The Strategic Science and Research Framework for the Chesapeake Bay Program.

Updated August 15, 2022

Purpose of the Strategic Science and Research Framework

The Chesapeake Bay Program (CBP) Strategic Science and Research Framework (SSRF) identifies and helps prioritize science needs of the partnership. The SSRF is an on-going, repeatable process that supports the CBP Strategy Review System (SRS) decision framework. The results from the SRS are used to help consider science gaps needed to be fulfilled to achieve a CBP outcome. SSRF aligns with SRS by focusing on those science gaps, identifying actions needed to complete those science gaps, and focus existing science resources and leverage the research enterprise to more effectively provide science to advance Chesapeake restoration and conservation efforts and decision making. SSRF expands CBP science capacity through more partnerships. The SSRF is overseen by the Scientific, Technical Assessment and Reporting (STAR) team, with input from the CBP Goal Implementation Teams (GITs), and interaction with the Science and Technical Advisory Committee (STAC) (Figure 1).

Long-term fundamental science and research gaps, and operational short-term needs, are included in SSRF. Short-term needs tend to be on the operational side of GIT Logic and Action Plans and include development of indicators, analysis of existing information, GIS support, and applications of models. Longer-term needs often relate to filling fundamental gaps in knowledge and understanding, and include monitoring of trends, development of new models, and research to better understand complex issues.

Each quarter, selected CBP outcomes are reviewed through the SRS process and the science needs are updated for the SSRF. The updated science needs are stored in the Chesapeake Bay Program Science Needs database which is used to summarize the type of needs and identify potential science providers. The science needs are shared with Chesapeake science community with the objective to increase the science capacity. The science community includes academic institutions (including those on STAC), federal and state agencies, and nongovernmental organizations.
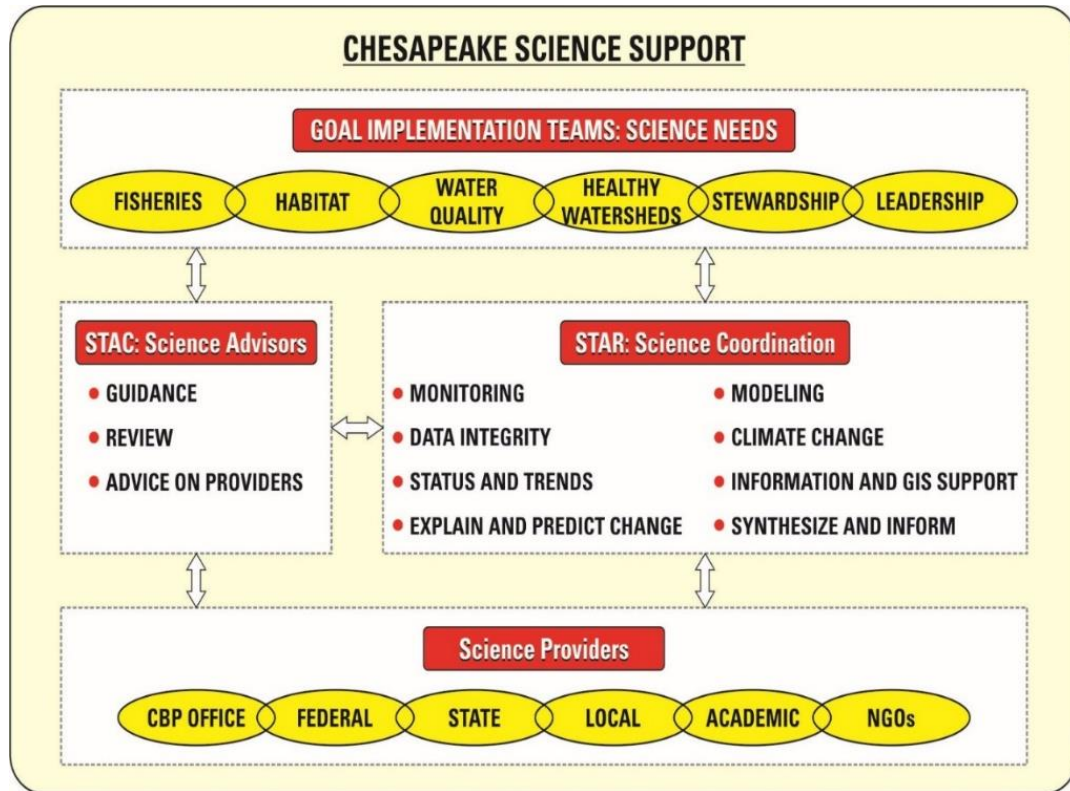
Figure 1. Current structure of science support within the Chesapeake Bay Program

Overview of Information in the Strategic Science and Research Framework

The SSRF contains information on the science needs and potential resources to address the needs. The type of information includes:

- Natural or social science needs from several sources including (1) science items identified for each CBP outcome through the decision framework used in the SRS process, (2) GIT input on science needs that have been given to STAR, and (3) previous recommendations from STAC workshops that address operational and fundamental research needs.
- Resource Assessment: The science needs are assessed if they are being met by CBP science providers, or if additional partnerships need to be explored. The resource assessment includes science activities provided directly by the CBP and additional efforts by federal, state, and academic partners. The CBP funded efforts include support from the modeling, monitoring, and GIS teams, GIT grants, and cooperative agreements with states, federal agencies, and academic institutions. Additional efforts include agencies or academic institutions that directly fund Bay-related research and monitoring efforts.
- Details on the types and priorities of the science needs. For science needs that are not being addressed, the GITs provide more information on the type of needs and their relative priority of operational and fundamental science needs. Examples of operational science needs include development of indicators, GIS support, data gathering, and analysis of existing information. Examples of longer-term fundamental needs might include advances in monitoring and research to address an outcome.
- In addition to the GIT needs, there are additional fundamental science needs that need to be brought forward. Examples include advances in monitoring and research to address a variety of knowledge gaps with implications for Bay management (e.g., predicting human behavior and

incorporating characterized uncertainty/risk toward making more robust decisions). STAC will continue its effort to identify critical science needs and potential emerging issues through its various proactive and reactive efforts (e.g., workshops, reviews, and whitepapers) and connect them back to CBP outcomes.

Chesapeake Bay Program Science Needs Database

The short- and long-term science needs of the partnership identified through the Strategic Science and Research Framework are captured and tracked in the [Chesapeake Bay Program Science Needs Database](#), which is continually updated throughout the year. The database provides an up-to-date list of science needs from across the partnership and additional information on each need such as detailed description, status, and engaged or potential resources identified to address the need. Science needs captured in this database are identified 1) by GITs as necessary to make progress toward Chesapeake Bay Watershed Agreement goals and outcomes, 2) through the CBP's SRS, or 3) from CBP's STAC workshop report recommendations connecting to a CBP outcome.

CBP uses this database to engage stakeholders, identify opportunities to better align or evolve resources, update activities and workgroups to address needs, and inform STAC of research priorities. This database can also be used by science providers to identify projects or collaborations of interest on which to engage CBP. Science providers can represent a wide range of entities including, but not limited to, academic institutions, federal and state agencies, local entities, non-profit organizations, and citizen science programs.

Approach of the Strategic Science and Research Framework and Alignment with the SRS.

The SSRF provides a strategic approach to:

- Continue to gather, track, and maintain the operational and fundamental science needs identified for CBP outcomes.
- Identify, and prioritize knowledge gaps that need to be addressed.
- Assess existing efforts by CBP and partner science providers to align efforts to address the existing and new needs
- Leverage the research enterprise by recommending approaches for CBP and partner resources to address operational and fundamental science needs and knowledge gaps.
- Expand CBP science capacity through more partnerships
- The results from the framework would be updated for each SRS biennial meeting.

Alignment with SRS and CBP Cohorts

SSRF was first initiated in 2019 and has evolved to help the partnership coordinate, track, assess, prioritize, and recommend resources for science needs identified to advance Chesapeake restoration and conservation efforts. A key component of SSRF is that it aligns with and integrates into SRS, CBP's current adaptive management decision-making framework (Figure 2.). SRS runs on a two-year cycle to give each "cohort" of workgroups and GITs an opportunity to report their progress on their associated outcome in the Chesapeake Bay Watershed Agreement. Cohorts are encouraged to consider new science needs while developing their SRS materials and identify any changes to those needs and any new emerging needs through SSRF.

SSRF

Each Outcome can update throughout the year

Track and Update Science Needs in CBP Science Needs Database

Conduct resource assessment for science needs

Engage with stakeholders to align resources

Recommend approaches for CBP partners to address science needs

Outcomes prioritize their science needs

Identify Scientific Knowledge Gaps

Identify Areas Outcomes Need Support on Scientific Challenges

Identify Scientific Factors Influencing Short – term and Long-term Actions

Assess Progress on Scientific efforts

SRS

2-year cycle for each Outcome

Track and Update Outcome Progress through Narrative Analysis, Logic & Action Plan, & Management Strategy

Review process for progress of all aspects of an Outcome – science, policy, financial, communication, engagement
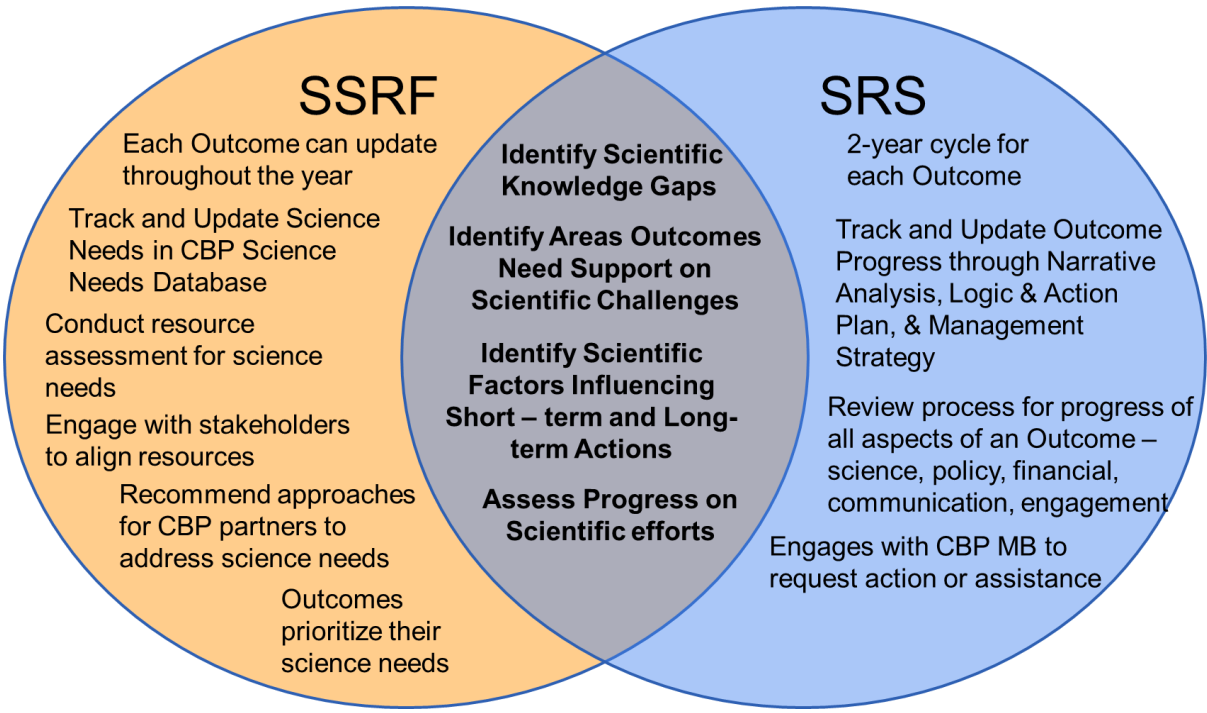
Engages with CBP MB to request action or assistance

Figure 2. Conceptual model representing the two different CBP processes, SSRF and SRS, and how they are complementary in identifying science needs to achieve the CBP outcomes.

Preparation of updating a cohort's science needs begins with the SRS check in meeting. At the meeting, a SSRF team member provides a brief overview of SSRF, a description of information captured with each science need, and timeline for upcoming meetings and material due dates. The cohort is directed to the CBP Science Needs Database to review their current science needs and a master list of all CBP science needs. It serves as a resource as they go through their progress review process, and they will provide an update on their science needs at a later date.

Six Weeks after the cohort's Quarterly Progress Meeting, a representative from each outcome presents their updated science needs at the STAR Science Need meeting for a discussion about the status of current needs, details about emerging needs, support for structuring actionable needs, and potential resources to address them. This meeting captures science needs that are necessary for making progress on the goals and outcomes of the Watershed Agreement. Science needs can cover a breadth of categories including social science, data gathering, and training related to technical information. The science needs list does not need to be finalized by the STAR meeting, but a draft update is required for discussion. Based on the discussion at the STAR Need Meeting, finalized science needs are due to STAR two weeks after the STAR meeting to input into the CBP Science Needs Database.

Following the STAR meeting, cohorts present a subset of science needs at the next STAC Quarterly Meeting. This is an opportunity to share CBP science needs with the academic community to assess current efforts to address any of the science gaps and potentially drive research directions. It also provides STAC members an opportunity to address any science needs that may be missing. An Outcome representative provides details on one or two science needs, along with suggestions on how STAC members could assist in addressing research-based gaps.

Science needs may be continually updated through discussions with STAR, but the overall application of SSRF in accordance with SRS is not repeated until the Cohort goes through the SRS process again, two years later (Figure 3).
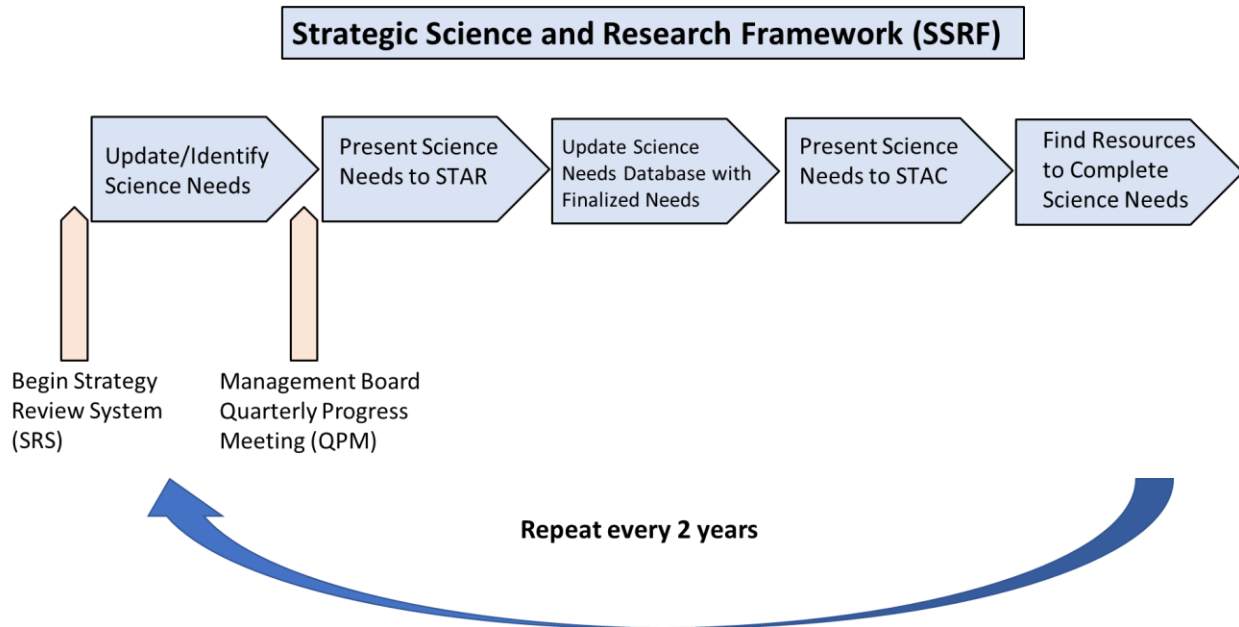
Figure 3. Strategic Science and Research Framework approach and timeline.

Strategic Science and Research Framework: Resource Assessment

Through the SSRF, the CBP better understands the science needs across the partnership and continues to provide a strategic approach to partner resources to address operational and fundamental science needs and knowledge gaps. Many key players in the CBP utilize the Science Needs Database and provide resources to support the needs. Managers reference it in strategic discussions about how to allocate budget and contract resources. CBP Workgroups/GITs use it to identify projects for GIT funding as well as other funding sources such as the USEPA Regional-ORD Applied Research Program (ROAR) and determine common needs across the program to address together. The CBP utilizes the database to align internal resources to meet needs and accomplish requests from the Principal Staff Committee. Federal agencies such as the U.S. Geological Survey (USGS) have reviewed the science needs to evolve their USGS Chesapeake Science Strategy.

If a science need requires additional support or does not have any engaged resources, STAR uses a decision tree to strategize what resource would be most beneficial to the science need. First, the science support teams within the CBP, modeling, monitoring, and GIS, are considered. Depending on the scope, capacity, and expertise of the CBP teams, they can evolve their work to advance the science need. If support within the CBP is not possible, the next step is to consider CBP partners, including federal and state agencies, local entities, nonprofit organizations, community science programs, and academic institutions (Figure 4). Request to these partners for the science need may be for funding to execute the need, expanding their staff support to address a need, collaborating as a team, or helping increase the knowledge of a science topic. Each science need requires its own specific action and resources so there is no direct line for which CBP partner to always consider first, but this does allow for the CBP GITs to build relationships with a diverse set of partners.
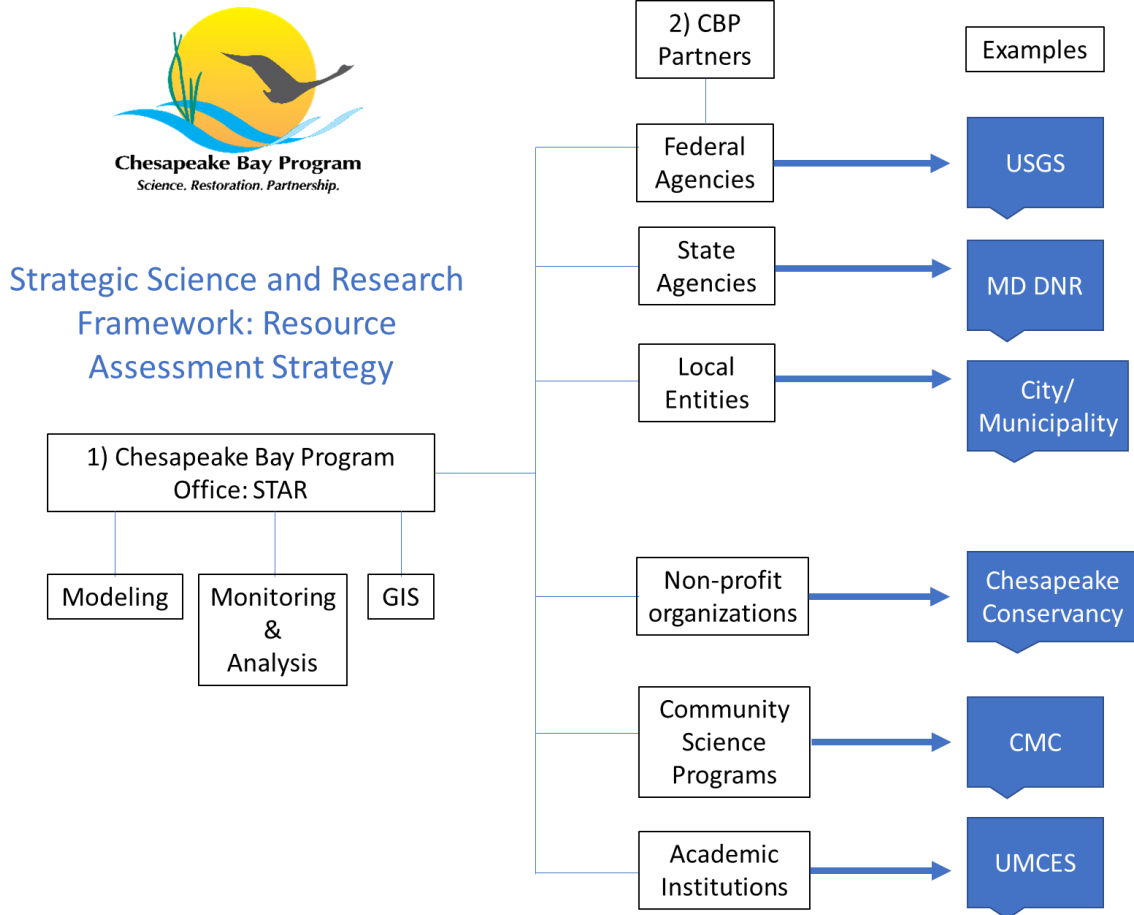
Figure 4. Resource assessment strategy for the Strategic Science and Research Framework.

Application of the SSRF information by CBP Office and partners

The science needs from the Strategic Science and Research Framework can be used for multiple purposes by the CBP and its partners:

- **Management Board (MB) and the agencies they represent**: MB can suggest how the collective resources of CBP (grants, contracts by EPA) for monitoring and modeling should evolve. MB can assist with priorities the science needs among the CBP outcomes. Agencies represented on the MB can identify their own resources to address science priorities (since many agencies have technical capabilities).

- **Goal Implementation Teams and Workgroups**: Members can identify how the agencies they represent can evolve efforts to address science priorities of the GIT team or its workgroups. GITs can use the science priorities to identify topics for Goal Team RFPs and other available funding opportunities.

- **CBP Office**: Evolve EPA grants and contracts to address science needs. Evolve focus of CBPO modeling, monitoring, and GIS teams.

- **STAR:** Update activities of STAR and its workgroups to address operational and fundamental science priorities to support Goal Teams. Help evolve directions for Citizens Monitoring Cooperative.

- **STAC:** Inform STAC's focus for proactive and reactive efforts (e.g., workshops, reviews, and whitepapers). Individual members (or their institutions) can consider evolving their research directions or bring forward current findings to inform management decisions.

- **Science Providers:** Current science providers can evolve their work to match CBP needs. Additional science providers can be identified based on their knowledge or experience with identified needs.

Strategy to expand resource capacity

The advancement of technology, the change in climate conditions, the increase in land use changes, etc., has amplified the amount of science needs within the CBP that need to be addressed to assess progress towards the outcomes established in the *Chesapeake Bay Watershed Agreement*. Expanded capacity to address the science priorities requires the engagement of the broader scientific community to (1) translate and disseminate existing science and (2) inspire and implement additional research to inform management of the Chesapeake Bay and its watershed.

CBP continues to engage federal and state agencies and nonprofits to expand science capacity and aims to increase collaboration with these groups. The current focus is to partner with academic institutions to increase those supporting the science priorities of the CBP. Academic institutions will play a strong role in advancing this understanding through their aims to strengthen the scientific leadership pipeline, support of their faculty research direction, and ability to convene a diverse team of managers and provisioners of science to tackle a shared problem. Science is continually reviewed and updated within academic institutions so fostering collaborative research and effectively providing science to advance Chesapeake Bay restoration and conservation efforts between these institutions and the CBP is a critical step in maintaining progress towards science needs.

Management of the Strategic Science and Research Framework and Current Team Members:

As requested by the MB, a team has been created to carry out the process. The team includes members from STAR, STAC, and the GITs. Throughout the SSRF, the team will engage the user community on moving the process forward. The team includes:

STAR: Scott Phillips (STAR Co-chair); Bill Dennison (STAR Co-chair); Breck Sullivan (STAR Coordinator), Alex Gunnerson and Amy Goldfischer (STAR staffers); Peter Tango (CBP monitoring team).

STAC: Kathy Boomer - kboomer@foundationfar.org, Denice Wardrop - dhw110@psu.edu, Mark Monaco - mark.monaco@noaa.gov, Tom Ihde - Thomas.Ihde@morgan.edu, Carl Hershner - carl@vims.edu, Kirk Havens - kirk@vims.edu, Kurt Stephenson - kurts@vt.edu

Goal Implementation Teams: Coordinators/staffers from each GIT.

SRS team: Kristin Saunders (Cross Program Coordinator and SRS representative) and Garrett Stewart (MB Staffer)

The database is maintained by Breck Sullivan, Amy Goldfischer, and Alex Gunnerson.

Appendix 1: Original Charge of the MB for science needs and recommended approach

Issue and Request from Management Board:

During the August 2018 Management Board (MB) meeting there was discussion about the science needs for climate resiliency, which led to the broader topic of what are the science needs for all the goals and outcomes of the Chesapeake Watershed Agreement. The MB wanted to better understand all the science needs that are being generated from the Strategy Review System (SRS), so they can help prioritize resources. The action from the August MB meeting was: *"The SRS small group will compile into a list the SRS data and science needs requests. This list will be shared with STAR and STAC leadership and the Chesapeake Bay Program (CBP) associate directors for input. The Management Board will review the 2017-18 SRS requests to prioritize science and data needs. The Management Board will present their prioritization during the 2019 SRS Biennial meeting"*
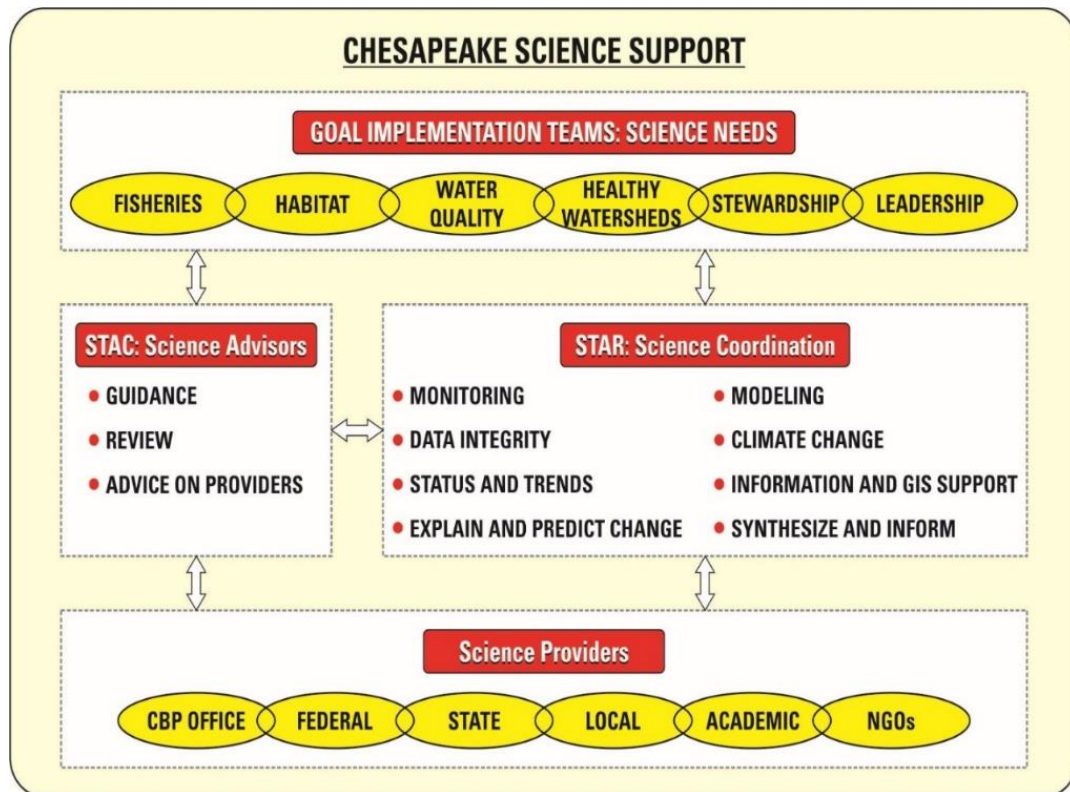

Figure 1. Current structure of science support within the Chesapeake Bay Program

In their initial discussions on addressing the MB request for prioritizing science needs, the GITs, STAR and STAC (figure 1) recognized the need for a broader, more strategic, holistic and on-going assessment of science needs of CBP. Some key issues included:

- The science needs across the CBP and the strategies to address them should be connected to the SRS decision framework.
- Needs should be assessed strategically and updated as CBP outcomes are reviewed by the MB every two years.

- Long-term fundamental science and research needs should be assessed in conjunction with the operational short-term needs associated with the outcomes and goals of the Program. Short-term needs tend to be on the operational side of GIT work plans and include development of indicators, analysis of existing information, GIS support, applications of models. Longer-term needs often relate to filling fundamental gaps in knowledge and understanding, and include monitoring of trends, development of new models, and research to better understand complex issues.
- There are opportunities to better engage the science providers who can address these needs, especially fundamental gaps in research, monitoring, and modeling.

Recommended Approach: Strategic Science and Research Framework:

The GITs, STAR and STAC worked together to develop an approach to address the MB request that identifies, and helps prioritize, both short- and longer-term science needs. The approach resulted in a Strategic Science and Research Framework (SSRF) that is an on-going, repeatable process that supports the SRS decision framework. The results will be used to help focus existing science resources, and leverage the research enterprise, to more effectively provide science to advance Chesapeake restoration and conservation efforts and decision making. To develop the Strategic Science and Research Framework and to address the immediate concerns of the MB, the following steps were proposed:

- Update understanding of currently identified science needs: Identify natural or social science needs. Combine science needs from these efforts: (1) science items identified for each CBP outcome through the decision framework used in the SRS process, (2) GIT input on science needs that have been given to STAR, and (3) previous recommendations from STAC workshops that address operational and fundamental research needs.
- Conduct a resource assessment: Inventory how needs are currently being addressed by different science providers. The inventory will include looking at resources provided directly by the CBP and additional efforts by federal, state, and academic partners. The CBP funded efforts include support from the modeling, monitoring, and GIS teams, GIT grants, and cooperative agreements with states, federal agencies, and academic institutions. Additional efforts include agencies or academic institutions that directly fund Bay-related research and monitoring efforts.
- Prioritize GIT science needs that require more resources: The GITs will identify, and provide relative priorities, of operational and fundamental science needs that require additional resources. Operational needs examples are development of indicators, GIS support, data gathering, and analysis of existing information. Examples of fundamental needs might include advances in monitoring and research to address an outcome.
- Further identify and incorporate long-term fundamental research needs: In addition to the GIT needs, there are additional fundamental science needs that need to be brought forward. Examples include advances in monitoring and research to address a variety of knowledge gaps with implications for Bay management (e.g., predicting human behavior and incorporating characterized uncertainty/risk toward making more robust decisions). STAC will continue its effort to identify critical science needs and potential emerging issues through its various proactive and reactive efforts (e.g., workshops, reviews, and whitepapers).
- Develop a Strategic Science and Research Framework that supports the SRS process. The framework would provide a strategic approach to:
  - Continue to update the operational and fundamental science needs identified for CBP outcomes through the SRS process, and their quarterly reviews.
  - Assess existing efforts by science providers to address the existing and new needs
  - Identify, and prioritize knowledge gaps that need to be addressed.
  - Recommend approaches for CBP and partner resources to address operational and fundamental science needs and knowledge gaps. The recommendations would be

considered by the MB and CBP partnership for evolving the necessary resources (CBP teams, grants, contracts) and identifying opportunities for other potential science providers to align efforts or explore other funding to address the gaps.

- o The results from the framework would be updated for each SRS biennial meeting.

Appendix 2: History of SSRF

2018:
- **September:** MB request discussed with STAR and with SRS leaders.
- **October 31 Goal Team chairs meeting**: Chairs provided input on science prioritization.
- **Oct-Nov: Goal team updates of their science needs.**
- **Dec STAC meeting:** Presented MB request and got feedback from STAC. They suggested a more strategic process to identify both operational and fundamental science needs that is integrated with the SRS process. Identified STAC members to help with the effort.
- **Dec STAR meeting:** STAC presented their perspectives and discussed with Goal Teams and STAR. Collectively it was recommended to develop a strategic science and research framework that supports the SRS process.

2019:
- **During Jan:** Lack of progress due to partial shutdown of federal government.
- **Feb:** Refine Goal Team science needs and begin to integrate needs/recommendations from previous STAC workshops. Begin initial resource assessment to document how needs are being addressed by different science providers, which include CBPO staff resources, EPA contracts, federal and state partner programs, and academic research. Initial focus would be on CBPO staff resources and grants. Begin to identify science gaps.
- **Feb 14:** Introduce the concept of a "strategic science and research framework" to the MB and get feedback.
- **Feb 28 STAR meeting**. Refine concept of the "strategic science and research framework" based on feedback from MB. Prepare to present at the SRS March meeting. Update on science needs and initial assessment of CBPO resources, identify some major gaps that need to be addressed.
- **March 13-14 SRS meeting:** Get feedback on the concept of, and proposed approach for, developing and maintaining a Strategic Science and Research Framework. Get preliminary feedback on the initial list of science gaps as identified to date by the GITs.
- **March-May:** Integrate science needs based on STAC workshop with GIT needs. Monthly interaction at the STAR meetings
- **June:** share integrated list of science needs with STAR and STAC. Discuss how to identify and integrate longer-term science needs
- **July-August**: Conduct more comprehensive resource assessment of how multiple science providers are addressing existing integrated science needs. Monthly interaction at the STAR meetings.
- **August-Sept**: Identify opportunities to evolve CBP and science providers efforts to address existing integrated science. This will occur during monthly STAR meetings
- **Fall:** Present opportunities and recommendations for evolving science to MB and Goal Teams. Take actions as opportunities arise.
- **Fall:** Institute process for Strategic Science and Research Framework.

2020-2021
- **2020-2021:** Repeat process as outcomes are reviewed by MB, be ready to provide updated results from the Strategic Science and Research Framework for 2021 SRS biennial meeting.
- **June 2020:** Outcomes started to present to STAR and STAC on their science needs 6 weeks following their Quarterly Progress meeting.
- **December 2020:** The Science Needs Database was officially launched.

2021
- **January:** Present SSRF to STAR, showing the new database and gathering feedback.
- **April:** Discuss improvements for SSRF and its integration with the Strategy Review System.
- **April-onwards:** Science Needs Database and SSRF utilized to understand monitoring gaps and enhancement needs for PSC monitoring review.
- **August:** Goal teams tasked with reviewing the science needs in the database and making updates, particularly considering monitoring needs, the urgency and utility of the monitoring need and synergies between that monitoring need and existing monitoring data.

- Outcomes continue to present to STAR and STAC on their science needs and science needs are entered into the database.

2022
- **February-March:** Presented SSRF to coordinators and staffers, gather feedback. Staff created Science Needs Presentation template based on feedback from outcomes to help outcomes gather their science needs and make the needs easier to enter into the Science Needs Database.
- **Summer:** Finalized the deadline as two weeks after the STAR science needs meeting for when updated science needs are due to be submitted to STAR. This deadline was posted on Chesapeake Decisions.
- **Summer:** Collaborated with the CBP web team to make major revisions to the Science Needs Database to improve ease of use for Goal Teams as well as STAR administrative users. Updates were based on user feedback and included:
  - Adding an indication of who last edited the Database and when they edited it
  - Added a new tab called SSRF Guidance, which outlines how to use the Database depending on the audience
  - Created a home page with explanatory text
  - Added functionality allowing the detailed information for each Science Need to be opened in a separate page so they can be linked directly
  - Added tags to identify projects that relate to climate change needs and to Diversity, Equity, Inclusion and Justice (DEIJ) needs
  - Added new need status of "not started"
  - Added a draft function for administrators to work on editing a Science Need without publishing it
  - New design for home page
- Spring and Summer: Explored opportunities for building capacity to address science needs using routes such as GIT Funding, Infrastructure Law Funding, and partnership with academic institutions and programs.
- Outcomes continue to present to STAR and STAC on their science needs and science needs are entered into the database.

Originally Prepared by: Scott Phillips, Emily Trentacoste, Bill Ball, Brian Benham, and Kristin Saunders. Edited by: Breck Sullivan, Amy Goldfischer