2021 STAC proposal outline: Develop recommendations for adoption to advance our Bay water criteria monitoring and assessment

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

11/17/2020

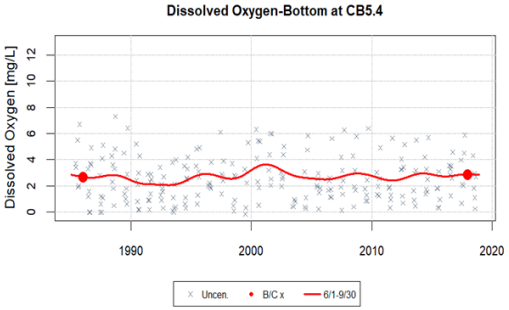
Through the 2014 Chesapeake Bay Watershed Agreement, *the Chesapeake Bay Program has committed to…*

Goal: *Water Quality*

Outcome:

Continually improve the capacity to monitor and assess the effects of management actions being undertaken to implement the Bay TMDL and improve water quality. Use the monitoring results to report annually to the public on progress made in attaining established Bay water-quality standards and trends in reducing nutrients and sediment in the watershed.

Successes and Challenges



- New analysis tools
  - e.g. GAMs, bay models, pilot work with AI/Machine Learning algorithms
- Enhanced communications
  - Bay Barometer, blogs, social media, partner meetings, Data Dashboard
- Implemented CBP's Strategic Science and Research Framework
  - Identify/fill gaps)
- Advanced scientific syntheses completed
  - publications and reports on Bay and watershed science)
- Supported an MOU using Citizen Science-based data
  - Chesapeake Data Explorer >300,000 data points

Successes and Challenges

- Unassessed criteria remain a hurdle for delisting decisions of State-adopted water quality standards with our existing framework
- Financial stresses on Bay cruises, SAV aerial survey, NTN
- Contraction of traditional long-term monitoring programming
- Slow pace for expanded assessment of water-quality standards
- Limited non-traditional data use in assessments
- Limited use of new interpretation and interpolation options

= Inability to report on standard attainmer

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

2021 STAC Workshop outline:

Evaluate the following options and supply recommendations on making more cost effective, full accounting of water quality standards in the TMDL

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

Method 1

- **Revise the rules for the application of the data we have to close gaps in information needs.**
  - We accept 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 do not accept 1 measurement a month for the 7-day mean, 1 day mean or instantaneous minimum at any other time or place.

- **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

Method 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.

No new data – Next steps

Method 3

- **Revise the language of the standards**

- Standards adopted the published criteria as presented.
- Criteria are very complex

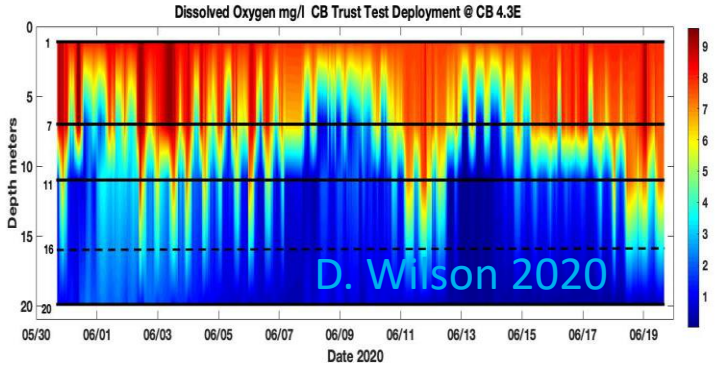
- **Option**
- Simplify standards without reducing protections
- Presently we track and report estimated standards with an indicator. Should we collapse the criteria using the indicator rules to simplify standards assessments?

Update data collections and analyses

Next steps

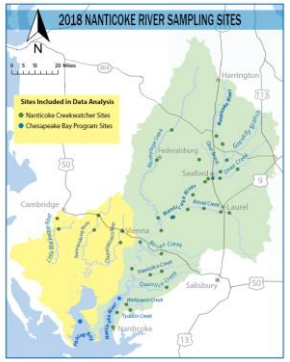
Method 1

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



- We depend almost exclusively the long term water quality monitoring program/SAV aerial survey
- Cit Sci is contributing equivalent water quality profile data collections on an expanded set of tributaries
- Satellite imagery is interpretable for one or more needs with existing tools
- Cost effective hypoxia monitoring is feasible in open bay conditions
- We can update our existing assessments to use new data streams

- **Option**
- Update programs to use all QA'd data available
- Invest in cost effective monitoring tools



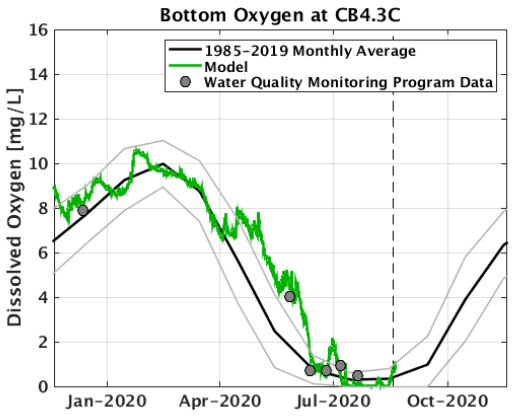
Update data collections and analyses

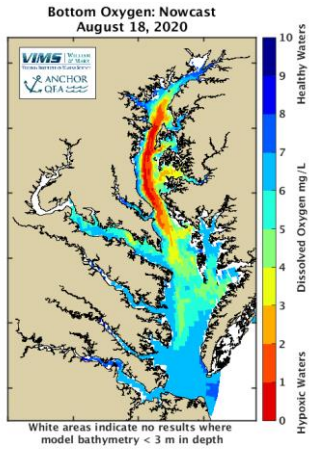
Next steps

Method 2

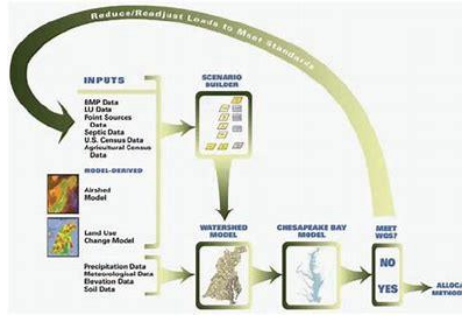
- **Approve new interpolation approaches to provide assessments of short-duration criteria**

- Bay models are operating in realtime with results aligning with less frequent bay surveys.
- Habitat assessments capture more variability in space and time than our traditional assessments





- **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 using a process model and some assessment rules. We should be able to improve our assessments with calibrated model interpolation too.

Update data collections and analyses

Next steps

Option 3

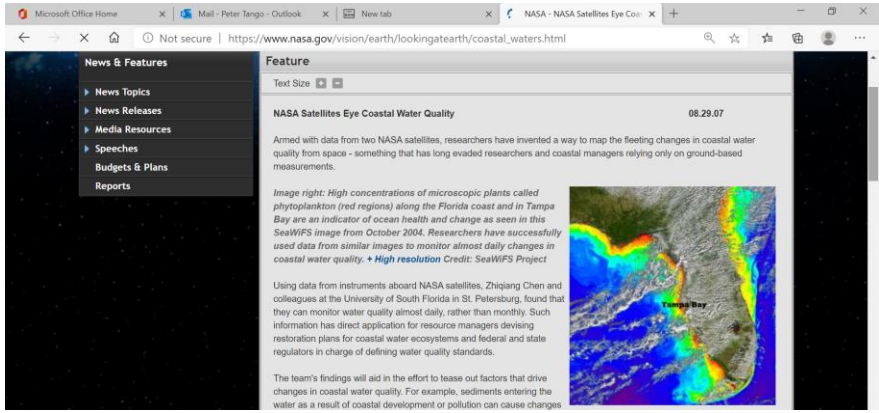
- **Adopt new data interpretations for assessing standards**

- 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

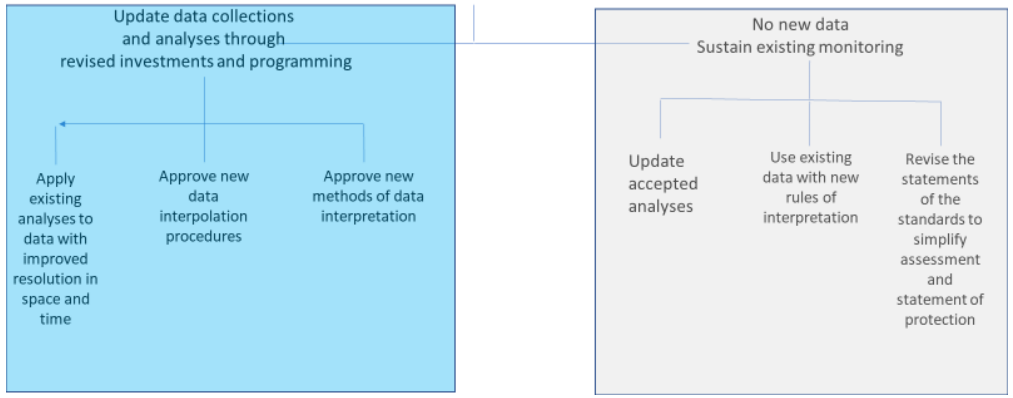
- Adaptation is essential and critical to achieving success
- There are new data streams, new tools of interpolation, and opportunities for revised data interpretation to address program issues
- We need to vet and develop recommendations,
- Promote and endorse commitments to those directions
- Adopt and implement revised programming to overcome stresses and deficiencies affecting full support of our assessment needs

STAC Proposal on Developing the Recommendations

- 6 (at least) items that need vetting. Next meeting: Others?
- Each option can have a sub-group evaluate what is needed to use the approach to fill gaps in our criteria attainment assessments
- Each group would report back on recommendation for viability of the option and the path forward needed to adopt the approach into the assessment program.

2021 STAC Workshop outline:
Evaluate the following options and supply recommendations on making more cost effective, full accounting of water quality standards in the TMDL

MANAGEMENT and POLICY OPTIONS

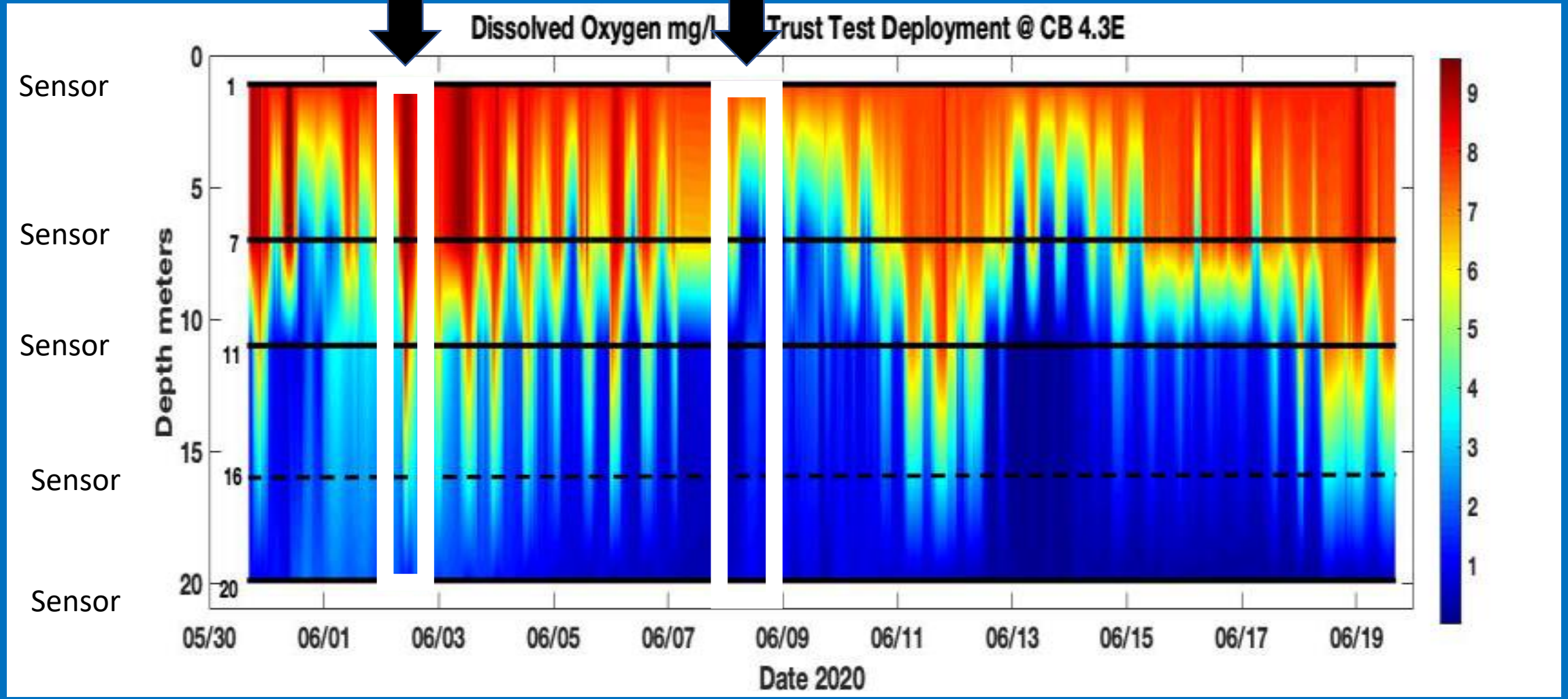


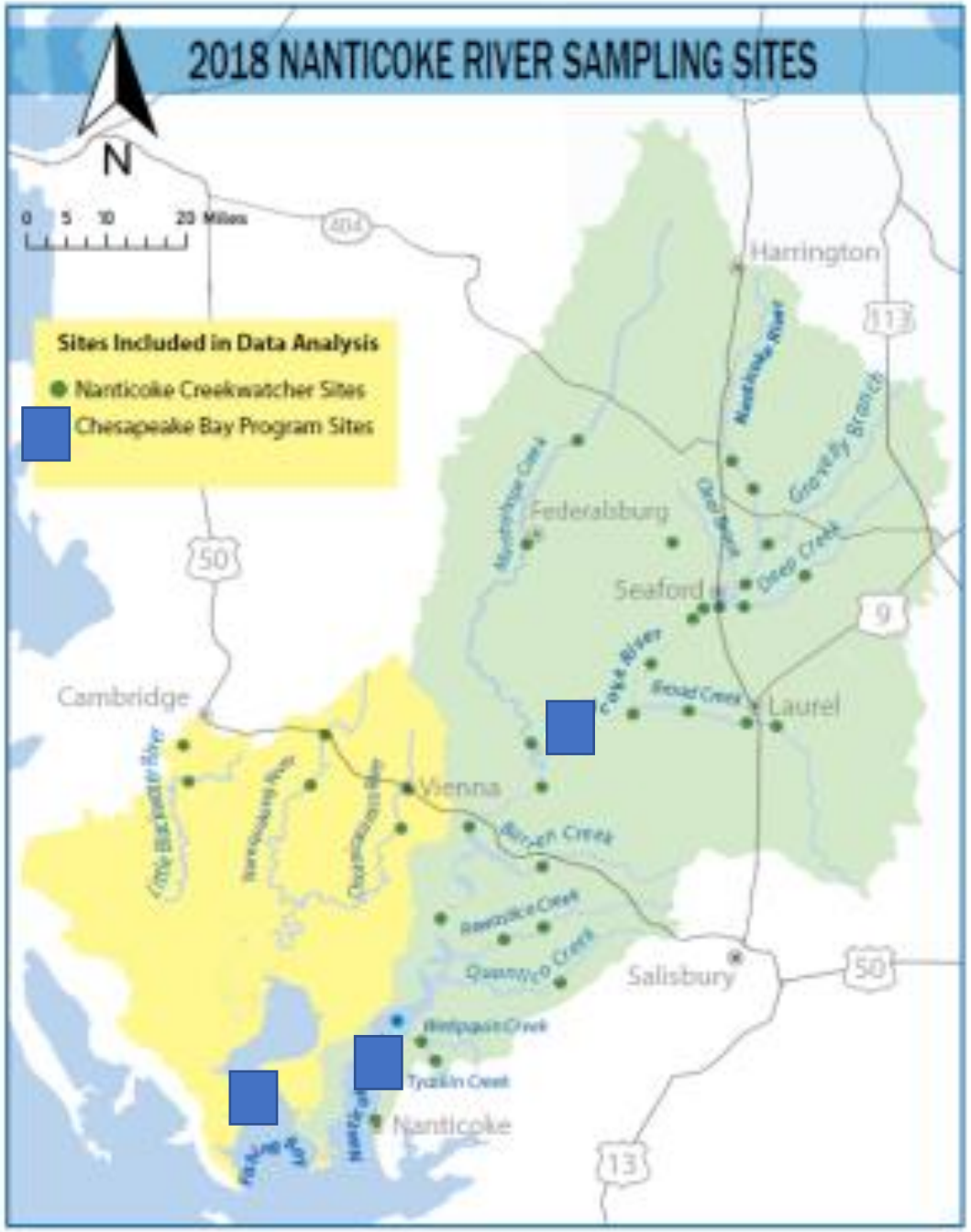
June 2
Sample here
80% >5mg/L

June 8
Sample here
90% <5mg/L

Continuous monitoring
Vertical profile interpolation
Mid-Bay
June 2020

D. Wilson. Caribbean Wind





Let's invest and analyze smarter!

Nanticoke Creekwaters are
Approved for Tier 3 D.O. monitoring
(Water quality standards approved)

Do we continue to compute standards
Attainment based on 3 sites visited
1x per month That is 12 data point for
the summer,

Or

Do we include 30 sites collected
weekly to evaluate D.O. standards? That is
Over 300 data points for one season?
That is a 30x increase over our existing
monitoring program by incorporating their
data, and that is just one tributary system.