Chesapeake Bay Program

Science. Restoration. Partnership.

PSC Request for Monitoring Program Review: Developing recommendations for addressing capacity shortfalls

- Peter Tango
- USGS@CBPO

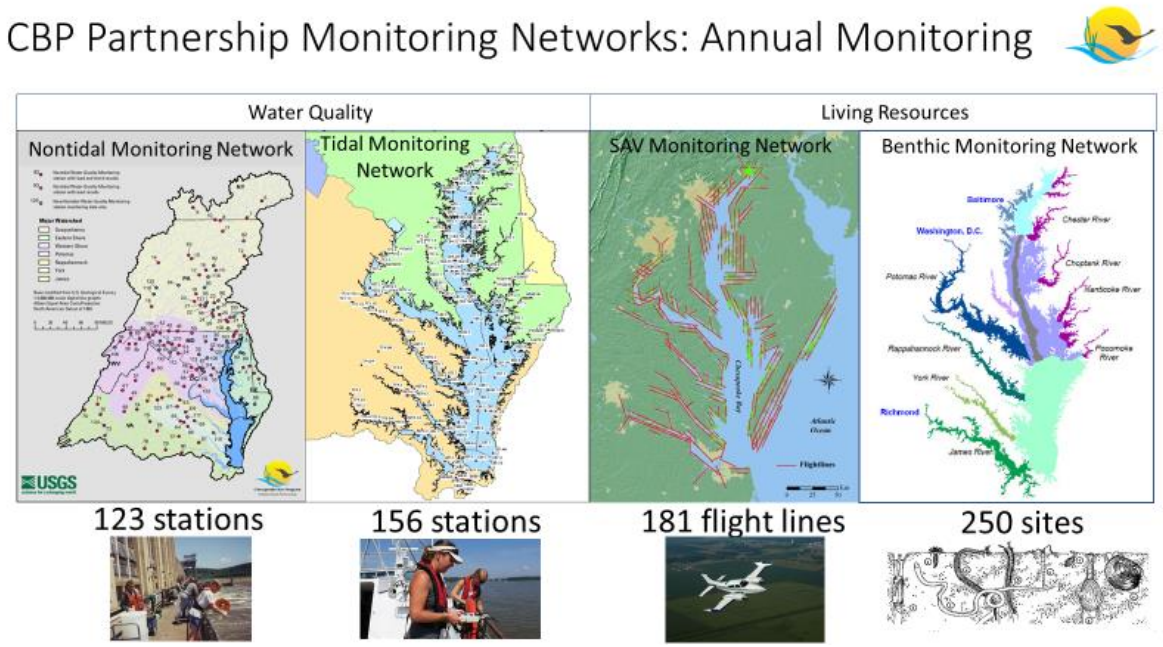
- WQGIT Meeting
- May 24, 2021

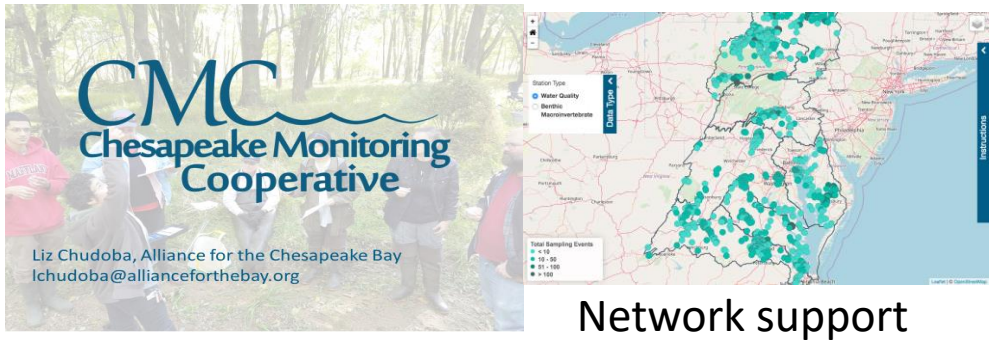
Acknowledgements – Review Team Leadership

- Peter Tango USGS
- Breck Sullivan CRC
- Scott Phillips USGS
- Lee McDonnell EPA
- Denice Wardrop CRC

Let's start here:
March 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 World Class Monitoring Networks*:
  - Tidal water quality
  - Nontidal nutrients and sediment
  - SAV
  - Tidal Benthic organisms
  - Citizen Monitoring
- Current Funding:
  - CBP $5M and partners >$7M





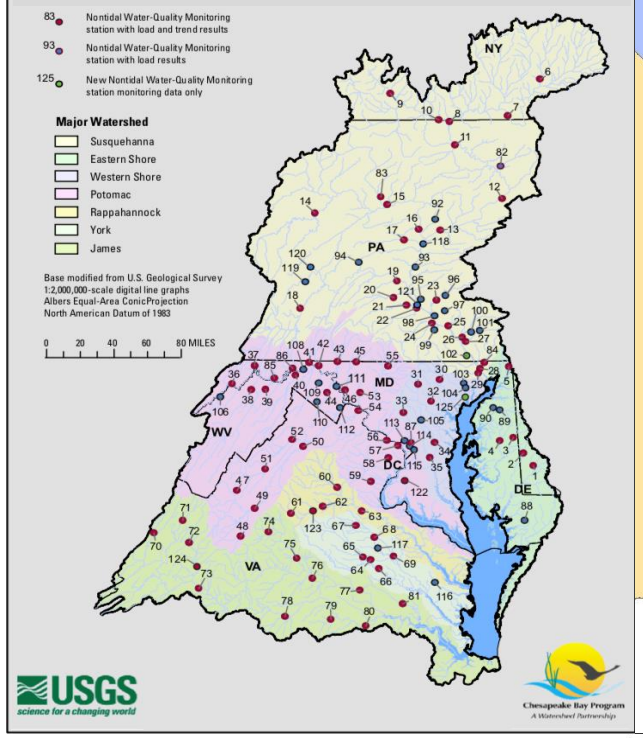
Network support

What did the PSC see?

CBP Partnership Monitoring Networks: Annual Monitoring

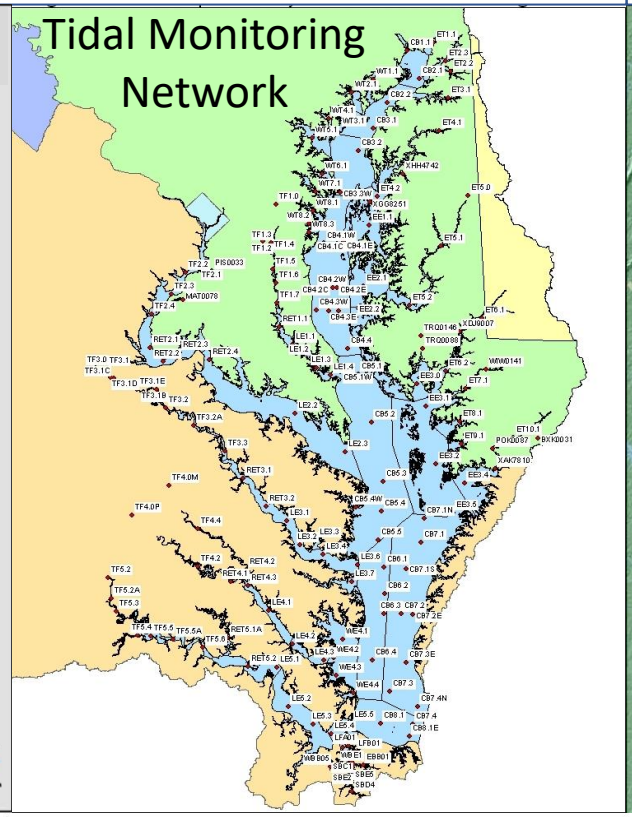
Water Quality

Nontidal Monitoring Network



123 stations

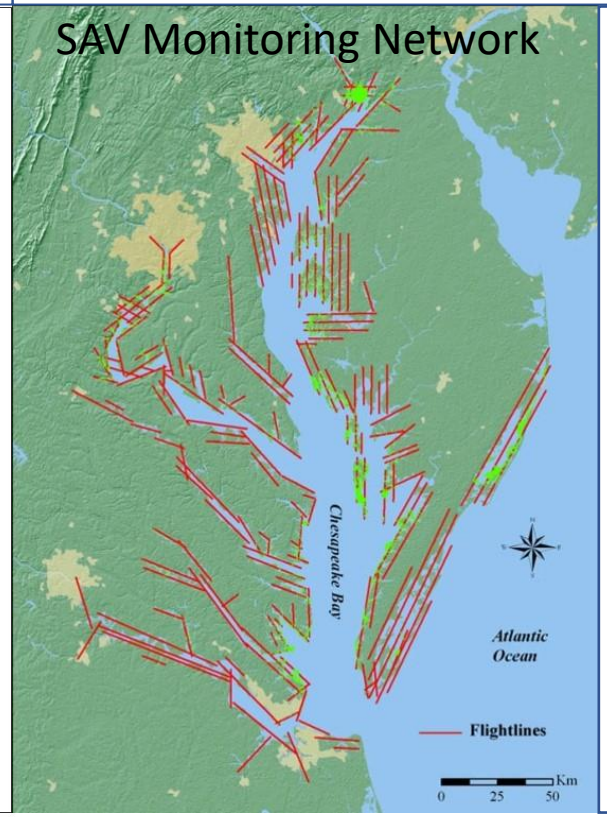
Tidal Monitoring Network



156 stations

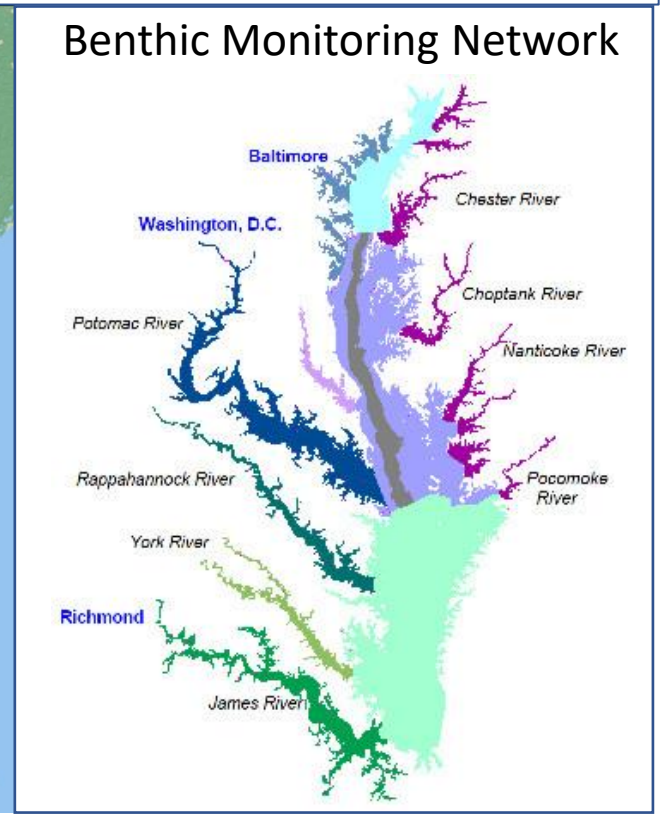
Living Resources

SAV Monitoring Network

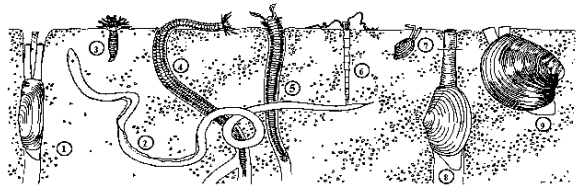


181 flight lines

Benthic Monitoring Network



250 sites



Adaptive Management Decision-Support:
From planning to sample collection to actionable knowledge

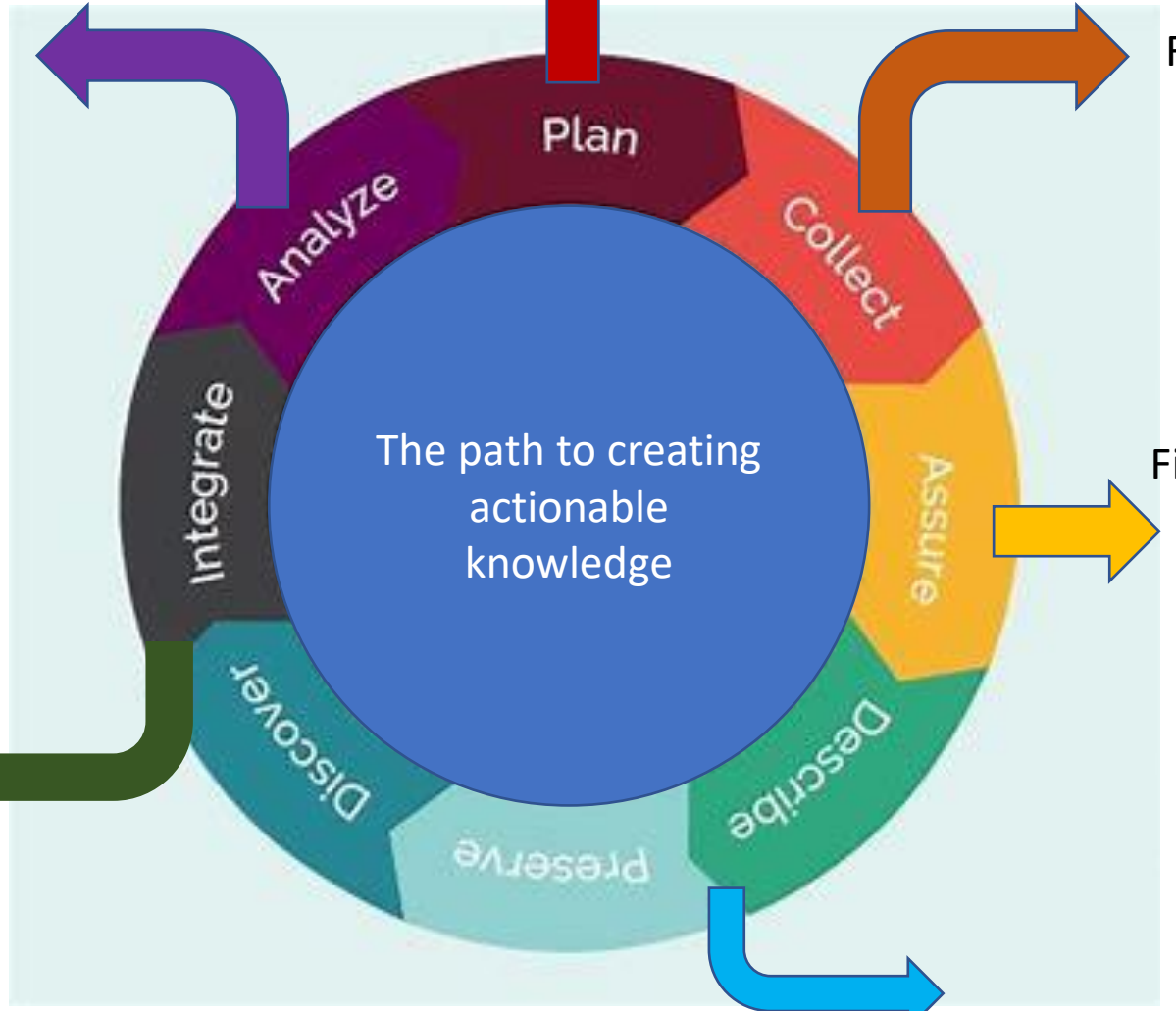
ACTIONABLE KNOWLDGE

INFORMATION

Method development
Synthesize
Translate
Data visualization
Report
Communicate

Administration
Coordination

Sensors
Field measures
Lab measures



Field, lab & data management
QA program

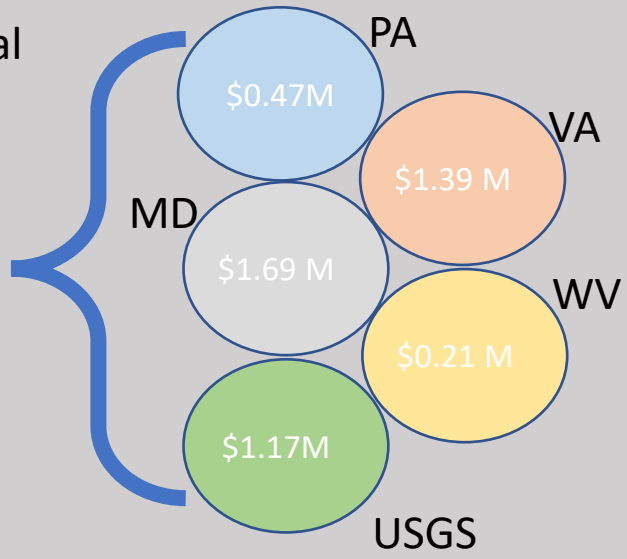
Model
Calibrate
Verify

Metadata management
IT data input and storage management

Integrated partner contributions: It takes a village.

Tidal and Nontidal Water Quality Monitoring

$ 5.0 M



$ 400 K — SAV

$ 450 K — Citizen Science

$ 5.85 M — **CBPO Support for monitoring**

>$ 12M Chesapeake Monitoring Program Partnership Investment

State 117e Matching Funds — $ 3.76 M

Estimated Additional Partner Network Support — $ 2.0 M

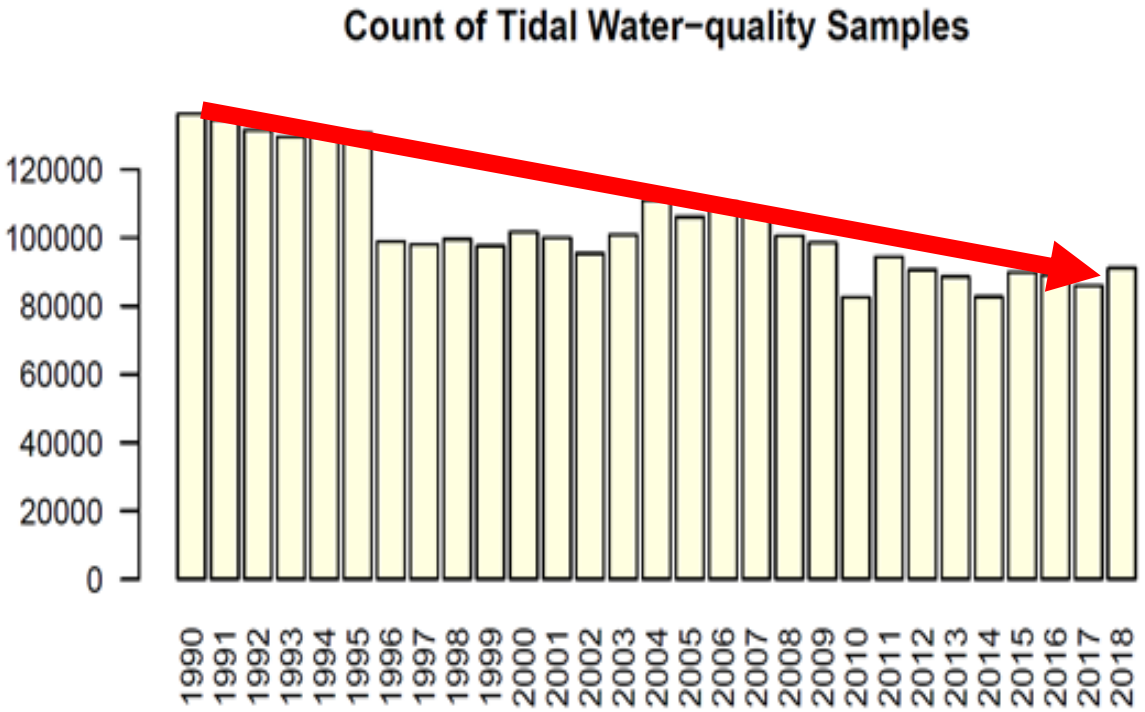
USGS Streamflow and Water Quality Monitoring — $ 250K

SAV Partners (MDE, MD DNR, VA CZW, VA) — $ 412 K

Citizen Science — priceless

Partner support for monitoring — $ 6.5 M

Chesapeake Bay Monitoring Program Capacity Status?



Traditional Monitoring Program Capacity: Good/Fair/Poor

- Traditional capacity is highly stressed and declining

  ~20 years: Tidal data monitoring remains "marginal"

  Nontidal data collection "adequate" for the watershed load estimates, station losses ahead

  Flat funding ignores inflation/COLAs translating to station and data losses.

  Impending SAV program cost increases may challenge program after 2021

Source: P. Tango USGS

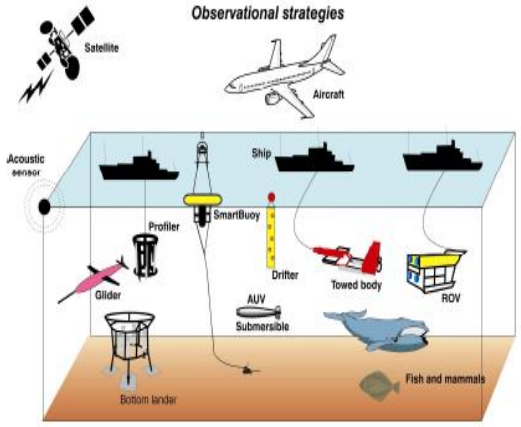
A Vision for Moving forward: Expanding capacity with and beyond EPA funding

New sensors, new data sources, new interpretation tools

Integrated monitoring and assessment

- Traditional data collection

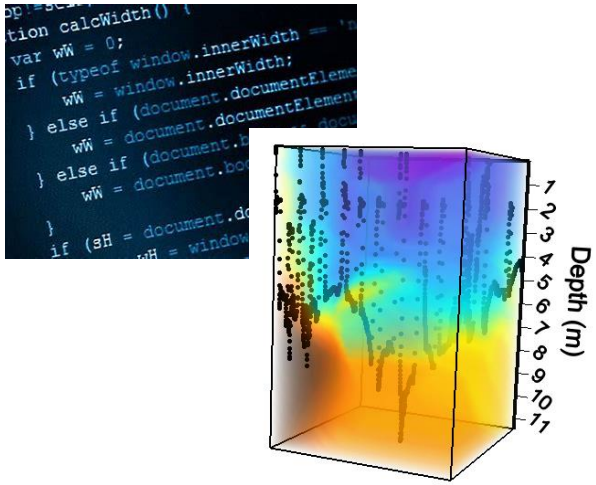
- Advanced collections
  - Satellite (SAV, clarity, chlorophyll)
  - Citizen Sci (SAV, Dissolved oxygen)
  - Fisheries (Dissolved oxygen)
  - Vertical profilers (Dissolved oxygen)



Updated assessment tools

- Artificial Intelligence assessment algorithms (NASA, NOAA, EPA, USGS)

- 4-dimensional water quality estimator (EPA-CBPO+)



Gap filling data needs

- Water quality standards
- Fish Habitat

Improved assessments

- Complete accounting
- Annualized accounting

Reduced uncertainty in status and trends

- Better explain habitat response to management

Cost efficiencies

- Free satellite imagery

Results of the PSC Presentation:

A request for a monitoring program review

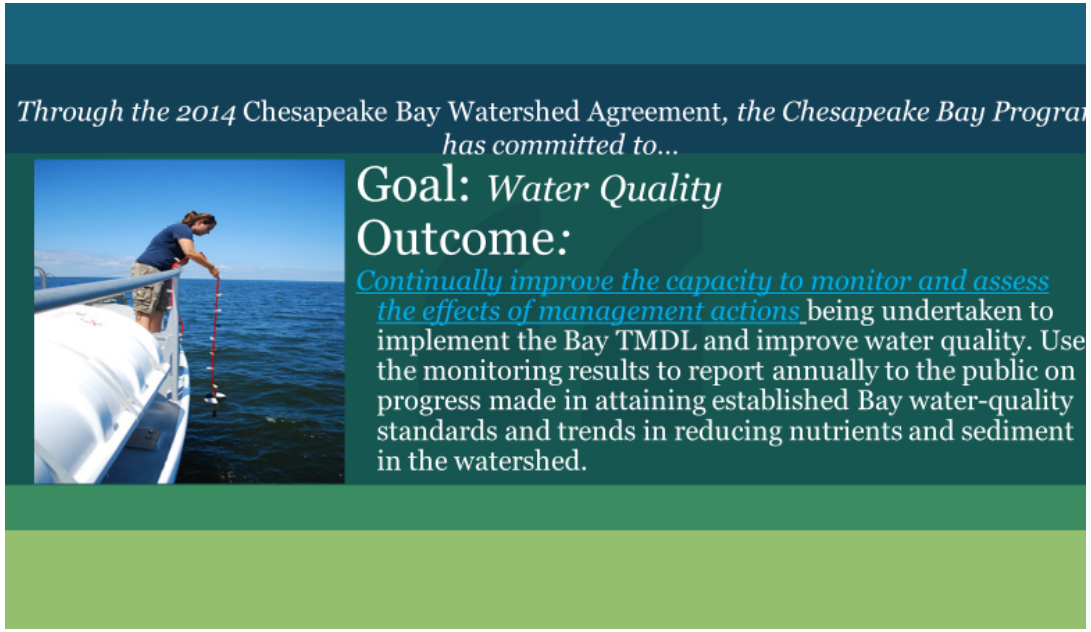
PSC request:

- In response to the status report, PSC requested information be provided on what is needed to improve the CBP monitoring networks, including:
  - (1) an overview of current status and threats to the networks, and
  - (2) what is needed to address the monitoring networks capacity shortfalls.

"Monitoring Program Review" translates to the 5 network activities described but anticipates some latitude.

Opportunities and Benefits of the 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 fill gaps




The
Path
Ahead

How about the process of the review?

Process

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

8 Questions

8 Questions to address in this 9-month review

1. Network Status?

2. Vulnerabilities to sustaining network operation?

3. Program management strategy?

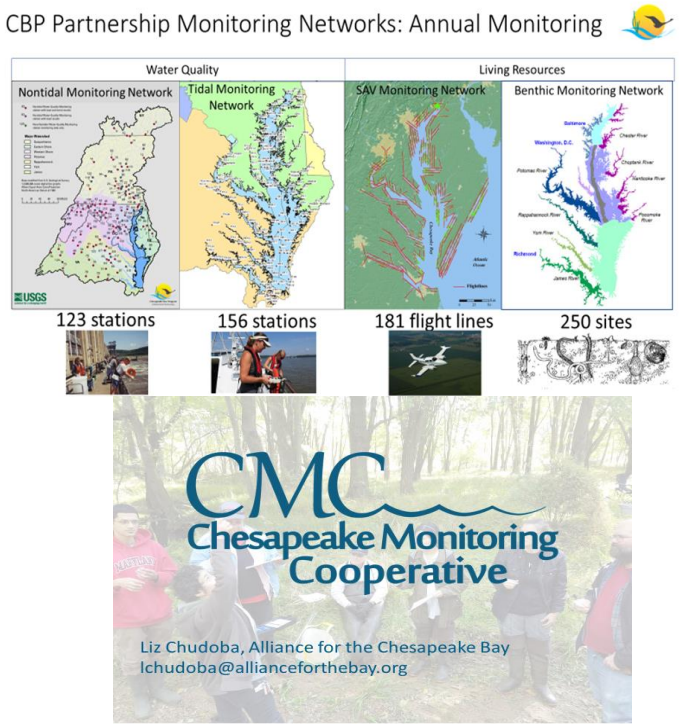
4. Monitoring information gaps?

5. Monitoring program options for filling gaps with existing resources?

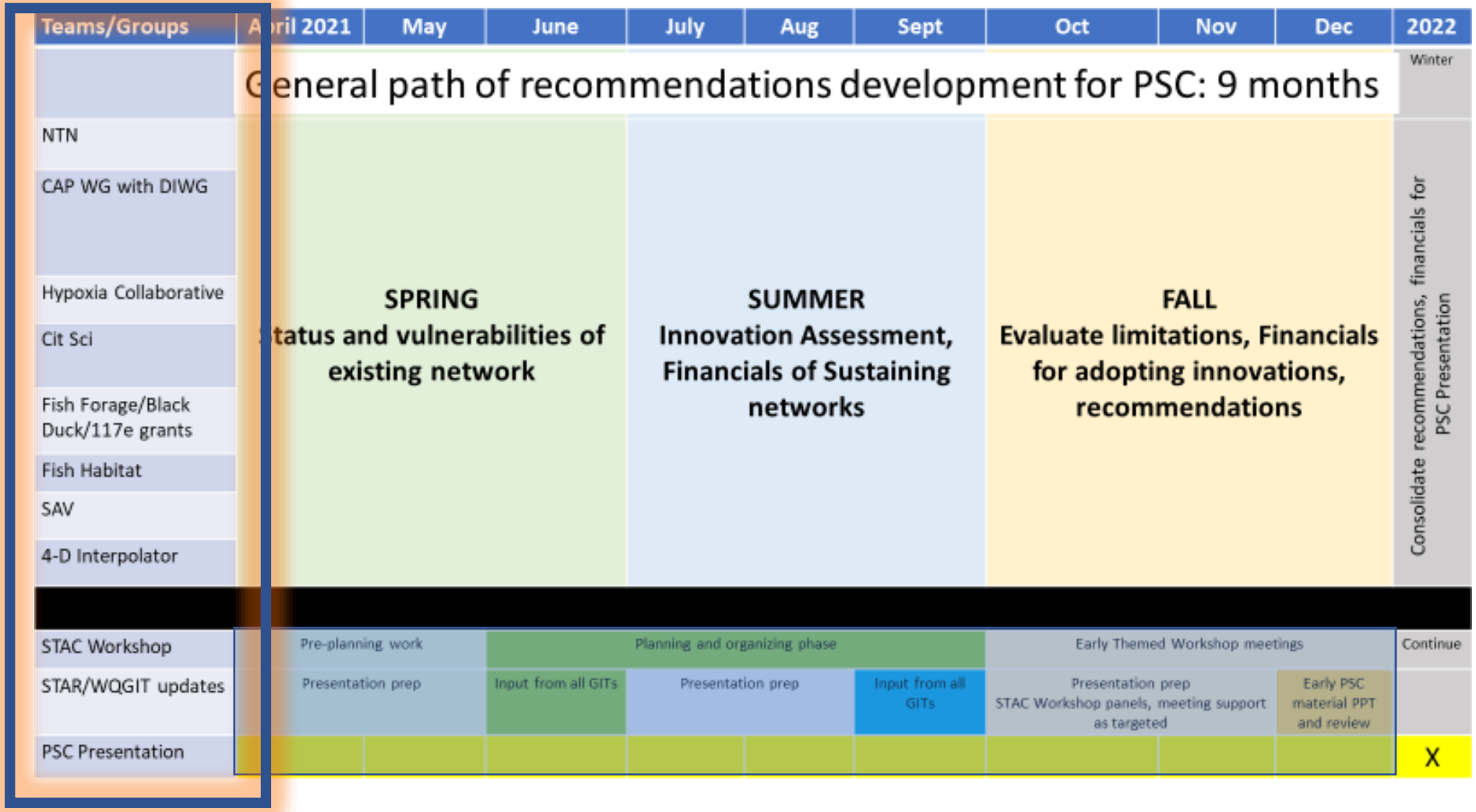
6. What innovations are available?

7. Who are the partners on operationalizing the innovations?

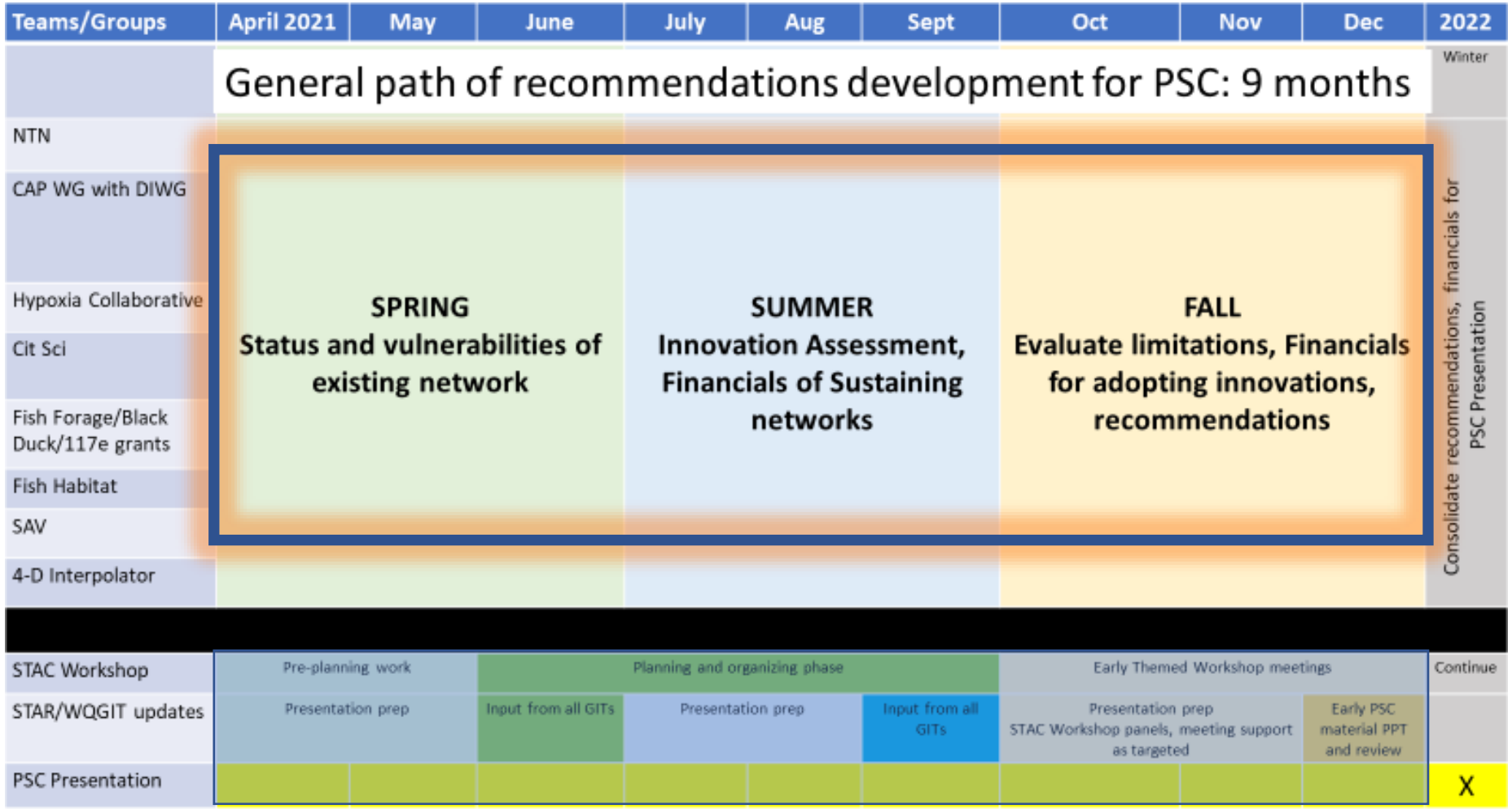
8. Financial perspective on sustaining, growing and innovation needs for our networks?



Process timeline – 9 months engaging many groups



Process timeline and themes to answer questions



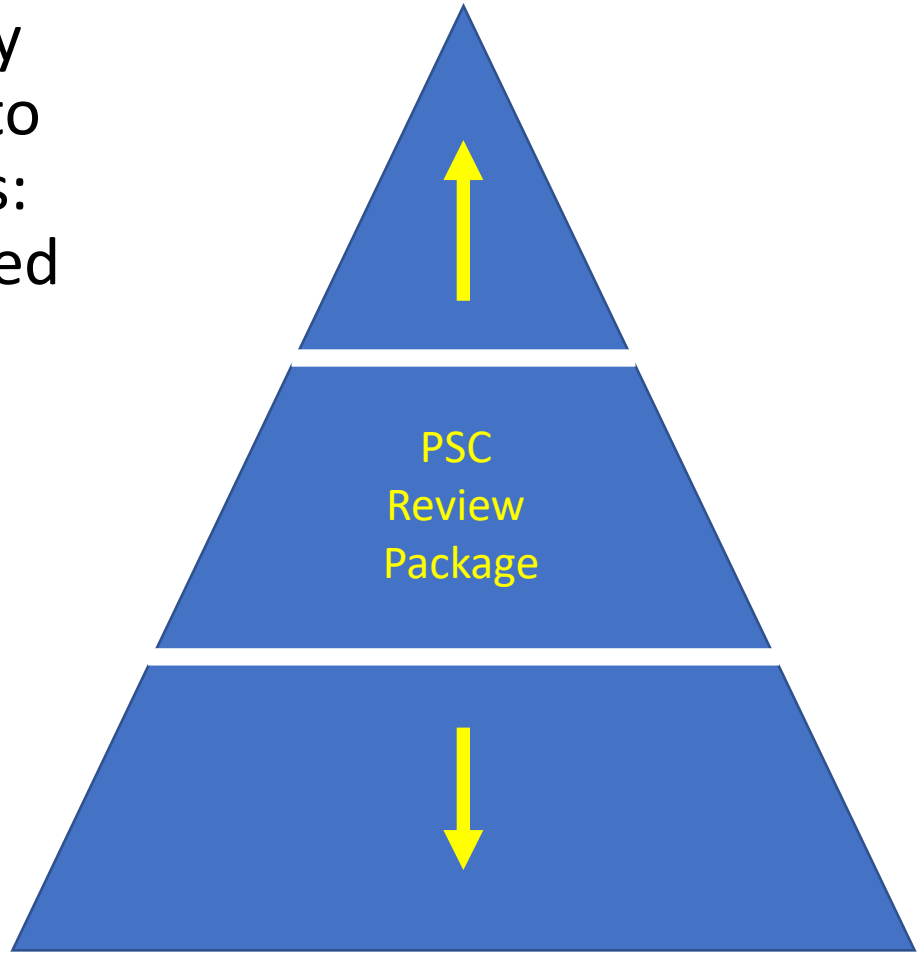
And, what about the end product?

The finish line: Sharp, focused recommendations on sustaining and growing the network will be key

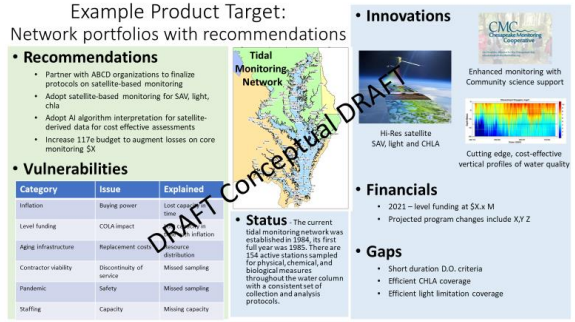
- Operationalize research to monitoring programming (e.g., new ConMon sensor applications)
- Acknowledge and grow partner commitments (NASA, NOAA, NRCS…)
- Enhanced use of existing resources (e.g., advanced analyses)
- Define investment needs with planned gap filling return on investment (ROI) – (e.g. vertical profiler network development)

Delivering a final product: Tiered communication

- 1 page: Executive summary on the recommendations to sustain and grow networks: strategies, resources needed
- 1 (max 2) page network portfolio summaries
- Short report on the 8 questions



Exec
Summary
1 pg



Report
Q1-Q8
Reference

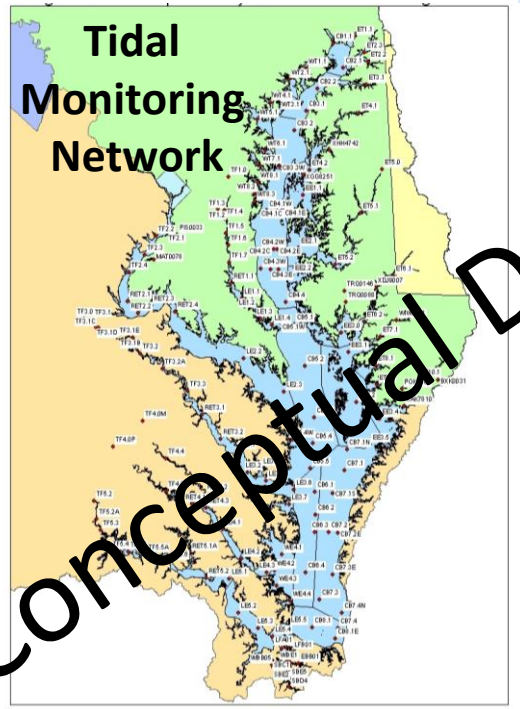
Example Product Target:
Network portfolios with recommendations

• Recommendations

- Partner with ABCD organizations to finalize protocols on satellite-based monitoring
- Adopt satellite-based monitoring for SAV, light, chla
- Adopt AI algorithm interpretation for satellite-derived data for cost effective assessments
- Increase 117e budget to augment losses on core monitoring $X

• Vulnerabilities

Category	Issue	Explained
Inflation	Buying power	Lost capacity in time
Level funding	COLA impact	Lost capacity in time with inflation
Aging infrastructure	Replacement costs	Resource distribution
Contractor viability	Discontinuity of service	Missed sampling
Pandemic	Safety	Missed sampling
Staffing	Capacity	Missing capacity

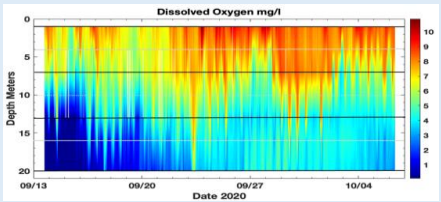


• Status - The current tidal monitoring network was established in 1984, its first full year was 1985. There are 154 active stations sampled for physical, chemical, and biological measures throughout the water column with a consistent set of collection and analysis protocols.

• Innovations

Hi-Res satellite
SAV, light and CHLA

Enhanced monitoring with Community science support



Cutting edge, cost-effective vertical profiles of water quality

• Financials

- 2021 – level funding at $X.x M
- Projected program changes include X,Y Z

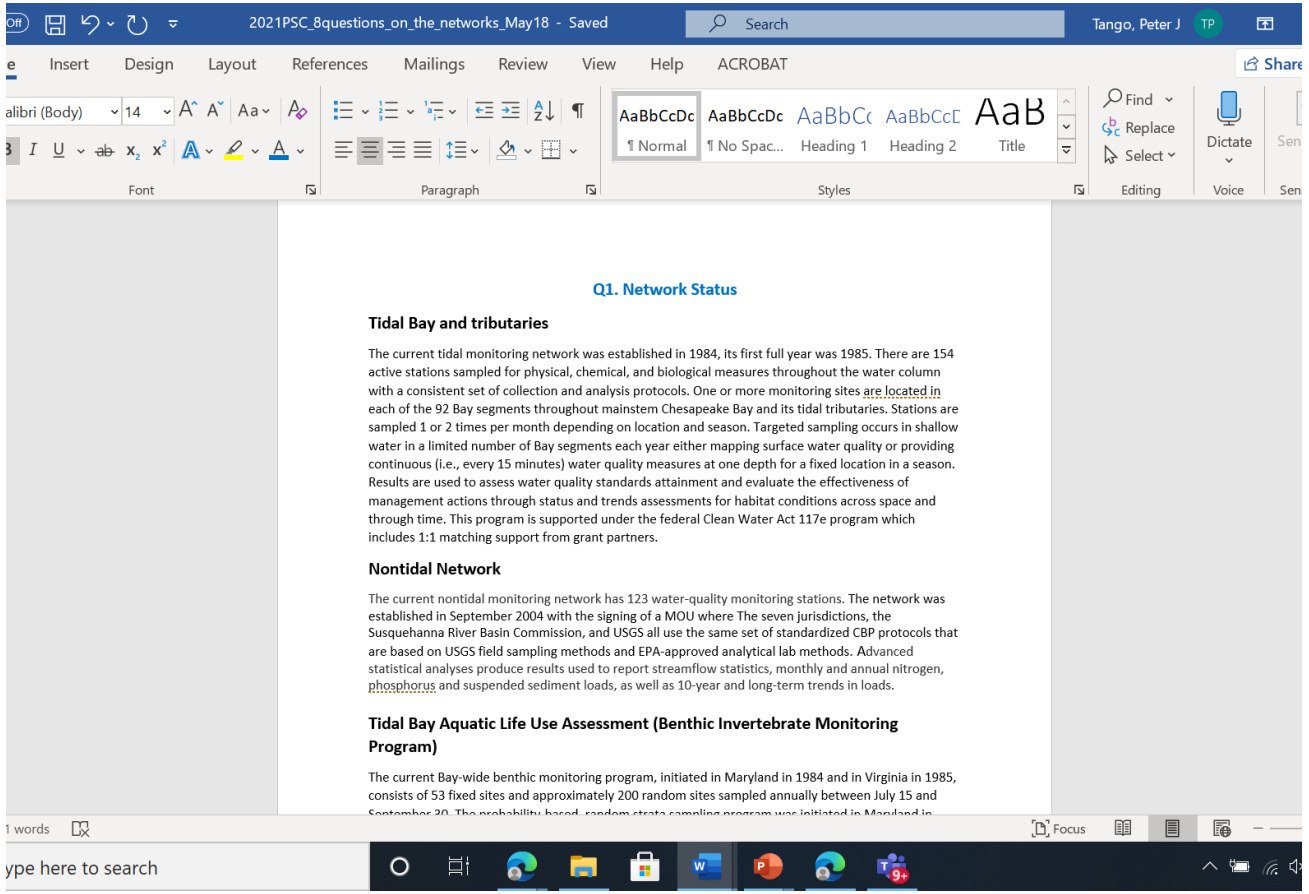
• Gaps

- Short duration D.O. criteria
- Efficient CHLA coverage
- Efficient light limitation coverage

Report product

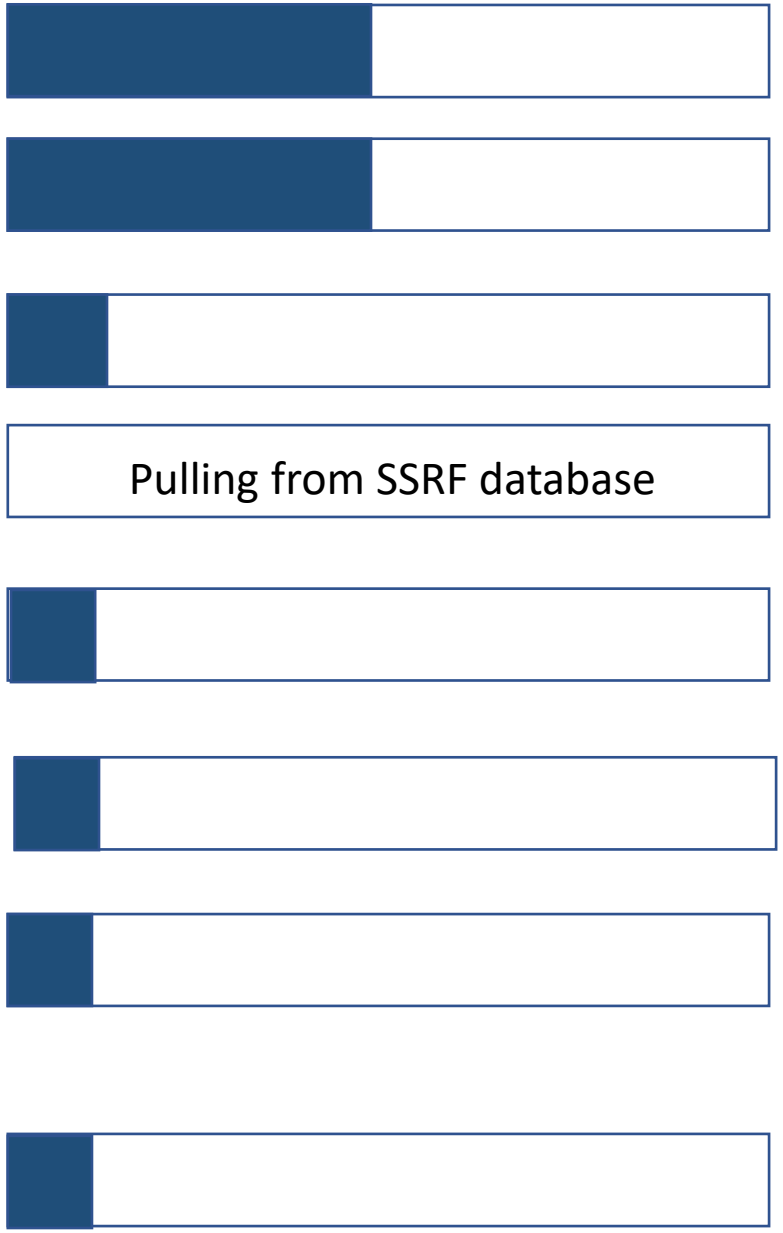
- Topics addressed with single paragraph summaries supported by tables and graphics.

- NTN WG meetings take bites at this in workshop mode to review/edit together



Continues

Tracking our progress on the final report: May 2020



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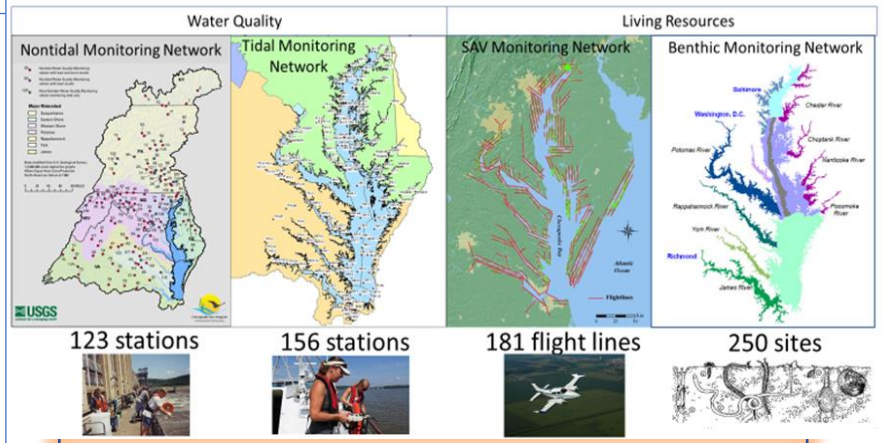
CBP Partnership Monitoring Networks: Annual Monitoring



Q1. Network Status

Tidal Bay and tributaries

The current tidal monitoring network was established in 1984, its first full year was 1985. There are 154 active stations sampled for physical, chemical, and biological measures throughout the water column with a consistent set of collection and analysis protocols. One or more monitoring sites are located in each of the 92 Bay segments throughout mainstem Chesapeake Bay and its tidal tributaries. Stations are sampled 1 or 2 times per month depending on location and season. Targeted sampling occurs in shallow water in a limited number of Bay segments each year either mapping surface water quality or providing continuous (i.e., every 15 minutes) water quality measures at one depth for a fixed location in a season. Results are used to assess water quality standards attainment and evaluate the effectiveness of management actions through status and trends assessments for habitat conditions across space and through time. This program is supported under the federal Clean Water Act 117e program which includes 1:1 matching support from grant partners.

Nontidal Network

The current nontidal monitoring network has 123 water-quality monitoring stations. The network was established in September 2004 with the signing of a MOU where The seven jurisdictions, the Susquehanna River Basin Commission, and USGS all use the same set of standardized CBP protocols that are based on USGS field sampling methods and EPA-approved analytical lab methods. Advanced statistical analyses produce results used to report streamflow statistics, monthly and annual nitrogen, phosphorus and suspended sediment loads, as well as 10-year and long-term trends in loads.

Tidal Bay Aquatic Life Use Assessment (Benthic Invertebrate Monitoring Program)

The current Bay-wide benthic monitoring program, initiated in Maryland in 1984 and in Virginia in 1985, consists of 53 fixed sites and approximately 200 random sites sampled annually between July 15 and

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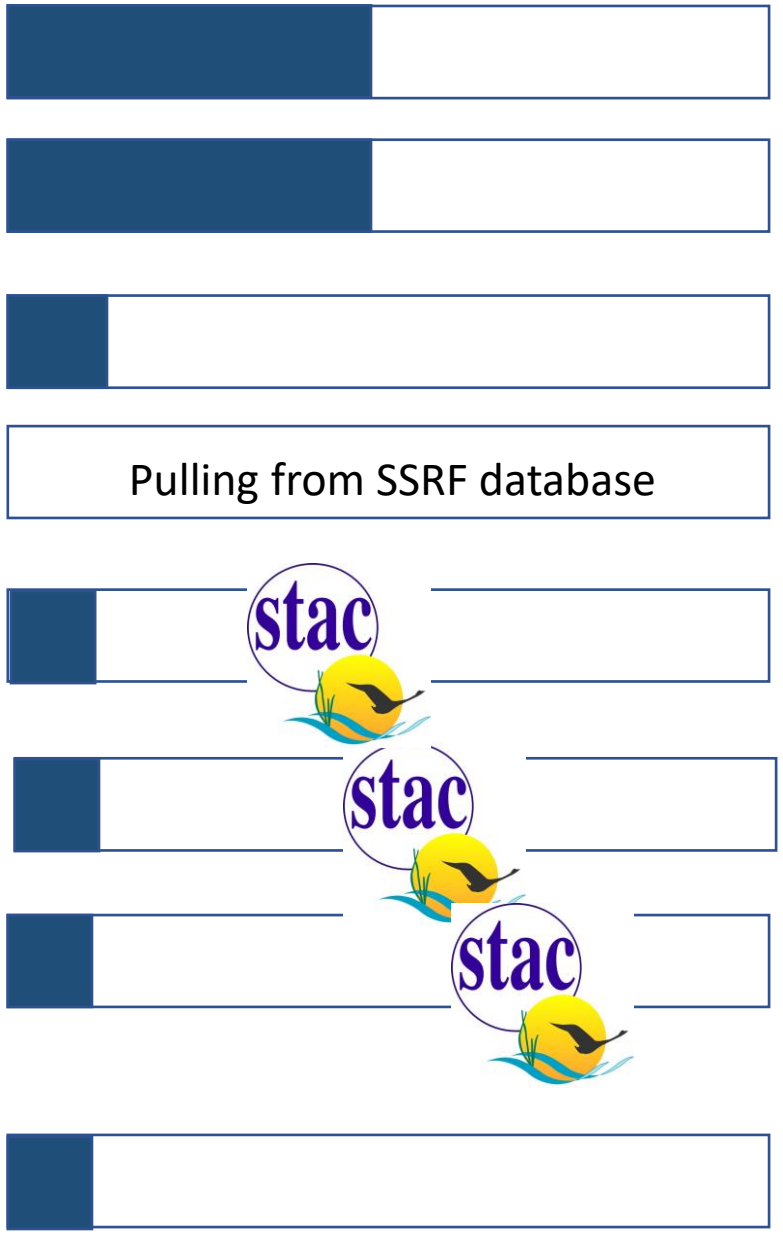

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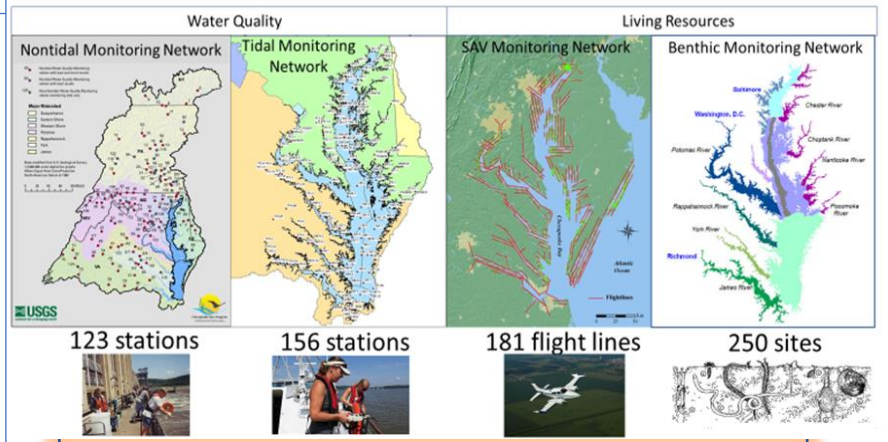

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STAC Workshop Support

STAC Workshop Autumn 2021/Winter 2021-22

Deeper dive on the assessment of options, their readiness for assessment support, identification of what questions/research needs might be required before adoption

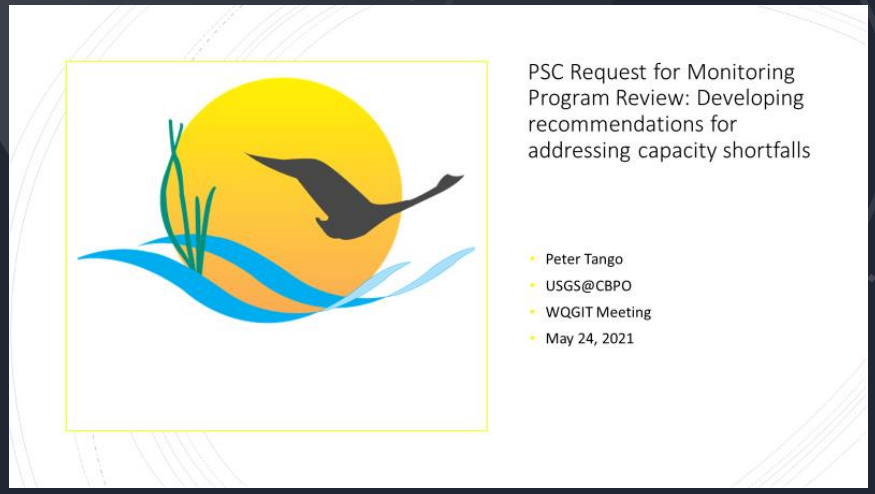
Tune recommendations on adoption of innovations and alternatives to address long-standing gaps in our assessment efforts

Mini-meetings targeting topics build from our summer/autumn workgroup meetings:

- E.g., AI algorithms for SAV assessment
- E.g., Protocol for acquiring different satellite-based data
- E.g., status and progress on satellite-based CHLA
- E.g., 4-D interpolator development support needs
- E.g., data interpretation options to address assessment

STAC Workshop
Autumn 2021/Winter 2021-22

Next Steps



- Deliver a work plan for PSC to endorse at their June 2021 meeting
- Coordinate with teams to address the questions for each network (Spring-Summer-Fall 2021)
- STAC workshop development and participation (fall-winter 2021-22)
- Deliver recommendations to PSC by January 2022.