Science Needs of the Chesapeake Bay Program – Clean Water Cohort

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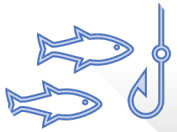
STAC Quarterly Meeting
12/6/2022

10 Watershed Agreement Goals

Chesapeake Bay Program
Science. Restoration. Partnership.


Sustainable Fisheries


Climate Resiliency


Vital Habitats


Land Conservation


Water Quality


Stewardship


Toxic Contaminants


Public Access


Healthy Watersheds


Environmental Literacy

Watershed Agreement

Chesapeake Bay Program
Science. Restoration. Partnership.

31 Outcomes:

specific, time-bound, measurable targets
that directly contribute to
achieving the Goals

A vast amount of science is required to achieve the goals and outcomes.

The Strategic Science & Research Framework was developed to increase the amount of science for the CBP

Photo Credit: William Parsons (Alliance for the CB)

SSRF provides a strategic approach to:

1.) **Gather, track, and maintain** science needs for each outcome

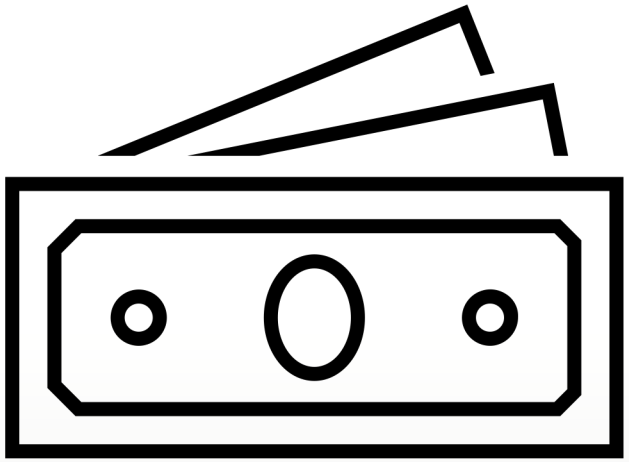
2.) Focus **existing resources** to help address the science needs

3.) Identify priorities for **new resources**

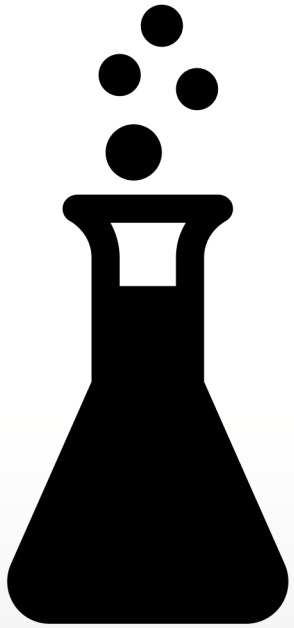
4). **Expand CBP science capacity** through more partnerships

Policy

Finance

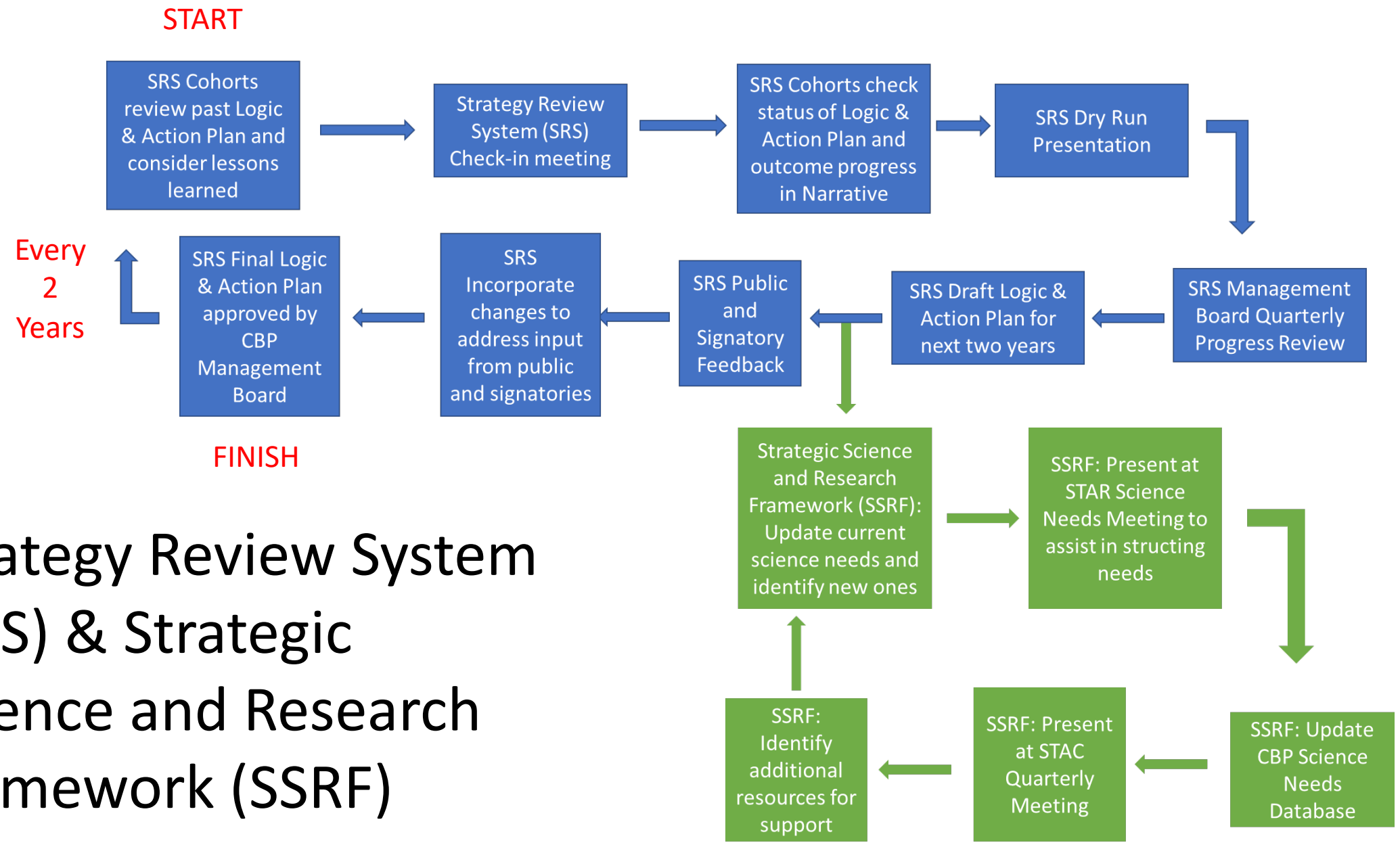


Science



SSRF

Strategy Review System (SRS)



Strategy Review System (SRS) & Strategic Science and Research Framework (SSRF) Processes

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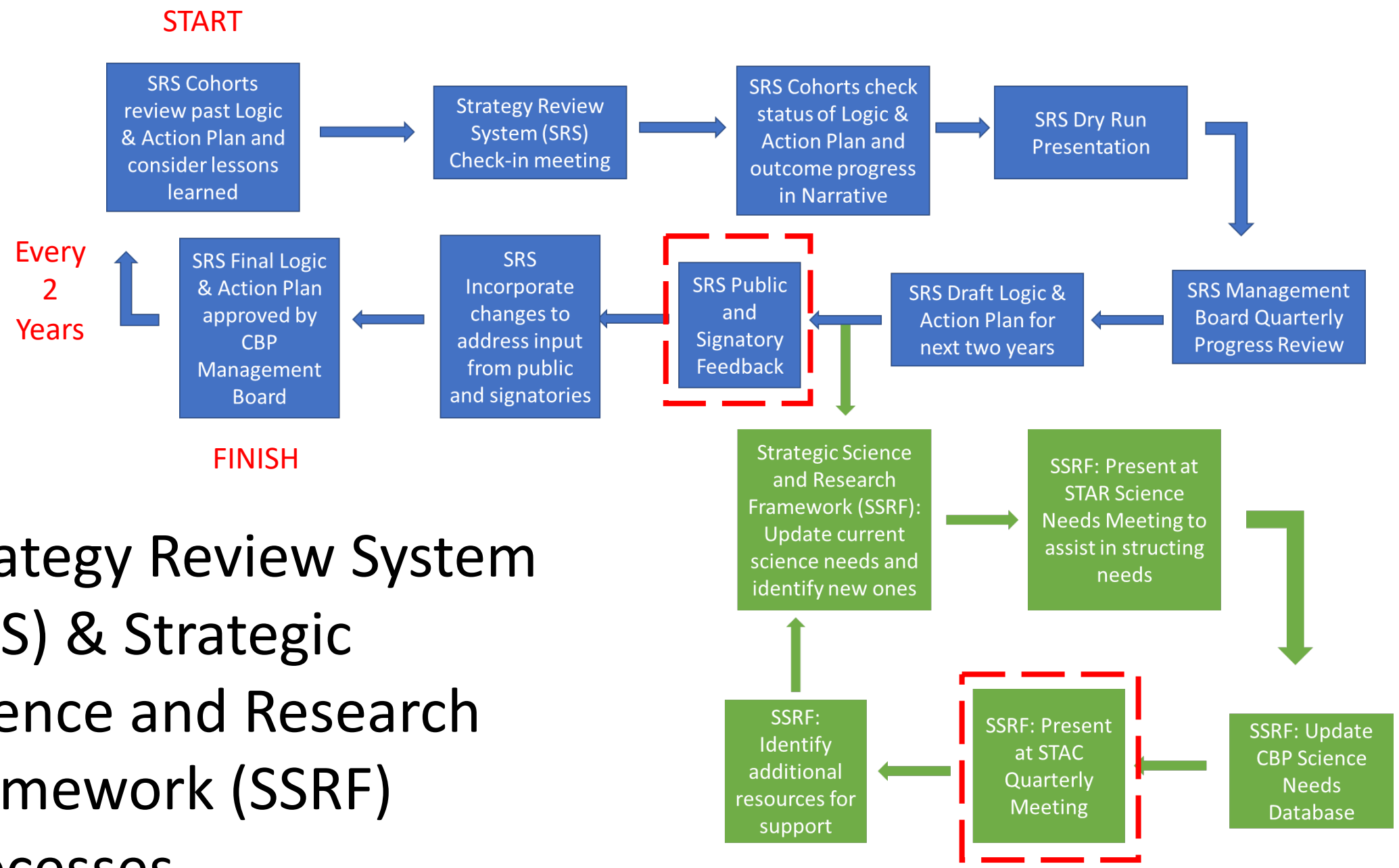

Clean Water Cohort

Feedback requested from STAC to expand science capacity:

- Do you or any of your colleagues have interest in contributing to addressing one of these needs?
- Do you or any of your colleagues know of existing efforts to support one of these needs?
- Do you want more information to come back to STAC from any groups on specific needs/projects?
- Are these needs appropriate? Do you see something missing?

Expanding Science Capacity: Examples

Faculty Research

- VIMS – Katrinna Nunez's research on shoreline inventory

Student Research

- VIMS – Katrinna Nunez's PhD student's research

Course Focus

- ODU – Introduction to Mitigation and Adaptation Studies Course, focus on Chesapeake Bay

Internships

- USGS – Internships with a regional focus, this summer is Chesapeake Bay

Department Seminars

- UMBC – Scientists share research, CBP share science needs

Toxic Contaminants Research & Toxic Contaminants Policy and Prevention Outcomes

- **Toxic Contaminants Research Outcome**
  - Continually increase our understanding of the impacts and mitigation options for toxic contaminants. Develop a research agenda and further characterize the occurrence, concentrations, sources and effects of mercury, PCBs and other contaminants of emerging and widespread concern. In addition, identify which best management practices might provide multiple benefits of reducing nutrient and sediment pollution as well as toxic contaminants in waterways.
- **Toxic Contaminants Policy and Prevention Outcome**
  - Continually improve practices and controls that reduce and prevent the effects of toxic contaminants below levels that harm aquatic systems and humans. Build on existing programs to reduce the amount and effects of PCBs in the Bay and watershed. Use research findings to evaluate the implementation of additional policies, programs and practices for other contaminants that need to be further reduced or eliminated.

Category of the need (Data gathering, monitoring, research)

Ongoing/In Progress/New Science Needs

- Assess effects of toxic contaminants on fish and shellfish in tidal waters (Research outcome)

  Engaged resources
  - Tracking studies and outcomes that examine the decline in tumor prevalence in the Anacostia River
  - Tracking study and outcome of the yellow perch condition in urban areas
  - Inform results and outcomes of studies designed to address temporal and spatial changes in fish health in mixed use watersheds in the freshwater portion of the Watershed

  Needed description (please remove reference to fish consumption advisors, that is not relevant to this need)
  - *New*: Impacts of PFAS on health of fish and shellfish (individual and mixtures of importance)
  - *New*: Guidance for PFAS sampling and analysis methods to support fish health studies and how it differs from sampling design for fish consumption studies (bioconcentration and biomagnification)

Status of the resource

- **Full resources**
- Partial resources
- No resources

Category of the need (Data gathering, research, Synthesis)

Ongoing/In Progress/New Science Needs

- Document occurrence, concentrations, and sources of legacy and widespread contaminants in different landscape settings (Research outcome)

  Engaged Resources
  - Tracking of results and outcomes of studies examining occurrence and concentrations of PFAS in wastewater effluent, streams receiving wastewater (USGS)
  - Tracking of results and outcomes of studies examing occurrence and concentrations of PCBs and PFAS in wet pond drainages categorized by land use (USGS)
  - Ongoing inventory of PFAS sampling efforts in the watershed that includes sampling and analysis methods leading to a mixture of the most common PFAS from common sources. (STAC Workshop)

  Needed Descriptions
  - *New*: Utilize DRBC databases of 1668 (congener-based) PCB data and PCB-era and current land use to develop a statistical model to identify patterns in PCBs related to current and/or former land use categories.
  - New: Utilize USGS data release (Banks and others, 2022 Priority Toxic Contaminant Metadata Inventory and Associated Total Polychlorinated Biphenyls Concentration Data - ScienceBase-Catalog)) to assess retrospective statistical trends in PCBs in fish tissue in 3 basins of the Chesapeake Bay watershed; lower Susquehanna, James, and Potomac

Status of the resource

- Full resources
- **Partial resources**
- No resources

Category of the need (Research, Synthesis)

Ongoing/In Progress Science Needs

- **Improved understanding of BMP effectiveness for removal of PCBs** (Other goals/outcomes: TC Research outcome, including other contaminants)
  Engaged Resources:
  - Reporting of results and outcomes of study investigating wastewater BMP effectiveness (Majcher and others, 2022)
  - Reporting of results and outcomes of bioretention efficacy and optimization for toxic contaminant removal (PCBs, metals, etc.; Kjellerup and Davis projects), and associations with land use (CBT restoration research effort)
  - To date literature review of BMP science advances (USGS), *paper in preparation* and bibliography included in MDE PCB TMDL guidance document

  Needed Description: Quantifying co-benefits for PCBs from most commonly used practices for nutrient and sediment reduction
  - *Remaining need*: Ongoing literature tracking of BMP removal efficiencies for PCBs and other toxic contaminants
  - *Remaining need:* Promote projects and studies that quantify removal of PCBs (other toxic contaminants) in common BMPs in different land use settings for sediment and nutrients.
  - *Remaining need*: Summary science document from January national PCB strategy meeting documenting differences between the regions and any progress related to BMP removal efficiencies for PCBs

Status of the resource

- Full resources
- **Partial resour**
- No resources

2025 Watershed Implementation Plans (WIP) Outcome

- By 2025, have all practices and controls installed to achieve the Bay's dissolved oxygen, water clarity/submerged aquatic vegetation and chlorophyll *a* standards as articulated in the Chesapeake Bay TMDL document

Support for additional multiple tributary models (MTMs) for Phase 7

- Additional fine-scale tributary models if funding is available, to support 1) Patuxent, 2) Chester, and 3) Pocomoke tributary modeling in collaboration with CBPO Modeling Team and other MTM teams.
  - Available resources are supporting 6 MTMs for the Potomac, York, James, Rappahannock, Choptank and Patapsco tributaries.

Status of the resource

- Full resources
- Partial resources
- **No resources**

Water Quality Standards Attainment and Monitoring 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.

WQSAM Analysis Science Needs: **Monitoring**

- All priority monitoring needs for the CBP core networks can be found in the report, “Enhancing the Chesapeake Bay Program Monitoring Networks.”
  - https://d18lev1ok5leia.cloudfront.net/chesapeakebay/documents/FINAL_Enhancing_the_Chesapeake_Bay_Program_Monitoring_Networks_A-Report_to_the_Principals_Staff_Committee_10.13.22-1.pdf
- CBP core networks include:
  - Tidal WQ
  - Nontidal WQ
  - SAV
  - Benthic
  - Community Science
  - Land Use

WQSAM Analysis Science Needs: **Tidal Analysis**

A. Needs related to criteria assessment	Status	Resources
1. Develop a 4-D interpolator to allow for evaluation of all DO criteria	Work underway at CBP and with contractors	Partial
2. Track/communicate/explain tidal water quality standards attainment/attainment deficit patterns and trends		Partial
3. Evaluate methods and potentially update protocols for criteria assessment to address more temporal periods and use new types of data (e.g., high temporal density water quality, remote sensing)	2 STAC Workshops completed, 1 workshop report still in progress	Present work funded, eventual STAC-review capacity needs

WQSAM Analysis Science Needs: **Tidal Analysis**

B. Needs related to explaining change in the estuary	Status	Resources
1. Finish cluster analysis tool to group tidal trend patterns	Work underway through ITAT with contractors	Partial
2. Improve understanding of bay response to loads and BMPs: multiple possible directions include overall water quality, just shallow-water regions, and/or living resources habitat	Some collaborative researchers' current work is relevant, but little CBP capacity to integrate or apply this research currently	Partial
3. Integrate tidal & nontidal water-quality trend results	Some discussion between tidal & nontidal teams, but no resources or current work	No
4. Accelerate shallow & open water attainment with focused nutrient and sediment reduction practices		No

WQSAM Analysis Science Needs: **Nontidal Analysis**

A. Needs related to understanding the changes in water-quality patterns in the watershed	Status	Resources
Improve understanding of source sector contributions to N,P,S loading, and how these landscape sources are changing over time.	In Progress	Partial Resources
Better describe patterns of nutrient and sediment trends and analyze patterns of trends in major sources sectors: agricultural, urban, air deposition - to attempt to explain why we observe given trends in monitored streams.	In Progress	Partial Resources
Collaborate with jurisdictions to communicate understanding related to nutrient and sediment trends, as well as the understanding of the drivers of these changes; based on this new understanding develop updated science needs	In Progress	Partial Resources
Improve understanding (conduct analysis) and build capacity for analysis and communication of linkage between watershed changes (including BMPs and land change), to loads to tidal water, and estuary response	In Progress	Partial Resources

WQSAM Analysis Science Needs: **Nontidal Analysis**

B. Other specific needs	Status	Resources
Compare observed and expected trends in watershed model where differences were identified	In Progress	Partial Resources
Analysis of continuous water-quality records for trend determination.	Planned	No Resources
Analysis of small agricultural monitoring data sets for determining the effects of conservation practices. Note that new analyses are likely needed.	Planned	No Resources

Top Priorities for WQSAM Science Needs - WQGIT and STAR

- Tidal Analysis
  - Criteria Assessment Needs
    - **STAR & WQGIT:** Track/communicate/explain tidal water quality standards attainment/attainment deficit patterns and trends
  - Change in the Estuary Explanation Needs
    - **STAR & WQGIT:** Improve understanding of bay response to loads and BMPs: includes overall water quality, shallow-water regions, and/or living resources habitat
- Nontidal Analysis
  - Understanding Changes in Water Quality Patterns in the Watershed Needs
    - **STAR & WQGIT:** Improve understanding (conduct analysis) and build capacity for analysis and communication of linkage between watershed changes (BMPs and land change)
  - Other Needs
    - **STAR:** Analysis of small agricultural monitoring data sets for determining the effects of conservation practices. New analyses are likely needed
    - **WQGIT:** Compare observed and expected trends in watershed model where differences were identified

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