Food for thought:

A. What is/are the objective(s) of each individual water quality indicator reported by CBP?
   - Are they designed to track responses to TMDL regulations?
   - Are they meant to represent progress towards the attainment of water quality standards?
   - Are they purely informational?

B. What is the utility of the CBP chlorophyll a and water clarity indicators?
   - Who uses the reported information and for what purpose(s)?
   - What would be a more accurate measure of phytoplankton biomass?

C. Let's re-evaluate the [averaged] thresholds being used to measure the water clarity goal?

***What** indicators are TMAW responsible for?*

1) Reported CBPO Bay indicators linked to water quality standards and criteria attainment

Indicator ***(analyst)***	**Applicable designated use(s)**	**What is it supposed to indicate? (target)**	**What is it really measuring?**	**Is the correct data used to evaluate target?**	**Is the target evaluated correctly?**	**What Method is being used?**
Dissolved Oxygen ***(Liza Hernandez)***	Open-water, Deep-water, Deep-channel	Acceptable DO levels for important animals	Excessive consumption of DO by bacteria	Yes	Yes	CFD
Water Clarity ***(Liza Hernandez)***	Shallow-water Bay Grasses	Acceptable light needs for underwater grasses	Phytoplankton light needs in open waters	No (uses mid-channel Secchi depth)	No	Area-weighted Pass/Fail Scoring
Chlorophyll *a* ***(Liza Hernandez)***	Open-water (only 7 segments)	Acceptable phytoplankton biomass	A phytoplankton photopigment	Yes, when clarity of open water is acceptable ++	No **	Area-weighted Pass/Fail Scoring

++ We are using a photopigment (chlorophyll *a*) to determine if phytoplankton biomass is acceptable; chlorophyll *a* becomes an increasingly uncertain measure of phytoplankton biomass when water clarity declines below salinity-specific Secchi depth thresholds.

** The current spatial coverage of the chlorophyll *a* indicator is baywide and evaluated using ecological thresholds. Meanwhile, numeric chlorophyll *a* criteria/standards only apply to 7 segments across the Bay.
Options to consider for revisions:
a) Perform criteria assessment analysis (CFD) for only the 7 segments with numeric criteria and report accordingly; or
b) Maintain the current analysis approach (pass/fail scoring) using ecological thresholds (not standards) and report for all segments to give the bay-wide picture of chlorophyll *a* exceedances. Acknowledge indicator uncertainty in Bay segments with history of poor water clarity related to high suspended sediment concentrations.

2) Reported CBPO Bay indicators of ecosystem health

Indicator ***(analyst)***	**Applicable designated use(s)**	**What is it supposed to indicate? (target)**	**What is it really measuring?**	**Is the correct data used to evaluate target?**	**Is the target evaluated correctly?**	**What method is being used?**
"Bay Grasses" Tidal SAV ***(VIMS)***	Shallow-water Bay Grasses	Acres gained or lost	Acres gained or lost	Yes	Yes	Aerial survey
"Bottom Habitat" Benthic IBI ***(Roberto Llanso, Jackie Johnson)***	All	Health of benthic macroinvertebrates	Community structure and function	Yes	Yes	Area-weighted Pass/Fail Scoring
"Phytoplankton" Phytoplankton IBI ***(Jackie Johnson)***	Open-water	Health of phytoplankton	Community structure and function	Partial (MD program abandoned)	Yes	Area-weighted Pass/Fail Scoring
Tidal Wetlands ** ***(Jennifer Greiner)***	Shoreline	Acres gained or lost	Acres gained or lost	Yes	Yes	N/A

** This indicator is used not to track progress toward a goal, but to measure how many acres of tidal wetlands are in the Bay and identify trends; not intended to speak to the quality or health of the wetlands being analyzed; it is simply a quantitative tool.

3) Supporting indicators calculated by CBPO staff but not **yet** reported on CBPO webpage

Indicator *(analyst)*	**Applicable designated use(s)**	**What is it supposed to indicate? (target)**	**What is it really measuring?**	**Is the correct data used to evaluate target?**	**Is the target evaluated correctly?**	**What method is being used?**
WQS EO Outcome Indicator ***(Liza Hernandez)***	All	Status of baywide attainment of WQS	Status of baywide attainment of WQS	Yes	Yes	Matrix: Area-weighted and/or Count
Incremental progress ***(Liza Hernandez)***	All	Status of attainment for each designated-use segment	Deviation from attainment of WQS is each designated-use segment	Yes	Yes	Percent attainment calculations for every designated-use segment
Current Conditions ***(Liza Hernandez)***	Open-water, Deep-water, Deep-channel	Monthly changes in dissolved oxygen levels, temperature, and salinity.	Hypoxic/Anoxic volume; temporal and spatial patterns temperature and salinity	Yes	Yes	Inverse-distance squared interpolation model

Note: CBP is currently developing procedures to quantify attainment of dissolved oxygen, water clarity/SAV, and chlorophyll *a* criteria according to the established Chesapeake Bay water quality standards. Results of these procedures will significantly differ from the dissolved oxygen, water clarity/SAV, and chlorophyll *a* results (above, #1), and will make it necessary for TMAW and WQGIT to explain the differences.

4) Supporting indicators calculated by CBPO staff and reported by other organizations (i.e., EcoCheck, Versar)

Indicator *(analyst)*	**Applicable designated use(s)**	**What is it supposed to indicate? (target)**	**What is it really measuring?**	**Is the correct data used to evaluate target?**	**Is the target evaluated correctly?**	**What method is being used?**
Dissolved Oxygen ***(Liza Hernandez)***	Open-water, Deep-water, Deep-channel	Acceptable DO levels for important animals	Excessive consumption of DO by bacteria	Yes	Yes	Area-weighted Pass/Fail Scoring

Water Clarity ***(Liza Hernandez)***	Shallow-water Bay Grasses	Acceptable light needs for underwater grasses	Phytoplankton light needs in open waters	No (uses mid-channel Secchi depth)	No	Area-weighted Pass/Fail Scoring
Chlorophyll *a* ***(Liza Hernandez)***	7 Chesapeake Bay segments	Acceptable phytoplankton biomass	A phytoplankton photopigment	Yes, when clarity of open water is acceptable ++	No	Area-weighted Pass/Fail Scoring
"Bottom Habitat" Benthic IBI ***(Roberto Llanso, Jackie Johnson)***	All	Health of benthic macroinvertebrates	Community structure and function	Yes	Yes	Area-weighted Pass/Fail Scoring
"Phytoplankton" Phytoplankton IBI ***(Jackie Johnson)***	Open-water	Health of phytoplankton	Community structure and function	Partial (MD program abandoned)	Yes	Area-weighted Pass/Fail Scoring
Hypoxic Volume Summer Review ***(Liza Hernandez)***	Open-water, Deep-water, Deep-Channel	Loss of summer habitat for many animals	Summer volume of hypoxia and anoxia	Yes	Yes	Inverse-distance squared interpolation model
Historical Hypoxic Volume Annual Reports [for monthly averaged and split datasets] ***(Liza Hernandez)***	Open-water, Deep-water, Deep-Channel	Loss of summer habitat for many animals	Summer volume of hypoxia and anoxia	Yes	Yes	Inverse-distance squared interpolation model

++ We are using a photopigment (chlorophyll *a*) to determine if phytoplankton biomass is acceptable; chlorophyll *a* becomes an increasingly uncertain measure of phytoplankton biomass when water clarity declines below salinity-specific Secchi depth thresholds.

What agencies other than EPA CBP currently manage and process monitoring data?
Are the data and relevant CBP indicators easily accessible?

1) SAV survey data and indicators managed and served by VIMS

   - VIMS website: http://web.vims.edu/bio/sav/
   - CBP does not have capacity to calculate indicators
2) Tidal benthic monitoring data and indicators managed and served by ODU and Versar
   - Versar website: www.BayBenthos.versar.com
   - CBP has programming to calculate indicator
3) Tidal phytoplankton monitoring data managed jointly with ODU;
   - indicators calculated and served by CBP
   - ODU does not have capacity to calculate indicators at this time
4) Tidal wetlands survey data not available on Internet?
   - CBP website: http://www.csc.noaa.gov/digitalcoast/data/ccapregional
   - CBP does not have capacity to calculate indicator

How *should the indicators be calculated?*

1) **EFFICIENTLY**
   - Better utilize the existing capabilities of CBPO staff and avoid duplicative efforts
   - Update (or create if non-existent) Standard Operating Procedures (SOPs) and computer programs necessary for routinely calculating indicators
2) **USING THE SAME METHODOLOGIES**
   - Review and resolve CBPO vs. EcoCheck differences in indicator calculations (e.g., chlorophyll *a* and dissolved oxygen)
   - Review and resolve CBPO vs. EcoCheck differences in presentation and interpretation of indicators

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Why *calculate ecosystem indicators?*

1) To better relate non-tidal and tidal indicator results and set realistic expectations
2) To support the "new" effort to develop better explanations for how outside factors affect trends
3) To improve public's general understanding of Bay issues and restoration progress