



# Responding to the PSC Request to Improve the CBP Monitoring Networks

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CAP WG

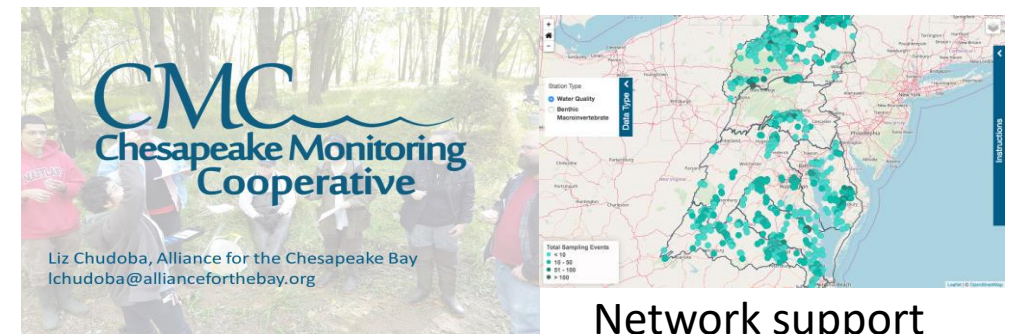
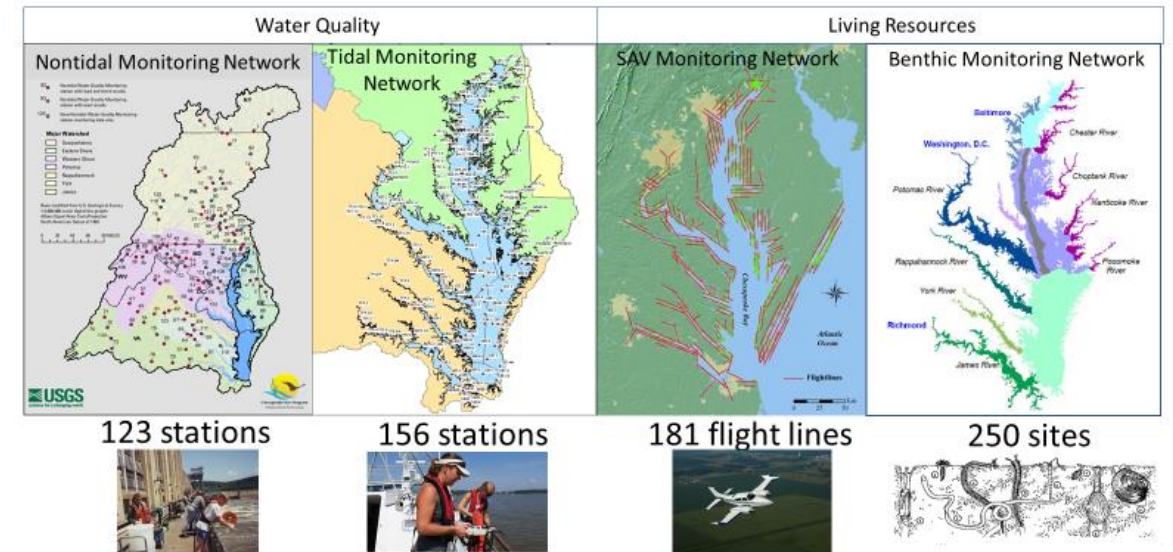
May 14, 2021

# 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

## CBP Partnership Monitoring Networks: Annual Monitoring




Network support

# 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

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.



## Process

9 months start to  
finish

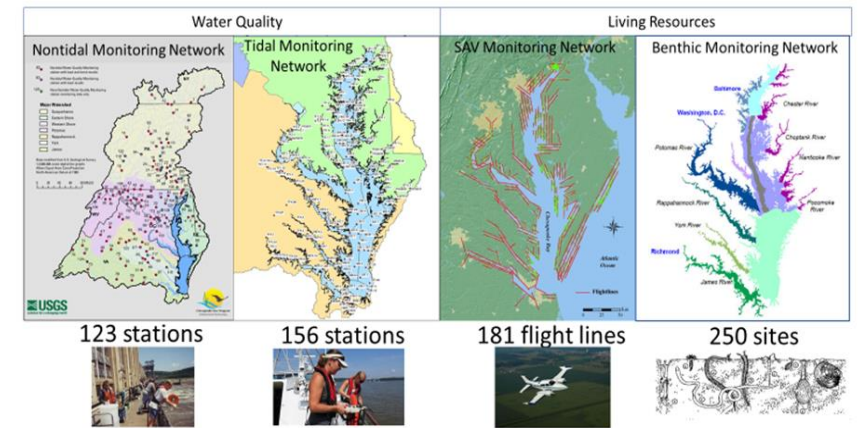
8 questions to  
answer

Provide a short  
synthesis to address  
the questions, vision  
going forward.

# 8 Questions to address in this 9-month review

- **NETWORK STATUS?**
- **VULNERABILITIES?**
- **PROGRAMMING STRATEGY?**
- **INFORMATION GAPS TO FILL?**
- **MONITORING PROGRAM OPTIONS TO FILL GAPS?**
- **WHAT INNOVATIONS ARE AVAILABLE?**
- **WHO - PARTNERS FOR ADDRESSING INFORMATION GAP DATA & PRODUCTS?**
- **DETAIL ON FINANCIALS FOR SUSTAINING AND GROWING NETWORK TO MEET INFORMATION NEEDS?**

CBP Partnership Monitoring Networks: Annual Monitoring 





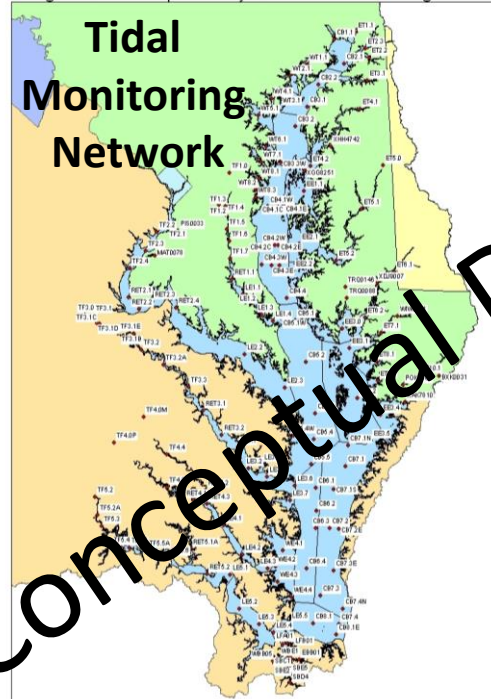
# Example Product Target for PSC: Network portfolios with recommendations

## • Recommendations

- Partner with ABCD organizations to finalize protocols on satellite-based monitoring
- Adopt satellite-based monitoring for SAV, light, chl<sub>a</sub>
- 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.

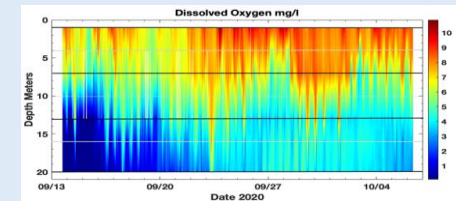
## • Innovations



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

# Sharp, focused recommendations will be key



- Operationalize research to monitoring programming (e.g. satellite-based assessments)
- Acknowledge and grow partner commitments (e.g., NASA, NOAA)
- Enhanced use of existing resources (e.g. modeling bioassays)
- Define investment needs with planned gap filling return on investment (ROI) – (e.g. vertical profiler network development)



# The Path Ahead

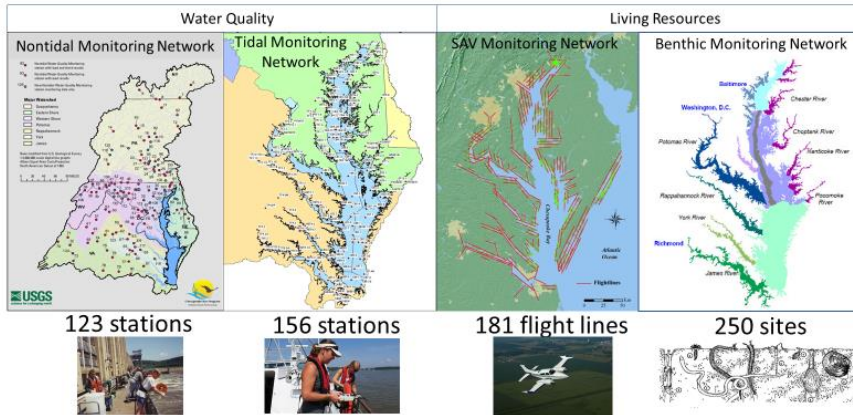


# WQ Standards Attainment will be one priority



## Traditional networks

CBP Partnership Monitoring Networks: Annual Monitoring



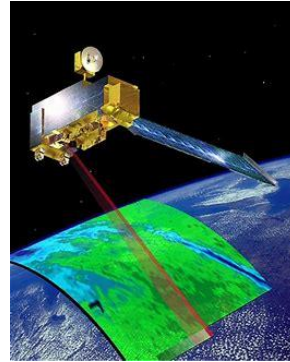
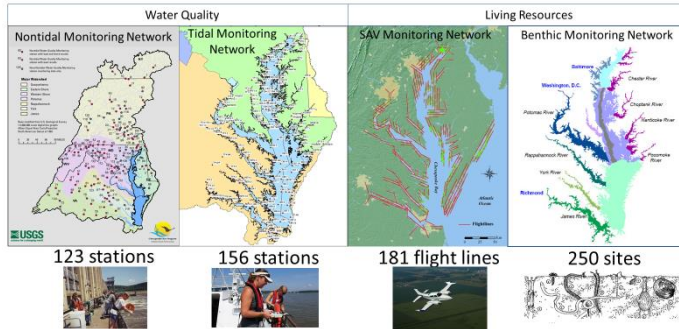
- **Water quality standards** – **0 of 92** segments have ever been fully assessed with our traditional monitoring and evaluation tools since criteria were published in USEPA (2003)
- **Fish Habitat resolution improvements are needed** over the National Assessment applied to Chesapeake Bay
  - We need to address capacity shortfalls
  - \* We need to adapt our existing program to meet expanded decision-support needs with new objectives, e.g., climate-related information needs

# We need to leverage successful research innovations. Adopt, integrate, and adapt to address capacity shortfalls.

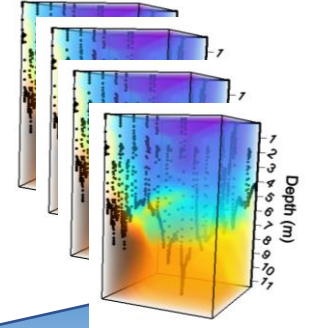


## Traditional networks

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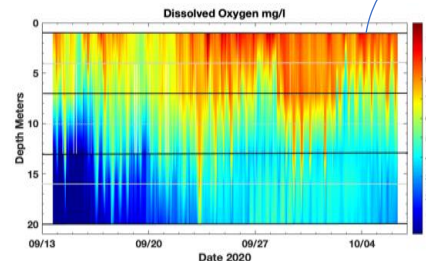
2. Adapt to baywide satellite-based data (SAV, Kd, CHLA)



4. Improve assessment tools (4D water quality estimator)

Monitoring and assessment capacity building beyond traditional monitoring

1. Apply Citizen-based observations (MOU 2018)



3. Innovate and adopt new WQ and living resource monitoring at needed data scales (CBT 2020 work, Bever et al. sampling design insights)

Expanded capacity

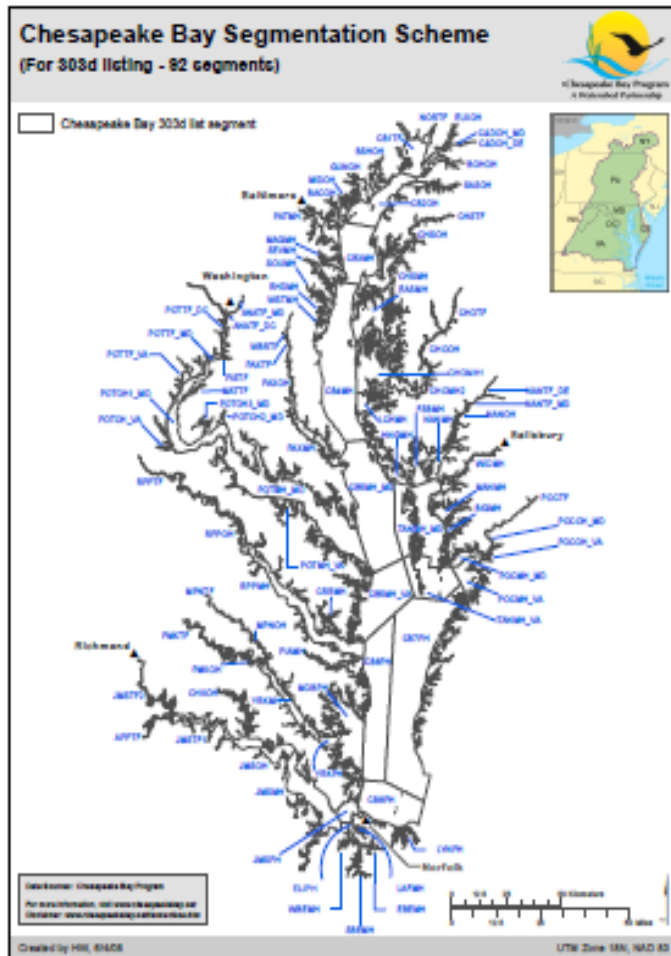
Expanded capacity

Full  
Water  
Quality  
Standards  
Attainment  
Assessment  
for  
Chesapeake  
Bay  
+  
CrossGIT  
Benefits

# Synergies with other workgroups:

## Monitoring for habitat assessments will include water quality measure distributions and a new assessment frame is in the works.

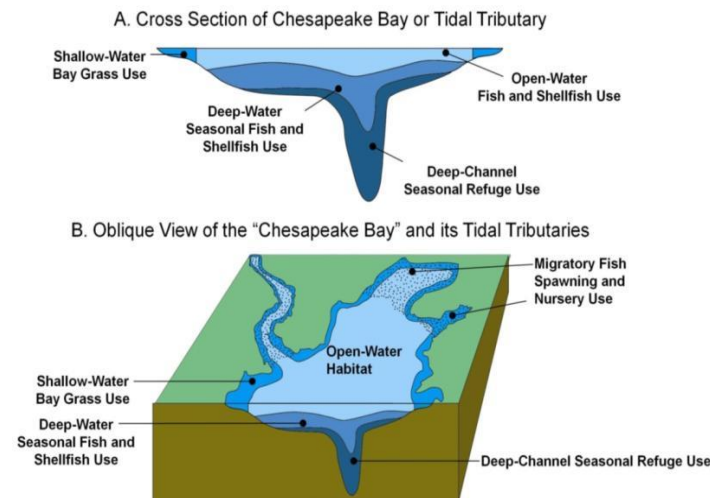
### Bay Management Segmentation



### Water Quality Criteria:

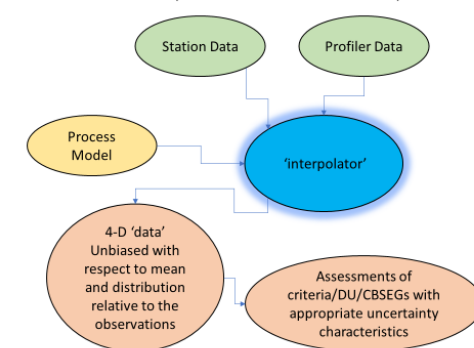
- Dissolved oxygen –
  - Requires temperature & salinity to define habitat
- \* Water clarity/SAV
- \* Chlorophyll *a*

### Refined Designated Uses for the Bay and Tidal Tributary Waters



### 4-Dimensional Assessment Framework is evolving

#### Vision: WQ Criteria Assessment (Habitat Assessment)



An 'interpolator' would take inputs from station data, profiler data, and process models to produce a complete historical hourly record of DO on perhaps a 200x200x1 meter cell framework.

We would want to specify that the resulting history was unbiased relative to several different distribution metrics

Assessments would be carried out in those areas and times-scales when uncertainty estimates are within acceptable ranges.

This could perhaps be tested using ChesROMs as the profiler data and WQSTM as the process model.

**\* Work underway by 4D BORG**  
= 4-D Water quality estimator team

# Timeline: Engaging groups across CBP for input

[illegible]



# Detailed needs – small bites, coming soon.

Teams/Groups	April 2021	May	June	July	Aug	Sept	Oct	Nov	Dec	2022
	SPRING Status and vulnerabilities of existing network			SUMMER – Innovation Assessment, Financials of Sustaining networks			FALL Evaluate limitations, Financials for adopting innovations, recommendations			Winter
NTN	Network support spreadsheet, vulnerabilities, financials, design options			Network revision proposals – BMP, climate, historical; financials of vulnerabilities next 5 years			Analysis innovation – target, timeline, investment. Formalize network & analysis revision recommendations			Consolidate recommendations, financials for PSC Presentation
CAP WG with DIWG	Tidal Mon program status, vulnerabilities, financials			Satellite SAV readiness, data management, QA needs	Satellite kd readiness, data management, QA needs	Satellite CHLA readiness, data management, QA needs	Cit Sci targets, expectations	STAC Wkshp: Knitting together innovations in – and –		
Hypoxia Collaborative	Establish Team, kick-off mtg, provide Vision, input on stakeholder requirements, initial deployment targets			Network design, sampling design adjustments						
Cit Sci	Award of contract.			Tier 3 document			Review of Cit Sci data can			
Fish Forage/Black Duck/117e grants	Is Spring BIB necessary?						Formalize recommendations and financials of existing and proposed modifications to program			
Fish Habitat	Data			Monitoring network design, data management and QA needs			STAC Workshop panels support			
SAV	Track acquire			Prep for STAC Workshop – sharpen financial assessment			STAC Wkshp: AI options, AI progress to improve efficiencies, comparability of method outputs, document path and financials			
4-D Interpolator	Establish Team, provide Vision, stakeholder requirements,			Guidance and development phase with monthly updates			STAC Wkshp: Shaping development, envisioning products to address WQ Stds reporting needs, fish habitat needs			
Detailed plans, dates, homework assignment assistance planning is in progress here										
STAC Workshop	Pre-planning work		Planning and organizing phase				Early Themed Workshop meetings			Continue
STAR/WQGIT updates	Presentation prep		Input from all GfTs	Presentation prep		Input from all GfTs	Presentation prep STAC Workshop panels, meeting support as targeted		Early PSC material PPT and review	
PSC Presentation										X

Detailed plans, dates, homework assignment assistance planning is in progress here

# Supporting group consultations



Data Integrity WG –  
All Network update  
considerations

Climate Resiliency WG  
– All networks

Fish Habitat Action  
Team – Tidal network,  
Hypoxia Collaborative,  
4D BORG links

Forage Fish Team –  
Benthic Network

Black Duck Team –  
Benthic Network

Healthy Habitats –  
outputs of 4-D  
analysis

Modeling WG – 4D  
water quality  
estimator

Water Quality GIT

STAR

STAC



# Next Steps

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Deliver a work plan for PSC to endorse at their May 2021 meeting

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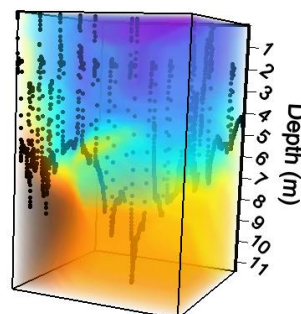
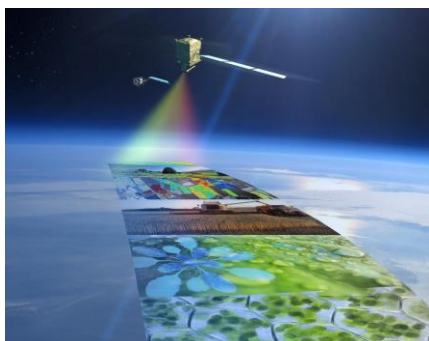
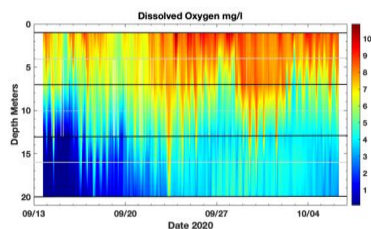
Coordinate with teams to address the questions for each network (Spring-Summer-Fall 2021)

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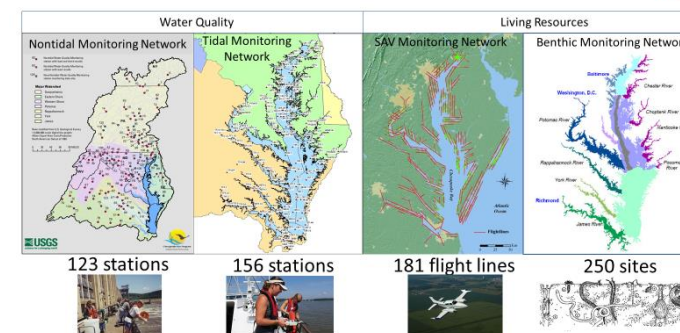
STAC workshop development and participation (fall-winter 2021-22)

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Deliver recommendations to PSC by January 2022.



## CBP Partnership Monitoring Networks: Annual Monitoring



# Thank you and Discussion



Chesapeake Bay Program  
Science. Restoration. Partnership.

CRWG assistance —

- Share your needs with justification to support monitoring density and distribution considerations
- parameter considerations with water quality related priority in this review
- Share more diverse monitoring needs to capture in final report recommendations for work beyond this review





# Integrated partner contributions: It takes a village.

