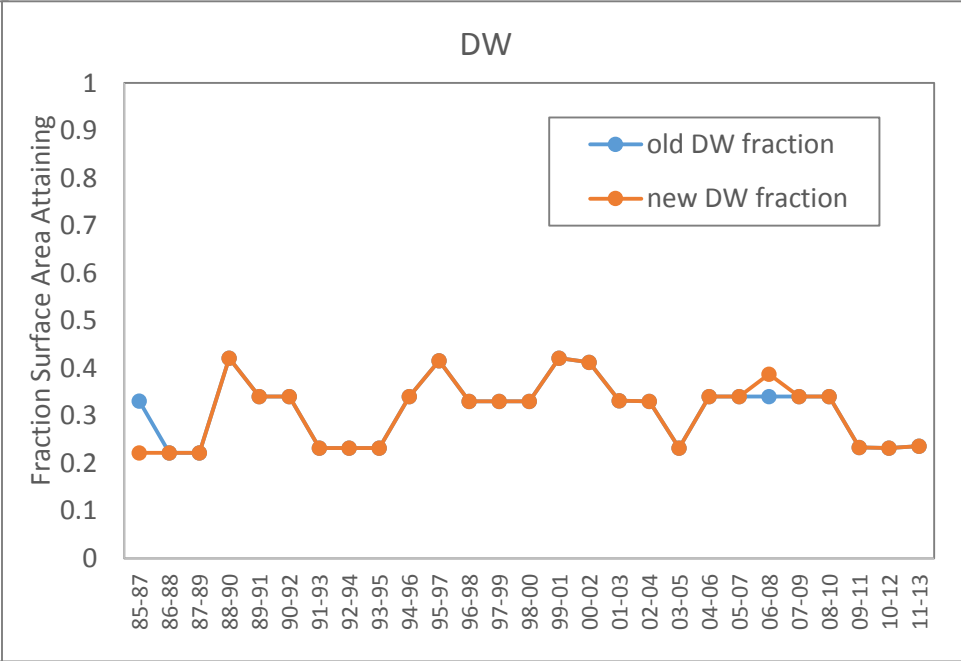
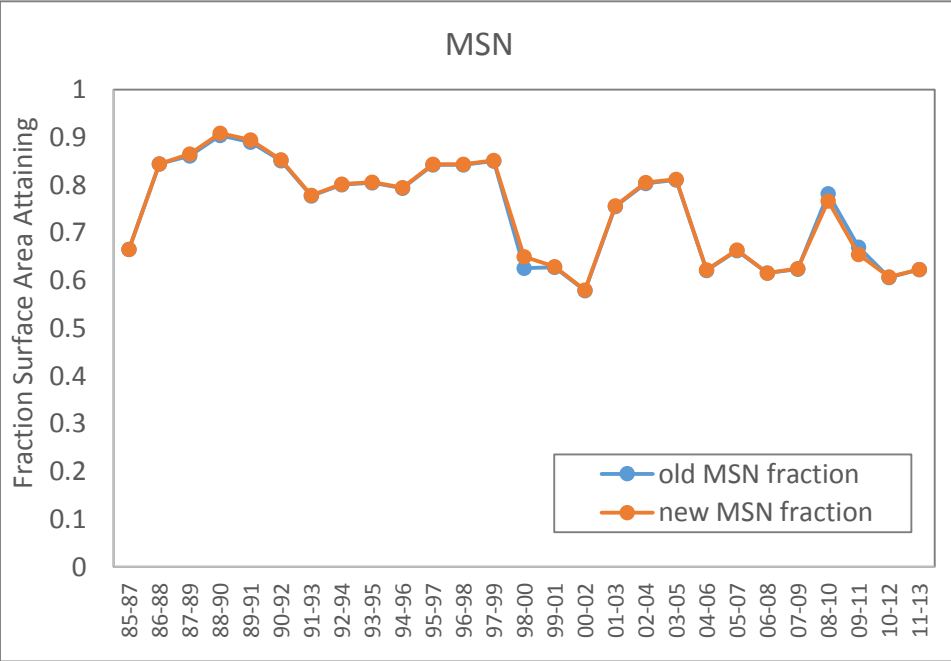
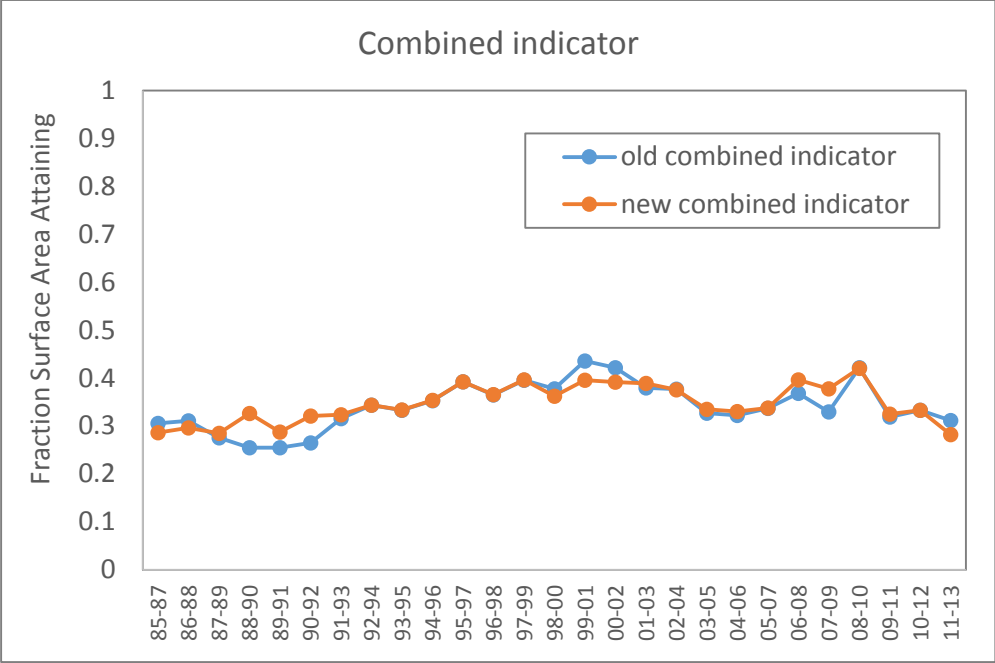


Final thoughts

- This analysis results in no changes to the set of segments since 2009 that are out of tidal water quality standards attainment
- These changes actually make the computations consistent with published methodology, and are *not* a new method
- When did this happen in our record? – definitely post-TMDL development
 - I compared to historical attainment computations conducted in March 2011 and the 1990 problem did NOT exist in that record

Extras

Other DO DUs



One unintended change

- Additional sampling is included in some cases when it was not within the “cruise” dates before.
 - This resulted in OW results in some segments that had “no data” in a few periods before (WBRTF, ANATF_DC, POTMH_VA)