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

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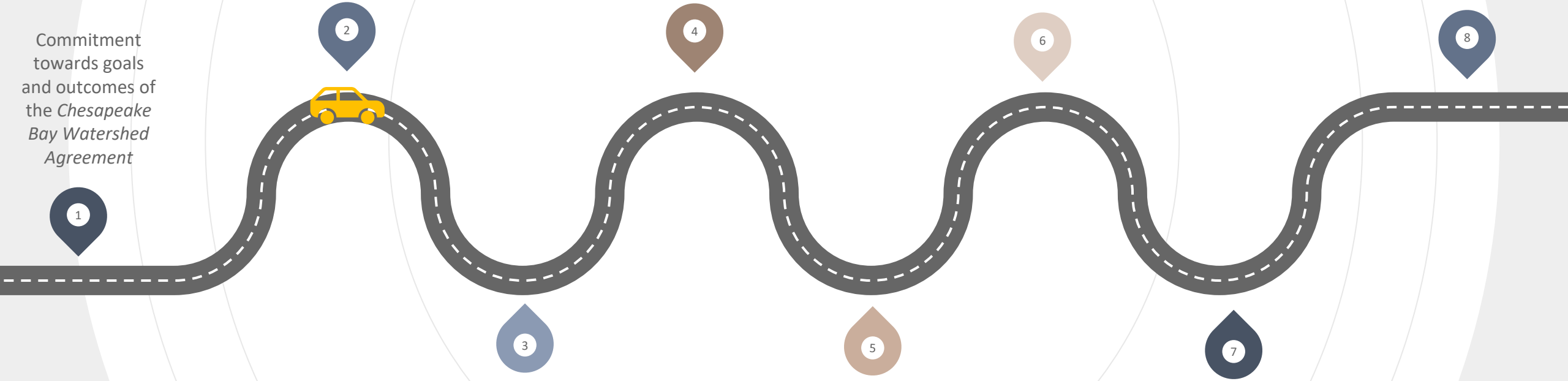
Chesapeake Bay Program

Water Quality GIT

February 28, 2022

Roadmap for PSC directed Monitoring Review



1. Commitment towards goals and outcomes of the *Chesapeake Bay Watershed Agreement*
2. PSC request on how to improve CBP monitoring networks
3. Meet with many monitoring representatives and GITs to understand networks' status and challenges
4. Produce report. Present opportunities to improve core CBP networks to PSC
5. Increasing monitoring capacity to attain WQ standards and track WQ improvements from implementation
6. Return to PSC with more mature monitoring needs for all Outcomes
7. Enhance monitoring and tracking progress for all Outcomes
8. Meet CBP Goals and Outcomes

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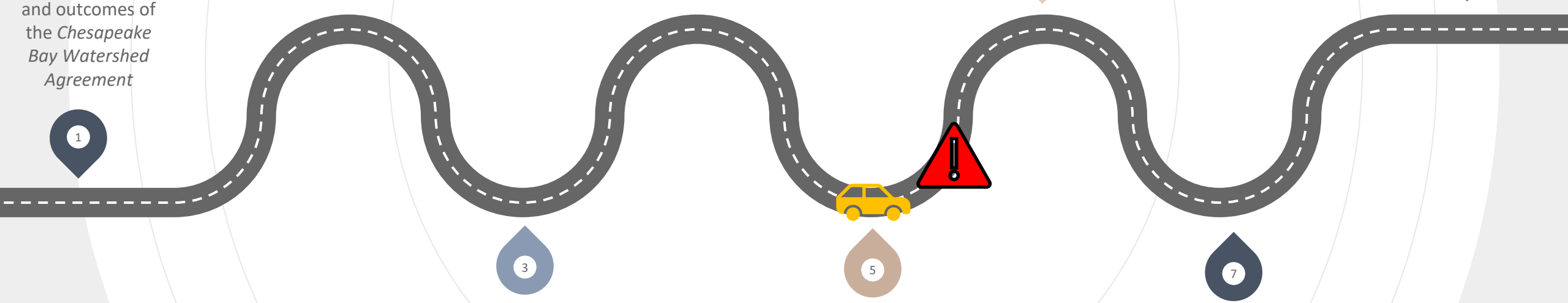
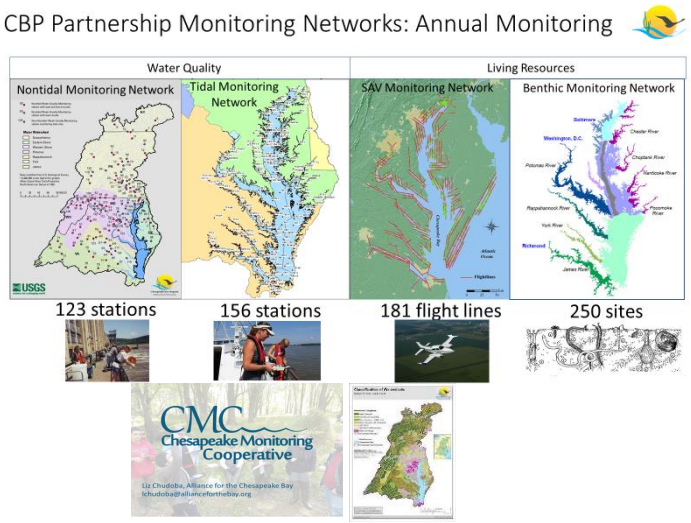


2021-22 Monitoring review

- We started with a vision of understanding core network funding status and coincident capacity gaps.
- We developed recommendations to address capacity shortfalls.

Traditional networks



Investments address gaps and expand capacity

Monitoring and assessment capacity building beyond traditional monitoring

Investments address gaps and expand capacity

Full

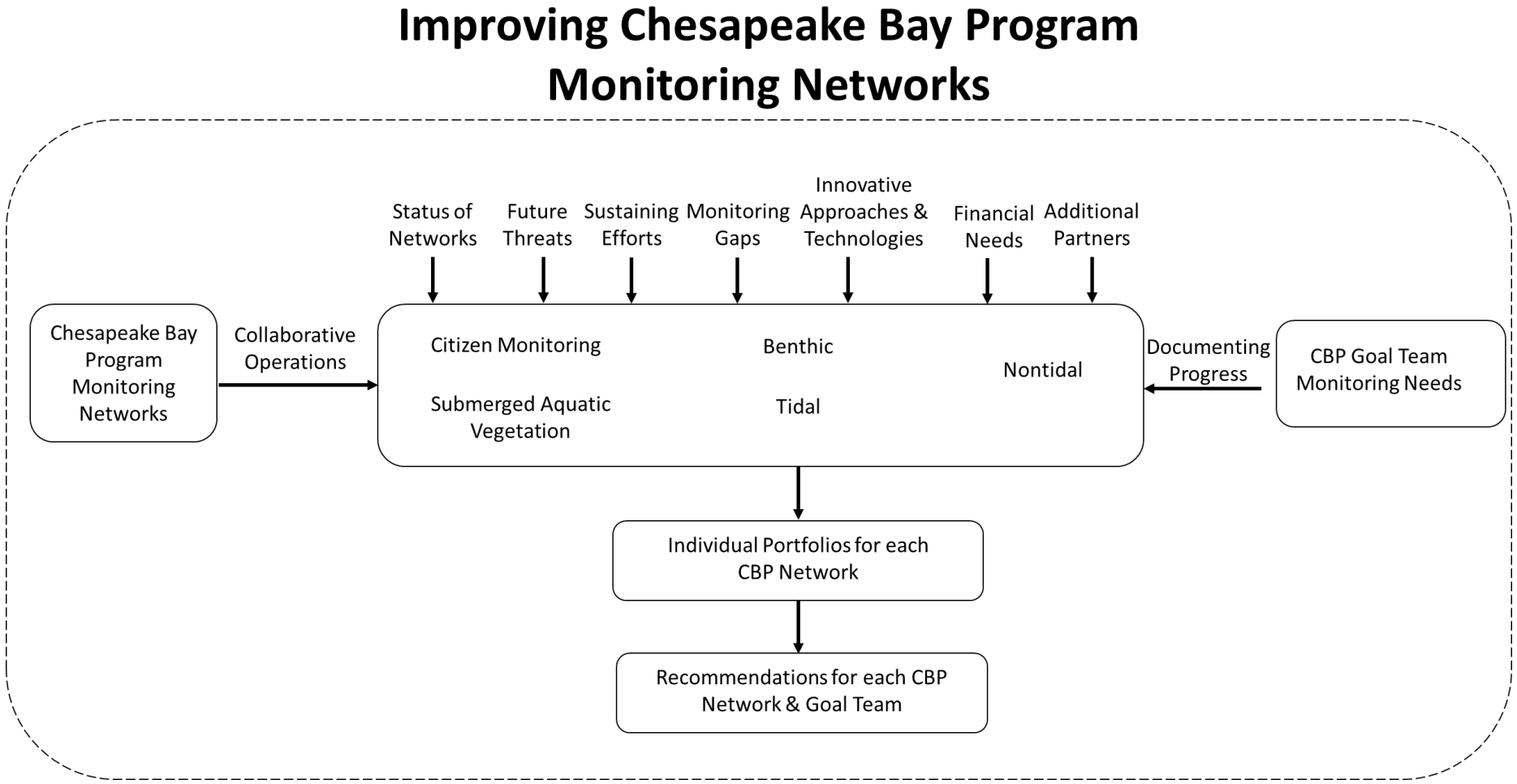
Water Quality Standards Attainment Assessment for Chesapeake Bay segments

+

CrossGIT Benefits

How did we get to the recommendations?

STAR-STAC team engaged multiple CBP partners and GITs to refine monitoring needs and develop recommendations.



Key Findings

- Monitoring is critical
  - Monitoring shows CBP partners progress from water-quality and restoration efforts
  - Need to maintain and enhance core CBP monitoring networks AND partner monitoring programs

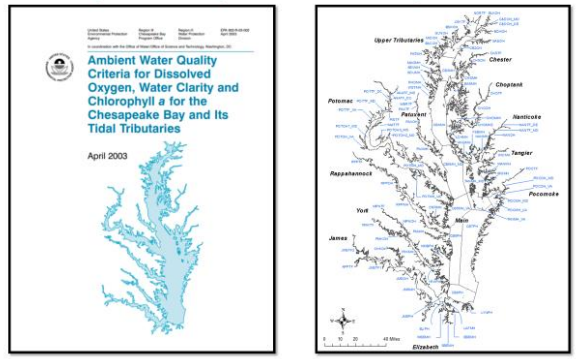
- Monitoring for many CBP outcomes is insufficient
  - No segment of the bay has assessed all water-quality criteria, and therefore can't be delisted!
  - Some Outcomes need a more coordinated effort to track progress
  - Some Outcomes lack information to assess progress

- Opportunities for fundings exist
  - The CBP partners committed to achieving these outcomes have a unique opportunity to build monitoring capacity.

Capacity building recommendations developed around 3 themes

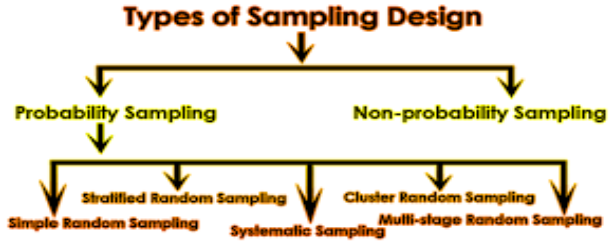
- Investment recommendations and supporting information relate to **3 themes**:
  - Assessing tidal water quality standards to support living resources
  - Evaluate implementation priorities for watershed-based outcomes
  - Document CBP progress toward Watershed Agreement goals and outcomes

Chesapeake Bay Water Quality Standards



Process of developing funding estimates:

- Needs assessments have been developed and cataloged into the CBP SSRF database
- Groups are developing sampling designs to address data collection needs
- Managers and scientists developed costs for each need based on proposed designs
- Cost estimates were collated and summed during the 9 month review process

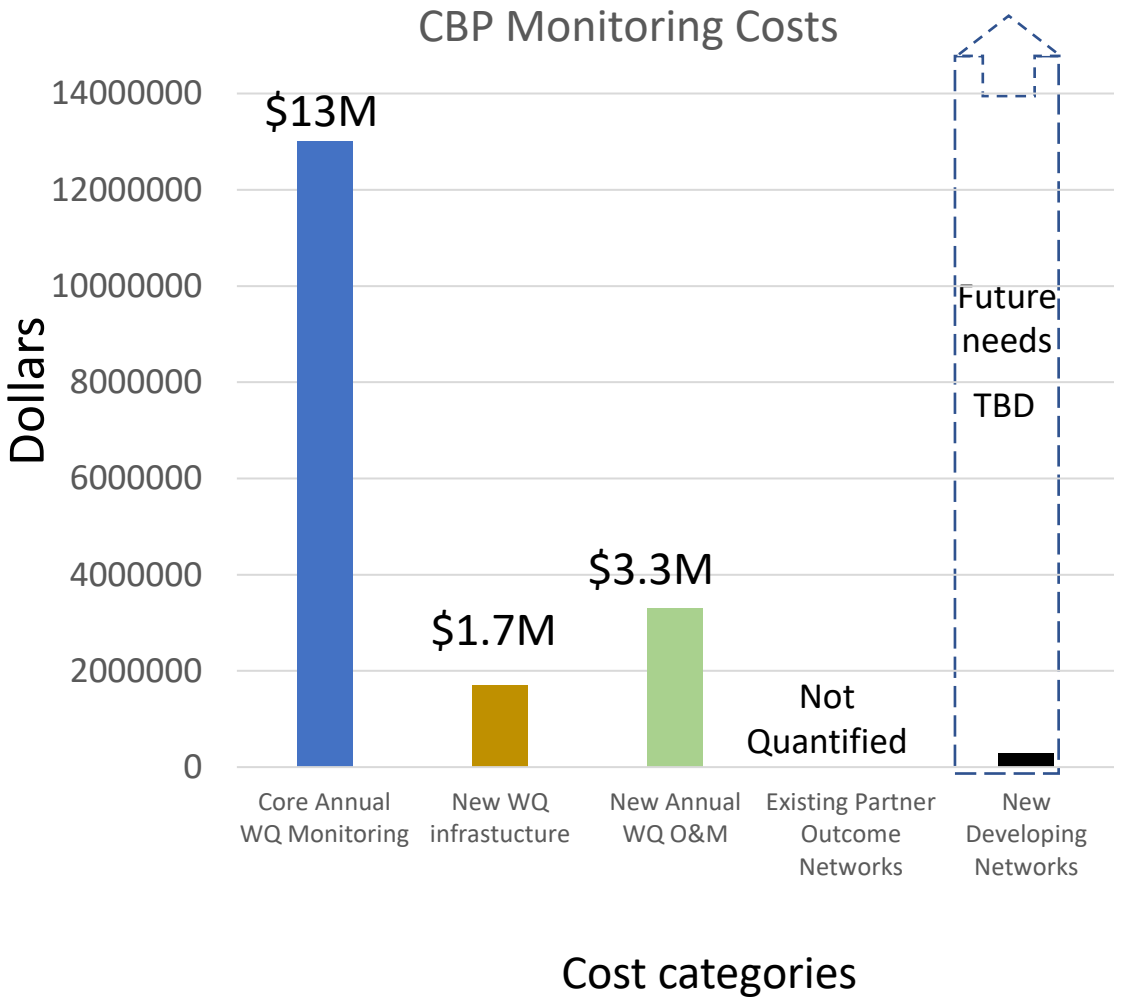


COST MANAGEMENT CATEGORY	Year 1
Salaries and Wages (Data management, regression development)	$21,520
Salaries and Wages (Installation of QW sondes)	$ 21,300
Equipment and Installation Supplies	$105,000

Total cost: $5.1M

Perspective: Big picture CBP monitoring funding with proposed new cost estimates for expanded monitoring needs

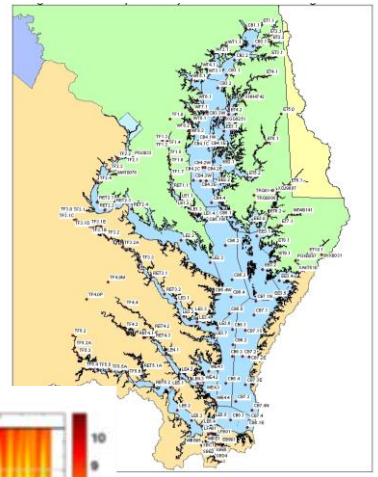
- "Core Annual Water Quality Monitoring Networks" = base funds, and they are:
  - Tidal Nontidal SAV Benthic (tidal)
  - Community Science Land Use Land Cover
- "New WQ Infrastructure" costs
  - derived from this monitoring review
- "New WQ Annual O&M" – annual costs
  - derived from this monitoring review
- "Existing Partner Outcome networks
  - not quantified for this review ($ Millions)
  - e.g. oysters, crabs, fish passage
- "New Developing Networks"
  - outcomes still working on their needs

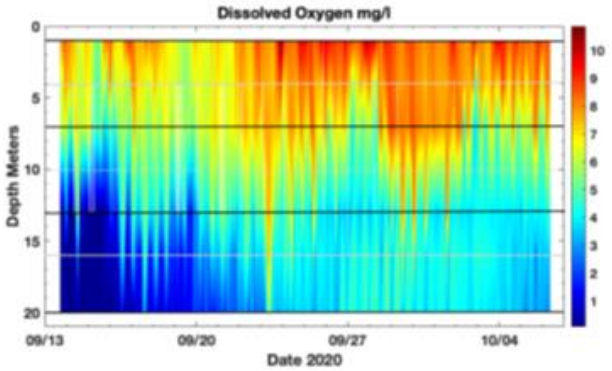


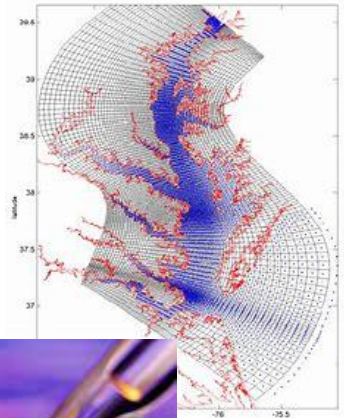
Just digging in a little on what is covered by the numbers then…

Tidal monitoring support requests

- Tidal enhancements amount to:
  - Maintain long-term programming consistent with COLA accounting
  - Hypoxia network development supporting data needs on unassessed short duration dissolved oxygen criteria and high temporal resolution fish habitat info.
  - 4D interpolator development to use our data effectively in assessments
  - Nutrient limitation program funding – test current statistical models of water quality change, calibrate and verify bay models of water quality

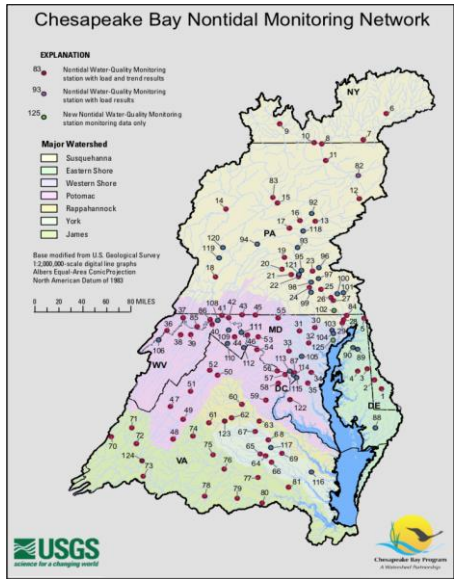


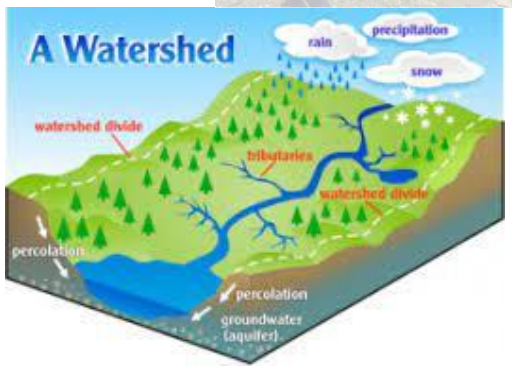


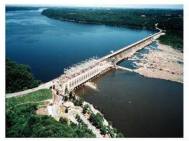


Nontidal monitoring support requests

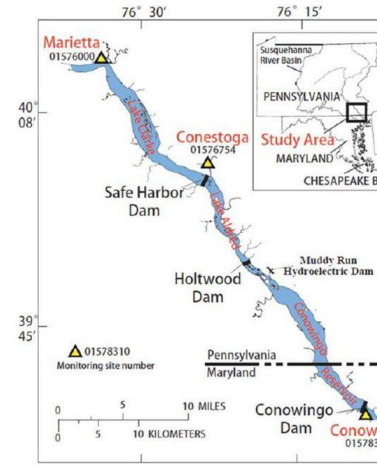
- Nontidal enhancements amount to:
  - Maintain consistency and integrity of long-term program
  - Expand RIM Continuous Monitoring to all stations (+1 Richmond, VA)
  - Lower Susquehanna River Monitoring enhancements (3 ConMon + discretes at Marietta)
  - Local scale management effectiveness monitoring (5 small watersheds)
  - Community science Nitrate Monitoring support







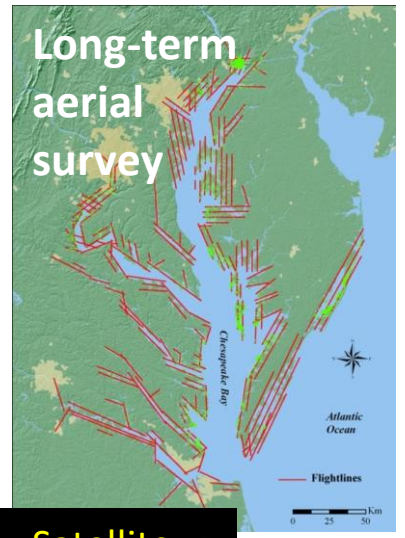
Lower Susquehanna River Reservoirs

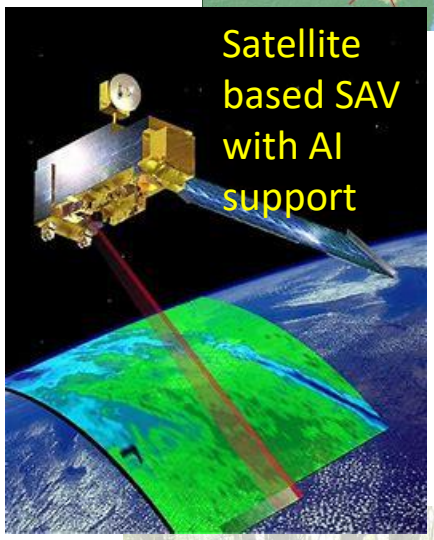


Sources: Langland, USGS, Bay Journal, Lower Susquehanna River Keeper

SAV monitoring support requests

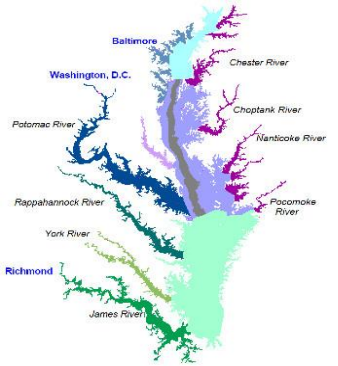
- SAV requests amount to:
  - Maintain consistency and integrity of long-term program
  - Expanding assessments with AI algorithm development support
  - Calibrate to historical assessments
  - Sentinel Site Network Development
  - Community Science SAV Watchers support





Also representing monitoring support requests

- Land Use Land Cover – tracking change over time



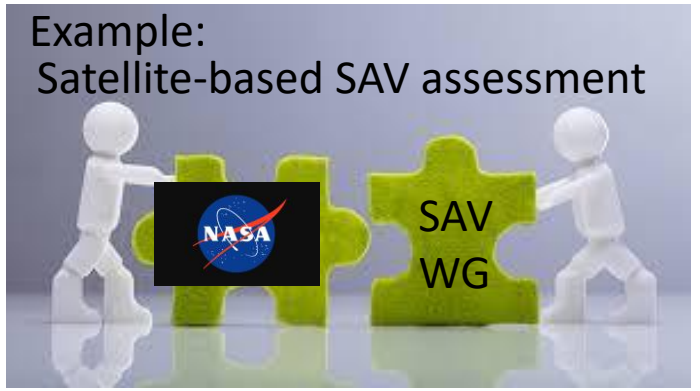
- Benthic macroinvertebrate (tidal) – cost of living

- Community Science – addressing capacity need to expand monitoring support in tidal and nontidal regions

Building Monitoring Capacity

- Need a *multi-partner approach* to invest in gaps.
- Partners can identify which monitoring items they want to support
- Example: Hypoxia collaborative

Several partnerships are developing!



Example: Small Watershed Network needs addressing BMP effectiveness

For PSC – Next steps

- The report will be shared with the PSC. MB, and CBP once completed.
  - Expected to be the end of March 2022

- **We ask the PSC to:**
  - **Form an action team** that will report out to the PSC on progress and identification of resources to fill needs
  - **Charge the action team** to evaluate, pursue and establish commitments to fund needed monitoring enhancements
  - **Each State and Federal Agency will designate a team member** to represent them on the action team
  - **Appoint STAR as the leader of the action team**

- **Identifying monitoring items for support doesn't commit an agency to provide resources.**
  - We need to have the more in-depth discussions on what are the potential resources
  - Based on these discussions, an agency can decide to move forward (or not) on providing resources

Thank You!

Questions?

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Chesapeake Bay Program

WQ GIT

February 28, 2022

Reference slides - Supplemental

Presentation example from the report - draft

Network Portfolios:
Basis for recommendations

Each Portfolio contains:

- Status
- Gaps
- Current Investment
- Innovations
- Vulnerabilities
- Monitoring Gaps
- Recommendations
  - LINE ITEM expressed in overall recommendations

TIDAL LONG TERM WATER QUALITY NETWORK – BAY MONITORING

RECOMMENDATIONS

- $100,000. Operations. Support network sustainability and integrity. Annual cost to tidal network funding addressing existing cost of living impacts in MD, Yr 1. Additional growth of $80,000 each year required in Yrs 2-5.
- $600,000. Infrastructure. Enhance hypoxia network efficiency and capacity with One time purchase of equipment and supplies for 8 advanced vertical profile water quality monitoring stations.
- $300,000. Operations and maintenance. Support the expanded hypoxia monitoring network to address short duration water quality criteria assessment. +5% COLA adjustment annually.
- $233,000. Operations. Nutrient limitation annual survey. Verify predictions on management progress, calibrate bay model. +5% COLA annually.
- $90,000. Infrastructure. Annual cost. Design & implement the 4-D interpolator. Support water quality criteria attainment assessments.
- **Total Infrastructure investment need:** $690,000 initially, 90K per year through 2025 for 4D tool development and implementation.
- **Total Operations and maintenance annual investment need:** Yr $633,000, estimated growth of 100K more needed each year in Yrs 2-5.
  - Funding for data analysis and reporting are not included.

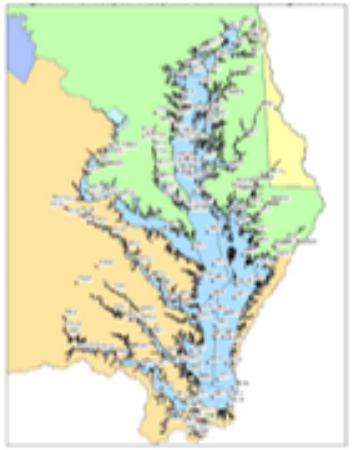

Figure 1. Tidal Bay Monitoring Program locations

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 baywide consistent collection and analysis protocols. One or more monitoring sites are located in each of the 92 Bay segments. 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. Advanced statistical analyses are used to report annual and seasonal trends.

VULNERABILITIES:

- Cost of living increases when funding remains unchanged leads to less buying power and decisions for reducing the size of the network.
- Winter weather influencing seasonal assessments

MONITORING GAPS:

- Short duration water quality (dissolved oxygen) criteria attainment assessment.
- Shallow-water monitoring representation.
- Annual full bay water clarity and chlorophyll measures and assessment

CURRENT INVESTMENT:

- Approximately $2.7M. Federal Clean Water Act 117e program funds which includes 1:1 matching support from grant partners.

INNOVATIONS:

- Robust, cost-effective continuous monitoring sensor units (vertical arrays) for open water, shallow and deep water, water column water quality monitoring. (oxygen, salinity and temperature)
- "Big data" management.
- Advanced statistical analyses

Tidal/Nontidal monitoring support requests

- Tidal enhancements amount to:
  - Maintain long-term programming consistent with COLA impacts
  - Hypoxia network development supporting data needs on unassessed short duration dissolved oxygen criteria and high temporal resolution fish habitat info.
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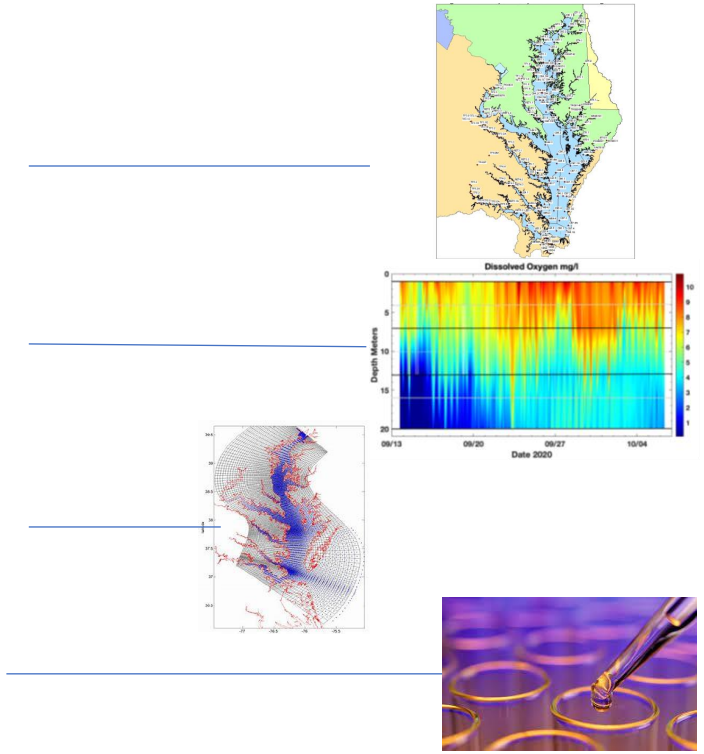

Cost *estimates* as of 2/22/22 PT&BS

			Year 1	Year 2	Year 3	Year 4	Year 5
Tidal WQ	Infrastructure	Vertical sensor arrays packages for adding 8 new s	600,000				
Tidal WQ	O&M	Vertical sensors arrays - operate/maintain	300,000	315,000	330,750	347,288	364,652
Tidal WQ	O&M	Sustain existing program	100,000	180,000	260,000	340,000	420,000
Tidal WQ	O&M	4D interpolator	90,000	90,000	90,000	90,000	90,000
Tidal WQ	O&M	Nutrient Limitation survey calibrate and verify m	230,000	235,750	241,644	247,685	253,877
Tidal WQ	O&M	VADEP 5% COLA (no increase in nearly 10 years)	50,000	52500	52625	52631.25	52631.56

Tidal/Nontidal monitoring support requests

- Non-Tidal enhancements amount to:
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  - Expand RIM Continuous Monitoring to all stations (+1 Richmond, VA)
  - Lower Susquehanna River Monitoring enhancements (3 ConMon + discretes at Marietta)
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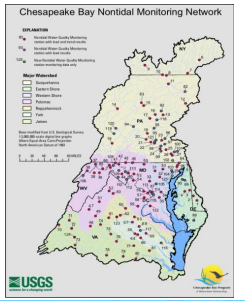

		Cost *estimates* as of 2/22/22 PT&BS	Year 1	Year 2	Year 3	Year 4	Year 5
Nontidal Network	Infrastructure	7 RIM Con-Mon sensor packages completes RIM n	455,000				
Nontidal Network	Infrastructure	3* Lower Susquehanna Reservoir input ConMons,	126,300				
Nontidal Network	O&M	10 more discrete samples at Marietta annually	17,460	17460	17722	17988	18258
Nontidal Network	O&M	new 7 RIM ConMon network O&M	210,000	214,200	218,484	222,854	227,311
Nontidal Network	O&M	Lower Susquehanna Reservoir (Marietta) ConMor	125,520	146,380	148,576	150,804	153,066
Nontidal Network	O&M	PADEP funded through EPA	233,000	233,000	233,000	233,000	233,000
Nontidal Network	O&M	Station loss backfill annual risks coverage	45,000	45,000	45,000	45,000	45,000
Nontidal Network	Infrastructure	5 new Small Watershed ConMon locations. 6 sens	375,000				
Nontidal Network	O&M	Operating 5 new Small Watershed ConMon locati	150,000	157,500	165,375	173,644	182,326

SAV monitoring support requests

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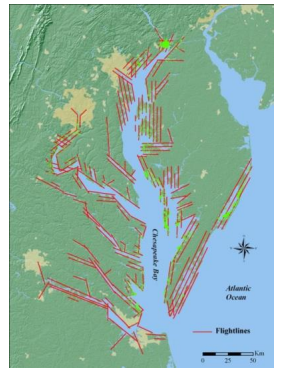
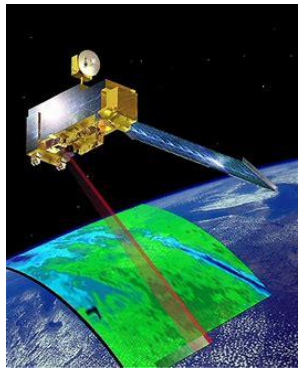


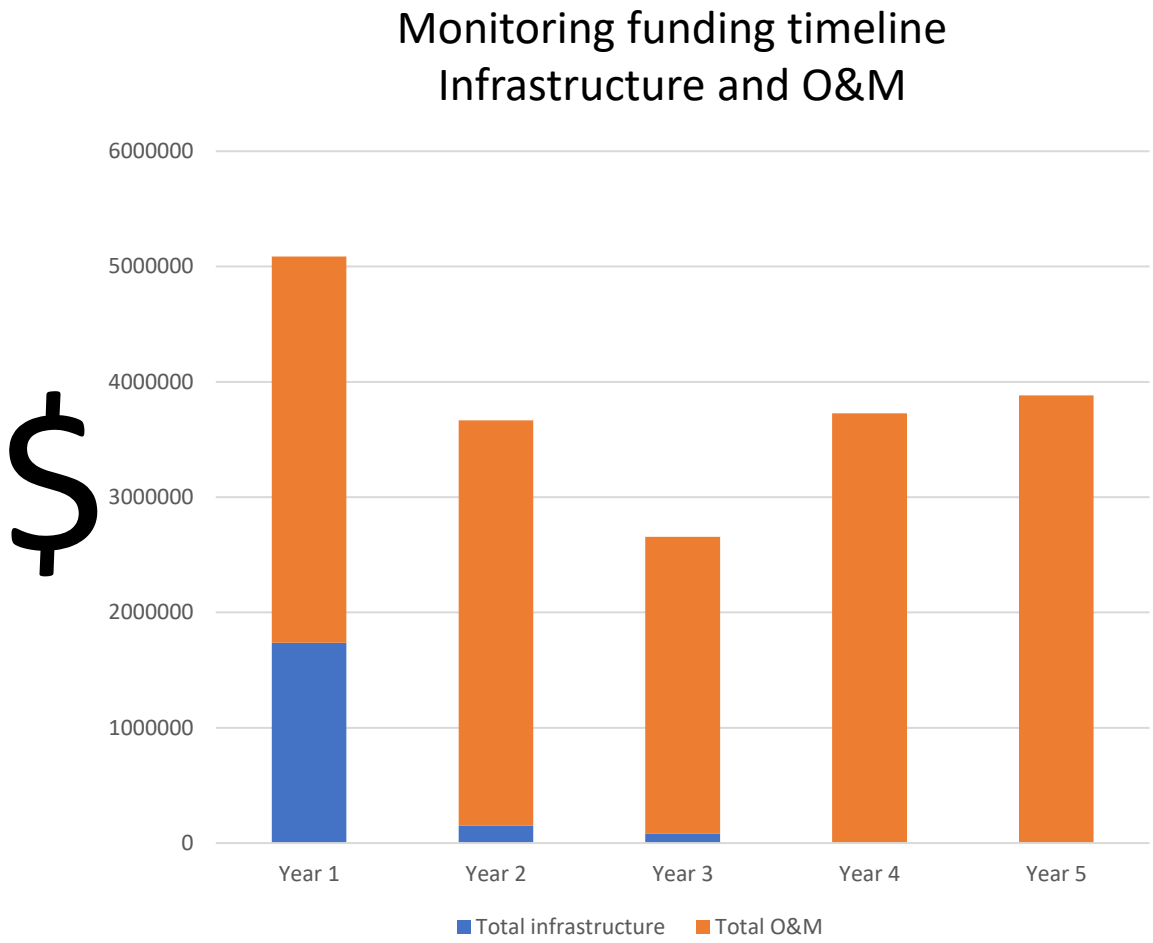


CMC
Chesapeake Monitoring Cooperative
Liz Chudoba, Alliance for the Chesapeake Bay
lchudoba@allianceforthebay.org

Cost *estimates* as of 2/22/22 PT&BS			Year 1	Year 2	Year 3	Year 4	Year 5
Tidal - SAV	Infrastructure	satellite imagery				TBD	TBD
Tidal - SAV	Infrastructure	AI interpretion of diverse satellite imagery	80,000	80,000	80,000		
Tidal - SAV	Infrastructure	Computer science SAV area polygon drawing with	70,000	70,000			
Tidal - SAV	O&M	Calibrate/align historical and new assessments			50,000	50,000	50,000
Tidal - SAV	O&M	Sentinel Site network	120,000	126,000	132,300	138,915	145,861
Tidal - SAV	O&M	Proof of concept: Test AI satellite-derived assessi	150,000	150,000			
Tidal - SAV	O&M	SAV program COLA of 5% annually	17,500	18,375	18,419	18,421	18,421
Community Science	O&M	Volunteer/Community Science SAV Watchers + N	205,000	215,250	236,013	247,813	260,204
Community Science	Infrastructure	SAV Watchers database development	30000				

Big picture of review findings
Monitoring funding – Timeline

- 5 year timeline
- $1M of O&M in year 1,2, 4 & 5 is Land Use Land Cover monitoring support.
- The rest is basically our water quality monitoring networks support



Projected estimated costs
Years 1-5