Responding to the PSC Request to Improve the CBP Monitoring Networks- Update

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Chesapeake Bay Program

STAR Meeting

November 16, 2021

Feedback Needed from the PSC in November

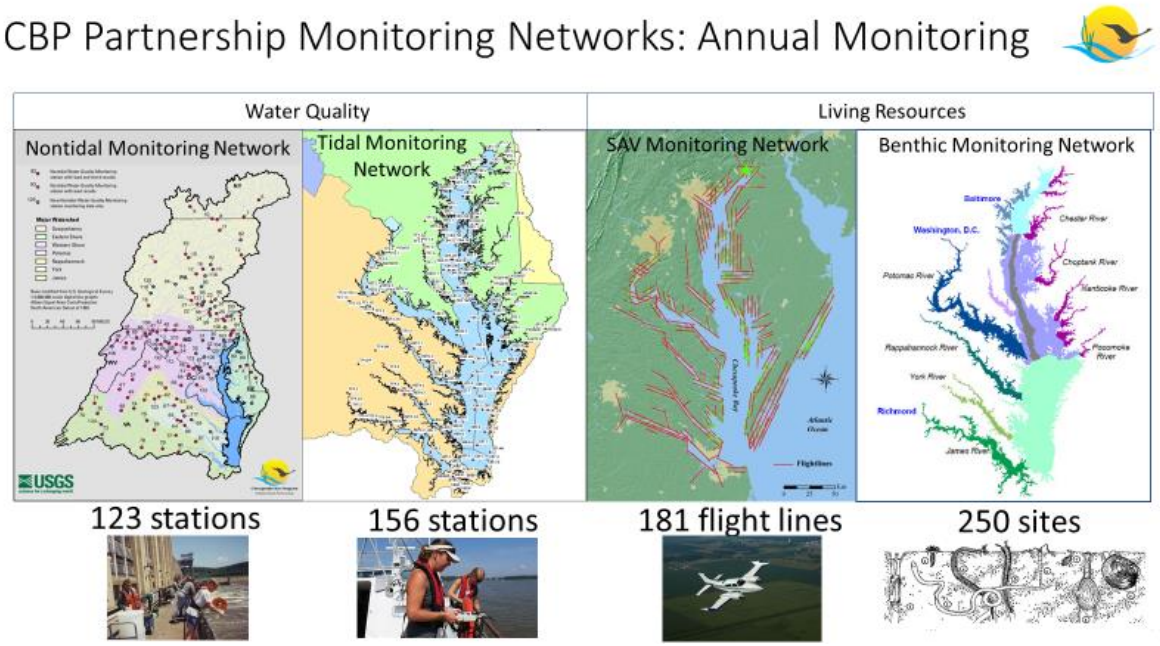
- Scope of the report that will be delivered?

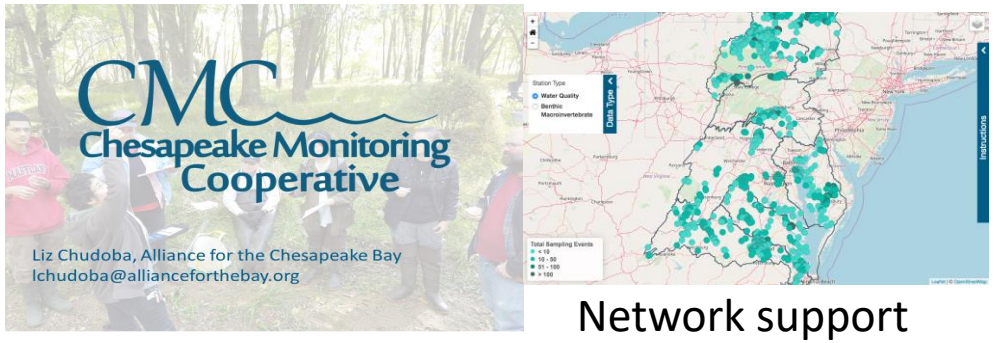
- What format for recommendations regarding support for our monitoring networks is best so that they are actionable?

- Outline for today:
  - Quick introduction
  - Some preliminary findings
  - Potential format for recommendations
  - Scope of report
  - Feedback

REMINDER: Monitoring Presentation to the Principal Staff Committee

- Lee McDonnell provided monitoring presentation on March 2
- Help them better understand CBP budget and funding for monitoring
- CBP networks:
  - Tidal water quality
  - Nontidal nutrients and sediment
  - SAV
  - Tidal Benthic organisms
  - Citizen Monitoring
- Current Funding:
  - CBP $5M and partners >$7M





Network support

Addressing the Principal Staff Committee Request

- Provide information needed to improve CBP monitoring networks, including:
  - (1) Current status and threats to the networks
  - (2) What is needed to improve the monitoring network sustainability
  - (3) What is already available to address capacity shortfalls in monitoring and assessment
  - (4) Opportunities for CBP networks to address multiple outcomes

- STAR will Coordinate Response
  - Work plan shared with PSC June 2021
  - Deliver network assessment and recommendations by January (FEBRUARY) 2022

Process

- 9 months start to finish
- 8 questions to answer
- Provide a short synthesis to address the questions, vision going forward.

General path of recommendations development for PSC: 9 months

Teams/Groups	April 2021	May	June	July	Aug	Sept	Oct	Nov	Dec	2022
										Winter
NTN	**SPRING** **Status and vulnerabilities of existing network**			**SUMMER** **Innovation Assessment, Financials of Sustaining networks**			*In Progress*			Consolidate recommendations, financials for PSC Presentation
CAP WG with DIWG										
Hypoxia Collaborative										
Cit Sci										
Fish Forage/Black Duck/117e grants										
Fish Habitat										
SAV										
4-D Interpolator							**FALL** **Innovation Assessment continues,** **Evaluate limitations, Financials for adopting innovations, recommendations**			
STAC Workshop	✓	✓	✓	Planni	ase	*In Progress too*	Early Themed Workshop meetings			Continue
STAR/WQGIT updates				✓		Input from all GITs	Presentation prep STAC Workshop panels, meeting support as targeted		Early PSC material PPT and review	
PSC Presentation										
STAC input						In progress: STAR presents at STAC				

In Progress

Monitoring gaps, options and innovations

CBP Network	Issues	Gaps & Applications	Options & Innovations
Tidal Network	• We are not assessing all applicable water quality criteria *for any segment* in the Bay.	• Sustain existing networks • Open water/shallow water high frequency to meet data needs • Model calibration/verification	• Gap funding on existing networks • New vertical arrays • Community Science and Sensor arrays • 4D interpolator assessment
Nontidal Network	• Annual threats of station loss • Underrepresentation of stations in Coastal plain • Refined load measures	• Sustain existing networks • Continuous monitoring for key load tracking and reporting • Coastal Plain stations • Model calibration/verification	• Strategic investment of new resources
SAV	• Rising contractor costs • Air-space restrictions • Evolving satellite-based protocol and assessment	• Low cost (free) imagery • Intra-annual repeated images • AI/Machine Learning algorithm efficient interpretation • Model calibration/verification	Repeated satellite imagery, Community Science protocols
Benthic	• Cost of living updates	• Sustain summer survey	COLA support
Community Science	• Equipment to volunteers	• Strategic distribution and sharing of monitoring equipment • Water quality stds attainment	Strategic coordination and expansion is under discussion

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Opportunities for CBP networks to address multiple outcomes

Issue

- Addressing monitoring needs for multiple outcomes including, but not limited to:
  - Indicator assessments
  - BMP effectiveness assessment
  - Living resource response to management actions
  - Information being gathered for selected goals and outcomes

Gaps and opportunities

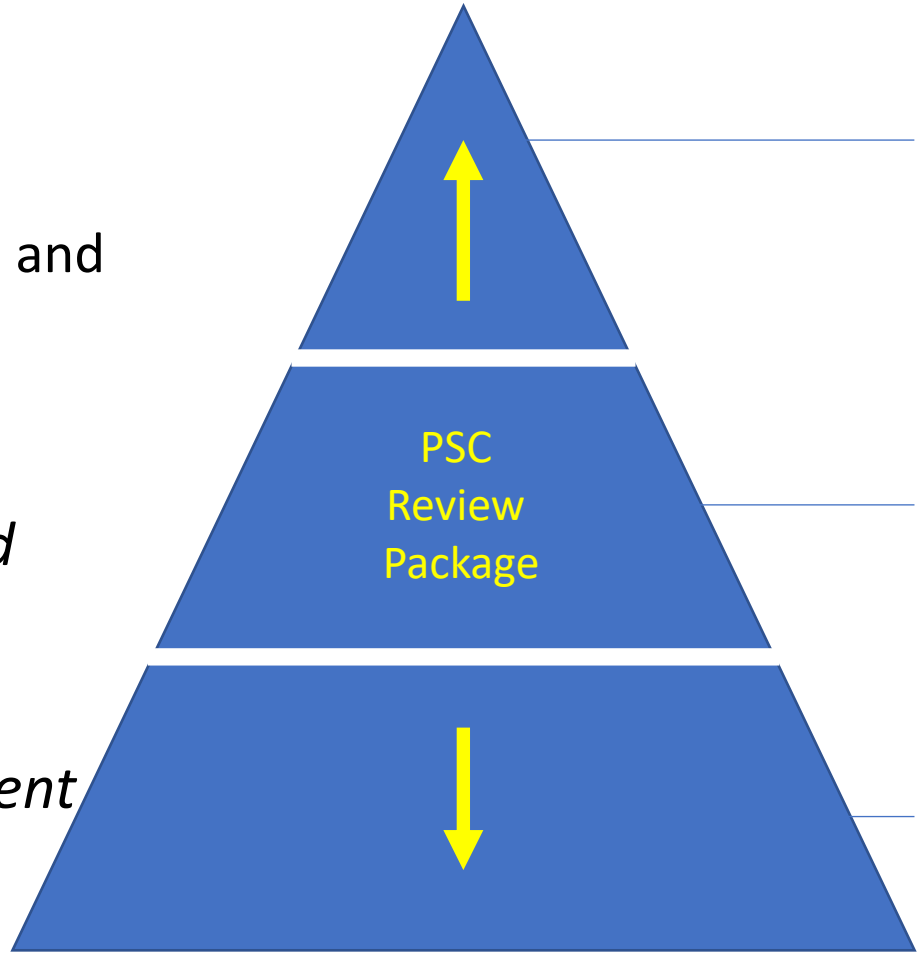
- **Innovation**: Enhance existing networks to address selected monitoring needs

Application (Examples)

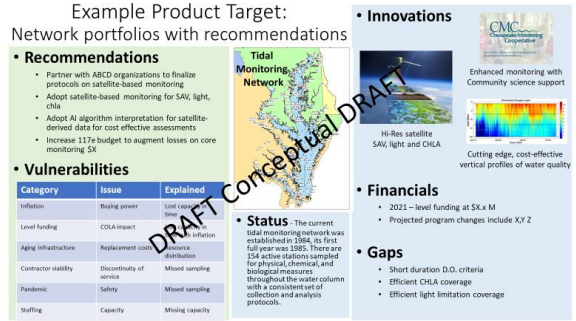
- Response to PCB mitigation actions
- Improve understanding in SAV, water quality, living resource responses to climate change and management actions
- Understand fish and wildlife habitat requirements

Ask PSC: Is the Tiered communication ok?

- **Section 1**: *Prospectus*
  - Questions answered by recommended data collections
  - Recommendations on strategies and resources needed for data collections
- **Section 2**: *Network portfolios and Unmet Needs*
- **Section 3**: *Foundational Assessment*
  - (9 questions answered)



Section 1
Prospectus

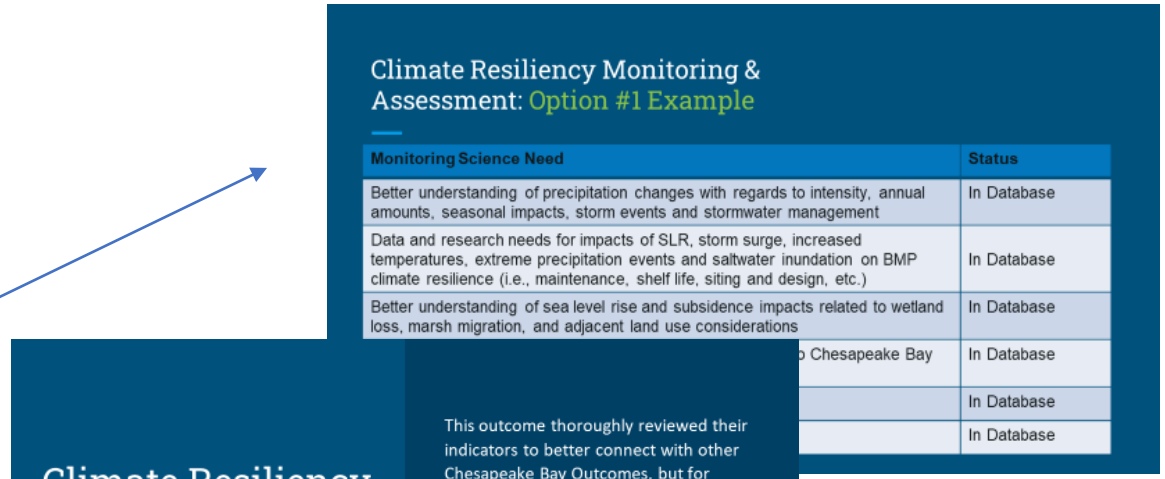


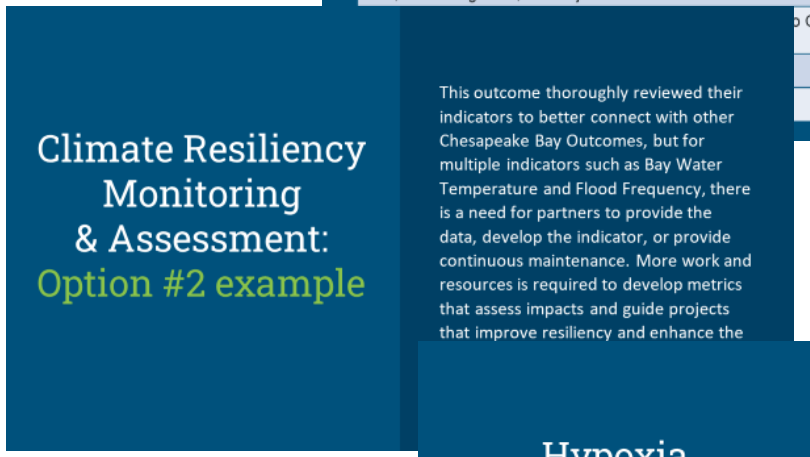
Section 3

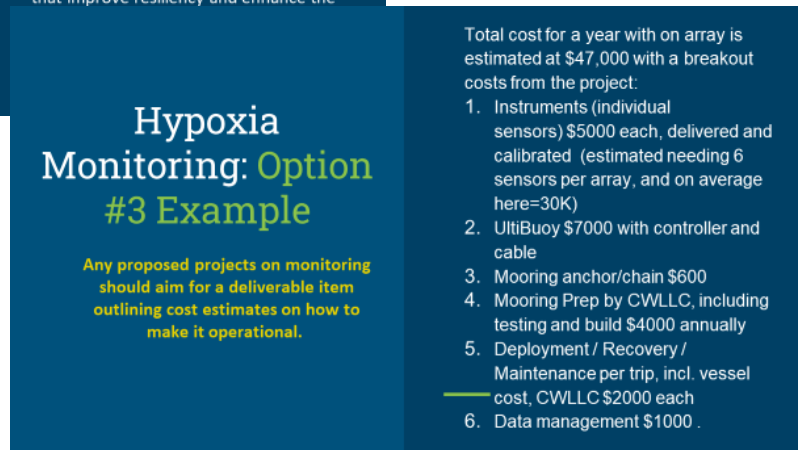
Recommendations – Options for presentation

- Ask PSC "What changes to each option will help to best serve you?":

1) Table of Monitoring Needs – the most general
2) Goal statement of monitoring needs – 3-4 sentences. Application, priority need highlighted
3) Detailed data need (what, where, when, how, why) with background and costs

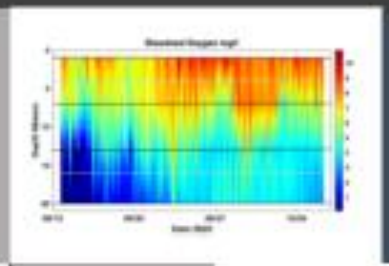


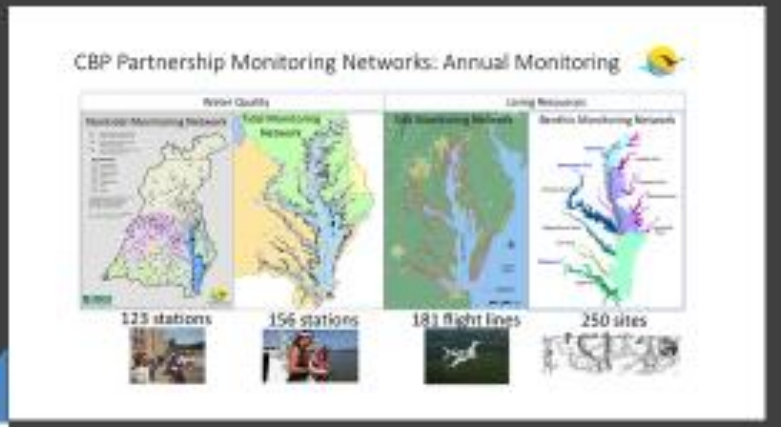


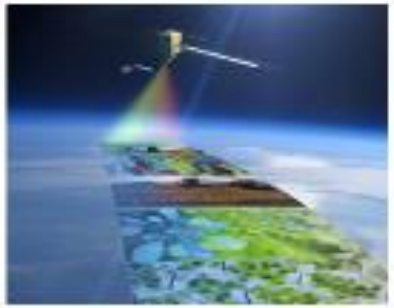


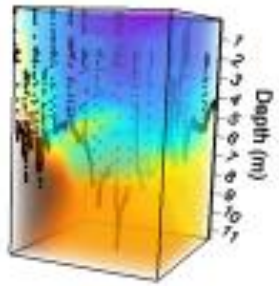
Feedback Needed from PSC Today

- Which format for recommendation style is actionable for you?
  - What changes would you like?
- Scope of report that will be delivered
  - Does the tiered approach meet your needs and those of the CBP?









Thank you!

Q&A

Chesapeake Bay Program

Reference Material for any more details discussions on a particular network

Tidal Water Quality

Issue

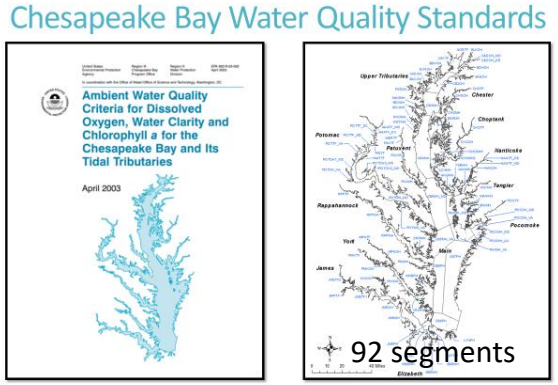
- We are not assessing all applicable water quality criteria *for any segment* in the Bay

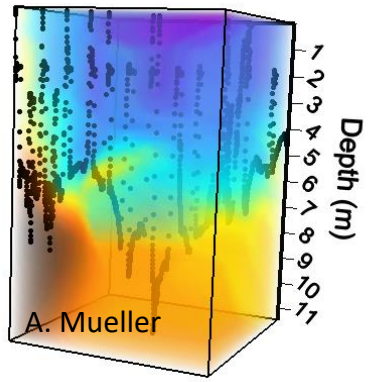
Gaps and opportunities

- **Unmet need:** effect of inflation on level funding for long-term water quality monitoring program support
- **Innovation**. Vertical sensor arrays to collect high frequency dissolved oxygen, salinity and temperature data.
- **Innovation.** Expanded use of Community Science data
- **Innovation**. 4-dimensional water quality interpolator

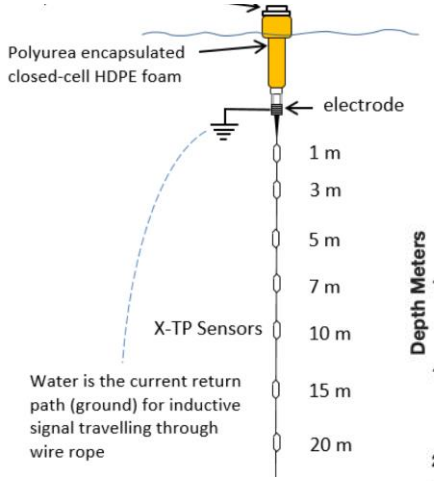
Application

- Provide jurisdictions with the data necessary to fully assess all applicable water quality criteria in bay segments that reflect fish and shellfish habitat needs for their survival, growth and reproduction
- Support bay models for calibration and verification

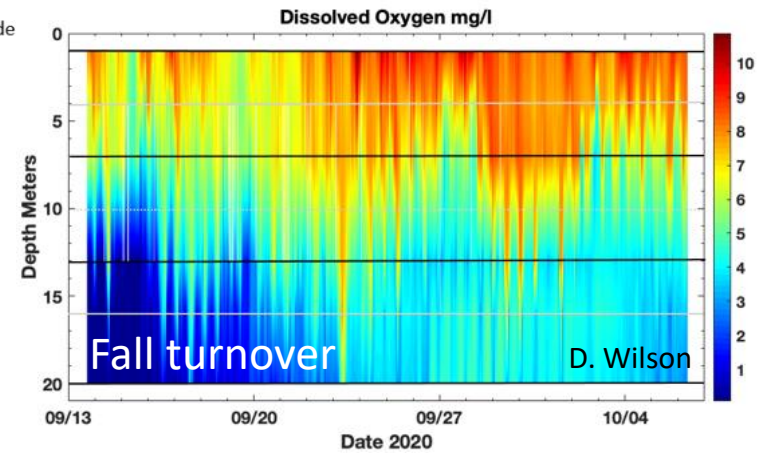




New water quality interpolator



Vertical sensor array



High temporal frequency water quality profile data

Watershed Water Quality

Issue

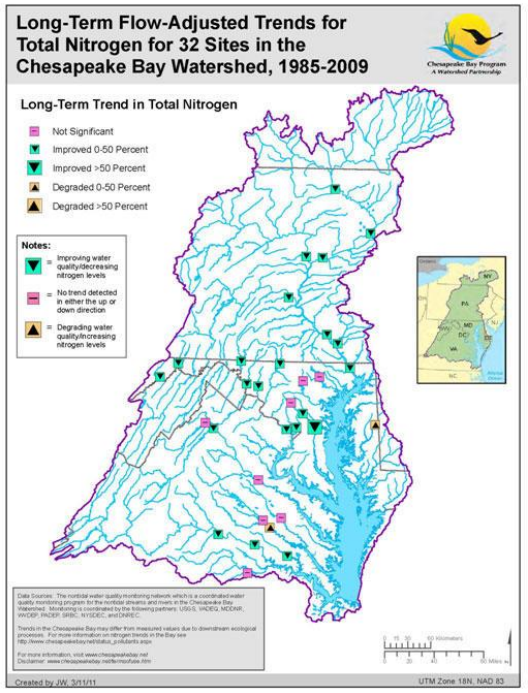
- Annual threats to station loss threaten the integrity of the Nontidal Network
- Under-represented geography in assessment, i.e., Coastal Plain

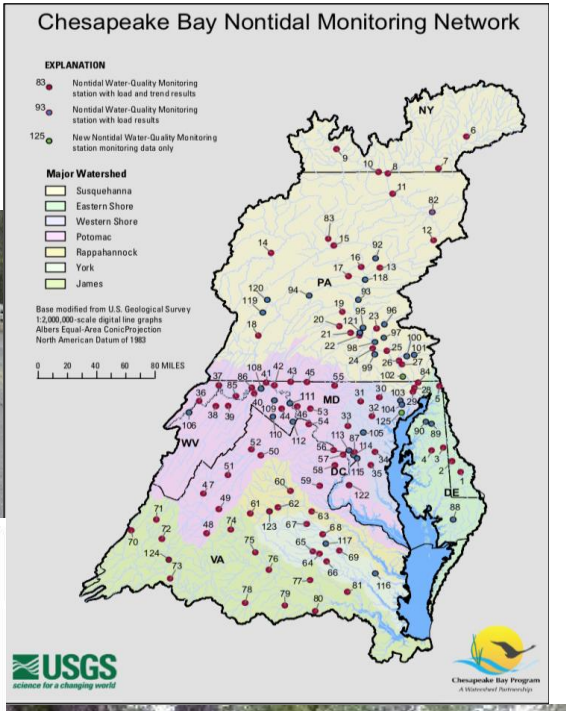
Gaps and opportunities

- **Unmet need**. Sustain existing long-term water quality monitoring program support
- **Unmet need**. Geographic representation of stations
- **Innovation**. Continuous monitoring sensors to collect high frequency water quality data reducing uncertainty in the assessments

Application

- Provide jurisdictions with locally and regionally relevant loads and trends assessing progress from management actions
- Provide models with high integrity, high resolution calibration and verification data.





Tidal Benthic Macroinvertebrates

Issue

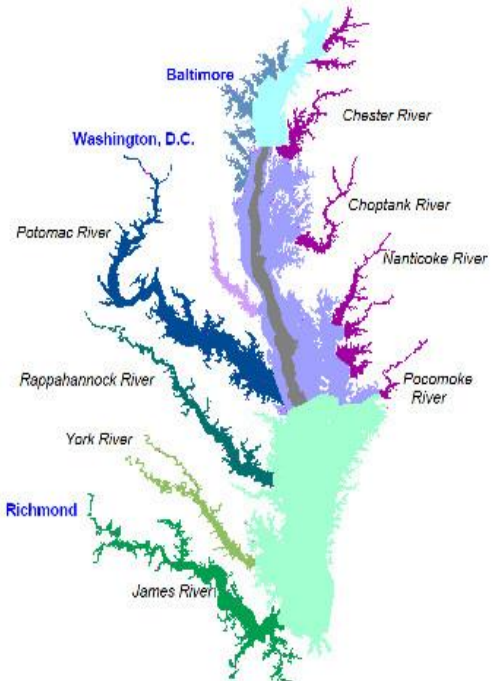
- Summer sampling season is a key living resource assessment supporting Aquatic Life Use in the Water Quality Standards.
  - Benthic macroinvertebrates are fish forage.

Gaps and opportunities

- **Unmet need**. Sustain existing long-term water quality monitoring program support

Application

- Aquatic Life Use assessment
- Gold standard of support to creating water quality criteria
- Fish food is essential to estuary productivity and health



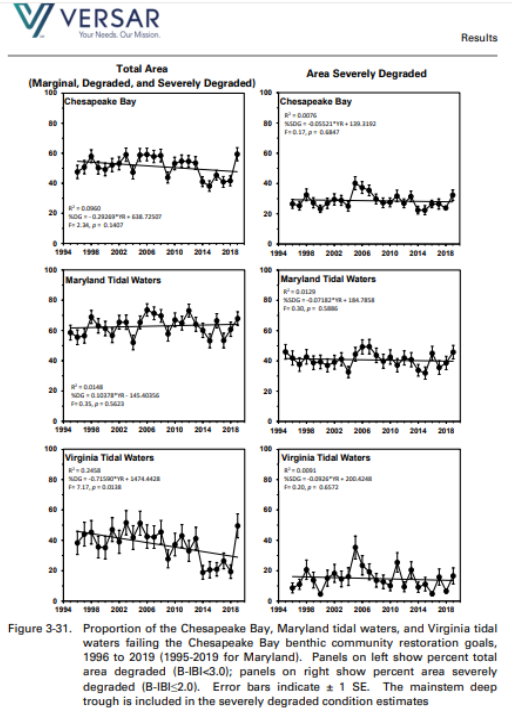
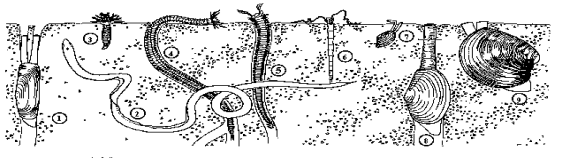


Figure 3-31. Proportion of the Chesapeake Bay, Maryland tidal waters, and Virginia tidal waters failing the Chesapeake Bay benthic community restoration goals, 1996 to 2019 (1995-2019 for Maryland). Panels on left show percent total area degraded (B-IBI<3.0); panels on right show percent area severely degraded (B-IBI≤2.0). Error bars indicate ± 1 SE. The mainstem deep trough is included in the severely degraded condition estimates

Benthic macroinvertebrate sampling regions and the Bay, MD and VA specific results 1995-2019



Submerged Aquatic Vegetation

Issue

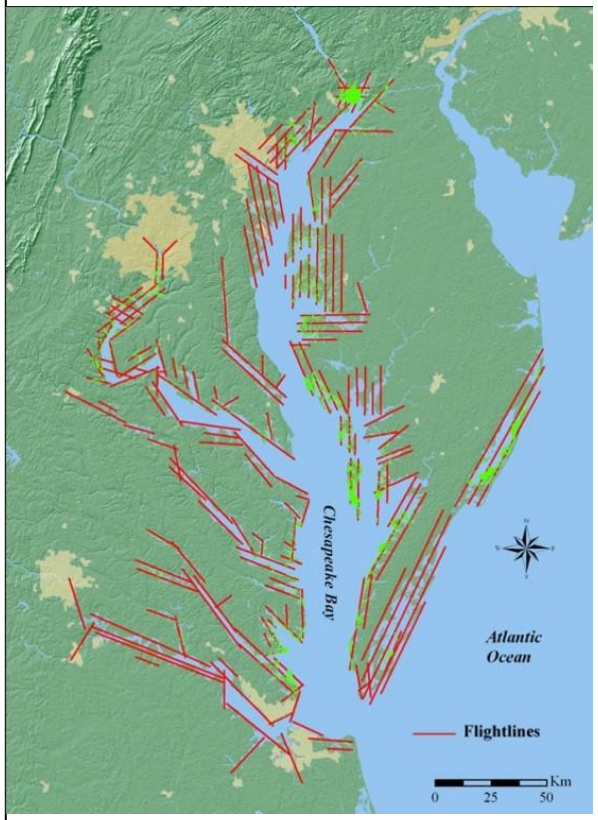
- Rising annual contractor costs
- Expanding air space restrictions and changing climate patterns are making it more difficult to collect imagery from planes.
- Satellite imagery options, and image access and evaluation protocols for the Bay are still evolving.

Gaps and opportunities

- **Unmet need**. Sustain long-term SAV monitoring program support
- **Innovation**. Hi-res satellite image assessment offers a potentially cost-effective monitoring option (i.e., free imagery)
- **Innovation**. Artificial Intelligent (AI)/machine-learning algorithms to enhance image processing efficiency

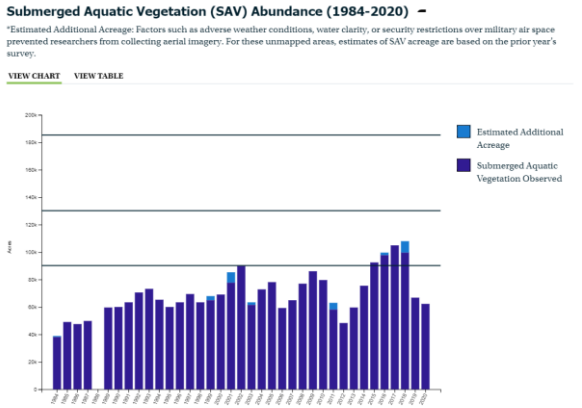
Application

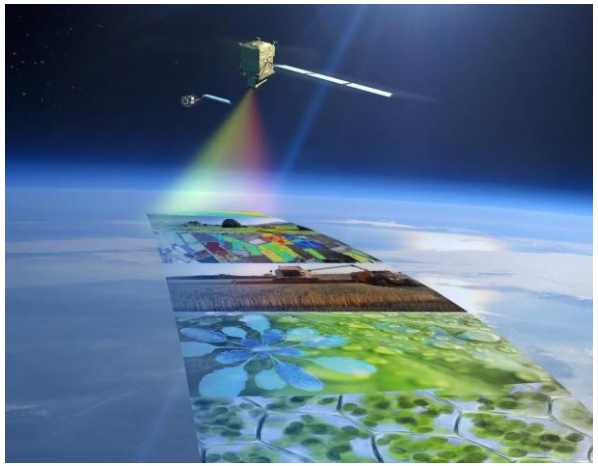
- Intra-annual imagery can provide uncertainty estimates on water quality criteria assessment, seasonal change tracking
- Provide models with high integrity calibration and verification data
- Provide biomass and carbon sequestration estimates for carbon budgeting and the Blue Carbon Market (restoration financing potential)



SAV Annual Survey transects

SAV Annual Survey results on Chesapeake Progress





Satellite survey techniques are improving for eventual use as satellite data becomes more widely and publicly available

Community Science

Issue

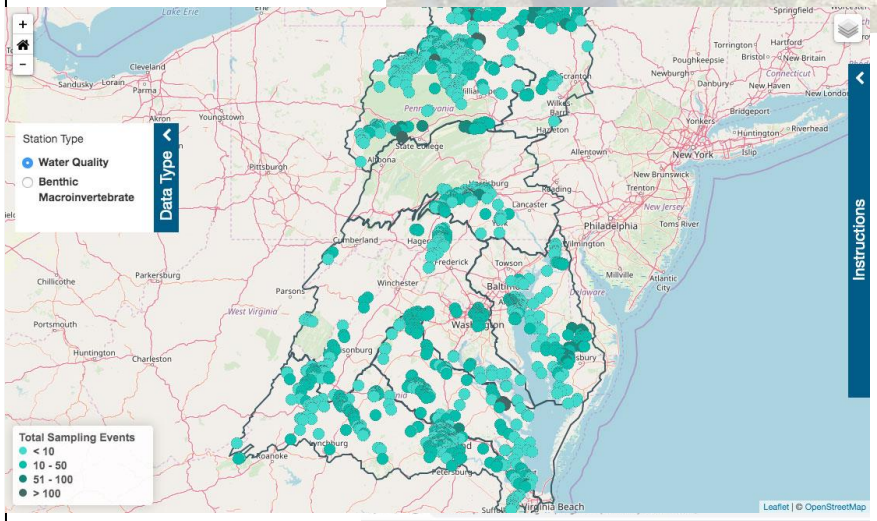
- Growing support for key monitoring programs

Gaps and opportunities

- **Unmet need**. Expanding monitoring group equipment availability

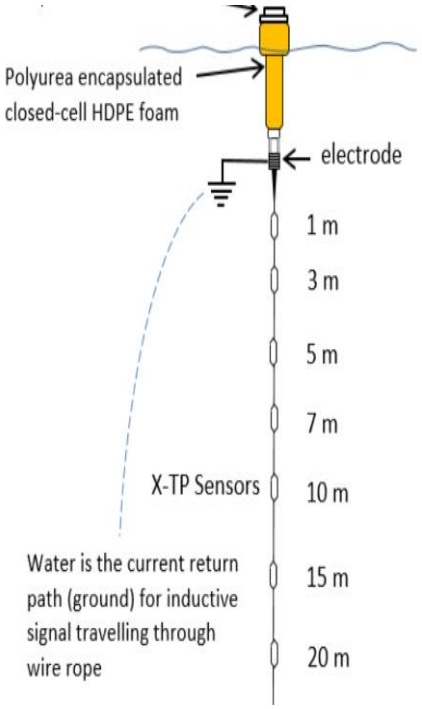
Application

- Improved spatial representation of water quality conditions for water quality standards attainment
- Provide models with high integrity, high resolution calibration and verification data.
- Fill gaps in Stream Health data needs (stream bug sampling and analysis support)



Example of detailed preparation supporting monitoring need: Translate concept to $$$

- Estimated budget for future deployments:
- Instruments $5000 each, delivered and calibrated.
- Buoy $7000 with controller and cable
- Mooring anchor/chain $600
- Prep by CWLLC, including testing and build $4000
- Deployment / Recovery / Maintenance per trip, incl. vessel cost, CWLLC $2000 each
- Data management $1000
- For a 6-instrument deployment and recovery, approximate cost would be around $47K.
- From a power standpoint, batteries will last an entire hypoxia season (estimated 8 months).
- One may want to budget one cleaning trip, totaling under $50K. One might also consider a spare instrument



See CBT website for full report: https://cbtrust.org/wp-content/uploads/16793_Caribbean-Wind_Final-Report_Jan2021.pdf