Responding to the PSC Request to Improve the CBP Monitoring Networks

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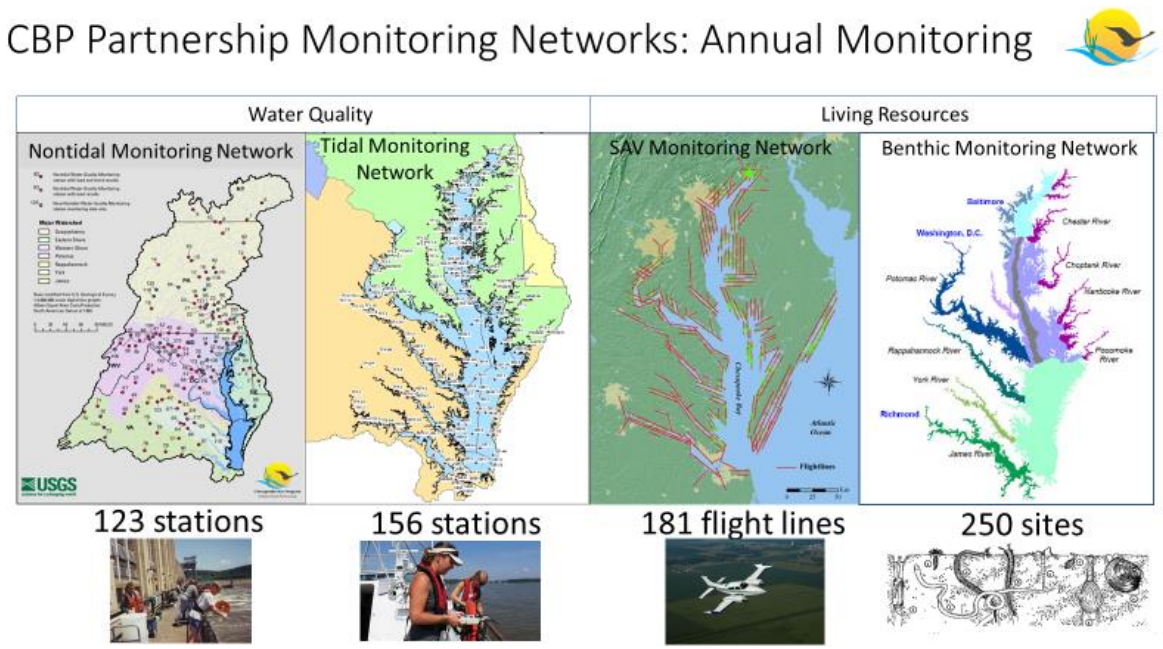
CAP WG

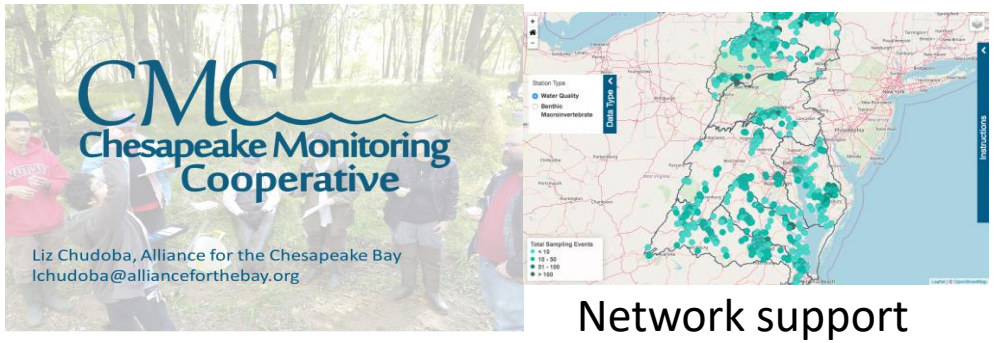
May 14, 2021

Background to review request

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

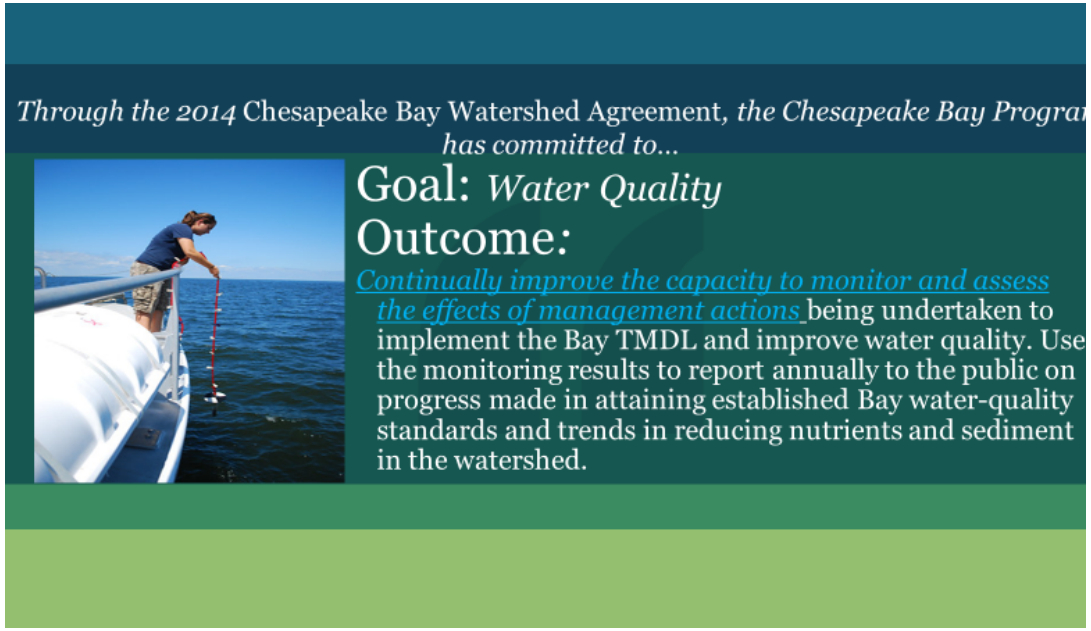




Network support

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



Process

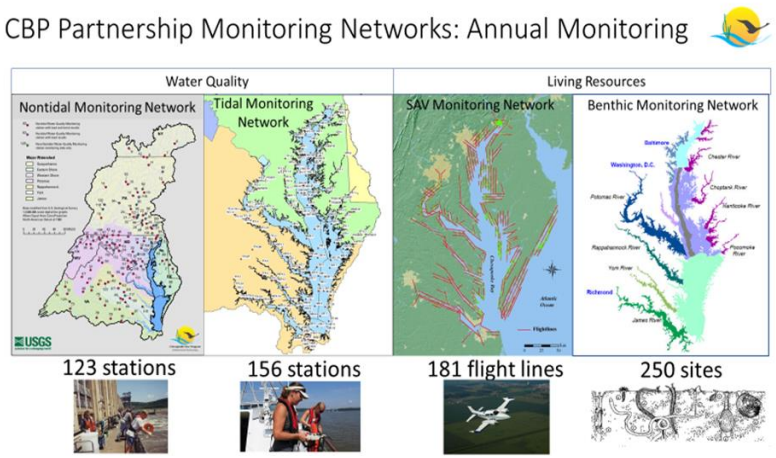
9 months start to finish

8 questions to answer

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

8 Questions to address in this 9-month review

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?

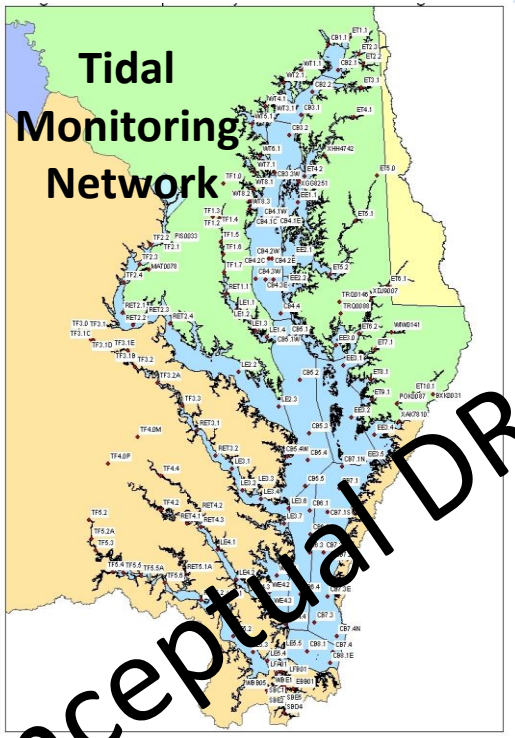


Example Product Target for PSC:
Individual network portfolios with recommendations

- **Recommendations**
  - Partner with ABCD organizations to finalize protocols on satellite-based monitoring
  - Adopt satellite-based monitoring for SAV, light, chla – CAP WG finalize.
  - Adopt AI algorithm interpretation for satellite-derived data for cost effective assessments – EPA approval needed.
  - Increase 117e budget to augment losses on core monitoring $X

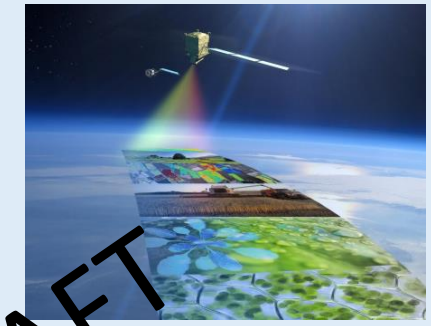
- **Vulnerabilities**

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



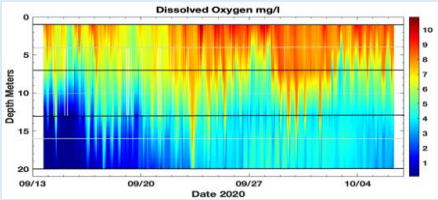
Status - The current tidal monitoring network was established in 1984, its first full year was 1985. There are 154 active stations sampled for physical, chemical, and biological measures throughout the water column with a consistent set of collection and analysis protocols.

- **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

Timeline: Engaging groups across CBP for input

Teams/Groups	April 2021	May	June	July	Aug	Sept	Oct	Nov	Dec	2022
	General path of recommendations development for PSC: 9 months									Winter
NTN	SPRING Status and vulnerabilities of existing network			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										
STAC Workshop	Pre-planning work		Planning and organizing phase				Early Themed Workshop meetings			Continue
STAR/WQGIT updates	Presentation prep		Input from all GITs	Presentation prep		Input from all GITs	Presentation prep STAC Workshop panels, meeting support as targeted		Early PSC material PPT and review	
PSC Presentation										X

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

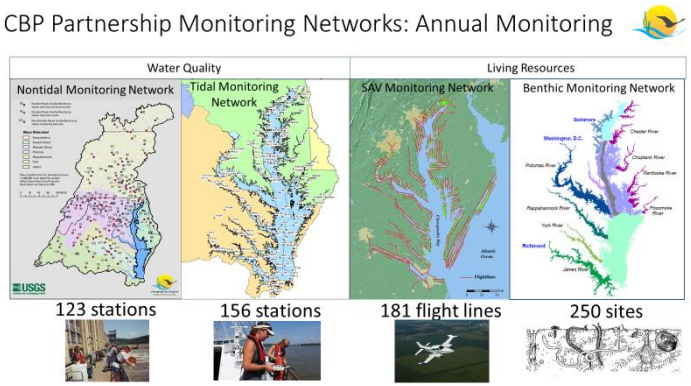
Detailed needs – small bites, coming soon.

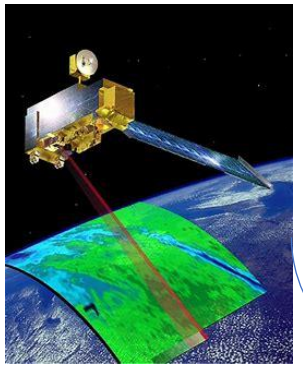
Teams/Groups	April 2021	May	June	July	Aug	Sept	Oct	Nov	Dec	2022
	SPRING **Status and vulnerabilities of existing network**			**SUMMER –** **Innovation Assessment, Financials of Sustaining networks**			**FALL** **Evaluate limitations, Financials for adopting innovations, recommendations**			Winter
NTN	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…		
Hypoxia Collaborative	Establish Team, kick-off mtg, provide Vision, input on stakeholder requirements, initial deployment targets			Network design, sampling design adjustm…						
Cit Sci	Award of contract.			Tier 3 documen…					…of Cit Sci data can	
Fish Forage/Black Duck/117e grants	Is Spring Billi necessary?						Formalize recommendations and financials of existing and proposed modifications to program			
Fish Habitat	Dat…			…monitoring network design, data …agement and QA needs			STAC Workshop panels support			
SAV	Track … acquis…		…ved	Prep for STAC Workshop – sharpen financial assessment			STAC Wrkp: AI options, AI progress to improve efficiencies, comparability of method outputs, document path and financials			
4-D Interpolator	Establis… 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			
STAC Workshop	Pre-planning work		Planning and organizing phase				Early Themed Workshop meetings			Continue
STAR/WQGIT updates	Presentation prep		Input from all GITs	Presentation prep		Input from all GITs	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

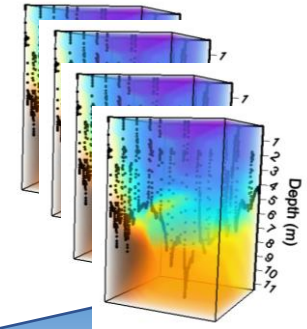
We need to leverage successful research innovations. Adopt, integrate, and adapt to address capacity shortfalls.

Traditional networks





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



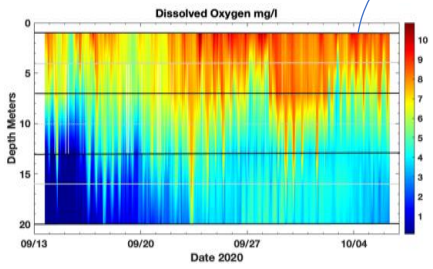
4. Improve assessment tools (4D water quality estimator)

Expanded capacity

Monitoring and assessment capacity building beyond traditional monitoring

Expanded capacity

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)

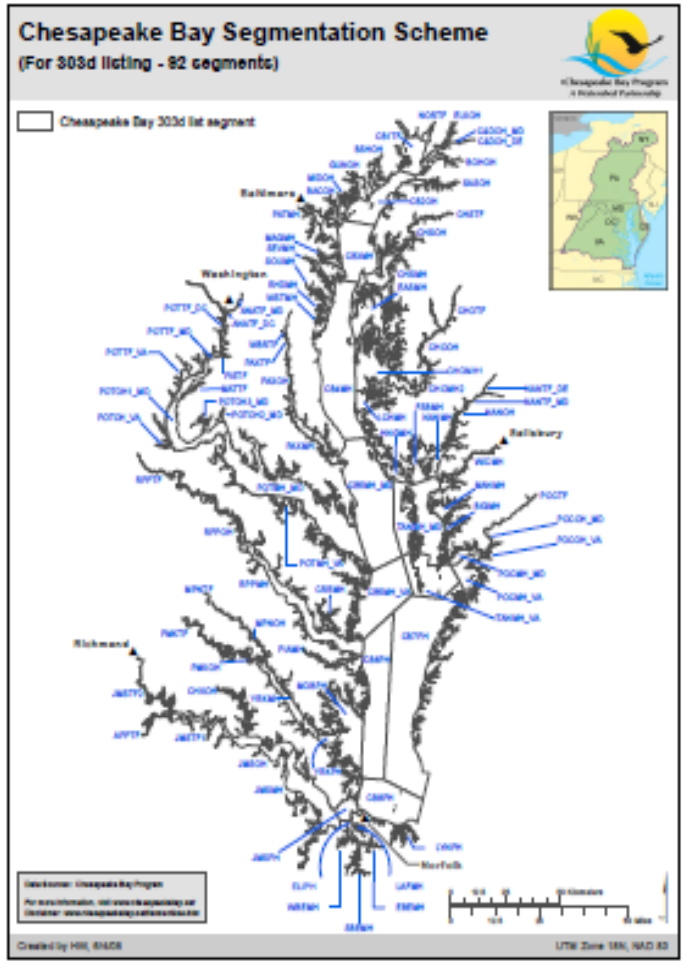
Full
Water Quality Standards Attainment Assessment for Chesapeake Bay

+

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

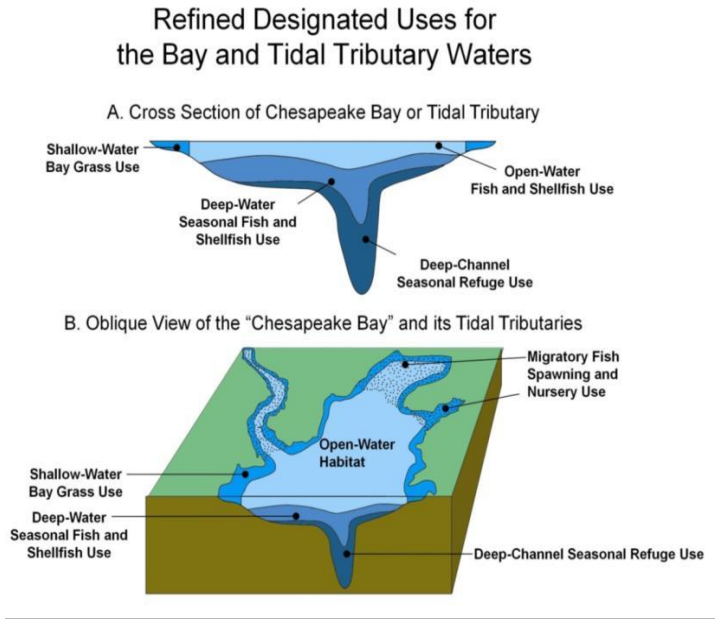


Water Quality Criteria:

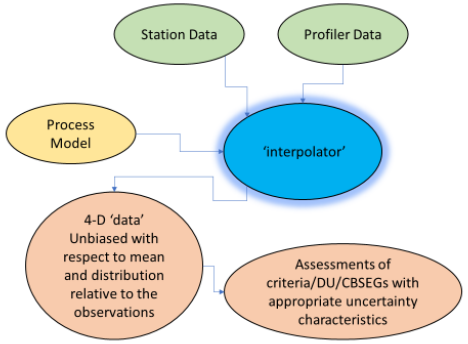
- Dissolved oxygen –
  - Requires temperature & salinity to define habitat

* Water clarity/SAV

* Chlorophyll *a*



4-Dimensional Assessment Framework is evolving



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

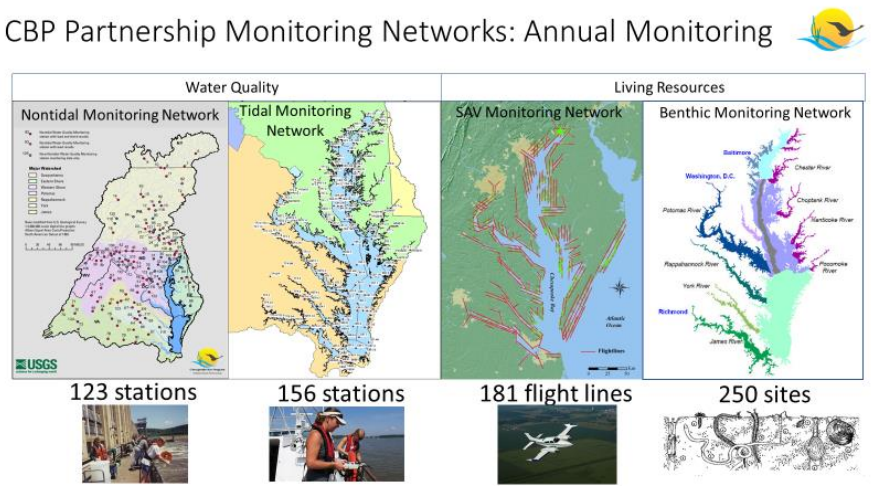
Assessments would be carried out in those areas and times-scales when uncertainty estimates are within acceptable ranges.

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

WQ Standards Attainment will be one priority… but not the only target

Traditional networks



- **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**

CRWG: Provide consultation on all networks to align monitoring with climate stressor info considerations

- **Provide guidance on aligning climate stressors with current monitoring networks**
  - E.g., What opportunities are there for better integrating citizen monitoring to help with monitoring needs?
  - E.g., What data is needed on increased water temperature and salinity to investigate impacts of climate change on freshwater SAV species, water quality standards
- **Identify beneficial use of existing monitoring data to support CRWG Outcomes**
  - E.g., Bay-wide water temperature indicator
- **Identify beneficial use of new monitoring innovations within the score of current networks**
  - E.g., Feed the new 4-dimensional interpolator with fisheries-based data collections that are already being used in fish habitat-climate interaction analyses
- **Track future monitoring needs through Strategic Science and Research Framework**

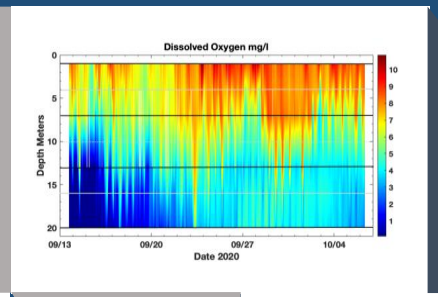
Next Steps

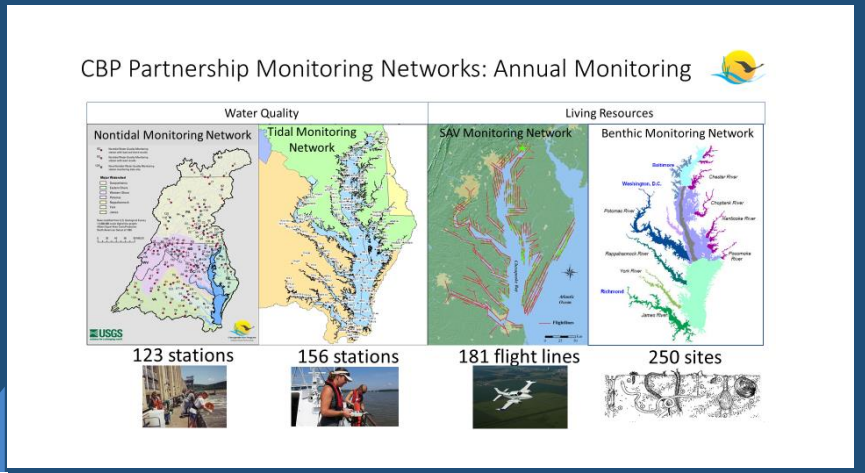
Deliver a work plan for PSC to endorse at their May 19, 2021 meeting

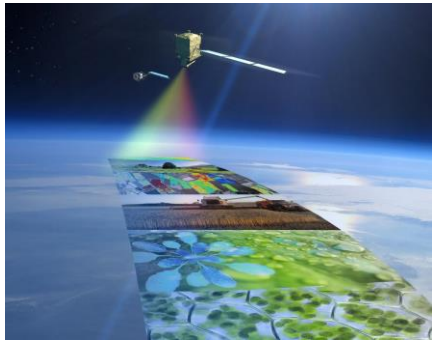
Coordinate with teams to address the questions for each network (Spring-Summer-Fall 2021)

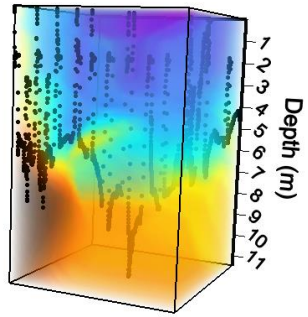
STAC workshop development and participation (fall-winter 2021-22)/recommendations tuning

Deliver recommendations to PSC by January 2022.









Thank you and Discussion

Chesapeake Bay Program
Science. Restoration. Partnership.

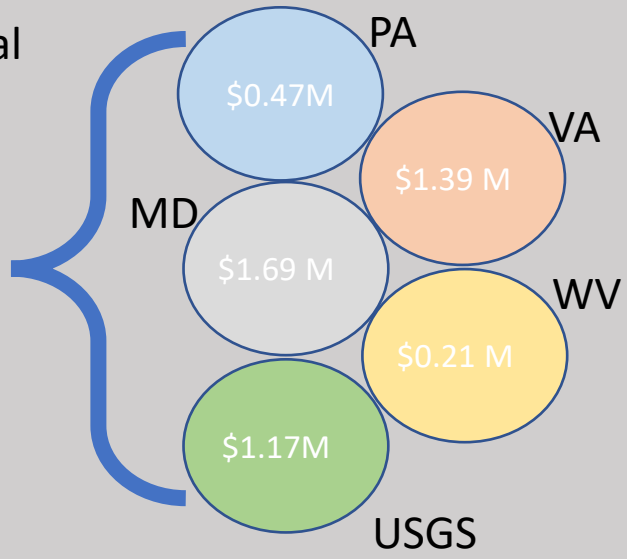
CRWG assistance –

- 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.

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 — $ 750K

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

Citizen Science — priceless

Partner support for monitoring — $ 7.0 M