Chlorophyll *a*: Comparing Data Input for Indicator Analysis

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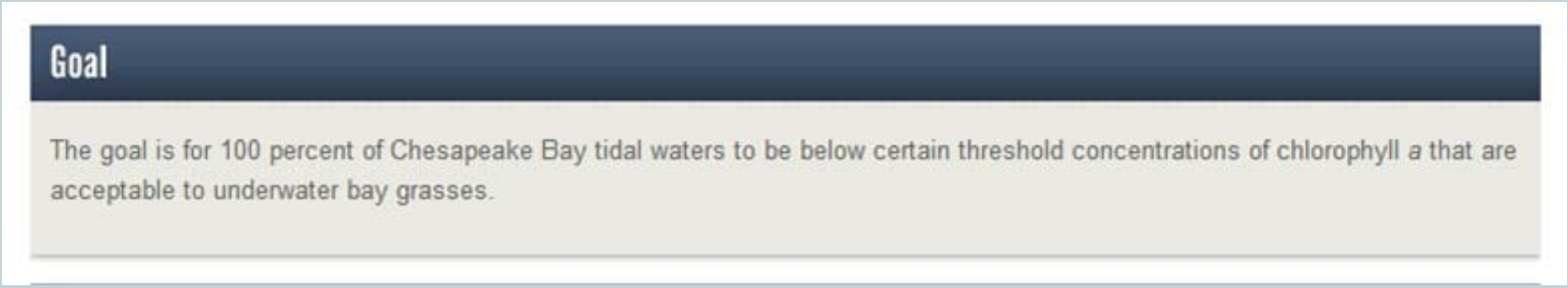
Chlorophyll *a*

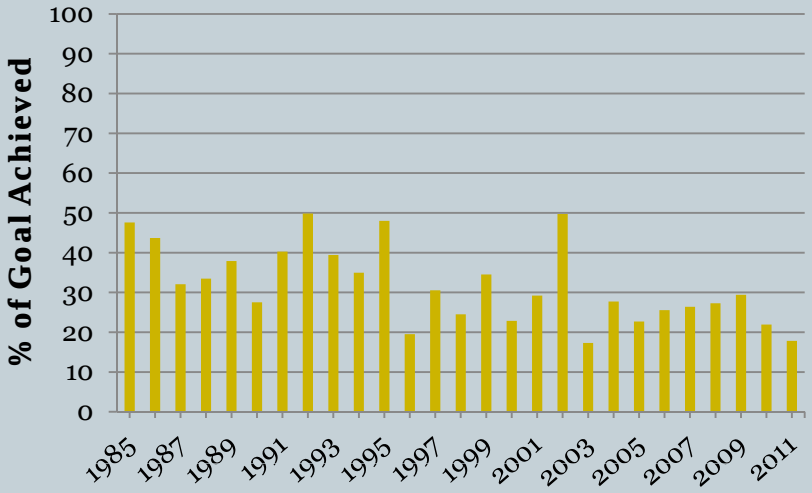
- Used as a measure of phytoplankton biomass
- Elevated phytoplankton levels can lead to reduced water clarity
- Decomposing phytoplankton can lead to reduced dissolved oxygen levels



Chlorophyll *a*: Water Quality Indicator

CBPO

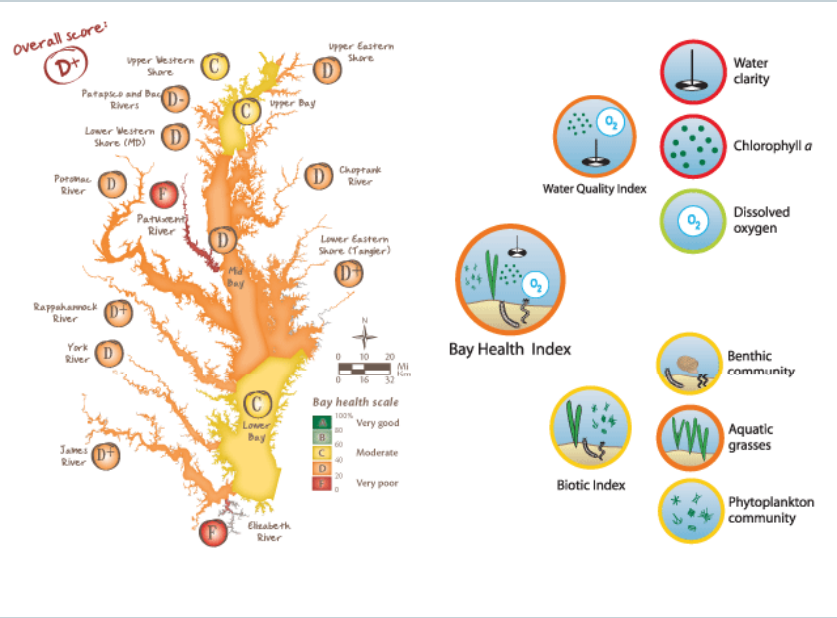
- Indicator of "Bay Health"



http://www.chesapeakebay.net/indicators/indicator/chlorophyll_a

UMCES

- Report Card



http://ian.umces.edu/ecocheck/report-cards/chesapeake-bay/2011/

Methods

1. Calculate total seasonal frequency for each station (i.e., percent of time a measurement passed the established ecological threshold values)
2. Average the frequencies for all stations in a segment, to obtain individual segment scores
3. Average the area-weighted segment scores to obtain individual reporting region scores
4. Area-weight and average the reporting region scores to get a baywide score (percent passing)

Thresholds (mg L^{-1})

Spring (Mar-May)	Summer (Jul-Sep)
• TF threshold ≤ 14 • OH threshold ≤ 20.9 • MH threshold ≤ 6.2 • PH threshold ≤ 2.8	• TF threshold ≤ 12 • OH threshold ≤ 9.5 • MH threshold ≤ 7.7 • PH threshold ≤ 4.5

Replicate Data

CBPO	UMCES
• Random replicate	• Mean of replicates
• Better approach when statistical method assumes independent and identically distributed data	• Better approach when goal is to minimize estimation error

Simulation Comparison

1. Compute UMCES percent compliance based on the mean of the replicates
2. Compute CBPO percent compliance using a random replicate
3. Compute the difference of the two methods
4. Repeat 1000x using new sets of randomly chosen replicates to develop a distribution of differences

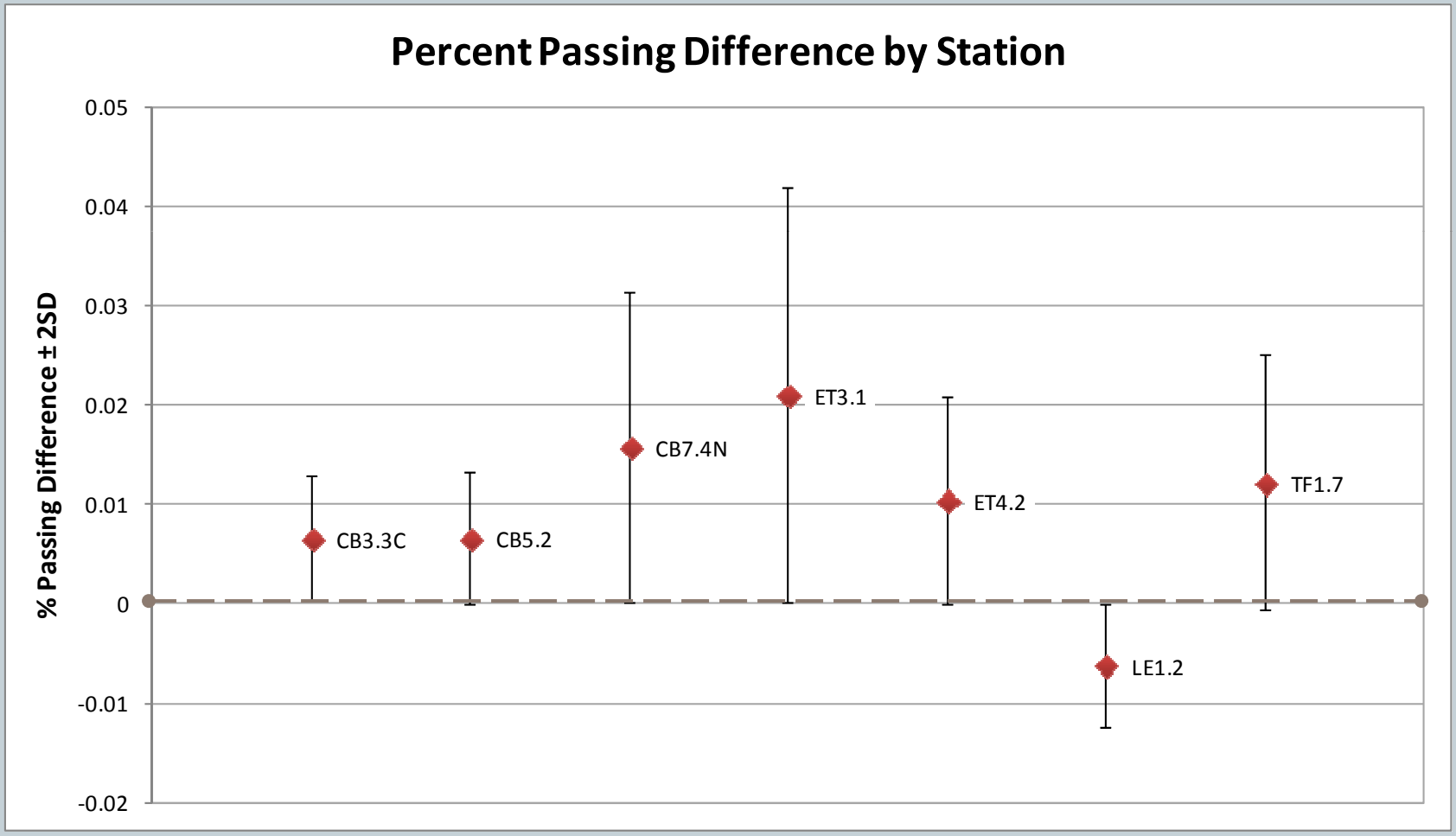
Testing the Difference

- 2008-2010 data
- ~144 stations of which only ~40 had replicates
- Only opportunity for difference:
  - When one replicate is above the threshold while one is below
- This was only the case for 7 of the ~40 stations
  - For each station only one pair of replicates had this property

Random Selection – Two Possibilities

1. Either the replicate chosen is on the same side of the criterion as the mean of the two replicates, in which case the methods yield the same results; or
2. The replicate chosen is on the opposite side of the criterion from the mean, in which case the two methods differ by 100*(1/n) percent

Results



No significant difference between replicate treatments

Action Requested: *VOTE*

- Moving forward, what recommendation(s) can we make related to the treatment of replicate chlorophyll *a* samples?

1. Use the mean value of the replicates; or
2. Select a random replicate?

Further Considerations

- Chlorophyll *a* indicator is NOT representative of progress towards the attainment of water quality standards, which is the Partnership's primary management objective
  - Should the Partnership continue to report the results of this indicator on the CBP website considering:
    - Inconsistencies with Partnership objectives;
    - Limited personnel resources at CBPO; and
    - Continued reporting by UMCES?