Chesapeake Bay Program

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Responding to the PSC Request to Improve the CBP Monitoring Networks

Peter Tango, Breck Sullivan, Scott Phillips, Lee McDonnell

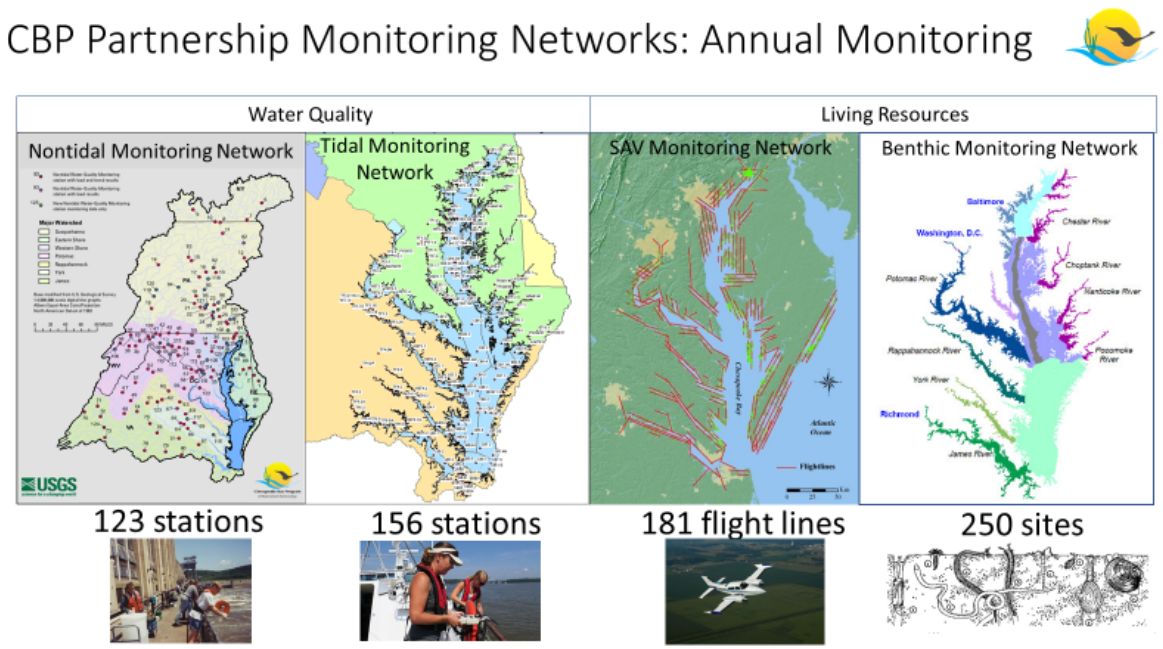
Chesapeake Bay Program

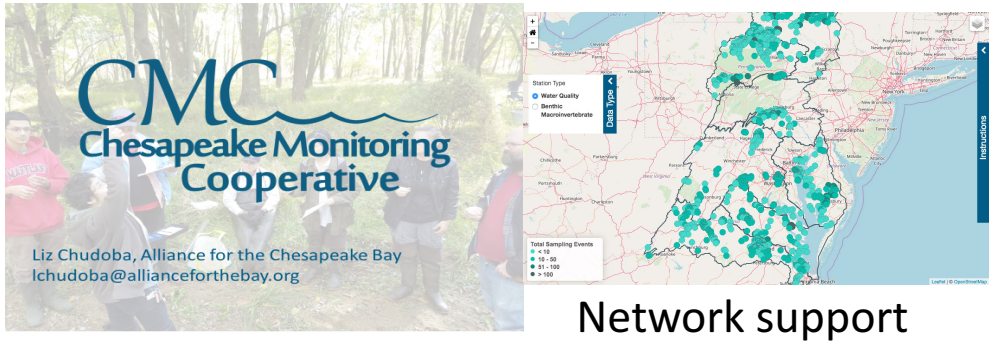
STAC Meeting

September 13, 2021

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



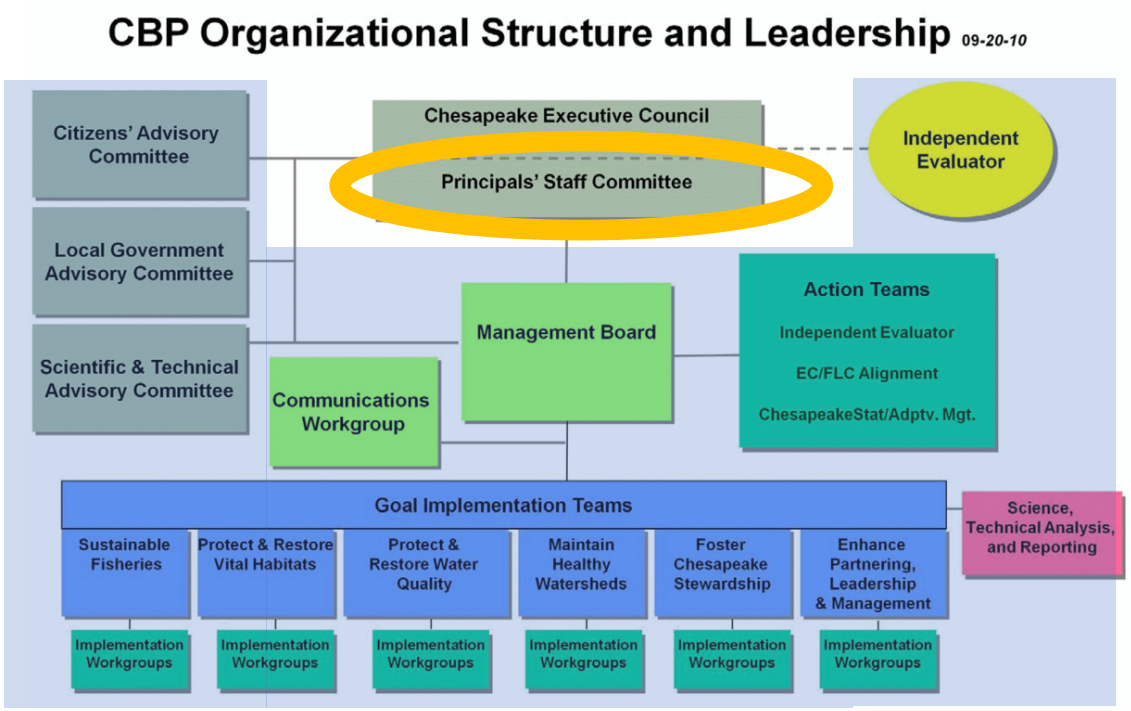


Network support

Principal Staff Committee Request

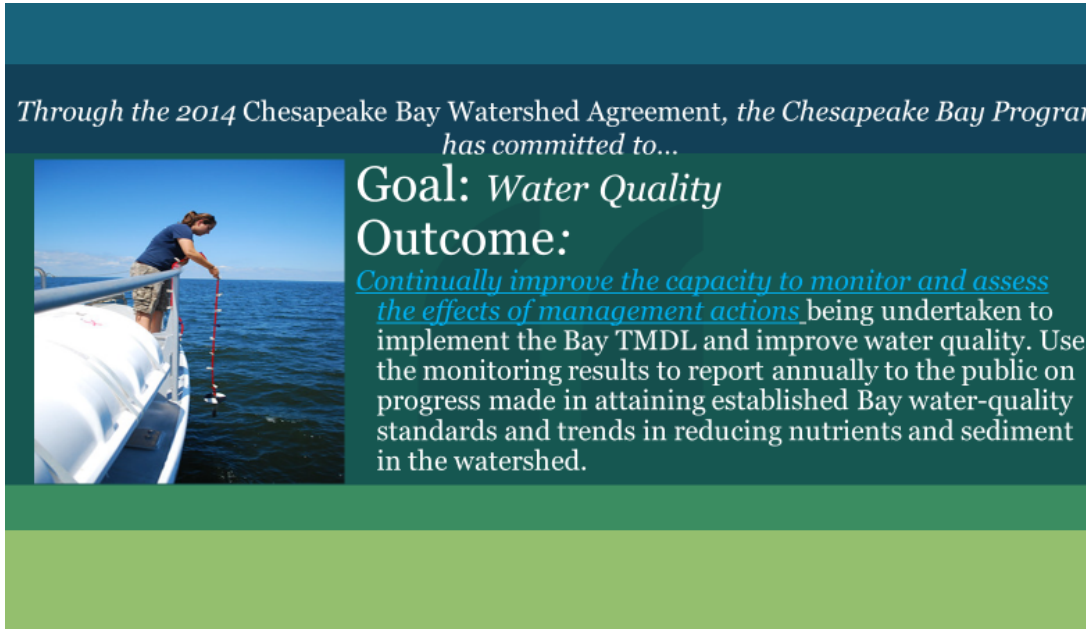
- Provide information needed to improve CBP monitoring networks, including:
  - (1) Current status and threats to the networks,
  - (2) what is needed to improve the monitoring sustainability, and
  - (3) what is already available to address monitoring and assessment capacity shortfalls.

- STAR will Coordinate Response
  - Deliver network assessment and recommendations by January 2022



Opportunities and Benefits of PSC request

- Over a decade since the last CBP monitoring evaluation
- Address CBP Outcome: Standards Attainment and Monitoring Outcome
- Address selected monitoring needs of other CBP outcomes
- Consider new technologies and innovation
- Identify priority improvements and gaps



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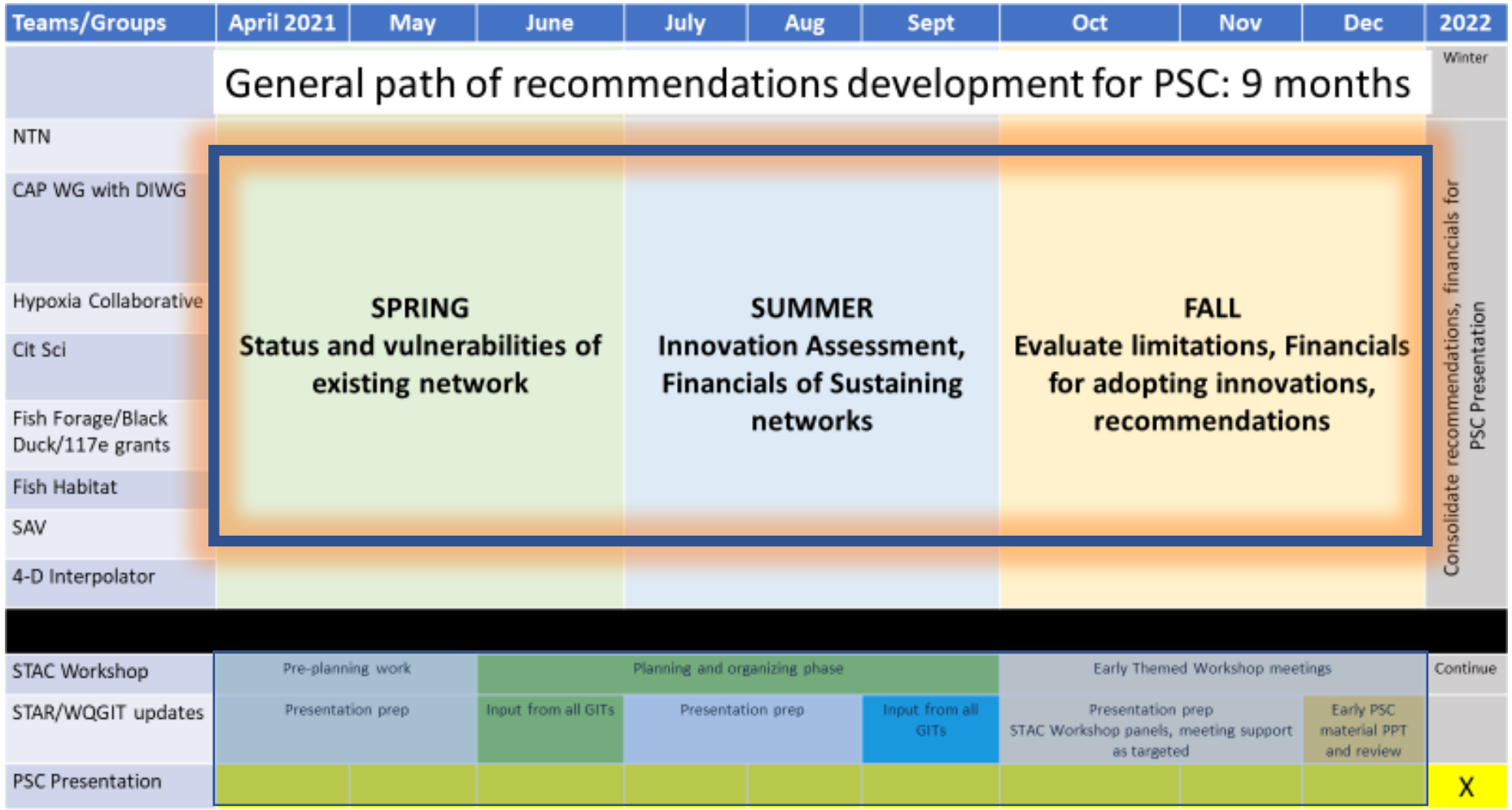
Process

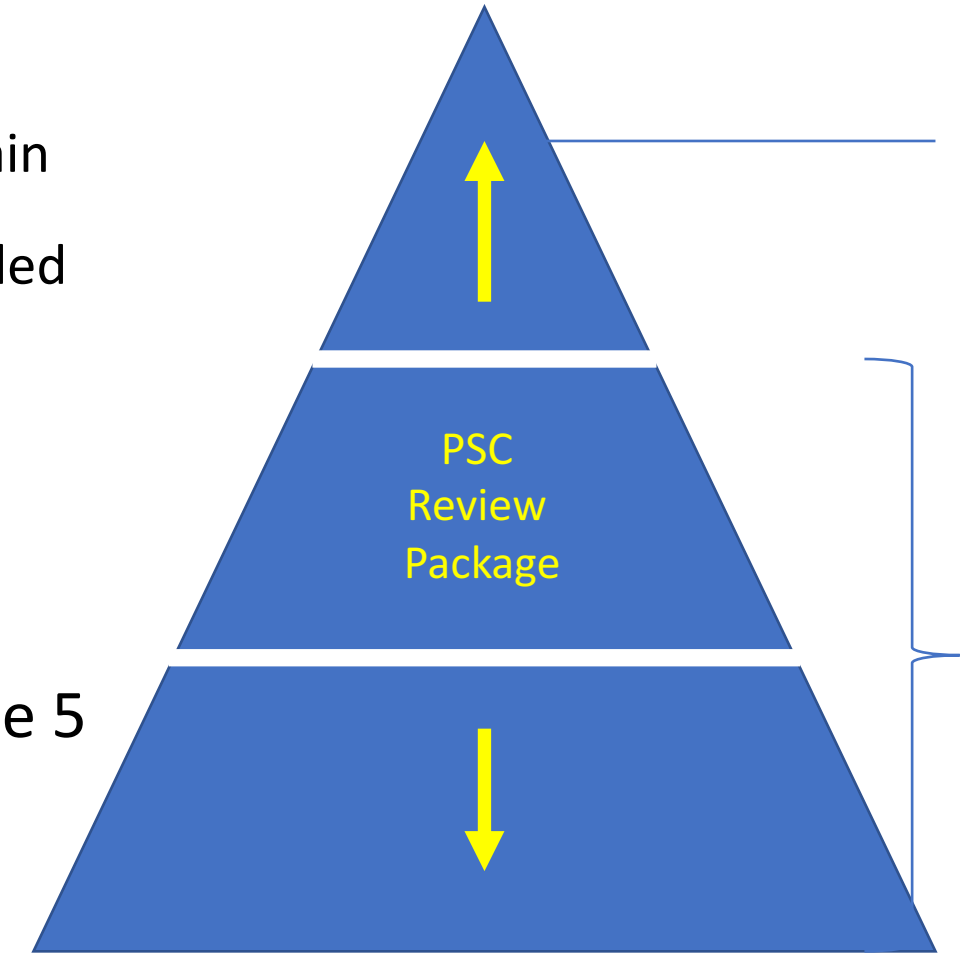
- 9 months start to finish
- 8 questions to answer
- Provide a short synthesis to address the questions, vision going forward.

Process timeline and themes to answer questions



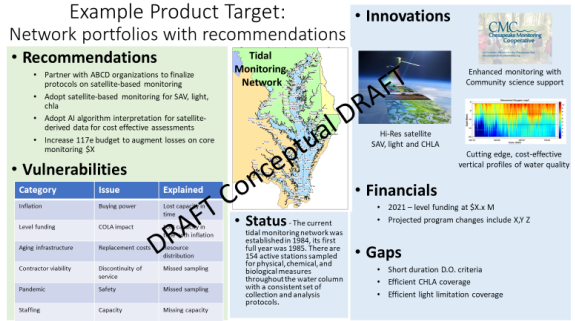
Delivering a final product: Tiered communication

- Section 1: Executive summary
  - recommendations to sustain and grow networks:
  - strategies, resources needed
- Section 2: 5 network portfolio summaries
- Section 3: Network and program needs beyond the 5 networks



Section 1
Exec
Summary

Example Product Target:
Network portfolios with recommendations



Section 2
and
Section 3


How Are We
Doing?

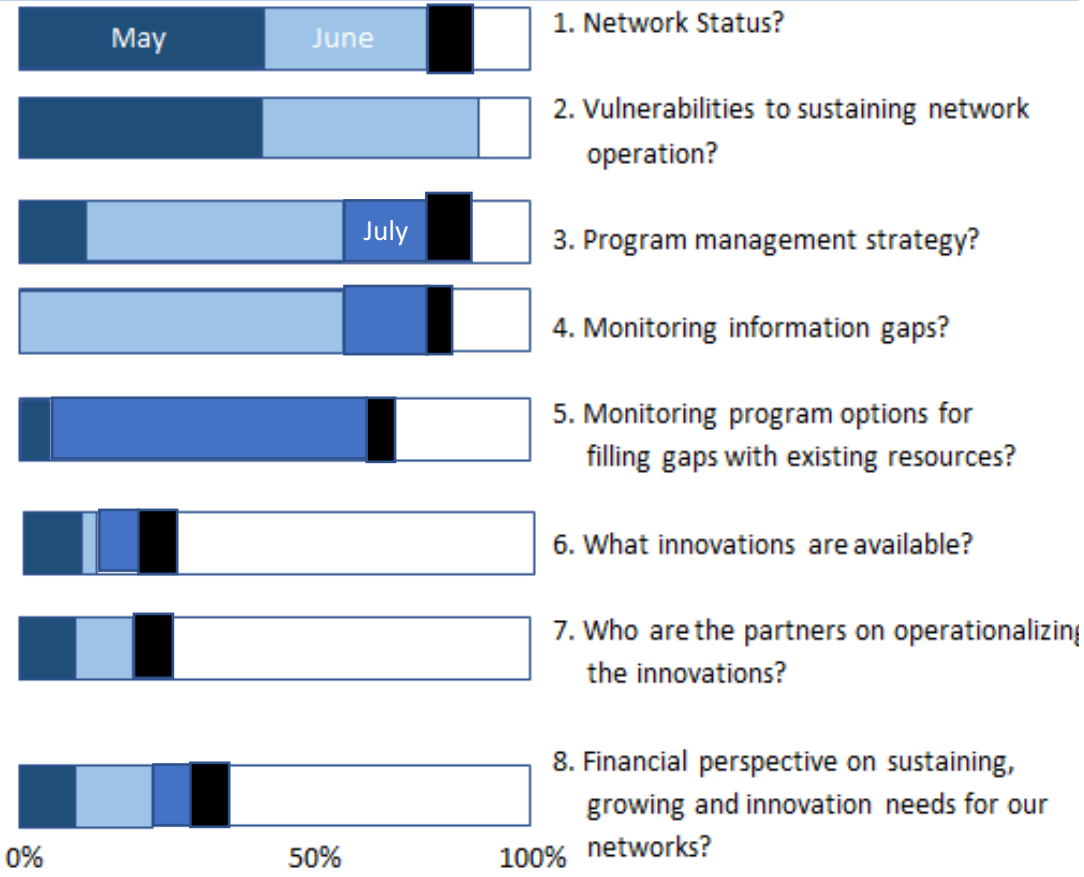
General path of recommendations development for PSC: 9 months

Teams/Groups	April 2021	May	June	July	Aug	Sept	Oct	Nov	Dec	2022
										Winter
NTN	**SPRING** **Status and vulnerabilities of existing network**			*In Progress* **SUMMER** **Innovation Assessment, Financials of Sustaining networks**			**FALL** **Evaluate limitations, Financials for adopting innovations, recommendations**			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				*In Progress too*						
STAC Workshop				Planning and organizing phase			Early Themed Workshop meetings			Continue
STAR/WQGIT updates				Presentation prep		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						

Report Progress:

Section 2

Tracking our progress on the short report: August 2020



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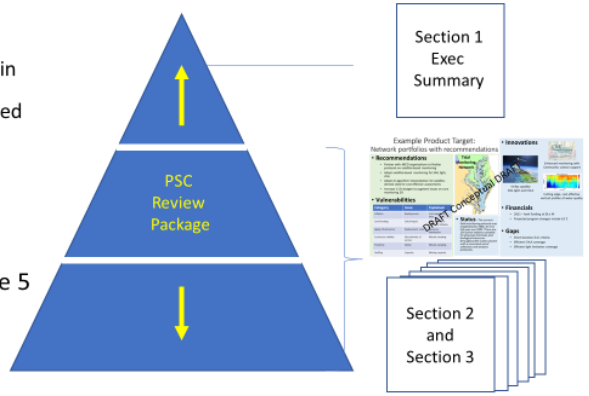
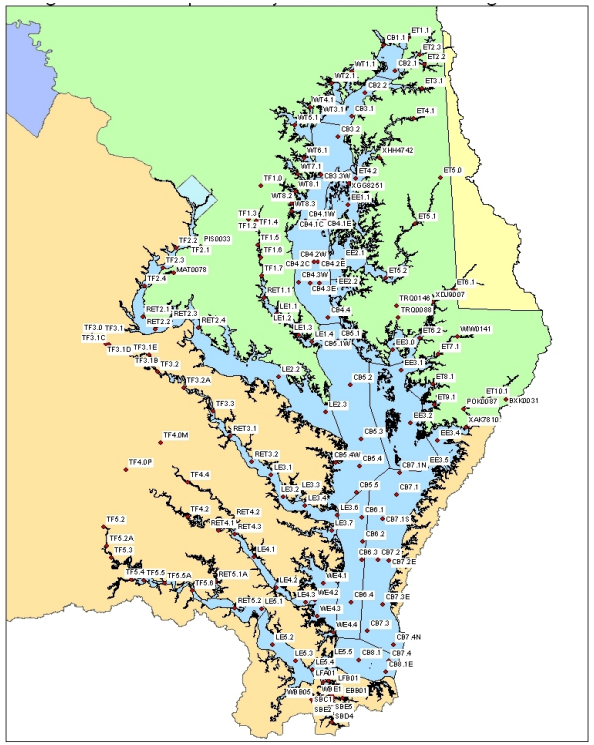


Section 3 (Q9). Addressing needs beyond the 5 networks

Key findings to date

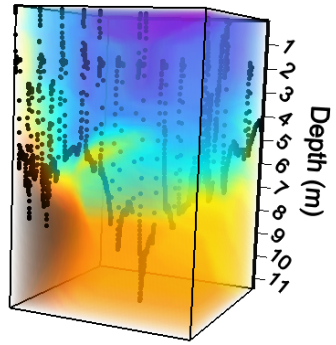
Status: Tidal Water Quality Monitoring Network

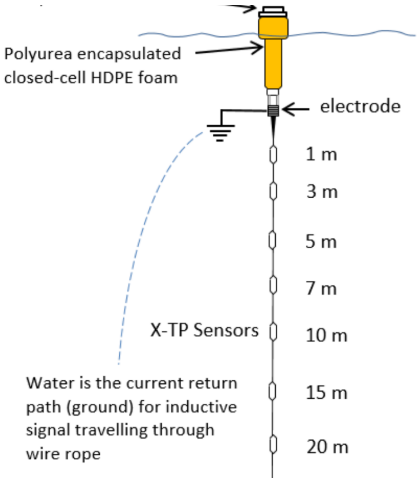


Tidal Water Quality Monitoring (1)

Time needed (i.e., about a year) before additional investment in high frequency monitoring sampling design for the bay

- **Documentation development** was started for the new 4D interpolator (4D Team)
  - **Initiated development on a case study** with new methods for interpolation (4D Team)
- **2 new mainstem bay deployments of vertical monitoring arrays** located on eastern and western sides of the deep channel (Hypoxia Collaborative)
  - Lower Potomac and Lower Rappahannock are interests for additional vertical arrays. (Sept. Hypoxia Collaborative and 4D Team suggestions)
- **High frequency DO monitoring design issue for the bay needs more work** before forming a project/workshop (Multiple teams)
  - General feedback from multiple groups – we need a bit more time before delving into a sampling design plan to account for detailed boundary estimation.

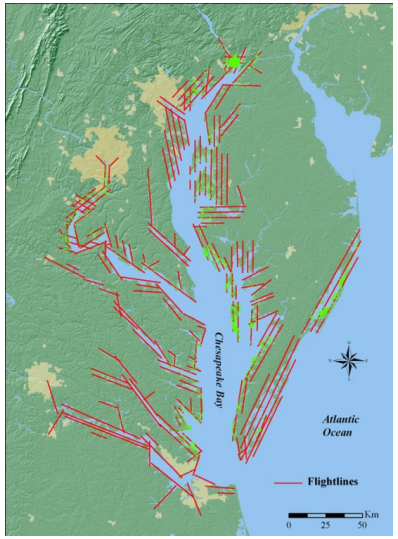




Tidal Water Quality Monitoring (2)

Monitoring workshop planning progresses

- STAC Workshop on Advanced Monitoring
  - **Subcommittee held meetings** in August and September
    - Meg Cole helping us plan next subcommittee meeting
  - **The SAV-focused workshop element is taking shape** for early December
    - Review the report findings from the 2019-2020 pilot study on
    - Presentations on advances in SAV assessment with other satellite resources, image filter improvements, AI algorithms for interpreting imagery
    - Program recommendations on next steps



Tidal Water Quality Monitoring (3)

Fill in details on financial assessments now

- Financials
  - Peter needs some one-on-one time with the agencies now.
    - We have had various conversations during grant progress reviews as well as in various meetings. Ready to tighten up status and outlook details now.
      - First up, MD DNR this Friday.

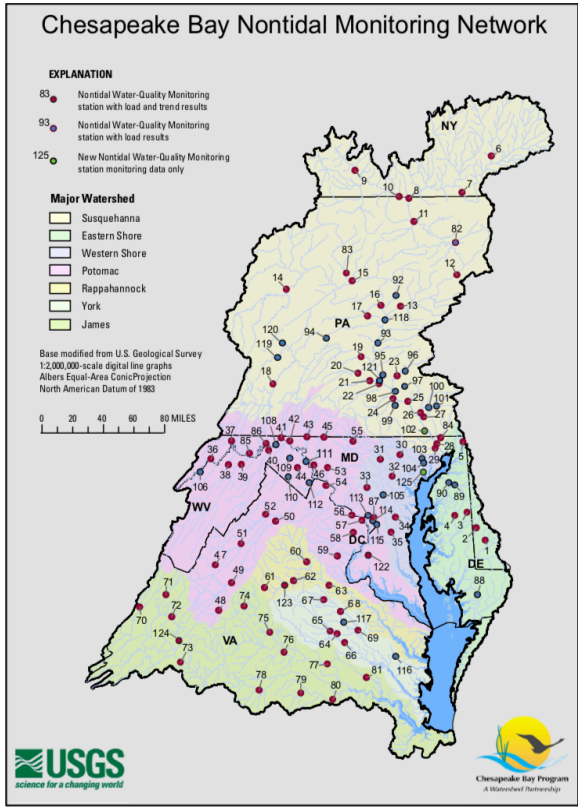
Table 4. Fundamental investment targets needed to maintain existing operations and address required growth to meet gaps in the existing monitoring programs to address essential remaining management decision support.

Network	Sustain existing network capacity	Grow existing network operations	Adopt new approach to fill assessment gap
Tidal	Annual COLA	Revised shallow water monitoring strategy	Hypoxia network investment
	Field and Lab audits		Satellite assessment - Chlorophyll
	Infrastructure (MD)?		
Nontidal	Annual COLA	Storm flow at 2ndary stations in Virginia	Not applicable
	Lost station funding (Deer Creek, MD)		
SAV	Supported	None	Satellite assessment – SAV & light limitation
			Algorithm application
Benthic Invertebrates	Supported	None	Not applicable
Citizen Science	Supported	Supported	Not applicable

Blue identified from the CBP Science Needs Database, Green identified from STAC Workshop activities, Yellow have been discussed in workgroup meetings.

Evolving report table and info

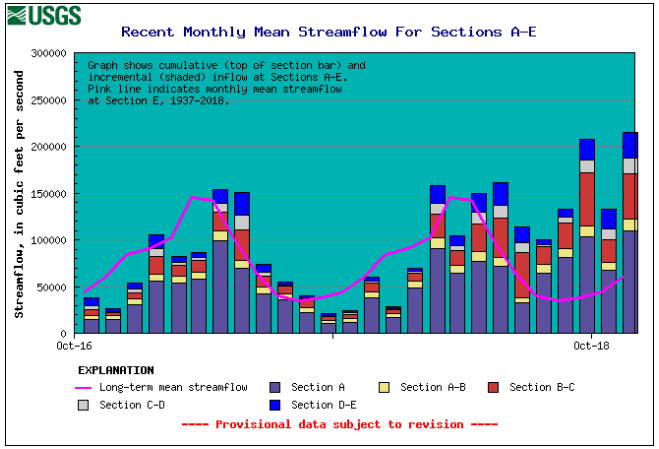
Status: NonTidal Monitoring Network



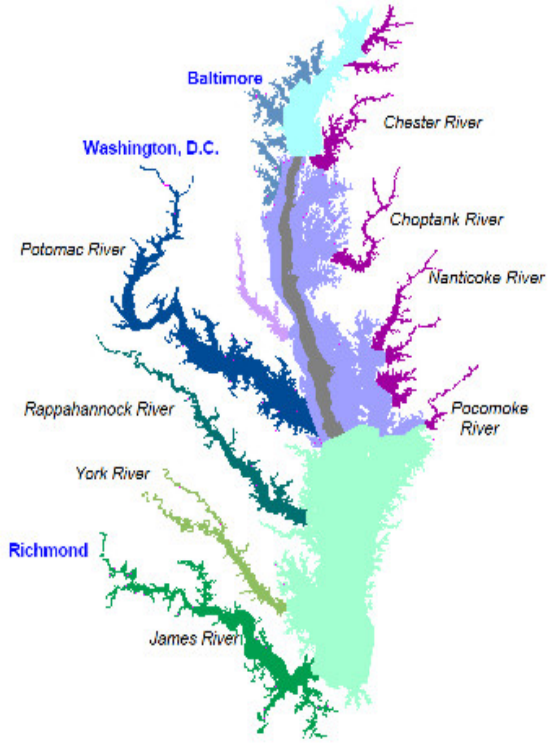
Nontidal Water Quality Monitoring

Immediate need for backfill on lost partner support at 1 station, optimization work getting established.

- **Nearterm**:
  - **Unplanned losses** on a near annual frequency remain a key vulnerability challenging the good plans and support to date maintaining the network.
    - **2021: Deer Creek monitoring station is losing support.**
  - **One partner is operating with a bootstrapped budget structure** – we need to visit this with EPA leadership.
  - **Network optimization tools** were updated and recently reviewed by Matt Cashman (USGS).
    - Qian Zhang (STAR Team, UMCES) is learning the tools to assist with network optimization work.
    - This work will feed into Financial need assessment for maintaining the network.
- **Long term**:
  - Considerations are being evaluated on where and when continuous monitoring stations may be added into the network.



Status:
Tidal Benthic Monitoring Network

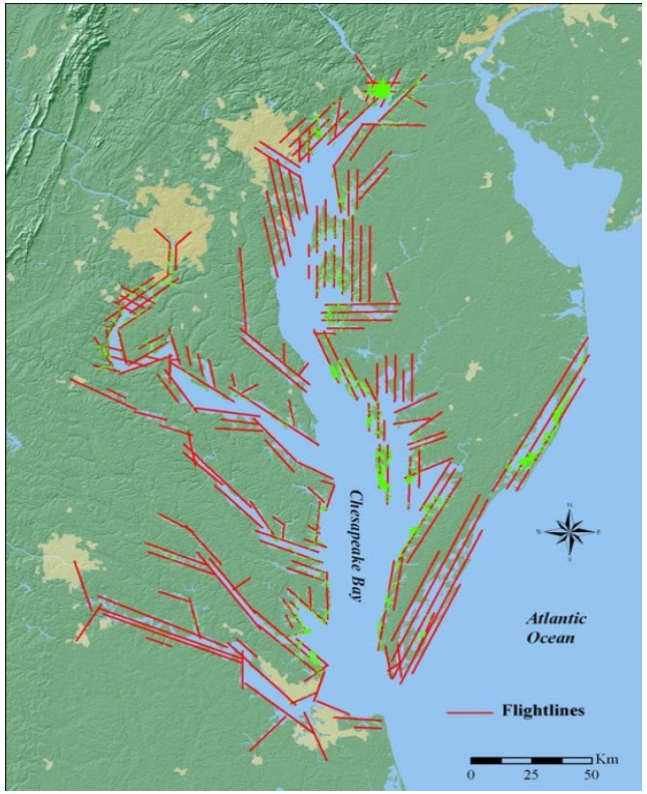


Tidal benthic invertebrate community monitoring

Summer season monitoring focus continues.
No additional support requested at this time.

- **Summer meetings and communications review (CAP WG, Fish Habitat, Fish Forage, Black Duck)**
  - Historically we had spring and summer assessments in the Bay
  - Spring sampling was defunded 2009/2010 (MRAT outcome)
  - States are well positioned in grants for continuing nearterm (i.e., 5-year) summer IBI sampling and reporting support
  - No support was expressed for the return of spring benthic monitoring program in the Bay at this time.

Status: SAV Monitoring



SAV Annual Survey

Stable. Support needs will be evaluated to match any new recommendations from the upcoming workshop

- **SAV Annual Survey**
  - Exploring Satellite-based Assessment STAC Workshop report released in 2021
  - EPA-supported pilot work on satellite-based SAV assessment following up on recommendations from the workshop using commercial satellite imagery from one satellite.
    - Protocol tests on how to access satellite imagery needed
    - Protocol tests on how to task the satellite to acquire imagery when and where it is needed
    - Pilot work report is in review.
  - Researchers continued working on additional recommendations for
    - Use of other satellite resources to assess SAV
    - Al algorithm development for image interpretation across diverse habitat conditions

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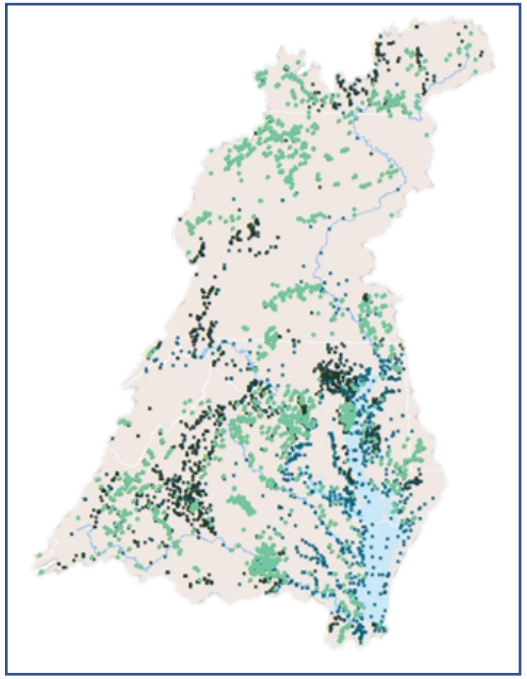
- STAC Advanced Monitoring Workshop 2021-22 (early December 2021 target)
  - Full report out on findings of the 2020 pilot study
  - Progress in satellite-based SAV assessment beyond the funded study
  - Provide recommendations on program adaptation and finances as a function of workshop findings

Status:
Community Science



Blue: Chesapeake Bay Program

Black: Volunteer monitors

Green: CMC integrated volunteer monitoring data locations

Community Science – new award in 2021.
No new resources requested at this time.

- Chesapeake Monitoring Cooperative is focusing on filling gaps in
  - **Tidal water quality monitoring** supporting water quality standards attainment assessments, and
  - **Nontidal benthic macroinvertebrate sampling** supporting Stream Health Outcome
  - **Other monitoring support needs will be evaluated** during the award period
- CMC is already capturing additional data that may serve other workgroup needs, e.g.,
  - Salt Watch
  - Bacteria
  - And more…

Community Science – new award in 2021.
Award is helpful in leveraging other resources.

- **CMC is coordinating with EPA Wheeling Laboratory** on Chesapeake Bay Trust-sponsored work aligned with Stream Health monitoring needs through community science support. Deliverables include:
  - Sample identification for CBT sponsored sampling the next 6 years (approximately 100 samples)
  - Documenting a protocol for volunteer-based sample collection
  - Documenting a protocol for volunteer-based picking of samples for identification purposes in the lab

- **CMC is coordinating with NFWF** on a habitat assessment protocol for stream health monitoring sites.

Section 3: Addressing needs beyond the WQ Networks

- Watershed Agreement
  - Fisheries
  - Habitats and waterfowl
  - Water quality
  - Toxic contaminants
  - Healthy watersheds
  - Land conservation
  - Stewardship
  - Access
  - Env. literacy
  - Climate resilience
- Monitoring needs (SRS)
- CESR

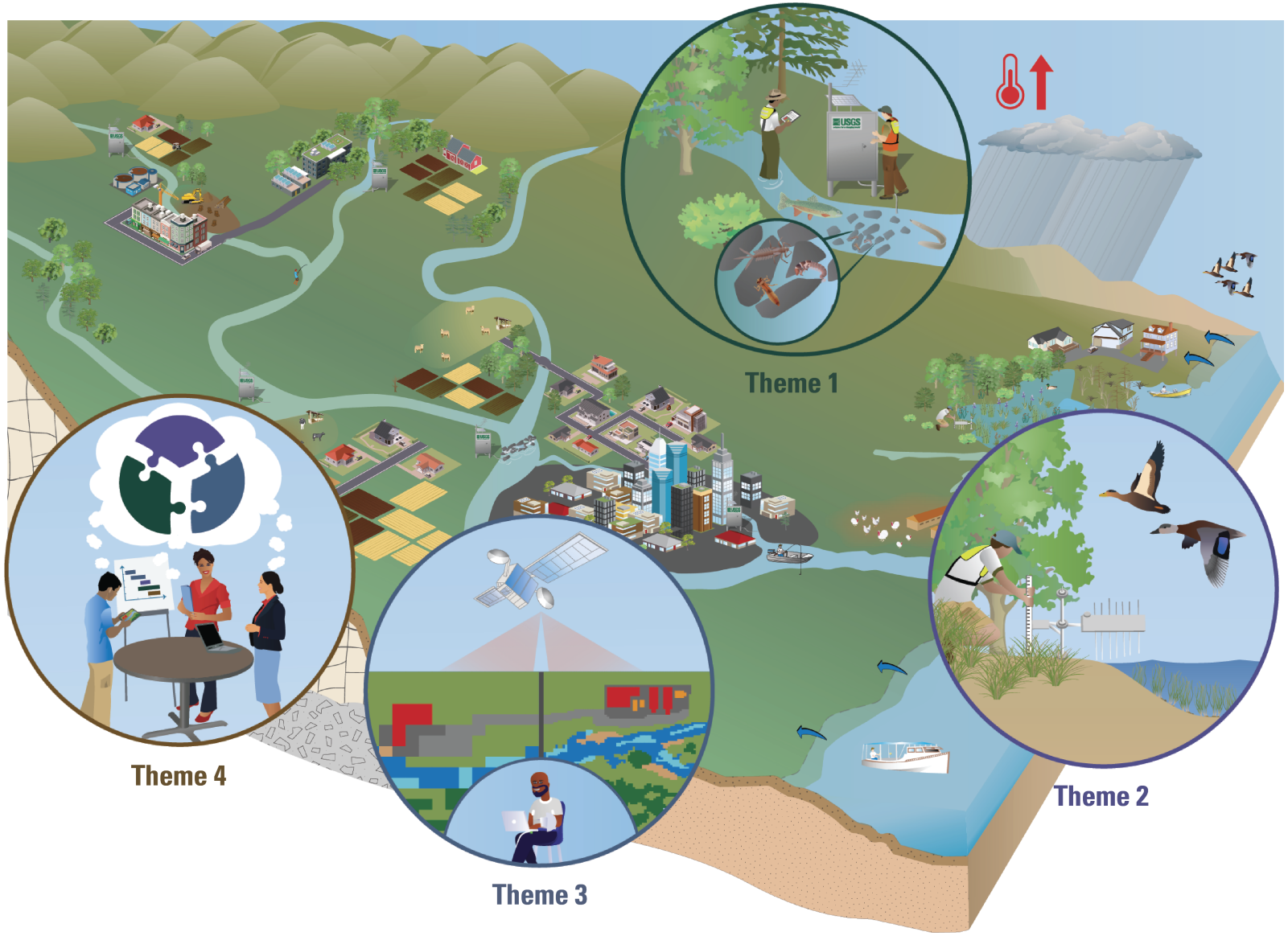
Climate Resiliency Goal

Temperature

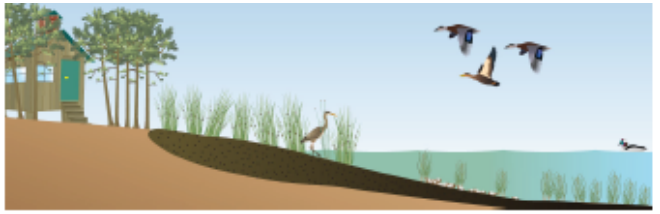
- Air temperature of heat islands
- Tracking management impact of local efforts (e.g., urban tree plantings)
- Water temperature: watershed and estuary
  - STAC workshop

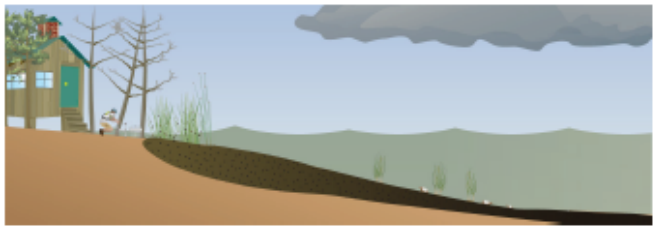
- **Sea-level rise**

- **Carbonate chemistry (Ocean/Estuarine Acidification) monitoring**
  - MD and VA have OA strategies now.



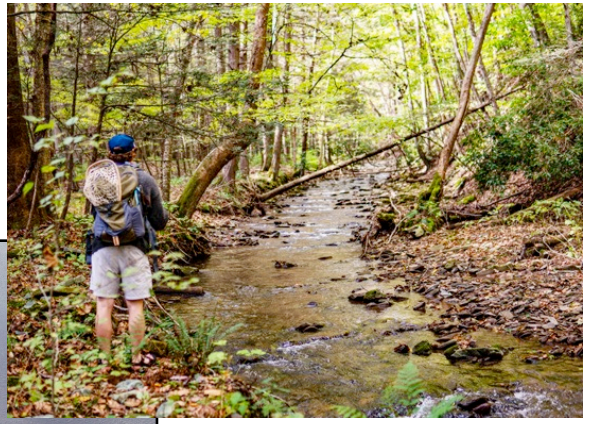
Other Outcomes: Contaminants and Habitats





Habitats

- **Baywide shoreline characterization:** Shoreline hardening/ adjacent and aquatic habitat
- **Estuary conditions** Zooplankton, Phytoplankton
- **Brook Trout:** stream temperature
- **Stream health**



Toxic Contaminants:

- Human health and fisheries: PCBs and Mercury
- Emerging contaminants: PFAS and Microplastics

Section 3: Support for Enhanced Monitoring
Addressing needs beyond WQ Networks

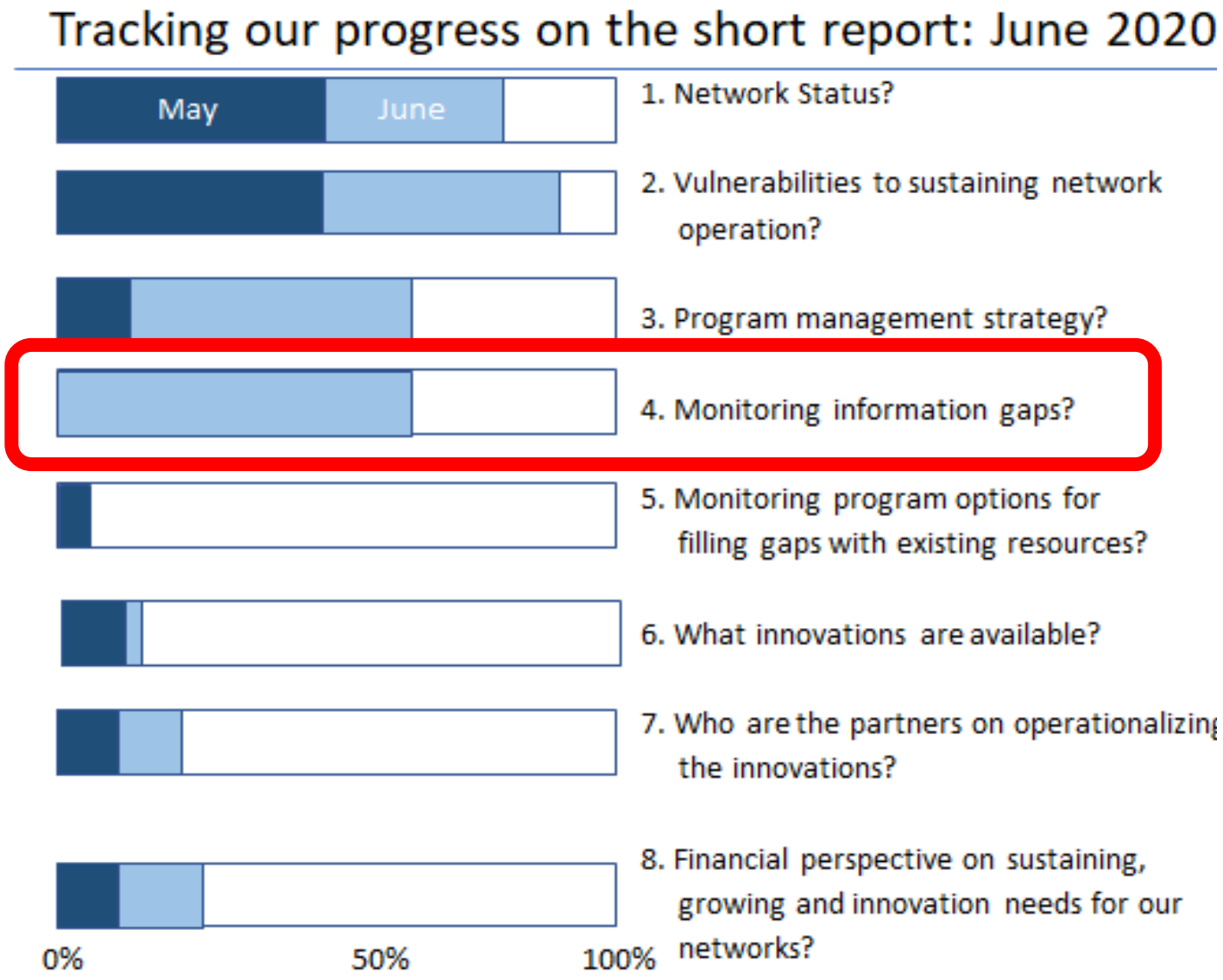
- **Data Management**

- **Research**
  - Describe patterns in bay and watershed health
  - Improve understanding in SAV, water quality, living resources response to climate change and management actions
  - Understand SAV, fish, wildlife habitat requirements
  - Forecasting future habitat availability
  - Assess impact of expanding aquaculture, climate change effects in the bay on SAV goals

- **Analysis**
  - Update tidal and nontidal water quality trends, criteria assessments
  - Related changes in habitat to BMP effectiveness

- **Reporting and Communications**
- **Indicator support**

Network Information



Monitoring Gaps captured in CBP Science Needs Database.

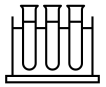
Assessing Monitoring Gaps: Science Needs Database

Total # of monitoring related science needs:

110

Total # of science needs connected to monitoring review:

64



Existing Monitoring Networks' Science Needs

Tidal & Nontidal	41
SAV	5
Benthic	1
Citizen Science	2

Categories of Cross-GIT science needs aligning with existing networks (15)

- Climate Change
- Indicators
- Rise in Water Temperature
- Development of New Monitoring Plans
- Vertical Profile

Tidal Monitoring Science Needs

CBP Outcome	Need	Status of Need
Water Quality Standards Attainment and Monitoring	Update Tidal Trends	Ongoing
Water Quality Standards Attainment and Monitoring	Shallow water - improve understanding of water quality response in shallow waters to nutrient loads	Ongoing
Water Quality Standards Attainment and Monitoring	Adjust, sustain and grow monitoring programs that are supporting water quality modeling and monitoring assessments	In Progress
Water Quality Standards Attainment and Monitoring	Exploring new monitoring technology	In Progress
WQSAM	develop targeted shallow water monitoring strategy	In Progress

Network Information

Q9. What are the monitoring needs beyond the Water Quality Network?

Outcome Monitoring Opportunities

CBP Outcome	Need	Status of Need
Healthy Watersheds	Increased capacity for individual jurisdictional efforts to monitor, assess, and determine watershed health	In Progress
Climate Resiliency Monitoring and Assessment	Better understanding of sea level rise and subsidence impacts related to wetland loss, marsh migration, and adjacent land use considerations	In Progress
Environmental Literacy	Quantify and support BMP installation and restoration at schools to contribute directly to Bay restoration goals.	In Progress
Public Access Site Development	Identify public access sites and potential effects from climate change (sea-level rise and flooding)	In Progress
Brook Trout	Track restoration efforts/monitoring across partners including states and non-profits like Trout Unlimited; Need framework for collecting data across partners and reporting back to CBP	In Progress

Assessing Monitoring Gaps: Network Design Considerations

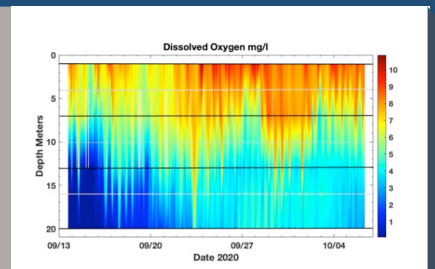
The next step is a GIT (or WG) develops a 2-page summary of potential enhanced monitoring for the outcome and should include six items:

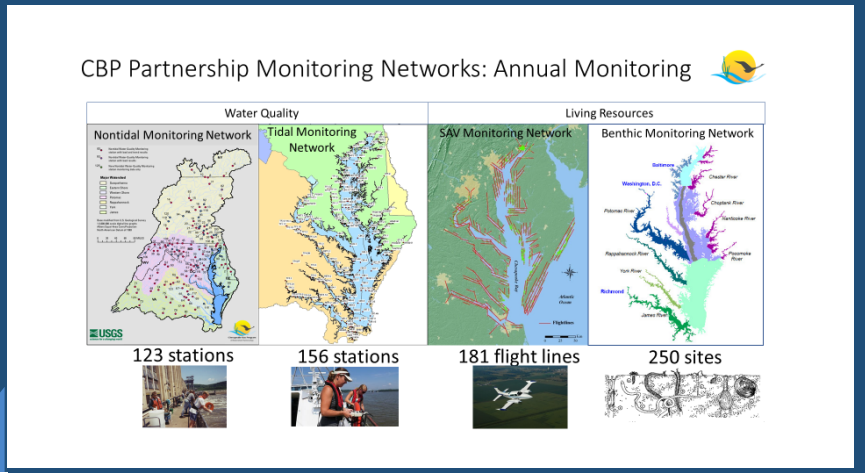
- Need for a network (relation to CBP goals and outcomes)
- Network objectives
- Monitoring design considerations (media, frequency, sample number, method – field and analytical, locations – targeted, random), will be informed by objectives.
- Existing monitoring that can be utilized (what is being done, partners involved, current resources, and what could be leveraged (if possible))
- Remaining gaps
- Options to address the gaps. (This would be general, not a detailed network design but could have funding estimates)

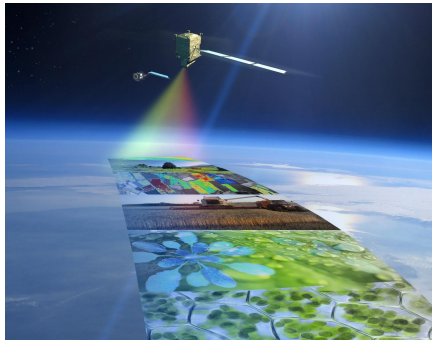
Feedback from STAC

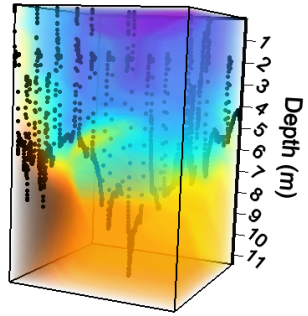
What monitoring-related recommendations from the CESR effort should be reflected in the CBP effort to enhance monitoring?

Which outcome science needs align with CESR recommendations?









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Thank you and Discussion