PSC Update:
4D Assessment Tool and Community Science Updates

May 18, 2023

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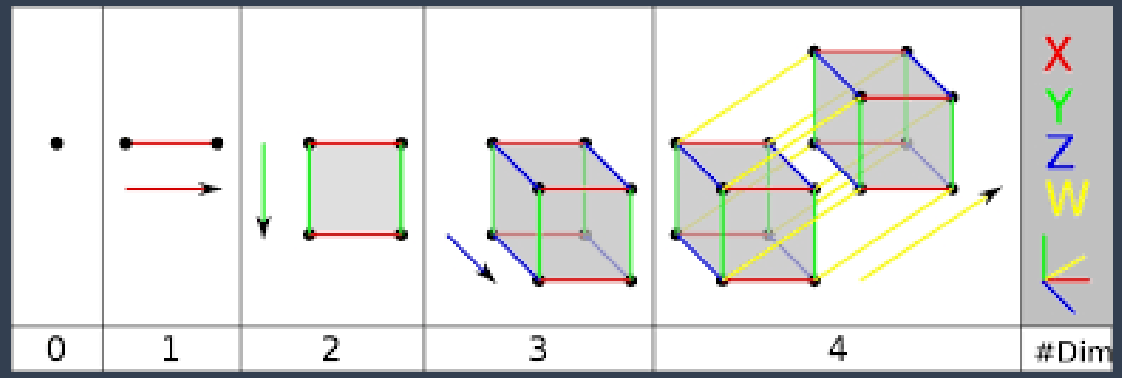
USGS

Co-coordinator : Bay Oxygen Workgroup (4D Tool)

Technical Advisor : Chesapeake Monitoring Cooperative

Chair : Criteria Assessment Protocol Workgroup

Let’s start with the new 4-dimensional interpolation analysis tool



RE: Water quality standards attainment assessment support

$tatus: EPA funded for development 2023-26; long-term TBD

Historical interest in 4-dimensional (4D) water quality interpolation: 2008 STAC Workshop

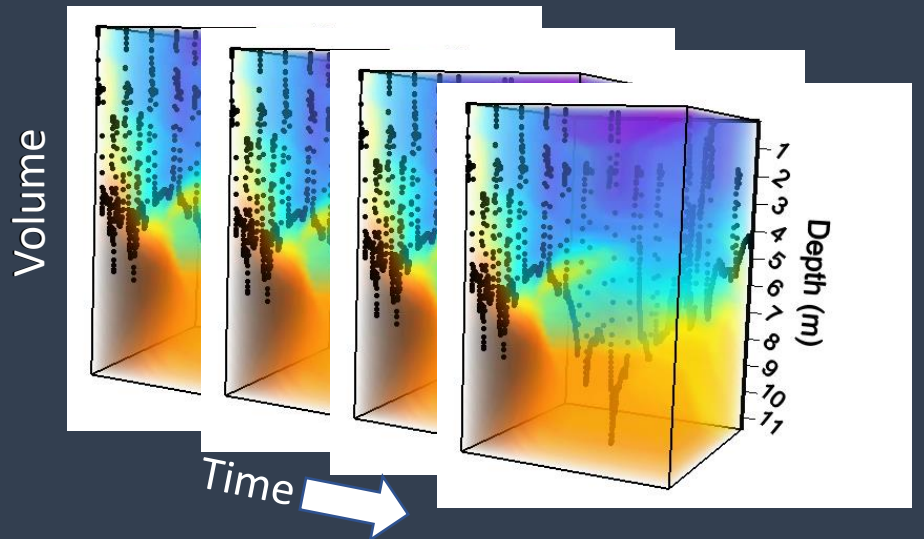
Assessing the feasibility of developing a four-dimensional (4-D) interpolator for use in impaired waters listing assessment December 2008 STAC Publication 08-008

Recommendations from the STAC Expert Panel

- Frank Curriero (Johns Hopkins University)
- Eileen Hofmann (Old Dominion University)
- Ragu Murtugudde (University of Maryland)
- Jian Shen (Virginia Institute of Marine Science)
- J. Andrew Royle (U.S. Geological Survey)

2008 Findings

- The panel recommended a study to evaluate the different approaches available for developing a 4-D interpolator



2021 - present: We have the understanding to build a 4D interpolator.

Where we are heading: Assessment of all Bay oxygen water quality criteria for 2025

A new analysis system, built on an expanded data collection effort, is envisioned that will allow assessment of all water quality criteria. Figure 1 shows the flow of information in the proposed system.

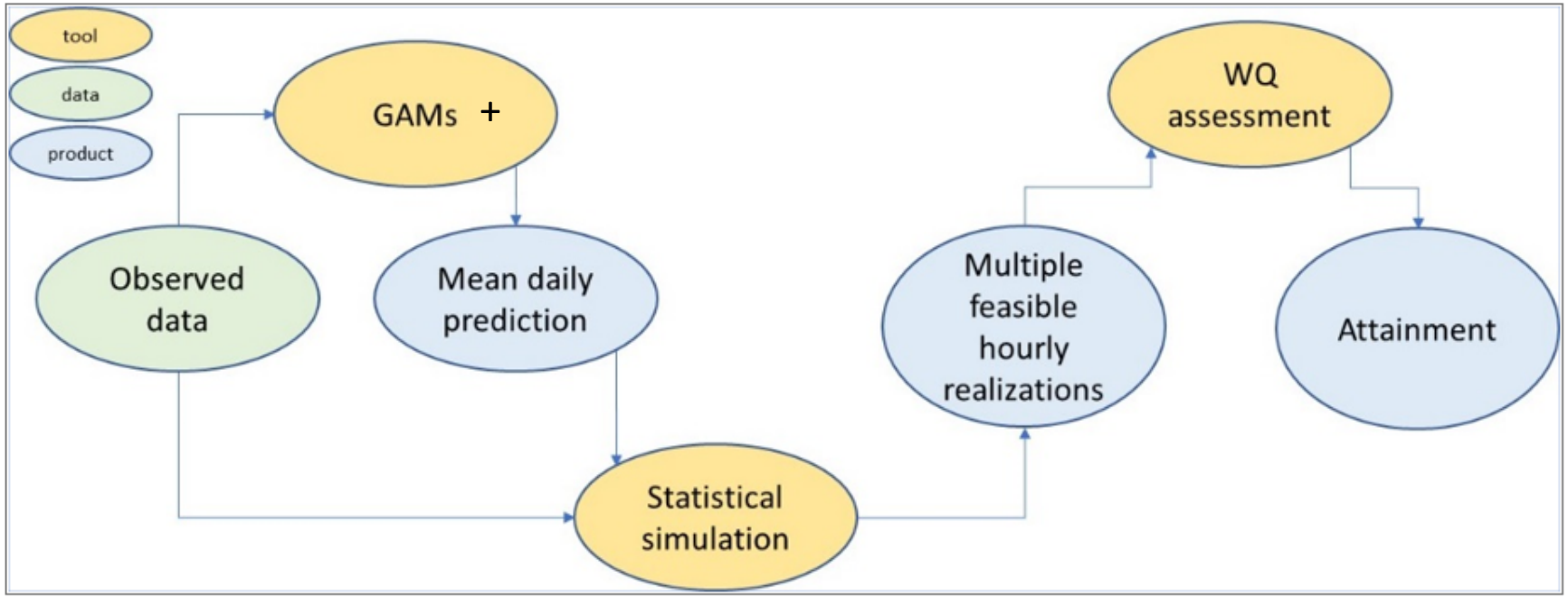


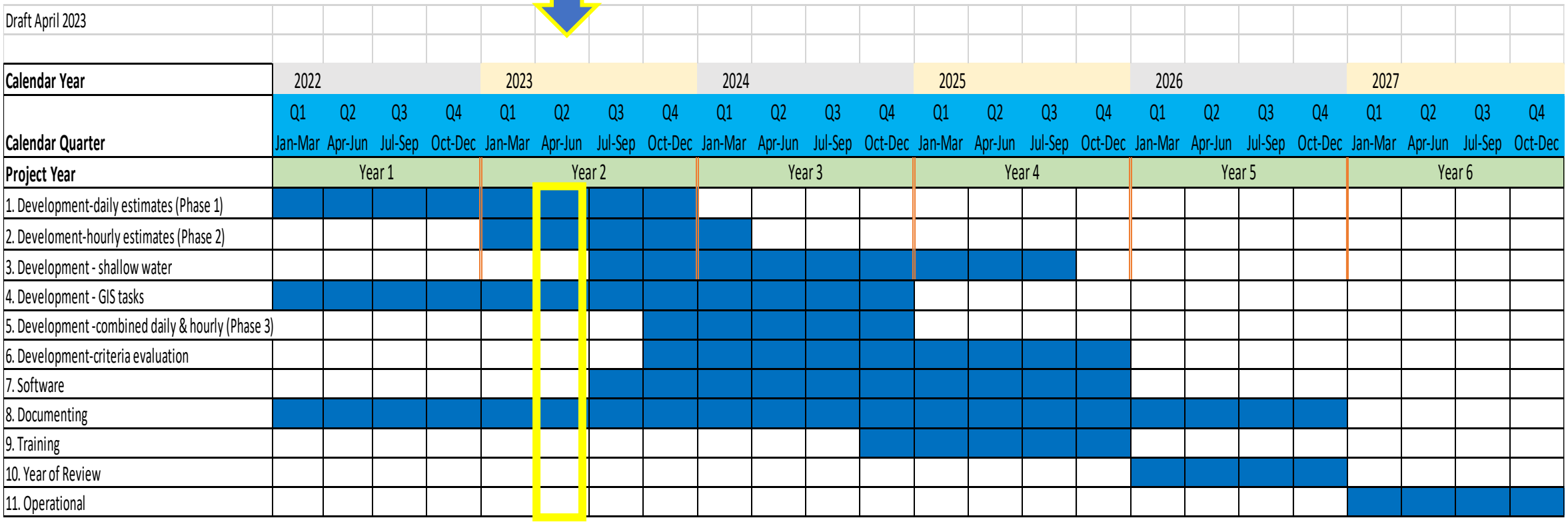
Figure 1: Interpolation and attainment assessment system

Source: G. Shenk

4D Interpolator Tool: Work timeline

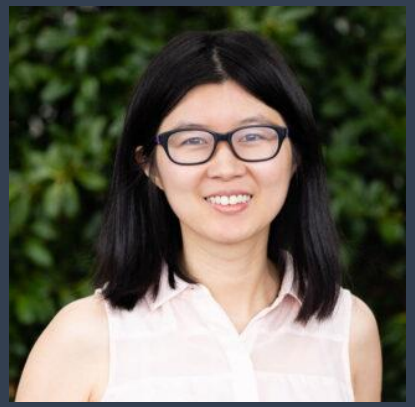
- We are still very much in the early development and testing phases.

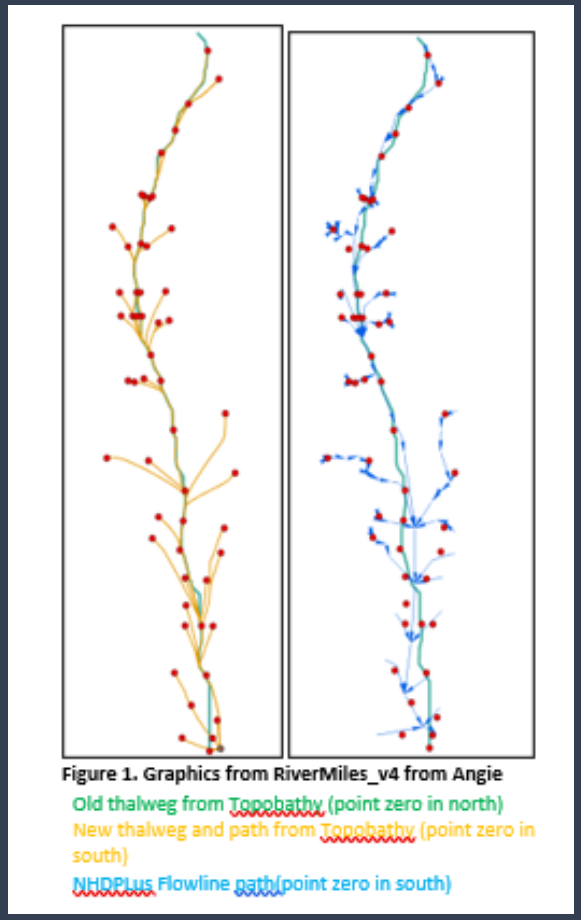
We are here



4D progress for interpolating dissolved oxygen concentrations (2022-early 2023)

- **A coordinate system** has been proposed underpinning development of the tool (Angie Wie, GIS)





Mainstem bay Coordinate system Testing for the 4D world from Angie Wei, GIS team, 2023.

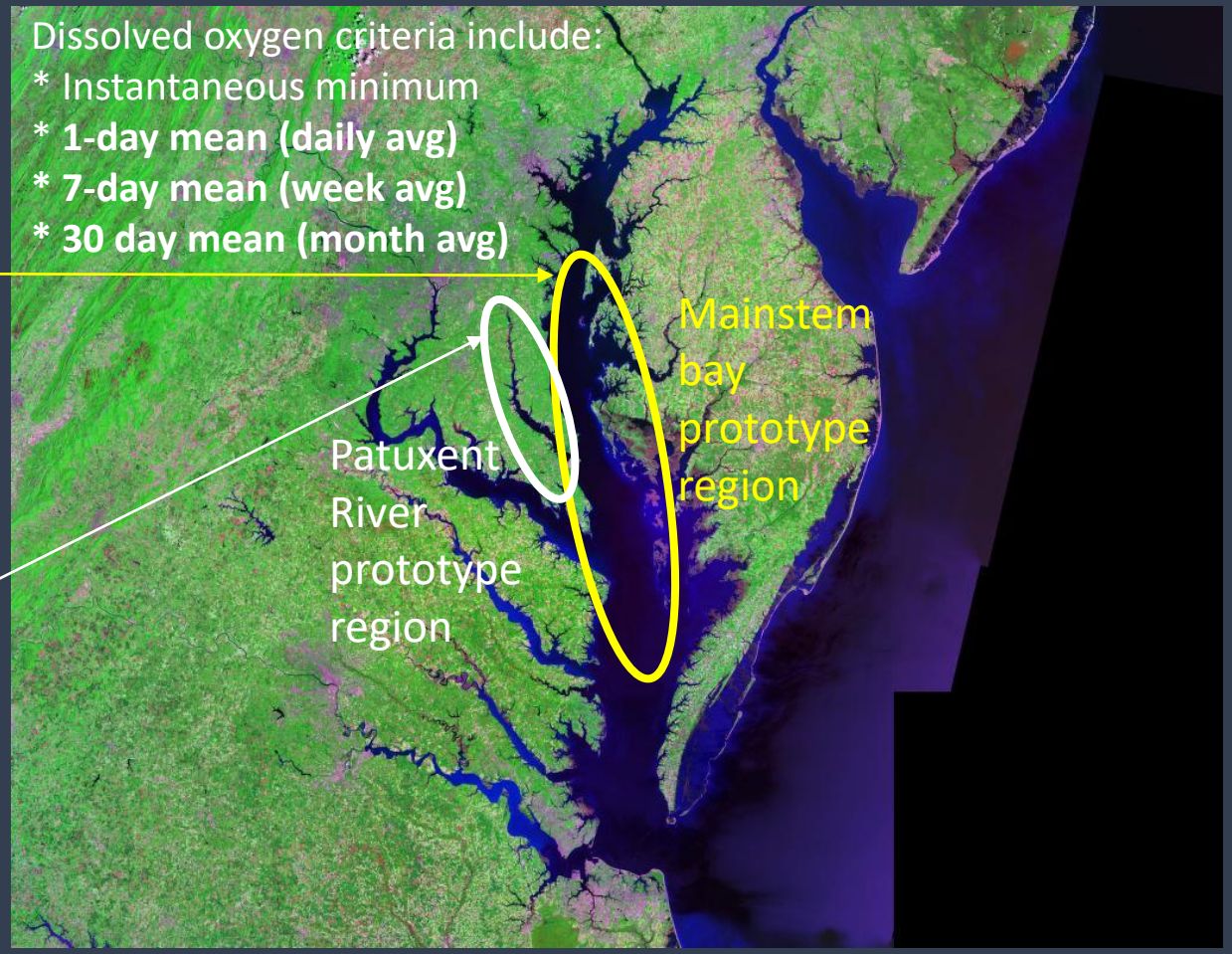
4D progress for interpolating dissolved oxygen concentrations (2022-early 2023)

Elgin

- **Success!** A working ***daily average*** **prototype using Generalized Additive Models (GAMs)** for a large chunk of the mainstem bay. (Elgin Perry and Rebecca Murphy)

Rebecca

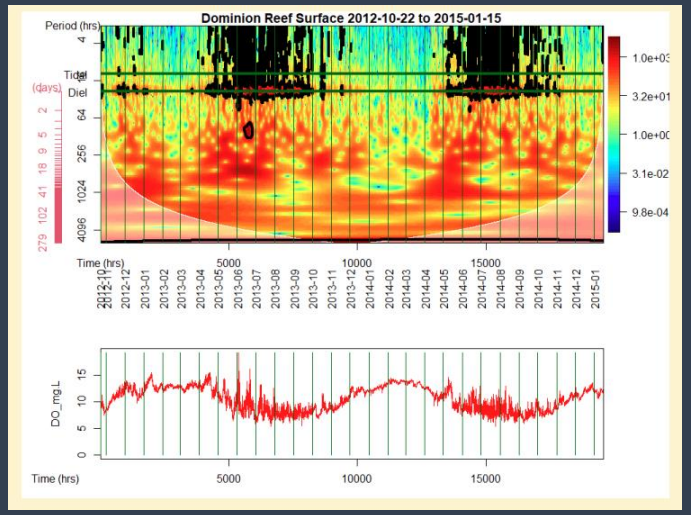
- **Success!** Application of ***daily average*** **prototype to the tidal Patuxent River** (Rebecca Murphy)



4D progress for interpolating dissolved oxygen concentrations (2022-early 2023)

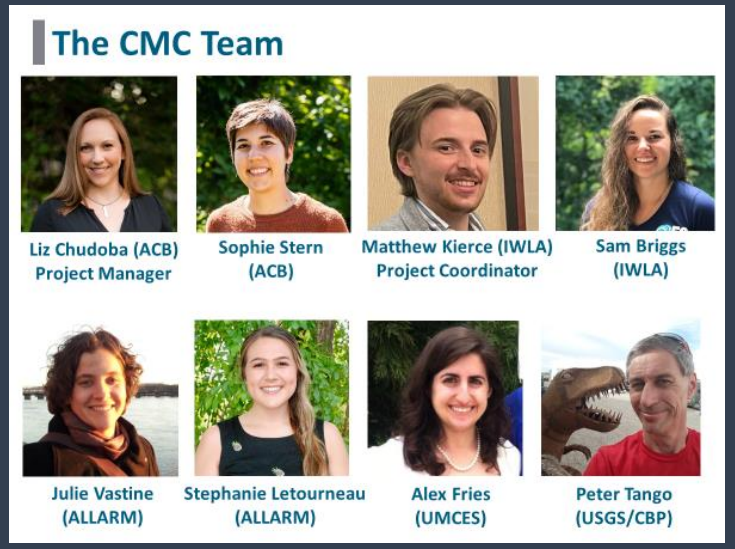
- Method exploration for **short-duration (sub-daily) d.o. dynamics** component of the interpolator is underway (Elgin Perry)

- **Tetra Tech support** in place to help on assembling data, creating the software of a working tool, documentation, etc.



Short duration D.O. pattern assessment with wavelet analysis
Elgin Perry, 2023

Switching over to Community Science



RE: Community Science data support multiple outcome assessments

$tatus: *Maintenance* - EPA awarded annual $500K 2023-28 (6 year award)
New - PSC Report Recommendations leading to EPA RFA, new work, +$'s
Long-term – Sentinel site support needs TBD

Applications of Community Science Monitoring Activities Aligned with Chesapeake Bay Program Partnership Data and Decision Support Needs

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Session J1: Local, State, and Regional Uses of Community Data

13th NATIONAL MONITORING CONFERENCE
Working Together for Clean Water
April 24-28, 2023 Virginia Beach, Virginia
NWQMC

USGS science for a changing world

Stream Health

Restoring water quality in local rivers and streams is a key step toward meeting water quality standards across the entire Chesapeake Bay. Restoring rivers and streams also benefits the fish, wildlife and people that use them.

Outcome: Continually improve stream health and function throughout the watershed. Improve health and function of ten percent of stream miles above the 2008 baseline for the watershed.

Current policy: 2014 Agreement

5 themes
10 goals
31 outcomes

- Abundant Life
  - Sustainable Fisheries
  - Vital Habitats
- Clean Water
  - Healthy Watersheds
  - Toxic Contaminants
  - Water Quality
- Climate Change
  - Climate Resiliency
- Conserved Lands
  - Land Conservation
- Engaged Communities
  - Environmental Literacy
  - Public Access
  - Stewardship

Collaboration: Indicator support

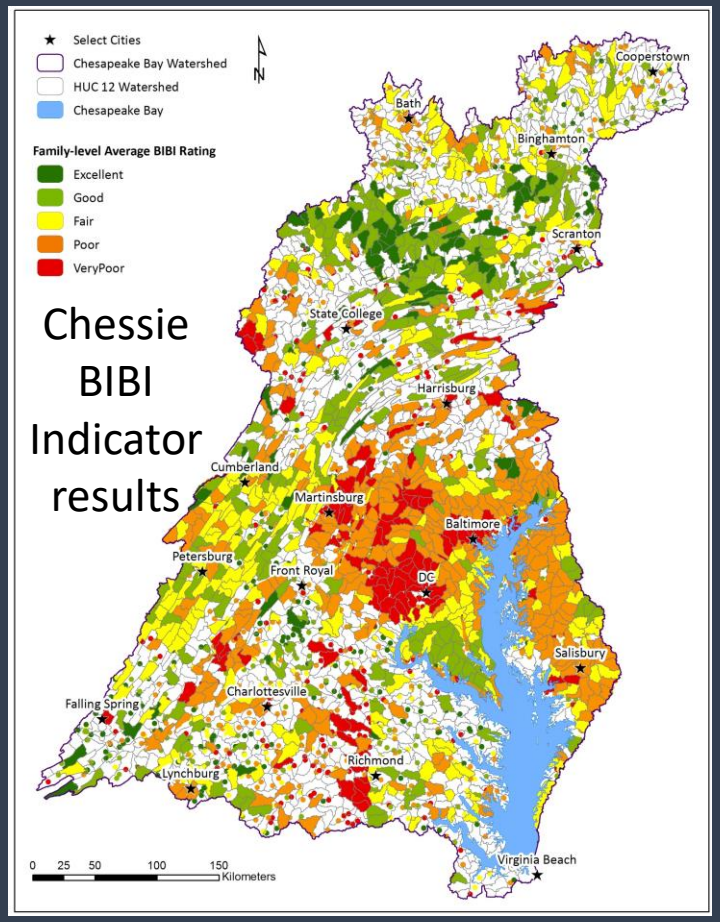
Benthic macroinvertebrate monitoring is needed for outcome assessment

Chesapeake Monitoring Cooperative Gap Assessment and data collection

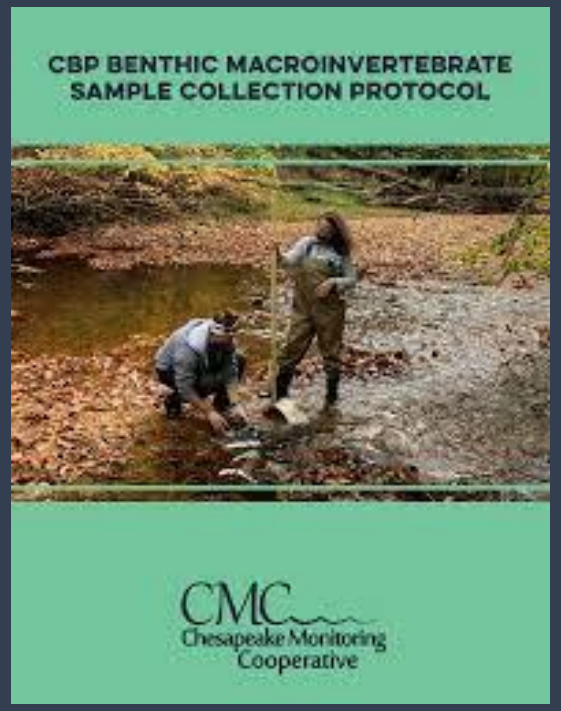
The **CBP Stream Health Workgroup** has identified gap areas based on the data used for the Stream Health Assessment.

Gap filling data support

Chessie BIBI Indicator results



Actions: Collaboration with EPA Wheeling Laboratory



Stream sampling guidance development

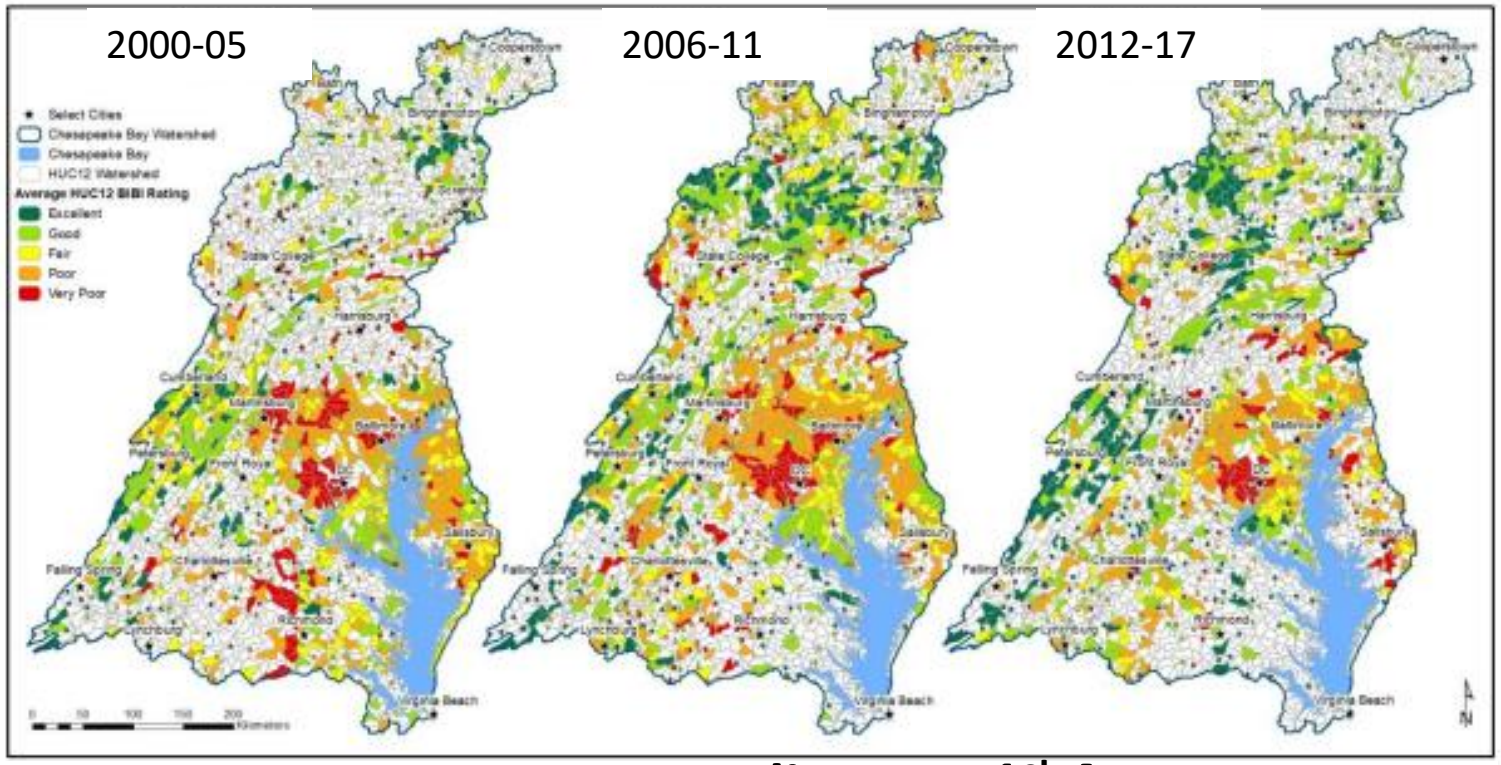
Stream sampling for macrobenthos

- **In 2020 the CMC team partnered with the Chesapeake Bay Trust and CBP** to develop a community-based benthic monitoring approach

  - Benthic samples collected in non-tidal, rocky bottom streams
  - Preserved samples sent to the **EPA Wheeling Lab** for family level i.d.
  - Annual sample collections have begun!

Stream Health Outcome – Assessment impact

Management target of a 10% improvement for the watershed



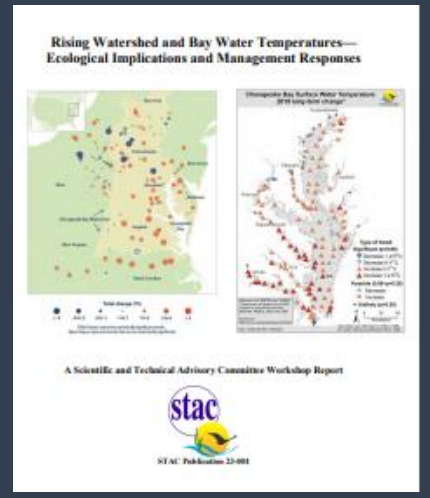
CHESAPEAKE WATERSHED AGREEMENT

2018-2023
2nd
assessment
dataset is
being
developed

Stream Health Indicator: Progress assessment results, Buchanan et al. 2023 ICPRB

Chesapeake Bay Program – Community Science (formerly "Volunteer Monitoring") Program Application Examples

- Watershed Implementation Planning (WIP) assistance
  - Centre and Cumberland Counties, PA
- Community Science pollution detection
  - Patapsco River, MD WWTP
- Water Quality Standards attainment data
  - South River, MD
- CBP STAC Rising Temperatures Report
  - Watershed-wide data use



New nearterm support on the horizon RFA: Ground-truth support to annual aerial surveys has been recommended, water quality in the watershed

Tango et al. 2022. PSC Enhanced Monitoring Report. CBP

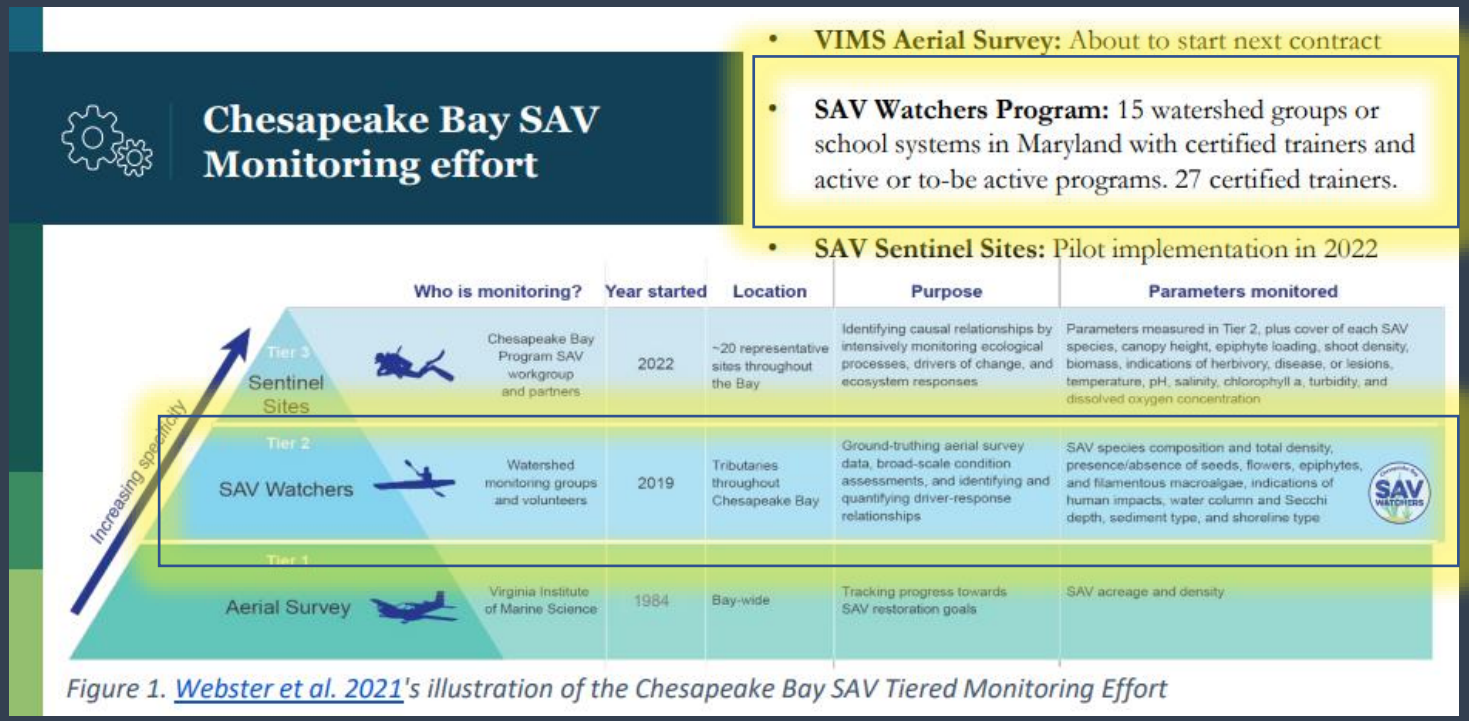


Figure 1. Webster et al. 2021's illustration of the Chesapeake Bay SAV Tiered Monitoring Effort

Long-term – Sentinel site support needs: TBD

- Thank you!