2020 and we are still nowhere near reporting on the full suite of Chesapeake Bay water quality criteria of the TMDL!

Suggested Management and Policy Options for Adapting the CBP Monitoring Program to Fully Address TMDL-related Water Quality Standards Attainment Assessments

Peter Tango

USGS@CBPO

CAP WG

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Challenges: e.g., dissolved oxygen

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

Challenges: e.g., dissolved oxygen

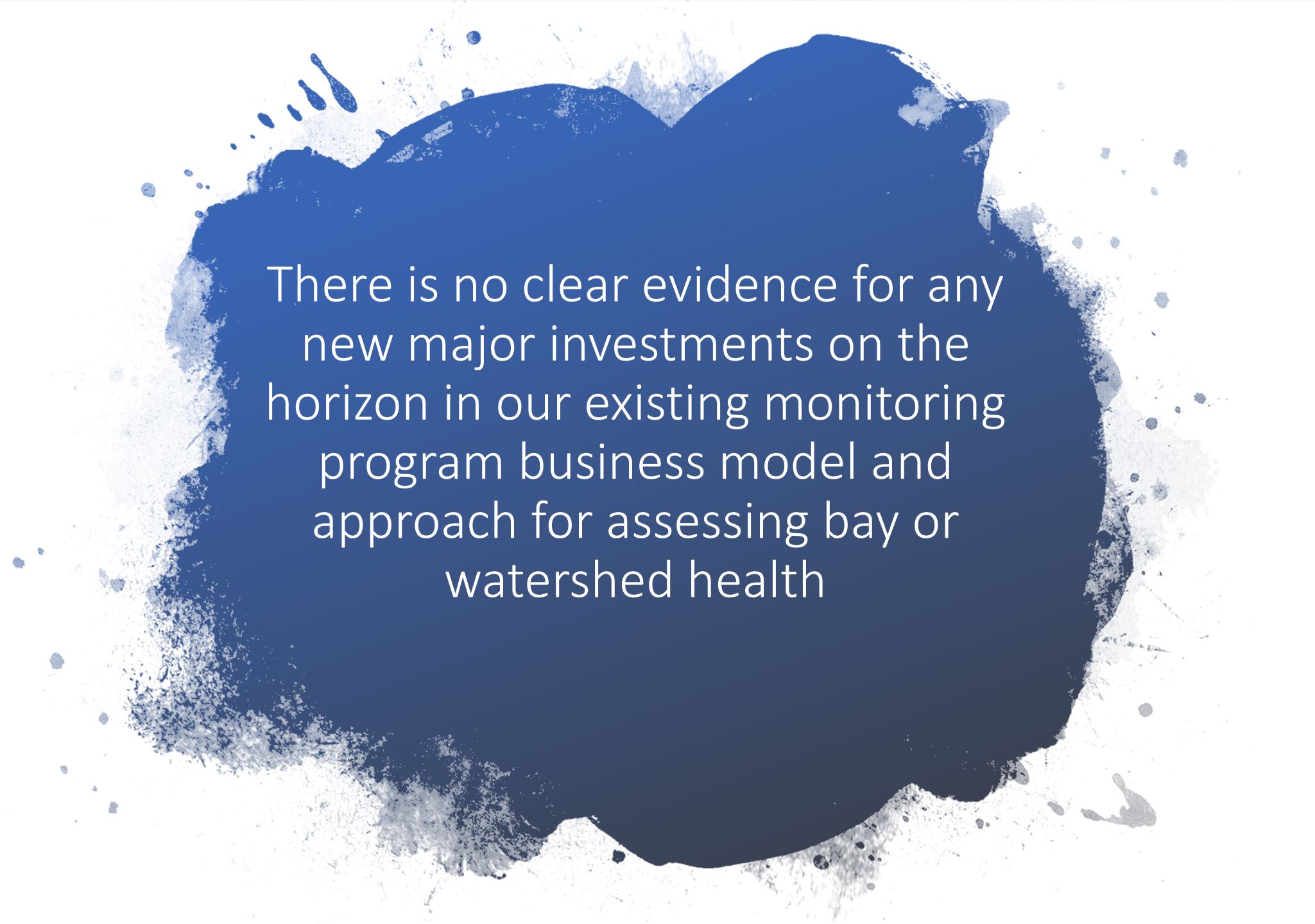| Designated Use	Dissolved oxygen Criteria Concentration/Duration		Temporal Application
Migratory fish spawning and nursery use	7-day mean $\geq$ 6 mg/L tidal habitats with 0-0.5ppt salinity		February 1 – May 31
	Instantaneous min $\geq$ 5 mg/L		
	Open water fish & shellfish designated use criteria apply		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	$\geq$ 5.5 mg/L Salinity: (0-0.5ppt)	Year-round
		$\geq$ 5 mg/L Salinity: >0.5ppt	
	7-day mean	$\geq$ 4 mg/L	
	Instantaneous min $\geq$ 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		
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Deep channel seasonal refuge use	Instantaneous min > 1 mg/L		June 1 – September 30
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Dissolved Oxygen Criteria

Unassessed criteria are a hurdle to assessing and reporting on standards

A segment must meet all its applicable criteria for all applicable designated uses to be delisted.
With unmeasured criteria still in play, we will never be able to delist even one segment in the Bay with present capacity and a business as usual approach
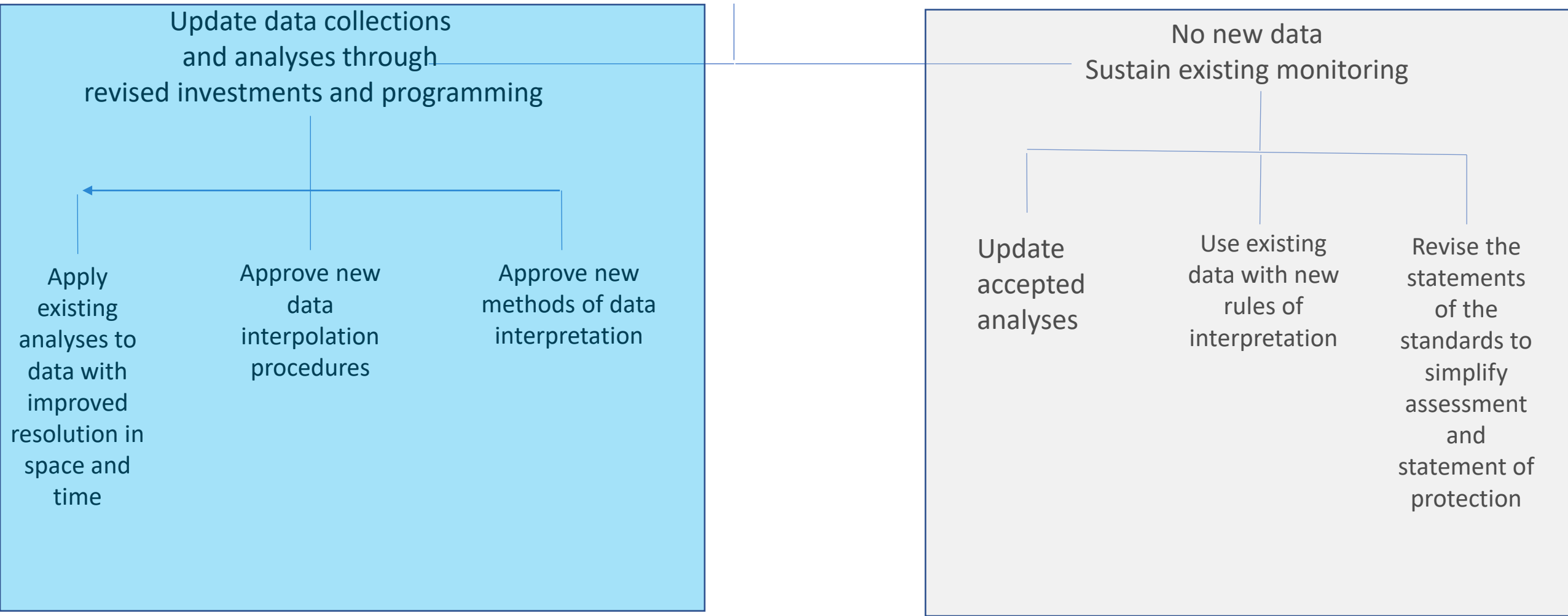
There is no clear evidence for any new major investments on the horizon in our existing monitoring program business model and approach for assessing bay or watershed health

AFTER 17 YEARS WE NEED ACTIONS TO ADAPT
WE NEED NEARTERM COMMITMENT AND IMPLEMENTATION OF UPDATES TO THE PROGRAM TO MEASURE WATER QUALITY STANDARDS ATTAINMENT

MANAGEMENT and POLICY OPTIONS

Update data collections and analyses through revised investments and programming

Apply existing analyses to data with improved resolution in space and time

Approve new data interpolation procedures

Approve new methods of data interpretation

No new data
Sustain existing monitoring

Update accepted analyses

Use existing data with new rules of interpretation

Revise the statements of the standards to simplify assessment and statement of protection

No new data – Next steps

Option 1

- **Revise the rules for the application of the data we have to close gaps in information needs.**

  - We <u>accept</u> 1-2 measurements a month in a segment to represent the 30-day mean OPEN WATER and DEEP CHANNEL designated use to support the instantaneous minimum assessment.

  - However, we <u>do not accept</u> 1-2 measurements a month for the 7-day mean, 1 day mean or instantaneous minimum for any other decision point.

- **Option**

  - Approve 1 measurement a month as acceptable for assessments of 7-day mean, 1 day mean and instantaneous minimum.

  - ***Because we have never evaluated these criteria, we would need rules for determining attainment

  - *** *Note: Virginia has a recent update to assess an element of short duration criteria, but not all short duration criteria.*

No new data – Next steps

Option 2

- **Update the use of published tools for conditional probability, accepting uncertainty in estimates.**

  - Since 1996 we have had the basics of a conditional probability approach available.

  - USEPA 2004 had an extensive assessment of the approach (Marcia Olson work)

  - USEPA updated the 2004 work as conditional probability in the 2017 Technical document.

- **Option**

- Adopt the conditional probability approach to evaluate unassessed criteria

- This will require declaring acceptable uncertainties in assessing previously unassessed criteria.

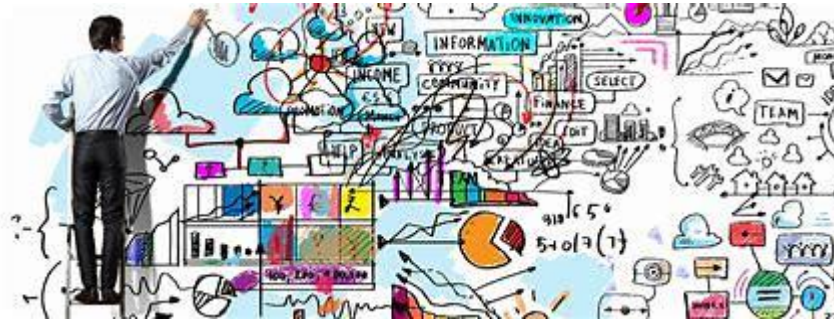*Jordan et al. 1996 – "A seasonal mean DO could provide a good measure of meeting other DO thresholds."*

U.S. EPA 2003 – Recommends estimating "probable attainment" to address short duration criteria.

No new data – Next steps

Option 3

- **Revise the language of the standards**

  - Standards adopted the published criteria as presented.

  - The criteria are very complex

Simplicity is the ultimate Sophistication
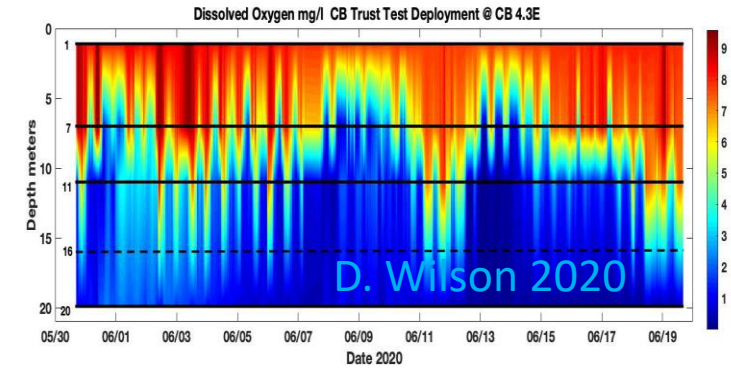-Leonardo Da Vinci

- **Option**

- Simplify standards without reducing protections

- Presently we track estimated standards with an indicator. Should we collapse the criteria like the indicator rules to simplify standards assessments?

- If the only season that really matters is summer, should the assessment rules be written exactly the way the TMDL is evaluated (e.g., as I understand, it was designed around an application of the Umbrella Criterion concept, Shenk and Batiuk 2010).
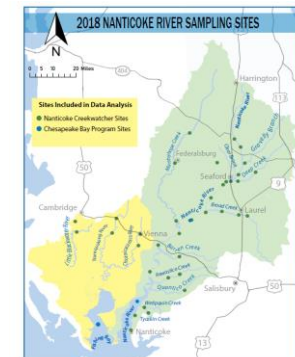
Update data collections and analyses

Next steps

Option 1

Dissolved Oxygen mg/l CB Trust Test Deployment @ CB 4.3E
D. Wilson 2020

- **Apply existing analyses with new data streams available**

- We have been very narrow in the use of data almost exclusively from the long term water quality monitoring program

- Increasingly there are tributaries in particular with enhanced monitoring with approved QA.

- Recognize, MD and VA do not do the exact same depth assessments in their profiles, therefore, why should we exclude data collected with some different depths if we are not even internally consistent? Best available data.

- **Option**

- Apply simplified standards language and assessment criteria without reducing protections

- Presently we track estimated standards with an indicator. Should the indicator rules be used to simplify standards and their assessments?

2018 NANTICOKE RIVER SAMPLING SITES

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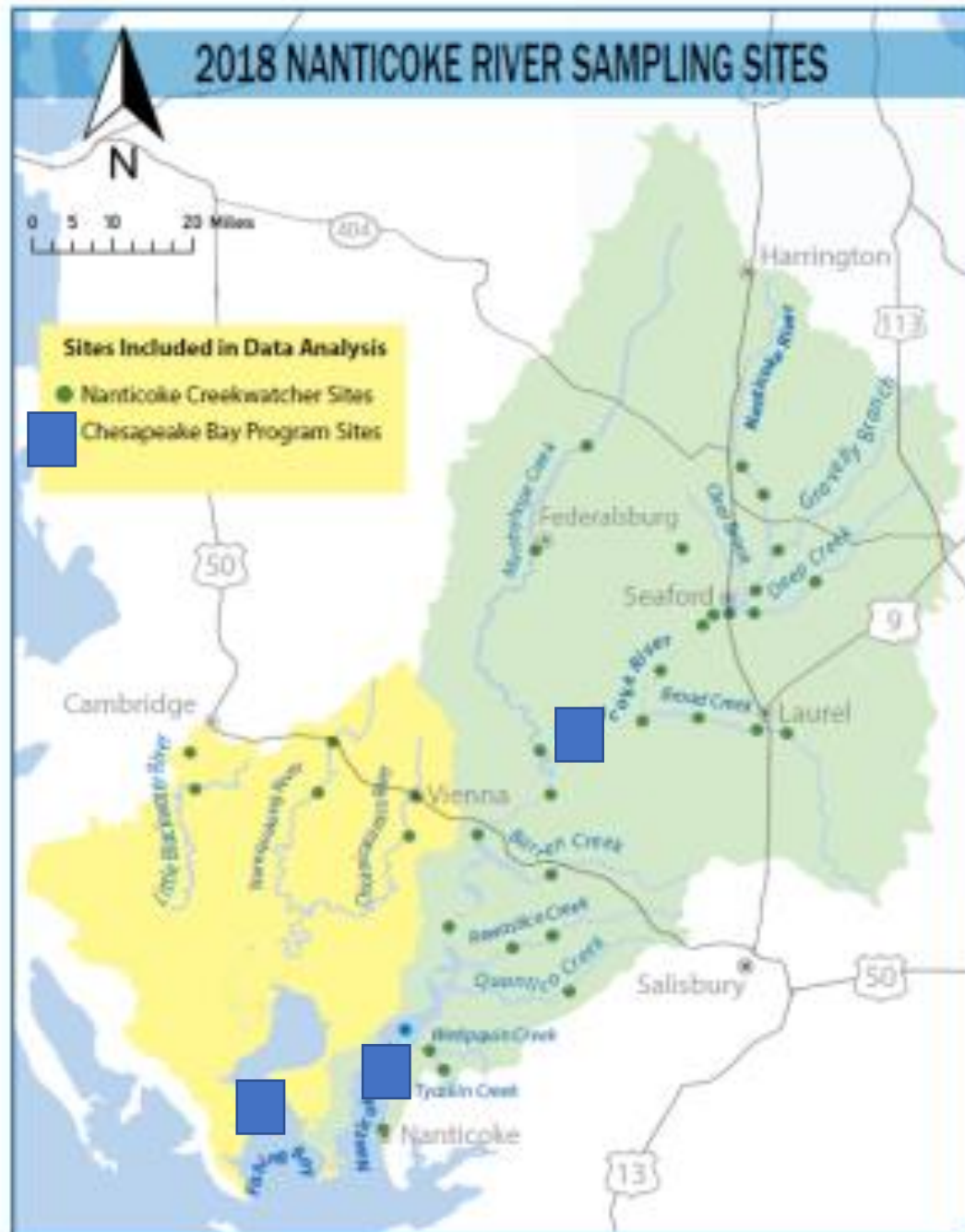
Let's invest and analyze smarter!

Example: Nanticoke Creekwatchers

Approved for Tier 3 D.O. monitoring
(Water quality standards level integrity approved)

Do we stay with only using data form 3 locations a month here when we have up to 30 locations of data available?
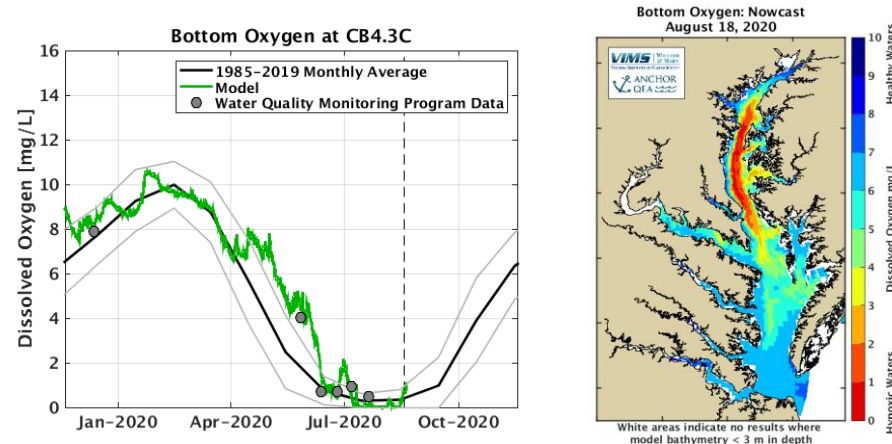
What is the logic in not deeper investment in coordinating to have at minimum of 10x the information available to support the accuracy of an assessment affecting multi-billion dollar decisions in each jurisdiction?

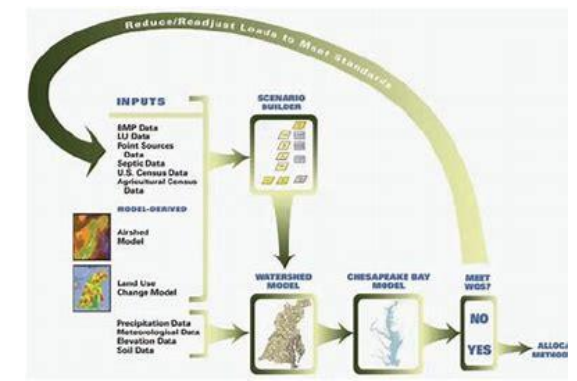# Update data collections and analyses

Next steps

Option 2

- **Approve new interpolation approaches to provide assessments of short-duration criteria**

- For example, the VIMS model provides hypoxia estimates aligned with monitoring based estimates of hypoxia, then why not use the model framework to fill in the spatial-temporal estimates of dissolved oxygen distribution to evaluate standards? This is the best estimate of fine scale conditions we have.

- **Option**

- Use independent model output calibrated to monitoring data to create high temporal and spatial resolution results to estimate standards attainment.

- We make multi-billion dollar decisions on management based on this approach, it should be good and practical enough to base assessments on as the best available form of assessment for addressing the scale of the issues.

# Update data collections and analyses

Next steps

Option 3

- **Adopt new data interpretations for assessing standards**

- Billions of dollars are invested in satellite image acquisition with diverse sensors.

- Use direct measures where available.

- Proxy measures are already used to estimate loads (e.g., continuous, easily measured turbidity provides accurate surrogate measures for phosphorus

- Proxy approach has been approved by EPA in FL for Water Quality standards attainment assessments (2012)

- **Option**

- Establish real or proxy measures with uncertainty evaluated in order to better apply satellite-derived assessments to our standards attainment assessments (.e.g., CHLA, Water clarity, SAV)
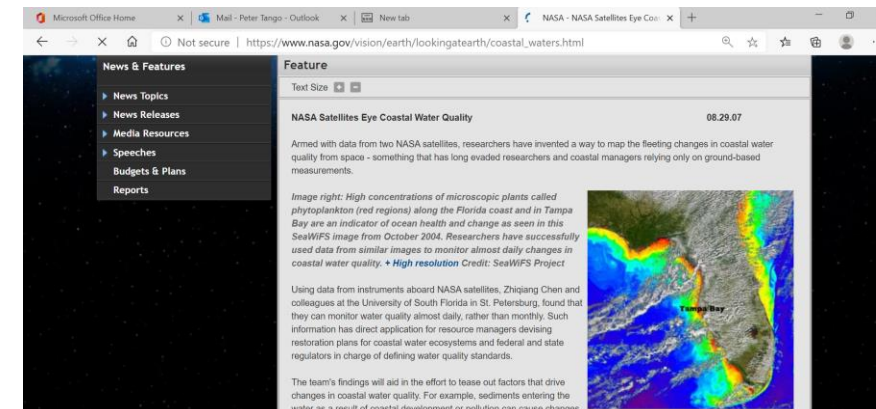
*Florida is approved for assessing CHLA water quality standards with satellite images

Summary

- The traditional water quality monitoring program is degrading in capacity under its present business model and assessment approaches

- Adaptation is essential and critical to achieving success

- There are new data streams, new tools of interpolation, and opportunities for revised data interpretation to address program issues

- In a timely manner, we need to vet and develop recommendations, promote commitments and adopt implementation of revised programming to overcome deficiencies and fill gaps in information needs to support our assessments