Proposed Steps to Address the Management Board's Request on Science Priorities

Chesapeake Bay Program
Science. Restoration. Partnership.

Scott Phillips, STAR Co-Chair
Emily Trentacoste, STAR Co-Coordinator

SRS Biennial Meeting
3/14/2019

Agenda Items for SRS Science Session

- **Part 1:** Overview of proposed process to develop a Strategic Science and Research Framework
- **Part 2:** Science needs gathered from the Goal Teams and examples of information available from STAC activities and reviews
- **Part 3:** Assessing existing science resources, identifying remaining science gaps, and developing recommendations to fund gaps
- **Concluding Panel**

Origin of the Framework

- Strategy Review System MB meeting (August 2018)

- Too many science needs for climate resiliency;
  - MB requested priorities

- Led to another MB request to understand science priorities from SRS reviews of all outcomes

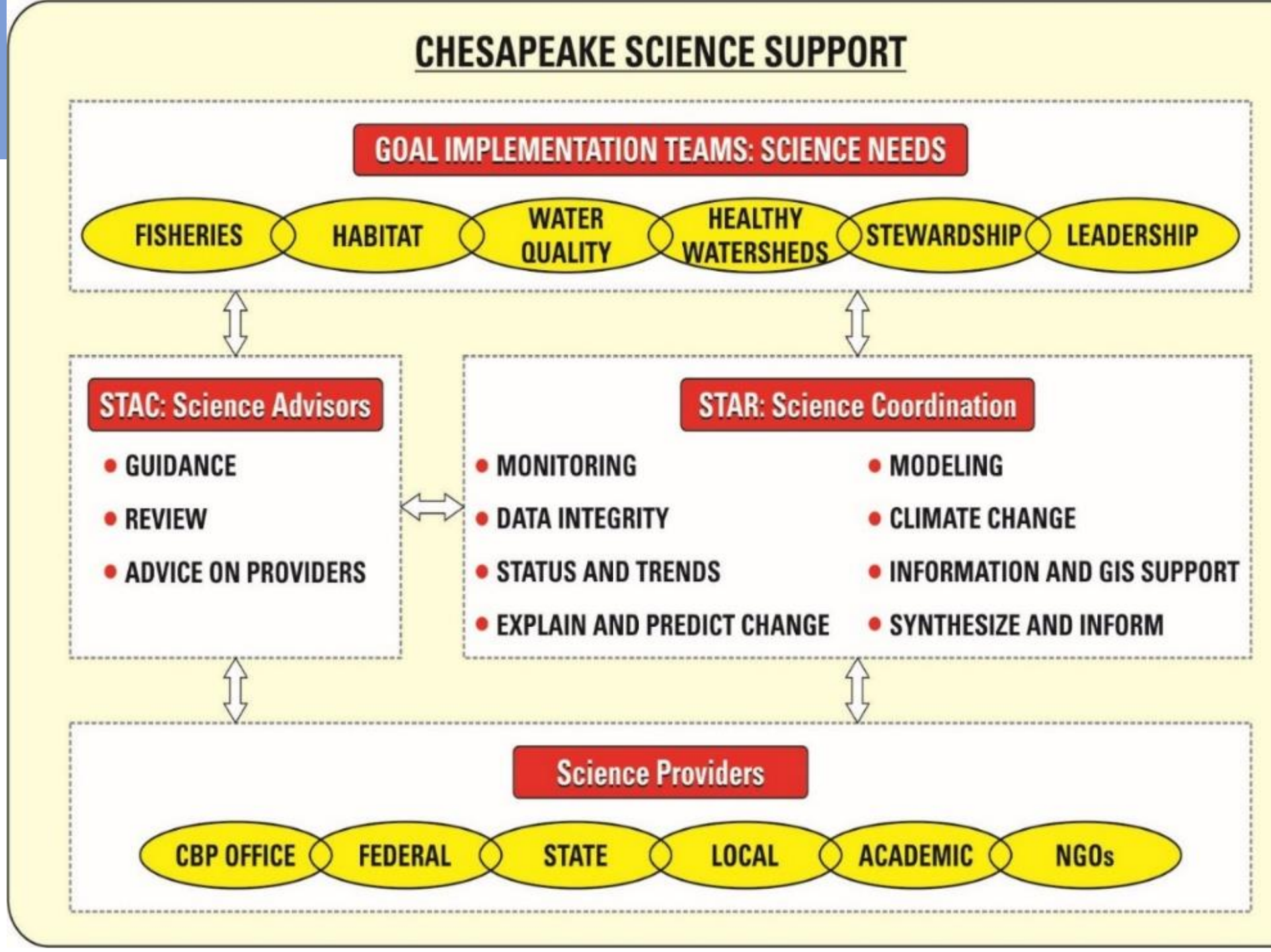
Request from Management Board

August 2018 Request from MB:

"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 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."

Involvement

- Goal Teams
- STAR
- STAC
- SRS team



Progress to Date

- MB request discussed with STAR and SRS team (Sep ‘18)
- Solicited feedback from GIT-chairs, STAR and STAC (Oct-Dec ‘18)
- Consolidated initial list of science needs from GITs (Oct-Dec ‘18)
- STAR coordinated discussion to develop idea of Strategic Science & Research Framework (Dec ’18-Feb ‘19)
- Began holistic look across all needs and initial resource assessment (Feb ‘18)

Move toward a Strategic Science & Research Framework

- Connect to the decision framework and SRS process
- Develop a process repeatable every 2 years with SRS reviews

<u>Consider:</u>

- Operational and fundamental science
- Integrate STAC science workshop and review findings
- Don’t prioritize numerically
- Look holistically: common themes, gaps in resources, and opportunities to address
- Be clear on how the findings can be used

Operational and Fundamental Science

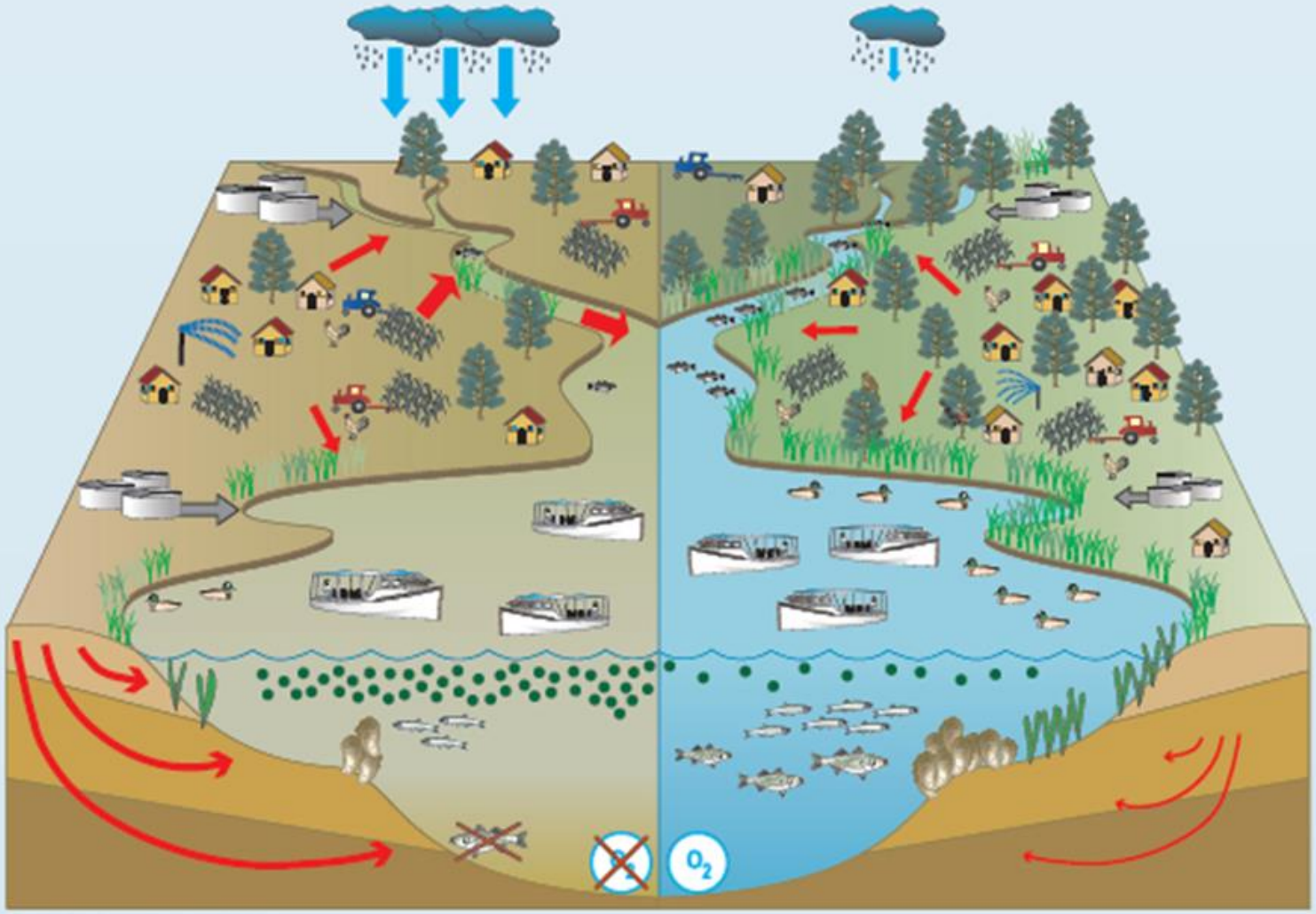
Chesapeake Bay Program
Science. Restoration. Partnership.

Operational

- Specific outcome
- Indicator, GIS, data gathering, synthesis

Fundamental

- Look holistically, multiple outcomes
- Monitoring
- Modeling
- Research



How Can Findings from Framework Be Used?

MB & their agencies: MB can suggest how collective resources should evolve; agencies represented can identify their own resources to address needs

GITs: Can identify projects for GIT RFPs; can determine common needs; represented agencies can identify how to evolve efforts

CBP Office: Evolve EPA grants and contracts to address needs; evolve focus of CBP modeling, monitoring, research, GIS

STAR: Updates activities and workgroups to address science priorities to support GITs; evolve directions of CMC; identify science providers to address needs

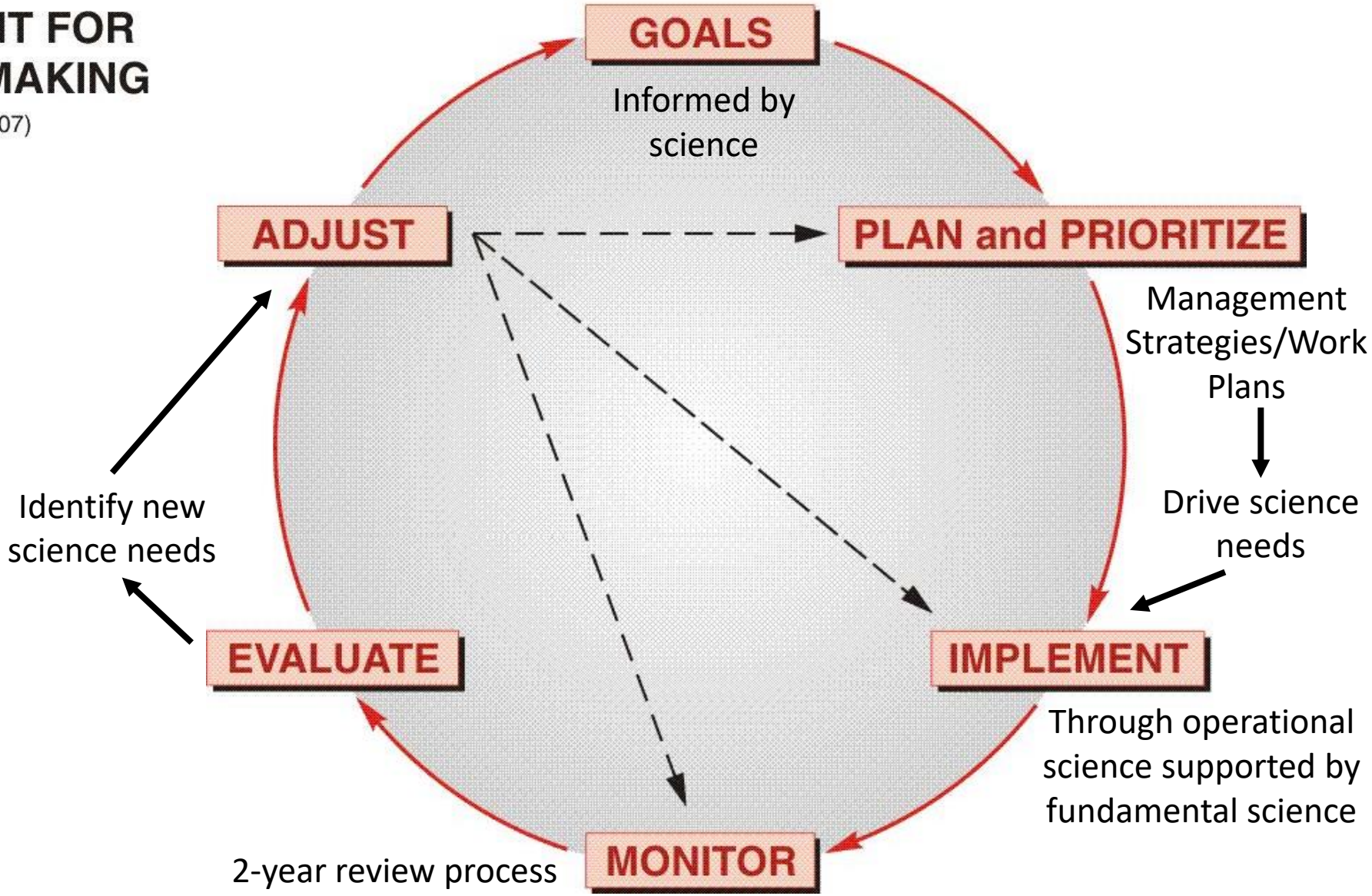
STAC: inform STAC research priorities and selection of workshops; individual researchers can be providers

Connection to Decision Framework and SRS

Chesapeake Bay Program
Science. Restoration. Partnership.

ADAPTIVE MANAGEMENT FOR ECOSYSTEM DECISION MAKING

[Modified from Williams and others (2007) and Levin and others (2009)]



Proposed Approach:
Strategic Science and Research Framework

- Update GIT science needs and proposed progress for Strategic Science and Research Framework — **Oct 2018 – Feb 2019**
- Integrate STAC workshop recommendations and reviews — **Mar-May 2019**
- Conduct a resource assessment to identify current science providers and gaps in resources — **Mar-July 2019**
- Holistically assess gaps in resources for science needs and work with GITs, STAR and STAC to prioritize needs requiring resources — **Summer, 2019**

Proposed Approach:
Strategic Science and Research Framework

• Identify opportunities to evolve CBP activities and work with science providers	**Aug-Sept 2019**
• Present opportunities to MB	**Summer-Fall 2019**
• Take actions to address primary gaps	**Summer-Fall 2019**
• Institute process for Strategic Science and Research Framework	**Fall, 2019**
• Update science needs based on 2019-2020 SRS Process	**2019-2021**

March 13-14 SRS Biennial Review

What we propose to do at the 2019 Biennial Review:

- Get feedback on the process and framework that STAR, STAC and the GITs have been developing together to adapt science needs
- Review and obtain input on the needs initially identified to have gaps in resources
- Discuss how we should work together to prioritize needs with gaps in resources
- Initial discussion on how to find and align resources for priority needs

Strategic Science & Research Framework: Current State of the Science Needs

Emily Trentacoste, STAR Co-Coordinator
Annabelle Harvey, STAC Staff
Breck Sullivan, STAR Staffer

SRS Biennial
3/14/2019

Current State of the Science Needs

- All GITs provided input: needs, explanations, priority, resources
- Currently conducting initial resource assessment
- Incorporating STAC workshop recommendations from 2014 on
- Working with STAC on how to engage them for feedback from larger group
- Initial assessment of needs list

Information in the Science Needs List

- Science need – identified by GIT or SRS meeting
- Progress – completed, ongoing?
- Additional detail
- Why it is needed
- Category – modeling, monitoring, research, synthesis, analysis, data gathering, coordination, training
- Other goals/outcomes addressed
- Current resources/efforts
- Future opportunities for resources
- GIT-identified prioritization

A Basic Breakdown of the Science Needs List

Chesapeake Bay Program
Science. Restoration. Partnership.

124 → **Total Needs Identified**

68 → **Needs that are not completed and not fully resourced**

Most have some resources or other contributions

A Basic Breakdown of the Science Needs List

Chesapeake Bay Program
Science. Restoration. Partnership.

Of those 68, 58 were given a priority by GIT:

35 → **High**

7 → **Medium**

16 → **Low**

A Basic Breakdown of the Science Needs List

Chesapeake Bay Program
Science. Restoration. Partnership.

Needs related directly to development or update of indicator:

Purple text = GIT-identified as high priority

- Forage fish indicator development
- Climate indicator development – fish distribution
- Stream Health indicator reporting
- Brook trout monitoring efforts for indicator
- New black duck indicator based on habitat acreage/baseline
- Tracking framework for potential healthy watersheds sustainability indicator
- Stewardship Indicator data collection support every 3-5 years
- Diversity indicator target/goal

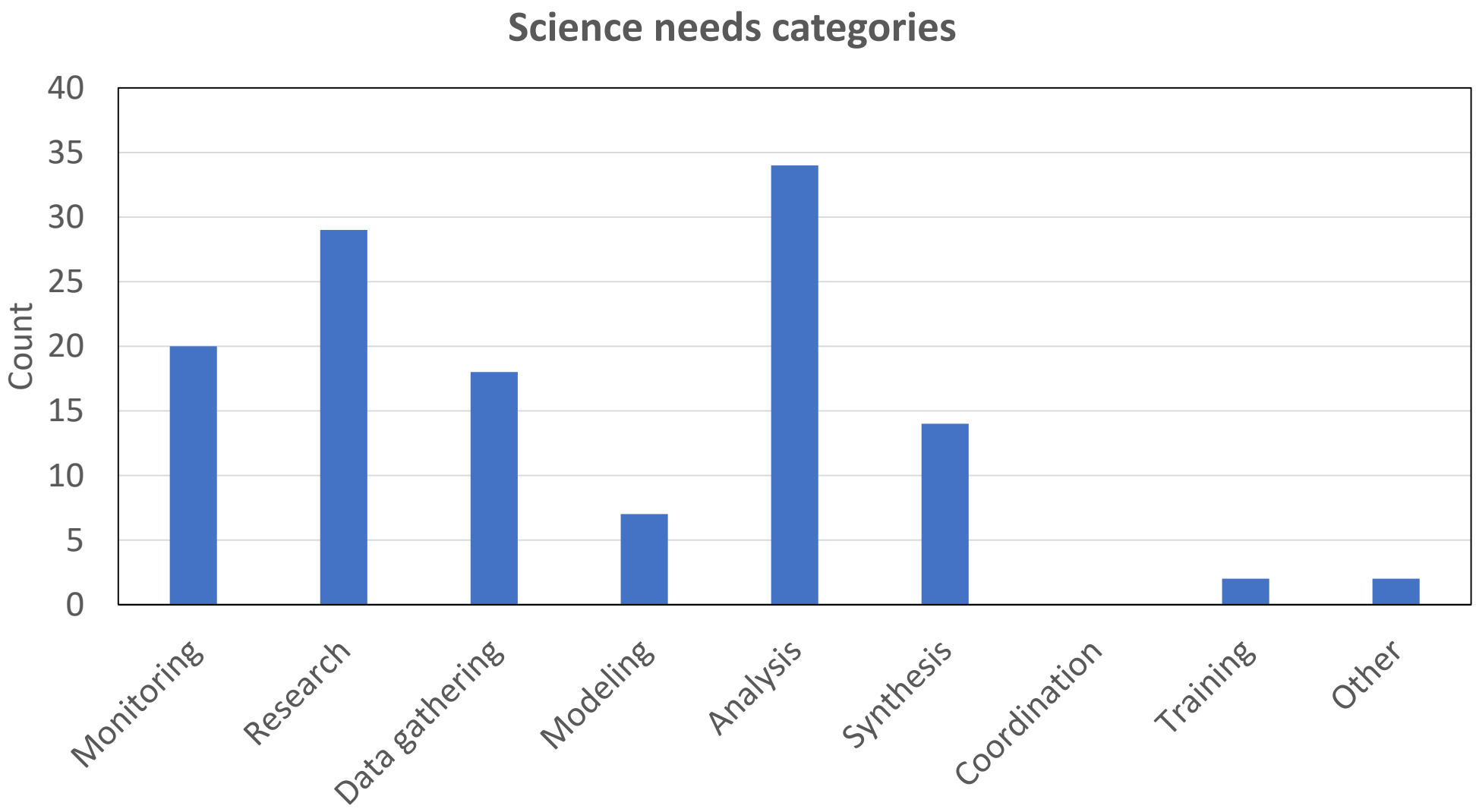
A Basic Breakdown of the Science Needs List

Chesapeake Bay Program
Science. Restoration. Partnership.

Science Needs Categories:

- **Modeling:** Modeling effort required, within CBPO or not
- **Monitoring:** Pertains to monitoring efforts including new efforts, utilizing existing efforts, coordinating efforts, etc.
- **Research:** Requires original research to address or generation of new data
- **Synthesis:** Requires synthesizing existing research or advancing science by pulling from multiple current lines of research
- **Analysis:** Requires new analysis be conducted on existing data or information
- **Data Gathering:** Requires identifying, consolidating, etc. existing datasets or data layers
- **Coordination:** Coordination needed between groups on existing data, information or efforts
- **Training:** Resources are necessary to disseminate information, data, product, etc.
- **GIS:** Support potentially needed from CBPO GIS Team

A Basic Breakdown of the Science Needs List



A Basic Breakdown of the Science Needs List

Chesapeake Bay Program
Science. Restoration. Partnership.

Needs flagged for environmental monitoring:

- Phytoplankton and zooplankton monitoring
- Shallow water monitoring
- Vertical water column monitoring
- Oyster restoration monitoring
- Brook trout monitoring
- Toxics contaminants monitoring in fish/shellfish
- Citizen science monitoring
- Forest buffer cover change monitoring
- Tree canopy change monitoring

Purple text = GIT-identified as high priority

A Basic Breakdown of the Science Needs List

Chesapeake Bay Program
Science. Restoration. Partnership.

Needs flagged for research:

Purple text = GIT-identified as high priority

- Ecosystems services
- Blue catfish predation
- Gauging public perceptions and fishery stakeholder views
- Biological lift from stream restoration
- Monitoring presence/absence fish species
- Spatial-temporal groundwater model expansion
- PCB sources and fate in environment
- BMP effectiveness at PCB removal
- Effects of toxic contaminants on fish and shellfish
- BMP response to climate change
- Precipitation changes due to climate change
- Sea level rise and subsidence impacts in changing climate
- Social science and human behavior behind climate change
- Climate change impacts on SAV
- Climate change impacts on invasive species
- Green infrastructure performance under climate change
- Climate change impacts on wetlands
- Climate change impacts on fish species

A Basic Breakdown of the Science Needs List

Chesapeake Bay Program
Science. Restoration. Partnership.

Needs flagged for modeling:

Purple text = GIT-identified as high priority

- Expand groundwater model for brook trout
- Black duck bioenergetics modeling
- Finer scale water quality modeling
- Implement estuary model in local waters
- Characterize BMP removal uncertainty due to climate change
- Better understand precipitation changes from climate change

A Basic Breakdown of the Science Needs List

Chesapeake Bay Program
Science. Restoration. Partnership.

Needs related to climate change estimations:

- SAV habitat availability
- Healthy watershed vulnerability
- Impacts to public access sites
- Mapping projected climate impacts for protected lands
- Human behavior response
- Impacts on invasive species
- Green infrastructure performance
- Impacts to wetlands
- Impacts to fish species abundance

Purple text = GIT-identified as high priority

A Basic Breakdown of the Science Needs List

Chesapeake Bay Program
Science. Restoration. Partnership.

Purple text = GIT-identified as high priority

Needs with GIS component:

- Regional fish habitat assessment
- Baywide inventory of shoreline condition
- Stream health reporting
- Development of black duck indicator
- Climate change impact on SAV habitat
- Generate mercury info in watershed
- Observed vs. expected monitoring trends
- Explaining water quality standards attainment
- Monitor forest buffer coverage trends
- Monitor tree canopy coverage trends
- Characterize watershed vulnerability to stressors
- Change in land use for informing other outcomes
- Climate change impacts on public access sites
- Diversity Indicator Target/Goal & EJ Screen
- Expanded analysis and mapping of climate change impacts on protected lands
- Improve methodology for data collection for Protected Lands Indicator
- Develop additional watershed health criteria
- Improve understanding of indigenous cultural landscapes
- Understanding sea level rise impacts
- Understand climate change impacts on wetlands

A Basic Breakdown of the Science Needs List

Chesapeake Bay Program
Science. Restoration. Partnership.

Examples of possible cross-pollination:

- Climate change estimations → modeling team
- Citizen science monitoring → monitoring needs
- Stream Health analysis & reporting → biological lift, brook trout monitoring, healthy watersheds assessments, marginally healthy watersheds
- Shallow water monitoring → estuary model in local waters
- Living resource modeling → fish habitat assessment case studies, oyster restoration monitoring
- Advancing/incorporating social science approaches → model human attitude/behavior relations, gauging public perceptions & fishery stakeholder views, implications of human response to climate change/motivation and needs of communities to adapt
- Land use/Land change metrics → forest buffer, tree canopy, healthy watershed vulnerability, protected lands threats

Incorporating STAC Recommendations

- MB requested the GIT Science Needs list be shared with STAC leadership for input
- STAC has been engaged throughout process through smaller volunteer cohort of members
- STAC suggested incorporating workshop and review recommendations
  - Emphasizing overlap between the GIT Science Needs and STAC recommendations
  - Incorporating both STAC recommendations and GIT needs will help identify research gaps

Water Quality GIT

Science Need

- Characterize uncertainty in the removal performance of BMPs due to climate change

Supporting STAC Workshops and Reviews

- 2018: Consideration of BMP Performance Uncertainty in Chesapeake Bay Program Implementation **(2)**
- 2018: Monitoring and Assessing Impacts of Changes in Weather Patterns and Extreme Events on BMP Siting and Design **(1)**
- 2018: STAC Review of the CBP Partnership's Climate Change Assessment Framework and Programmatic Integration and Response Efforts **(1)**
- 2017: Quantifying Ecosystem Services and Co-Benefits of Nutrient and Sediment Pollutant Reducing BMPs **(1)**
- 2017: Scientific and Technical Advisory Committee Chesapeake Bay Watershed Model Phase 6 Review **(1)**

Water Quality GIT

Science Need

- Characterize uncertainty in the removal performance of BMPs due to climate change

Supporting STAC Workshops and Reviews

- Recommendation:

The Chesapeake Bay Program Partnership should systematically document and represent uncertainties throughout the BMP treatment process and produce information about the distribution of removal effectiveness of each BMP.

Healthy Watersheds GIT

Science Need

- Develop and apply tools or methods that integrate various inputs to characterize watershed vulnerability to future high-level risks including development and climate related stressors

Supporting STAC Workshops and Reviews

- 2018: Chesapeake Bay Water Quality and Sediment Transport Model (WQSTM) Review **(5)**
- 2018: Monitoring and Assessing Impacts of Changes in Weather Patterns and Extreme Events on BMP Siting and Design **(2)**
- 2018: Integrating Recent Findings to Explain Water-Quality Change: Support for the Mid-point Assessment and Beyond **(2)**
- 2017: “Cracking the WIP”: Designing an Optimization Engine to Guide Efficient Bay Implementation **(1)**

Citizen Stewardship GIT

Science Need

- Path Forward for advancing social science approaches.

Supporting STAC Workshops and Reviews

- 2015: Exploring Applications of Behavioral Economics Research to Environmental Policy-making in the Chesapeake Bay Watershed **(2)**

Citizen Stewardship GIT

Science Need

- Path Forward for advancing social science approaches.

Supporting STAC Workshops and Reviews

- Recommendation:

Develop methods that can be used to cultivate peer pressure related to stewardship in order to encourage change. One example that is gaining traction in USDA is “community conservation”, where groups of landowners are encouraged to work together to solve a water quality problem through an incentive based on a joint outcome.

Climate Resiliency Workgroup

Science Need

- Detailed statement of data/research needs for climate resilient BMP siting and design by developing a better understanding of the BMP responses, including new or other emerging BMPs to climate change conditions.

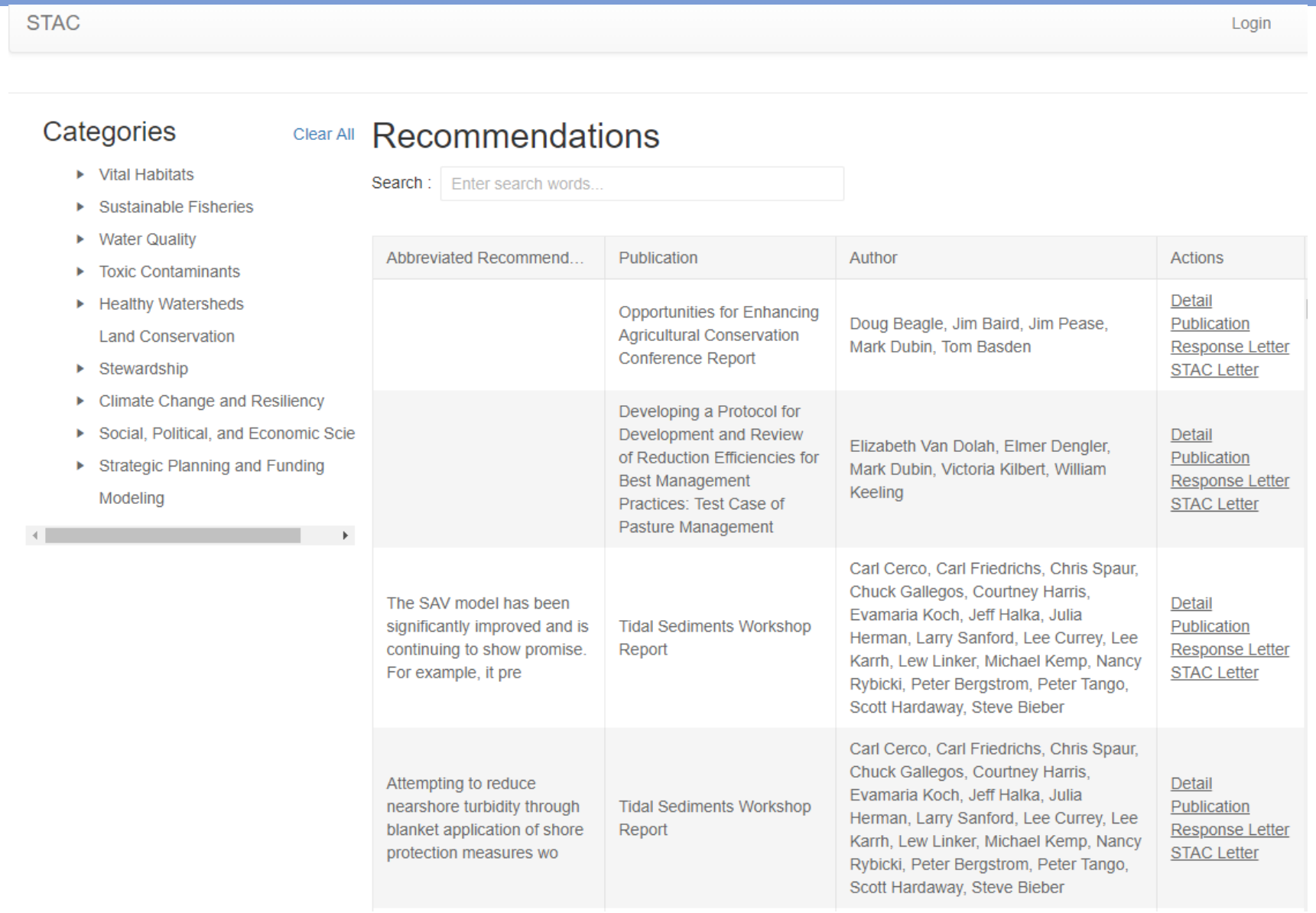
Supporting STAC Workshops and Reviews

- 2018: Consideration of BMP Performance Uncertainty in Chesapeake Bay Program Implementation **(2)**
- 2017: “Cracking the WIP”: Designing an Optimization Engine to Guide Efficient Bay Implementation **(1)**
- 2016: The Development of Climate Projections for Use in Chesapeake Bay Program Assessments **(1)**
- 2015: Estimating Land Management Effects on Water Quality Status and Trends **(1)**

Next Steps:

- Currently engaging with STAC to develop the best approach for integrating longer-term STAC input on list – March STAC meeting
- Possibly narrowing focus on which STAC recommendations to use
- STAC Recommendation Database

STAC Recommendation Database

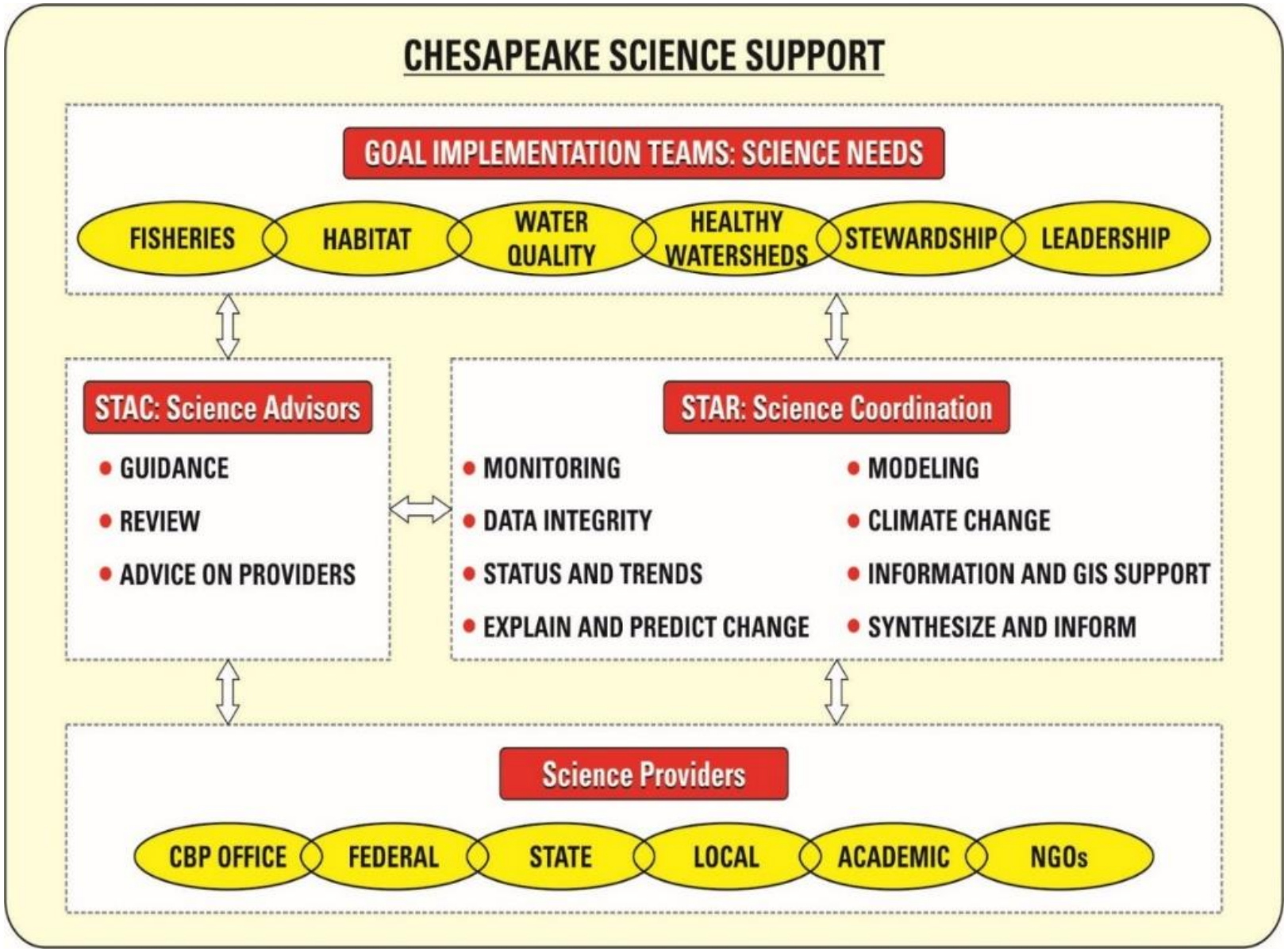


Strategic Science & Research Framework: Assessing Existing Resources

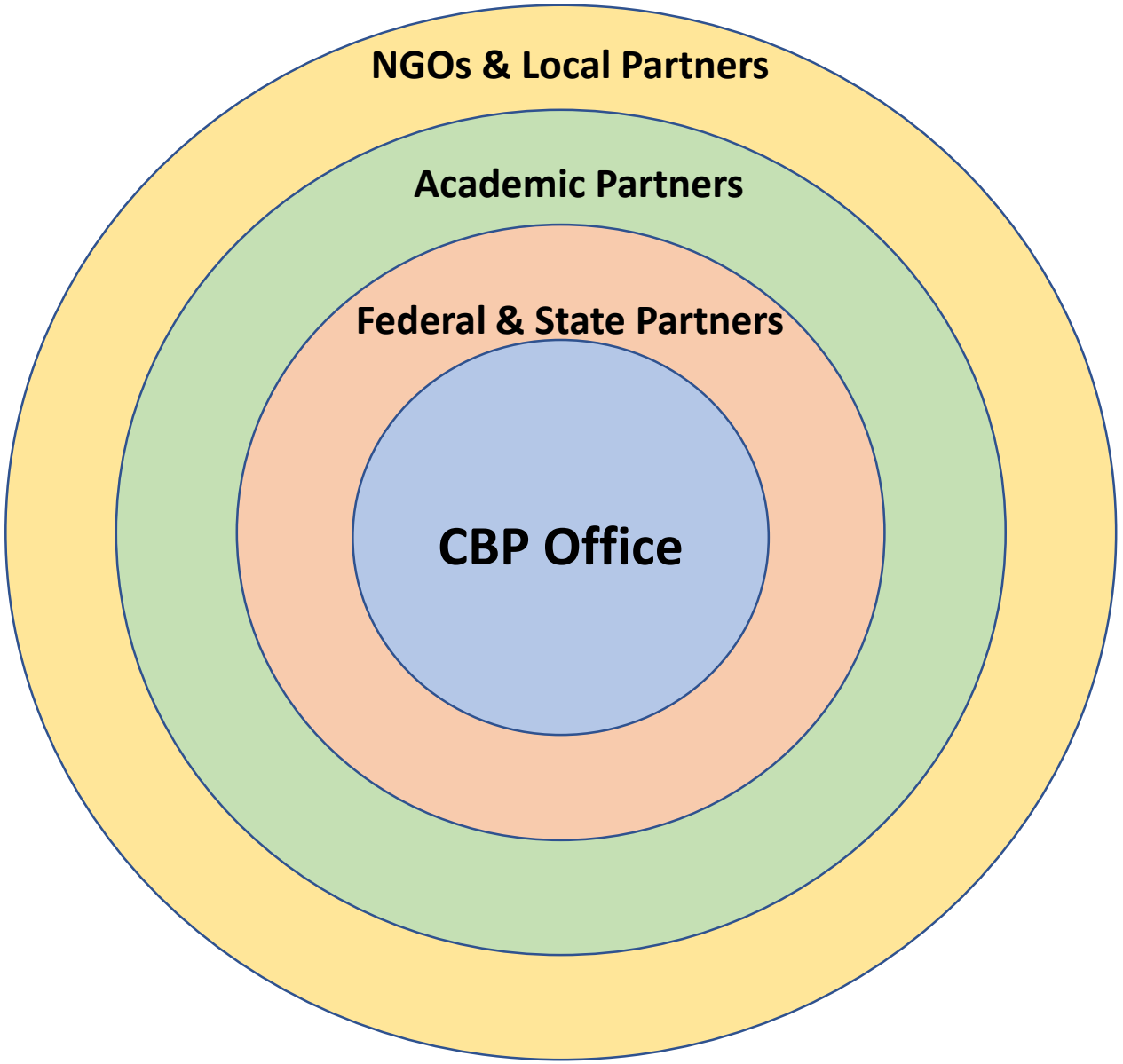
Emily Trentacoste, STAR Co-Coordinator

SRS Biennial
3/14/2019

Science Providers



Assessing Resources from Science Providers



Assessing Resources from Science Providers

CBP Office:
Modeling Team
GIS Team
Researchers
GIT-funding
EPA Agreements

A Basic Breakdown of the Science Needs List

Chesapeake Bay Program
Science. Restoration. Partnership.

Needs related to climate change estimations:

- SAV habitat availability
- Healthy watershed vulnerability
- Impacts to public access sites
- Mapping projected climate impacts for protected lands
- Human behavior response
- Impacts on invasive species
- Green infrastructure performance
- Impacts to wetlands
- Impacts to fish species abundance

Purple text =
GIT-identified as high priority

A Basic Breakdown of the Science Needs List

Chesapeake Bay Program
Science. Restoration. Partnership.

Purple text = GIT-identified as high priority

Needs with GIS component:

- Regional fish habitat assessment
- Baywide inventory of shoreline condition
- Stream health reporting
- Development of black duck indicator
- Climate change impact on SAV habitat
- Generate mercury info in watershed
- Observed vs. expected monitoring trends
- Explaining water quality standards attainment
- Monitor forest buffer coverage trends
- Monitor tree canopy coverage trends
- Characterize watershed vulnerability to stressors
- Change in land use for informing other outcomes
- Climate change impacts on public access sites
- Diversity Indicator Target/Goal & EJ Screen
- Expanded analysis and mapping of climate change impacts on protected lands
- Improve methodology for data collection for Protected Lands Indicator
- Develop additional watershed health criteria
- Improve understanding of indigenous cultural landscapes
- Understanding sea level rise impacts
- Understand climate change impacts on wetlands

A Basic Breakdown of the Science Needs List

Chesapeake Bay Program
Science. Restoration. Partnership.

Purple text = GIT-identified as high priority

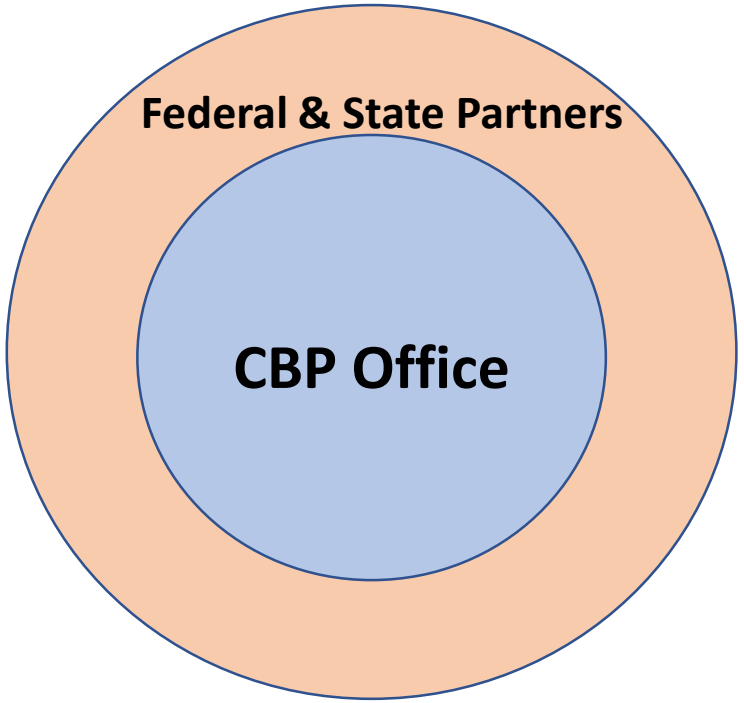
Needs utilizing GIT-funding:

- Regional fish habitat assessment
- Monitoring vertical water column habitat
- Oyster restoration monitoring
- Shoreline threshold analysis
- Forage fish indicator
- Ecosystem factors affecting blue crab mortality
- Climate related changes in fish distribution
- Stream restoration and biological lift
- Cross-GIT collaboration of monitoring for brook trout
- Watershed vulnerability under different stressors
- Healthy watersheds sustainability indicator
- BMP installation at schools
- Methodology for data collection for Protected Lands Indicator

Assessing Resources from Science Providers

Federal Partners:

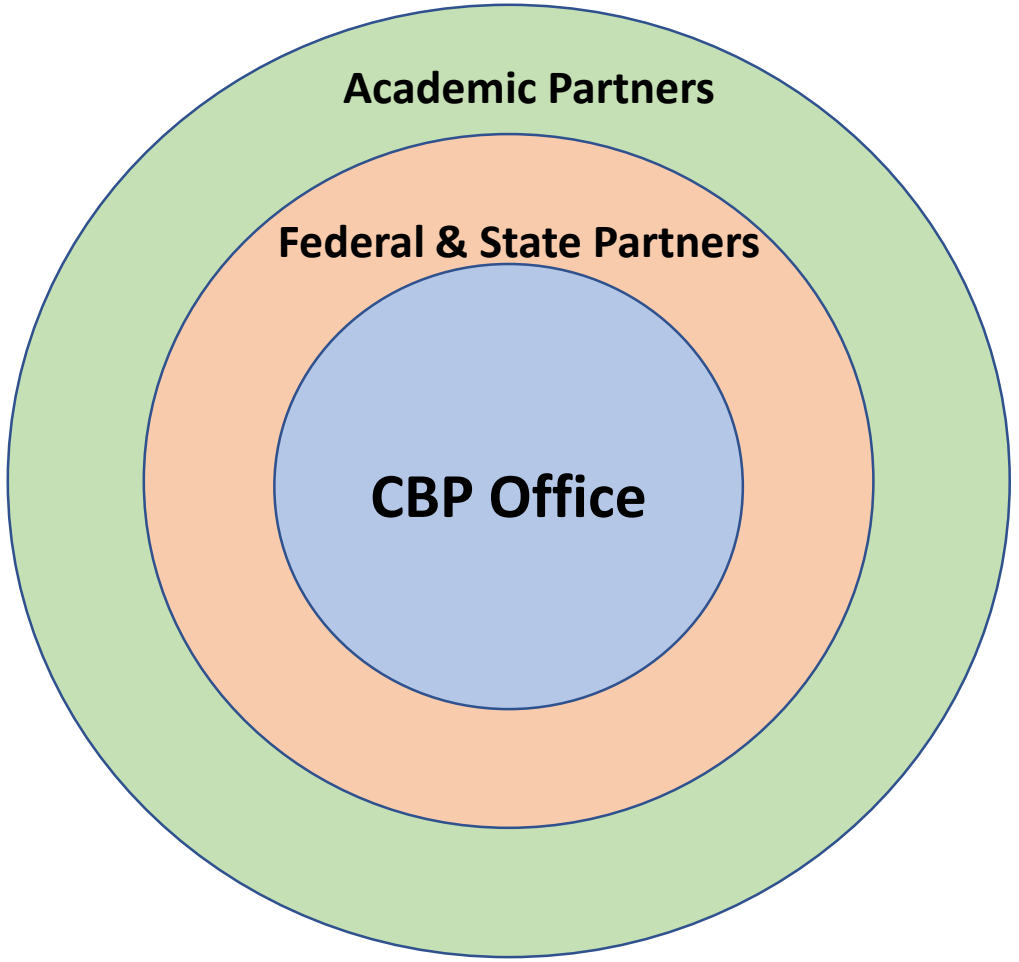
EPA
NOAA
NPS
UFWS
USGS
USFS



State Partners:

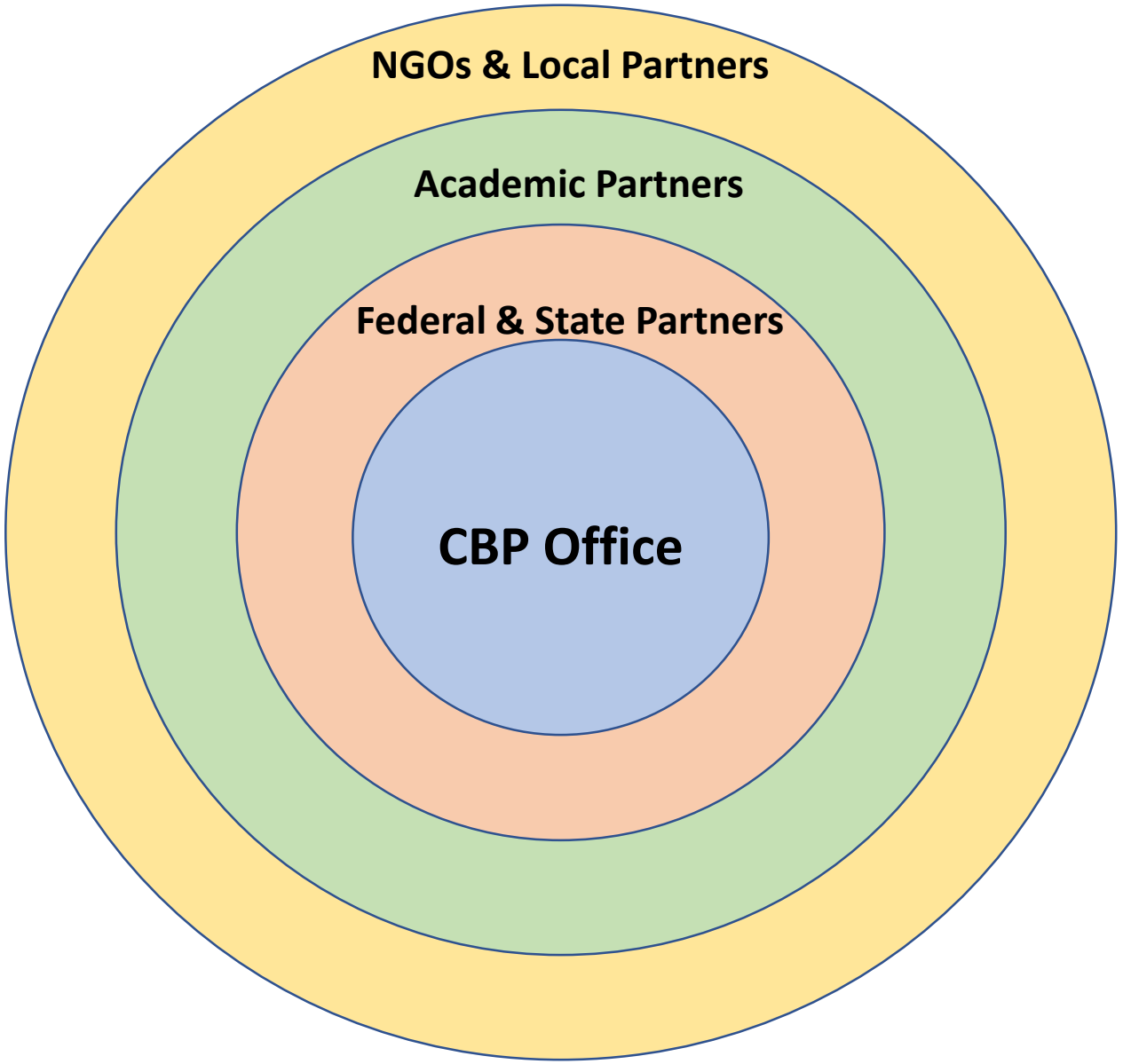
State Agencies
States' partners

Assessing Resources from Science Providers



Academic partners:
STAC
Regional institutions
Extension institutions
National organizations

Assessing Resources from Science Providers



NGO & Local Partners:

Citizen science

Chesapeake NGOs

Local governments

Water Quality Goal Implementation Team

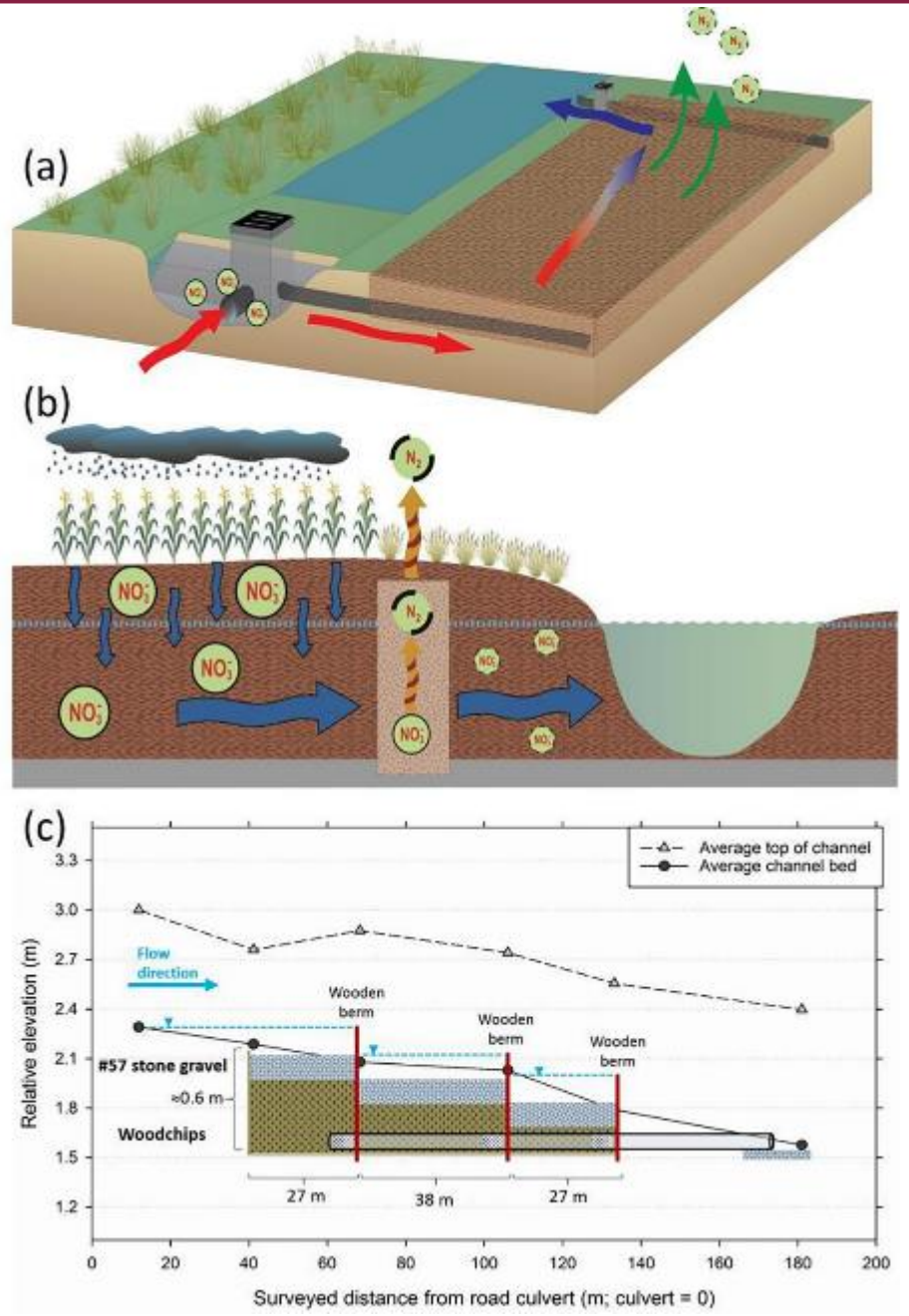
Agriculture Workgroup

Issue

- Agricultural drainage improves production but contributes to water quality degradation.
  - Short circuits natural nutrient attenuation processes in the soil
  - 1,000s of kg of N discharged

Need

- Design BMPs to address N loads and document performance



- Denitrifying bioreactors (DNBRs) are beds containing carbon source, typically woodchips.
- Intercept agricultural drainage or shallow groundwater containing excess nitrate (NO_3^-) and support the activity of soil microbes to convert NO_3^- into the inert nitrogen gas (N_2)
- Developed several designs:
  a) tile drainage
  b) walls
  c) in-ditch

USDA
United States Department of Agriculture

Conservation Practice Standard 605

Denitrifying bioreactors can remove a substantial portion of the nitrates flowing off of farm fields and into local waters, reducing the likelihood of habitat degradation and algae blooms, both locally and downstream. Denitrifying Bioreactor was approved as a new NRCS national conservation practice standard (no. 605) in late 2015. Denitrifying The practice has the potential to help with significant water quality challenges such as the hypoxic zones plaguing the Gulf of Mexico and the Chesapeake Bay.

The Denitrifying Bioreactor conservation practice was developed for agricultural application in Iowa, Ohio and South Dakota, in part through funding assistance provided by NRCS's Conservation Innovation Grants program.

A denitrifying bioreactor is a buried trench filled with a carbon source – usually wood chips – installed at the edge of a field. Tile drains from the field carry excess water from the plant root zone, and divert a portion of the drainage water into the bioreactor. Microorganisms on the wood chips consume the nitrates in the water and expel it as nitrogen gas. Performance varies based on size, location, and a variety of other factors, but the average bioreactor can be expected to remove up to half of the nitrates in water flowing through it.

Excavating the pit for bioreactor installation.

Helping People Help the Land

Natural Resources Conservation Service
www.nrcs.usda.gov
An equal opportunity provider and employer.

Conservation Practice Standard 605
Denitrifying BIOREACTOR

Characteristics of Dentrifying Bioreactors

- Organic last line of defense against subsurface nitrates;
- Removes 35-50 percent of nitrates from water flowing through it;
- Relatively inexpensive to install and maintain;
- No adverse effects on crop production or drainage.

The Denitrifying Bioreactor is available Nationwide and can be used by farmers for financial assistance as soon as their State NRCS has incorporated the new standard into its handbook. Farmers should check with their local NRCS office for the latest information.

A view of an installed bioreactor, showing the upper control structure and warm season grasses that have re-established in soil covering the bed of wood chips in which water is treated.

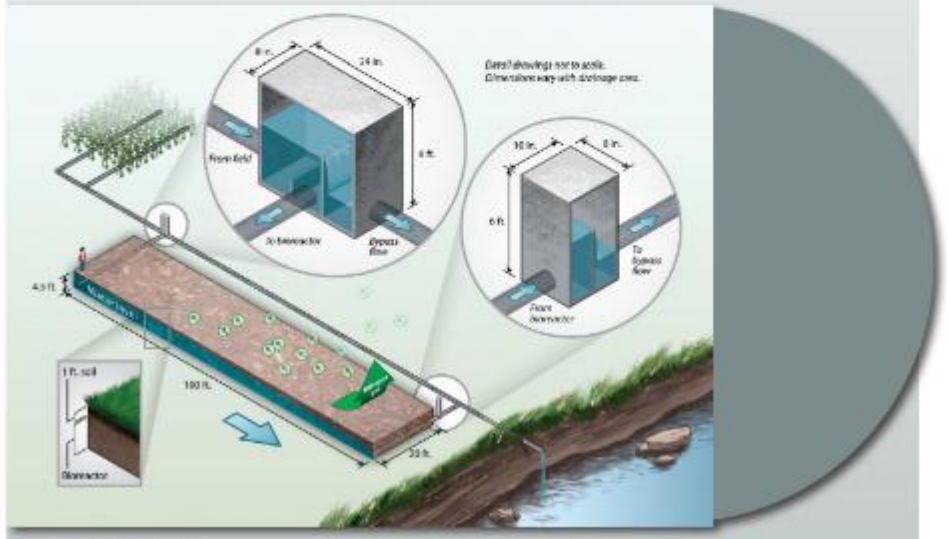


Illustration of a denitrifying bioreactor.

Natural Resources Conservation Service
www.nrcs.usda.gov
An equal opportunity provider and employer.

https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcseprd1027206.pdf

Agricultural Ditch BMP Panel Pre-proposal

Problem:

Already existing and soon to be approved NRCS BMPs related to ditches are not credited in the Chesapeake Bay Model for Progress Scenarios. Currently, only water control structures and ditch filters are credited in Model Planning Scenarios as a result of interim status. Agricultural BMPs installed in ditch systems represent a significant source of nutrient loss reduction credit in the Chesapeake Bay, as 70% of Delaware's tax ditches are in the Chesapeake Bay Watershed. In Maryland, 821 miles of ditches drain approximately 183,000 acres of land, most of which is located within the Chesapeake Bay watershed.

Denitrifying Bioreactors

The current NRCS standard applies only to subsurface flow, the panel will be examining the same technology applied to open agricultural ditches.

NRCS Code 605

NRCS Definition: A structure that uses a carbon source to reduce the concentration of nitrate nitrogen in subsurface agricultural drainage flow via enhanced denitrification.

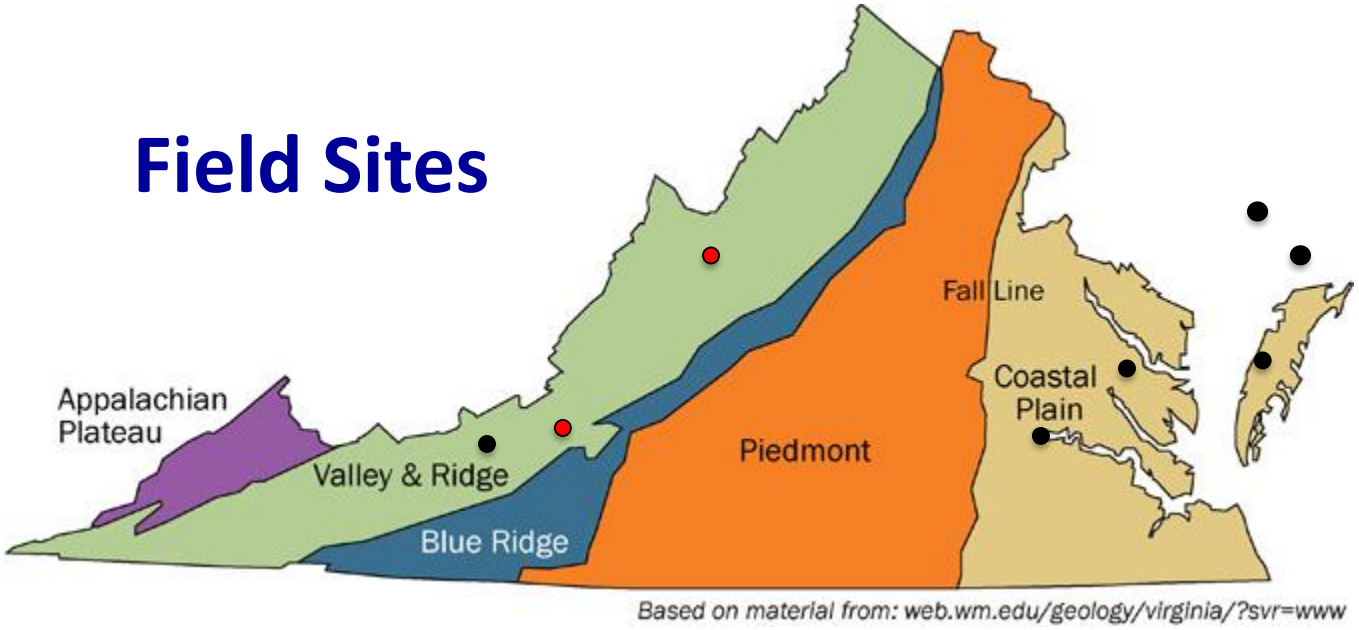
NRCS Purpose:

Improve water quality by reducing the nitrate nitrogen content of subsurface agricultural drainage flow.

Investigating biofilter utility in the Mid-Atlantic

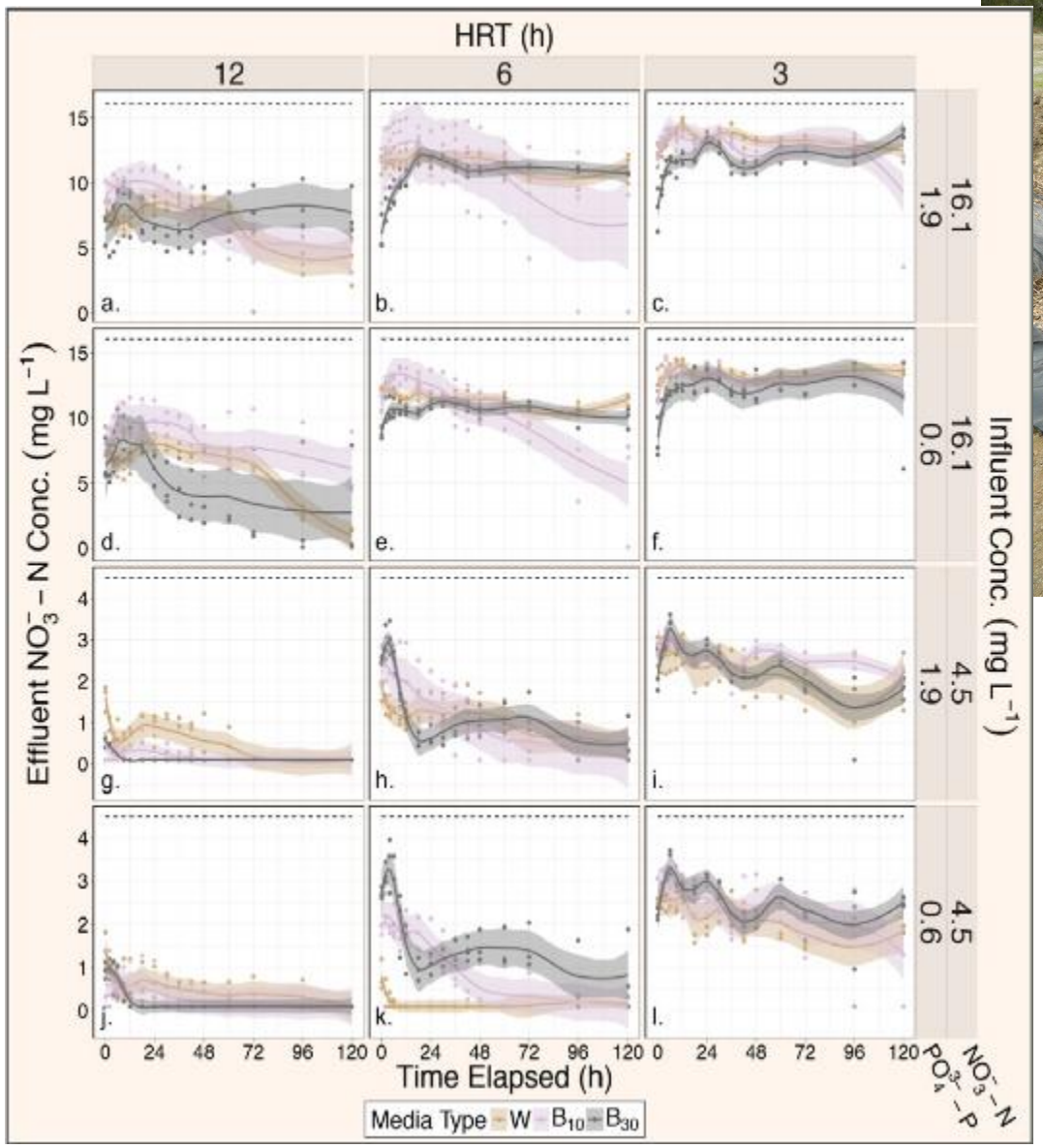
- Assess viability for N and P removal with long-term monitoring of field installations
- Optimize design to maximize nutrient removal and minimize GHG emission using lab and field experiments

Field Sites



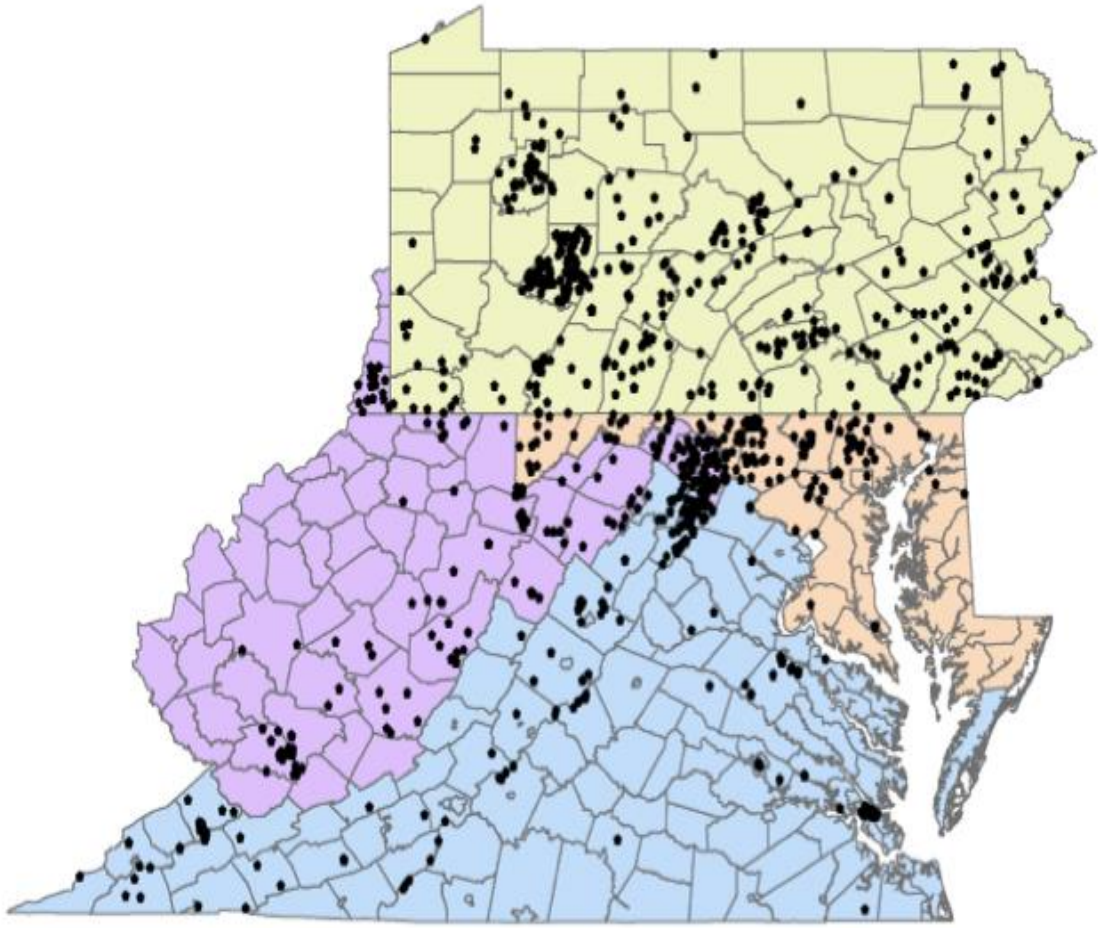
Current installations
- 4 in VA
- 2 in MD

Planned installations:
- 2 in VA

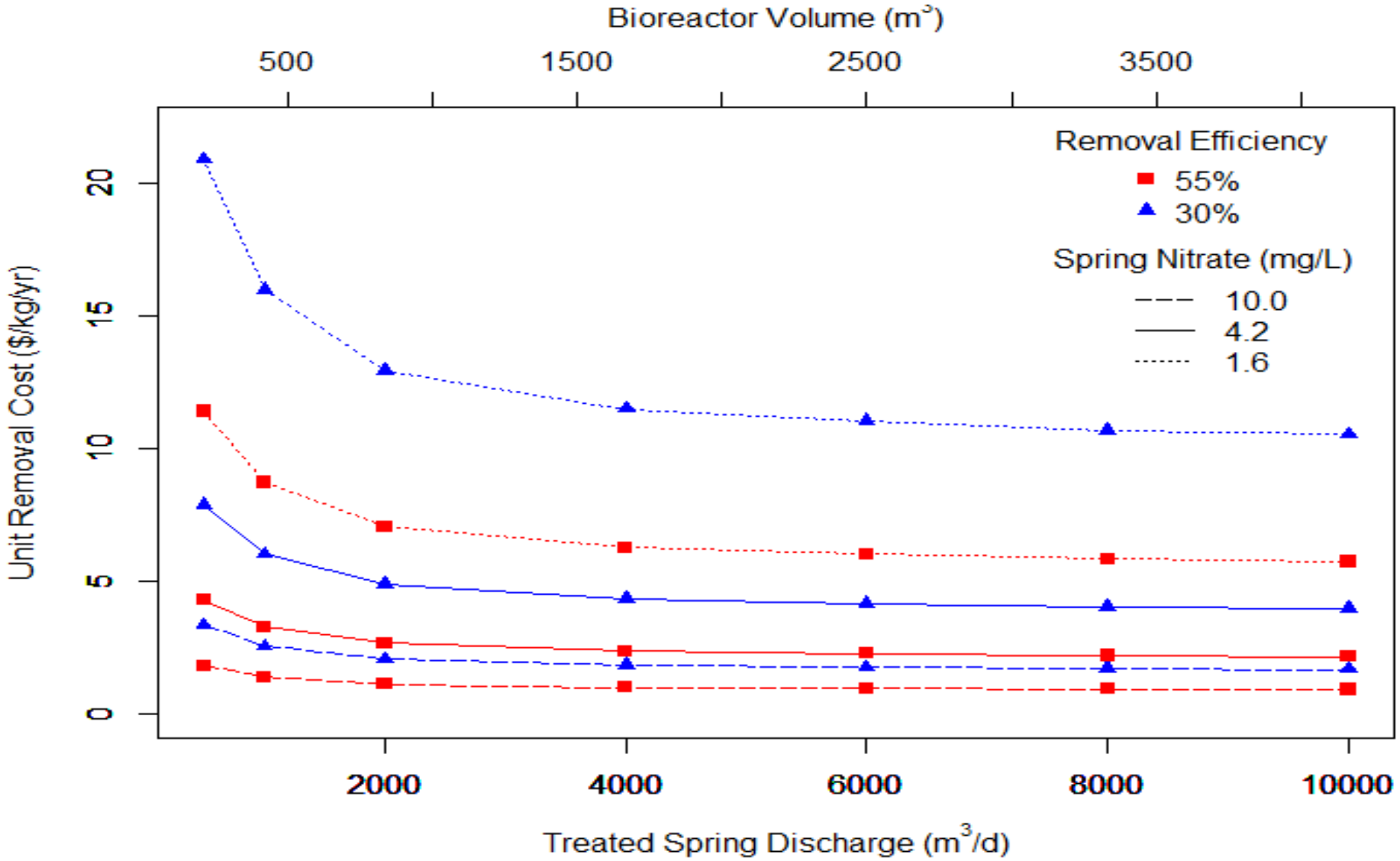


- Performance dependent on influent concentration, residence time, pH, temp, matrix (USDA-CIG)
- N removal 15-98%, 11 g m^{-3} d^{-1} average

New Opportunity – Groundwater N



- Emergent groundwater (springs) delivers 1000's kg/d of N to surface water
  - There are springs that discharge over 200 kg/d of N, equivalent to the daily discharge of Annapolis' water reclamation facility
  - Pilot testing bioreactors to treat spring discharge (USDA-NIFA)



Potential to remove more N at much lower costs compared to other options.

Selected Publications

Easton, Z.M., E.M. Bock, and K. Stephenson. 2019. **Feasibility of employing bioreactors to treat legacy nutrients in emergent groundwater**. Environ. Sci and Technology. (In Review).

Stephenson, K. and Z.M. Easton. 2019. **Evaluation of regulatory compliance options to meet Chesapeake Bay water quality goals: Treatment of legacy nitrogen using bioreactors**. Environ. Sci and Technology. (In Review).

Christianson, L., A.S. Collick, E. Bock, P. Kleinman, and Z.M. Easton. 2017. **Enhanced denitrification bioreactors hold promise for Mid-Atlantic ditch drainage**. J. Environ. Qual. doi:10.2134/ael2017.09.0032.

DeBoe, G., E.M. Bock, K. Stephenson, and Z.M. Easton. 2017. **Nutrient biofilters in the Virginia Coastal Plain: Nitrogen removal, cost, and potential adoption pathways**. J Soil and Water Conserv. 2017 72(2):139-149; doi:10.2489/jswc.72.2.139

Bock, E., N. Smith, M. Rogers, B. Coleman, M. Reiter, B. Benham, and Z.M. Easton. 2015. **Nitrate and phosphate removal and nitrous oxide production in lab-scale denitrifying bioreactors**. J. Environ. Qual. 44:605–613. doi:10.2134/jeq2014.03.0111.

Summary

- Need
  - Reduce N loading to surface waters
  - Gather BMP performance evidence
- Resources – Time and Money
  - First installation and lab work: 2010
  - Virginia Department of Environmental Quality – $120K
  - Conservation Innovation Grants (USDA; NRCS-CIG) – $748K
  - National Institute of Food and Agriculture (USDA-NIFA) – $500K
  - National Fish and Wildlife Foundation (NFWF) – $??
- Partnerships
  - Multiple universities
  - Multiple academic disciplines (engineering, economics, etc.)
  - NGOs (Midshore River Keepers, Ridges to Reefs)
  - Jurisdictions
- Impact

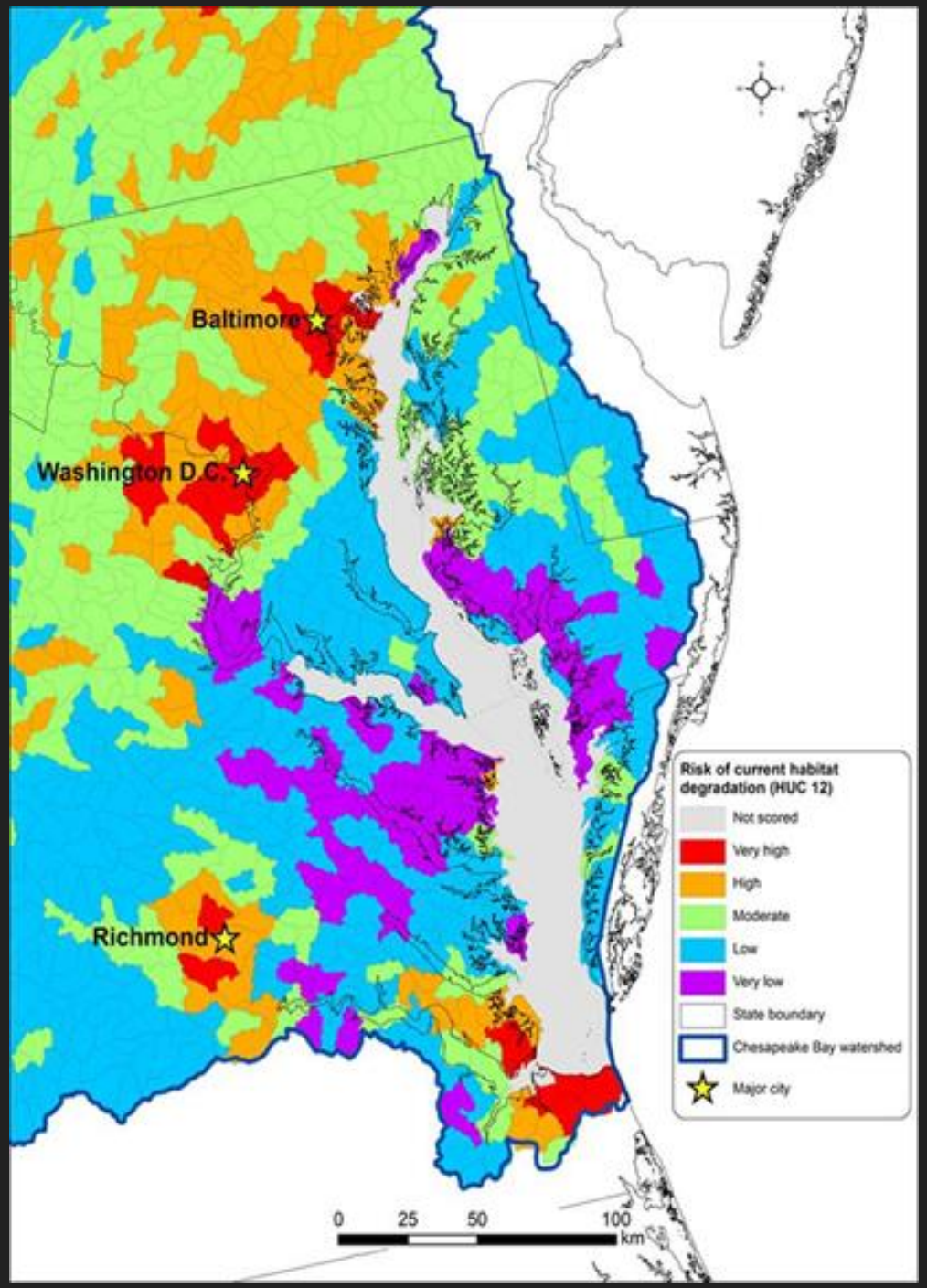
Fish Habitat Science Need

Example: Combining NOAA, USGS, and Bay Program resources

What is the science need?

A comprehensive regional-level assessment of the quality and quantity of inland and coastal habitat area to support fish spawning, feeding, nursery.

Synthesis of high-resolution data available to inform decision making in Chesapeake Bay watershed.



NATIONAL FISH HABITAT PARTNERSHIP

Source: 2015 National Fish Habitat Assessment by the NFHP

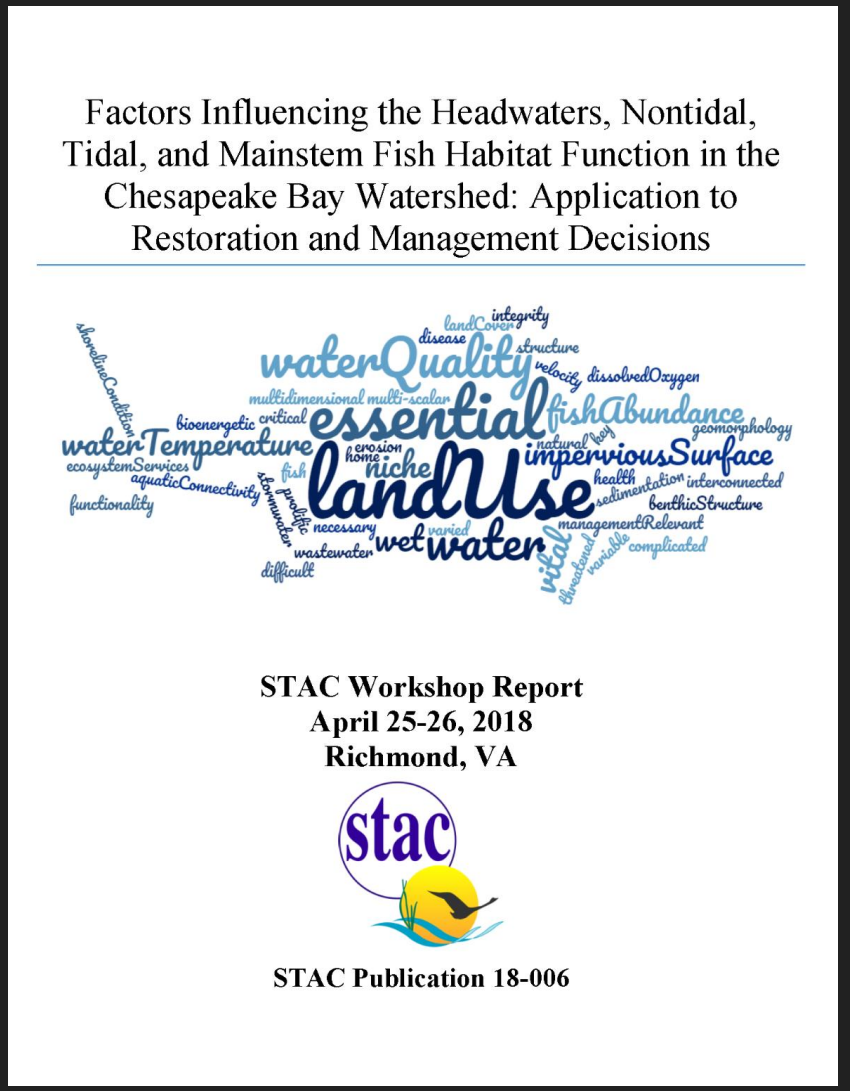
How are we starting to address the need?

STAC Workshop

- Identified need and applied for STAC funding
- Compiled existing data on existing habitat and sensitivity to stressors
- Conducted workshop bringing together scientists
- Informed by user needs survey

Find Partners

- Needed partners to compile a data inventory on habitat conditions and stressors
- Over 400 data variables were identified



Factors Influencing the Headwaters, Nontidal, Tidal, and Mainstem Fish Habitat Function in the Chesapeake Bay Watershed: Application to Restoration and Management Decisions

STAC Workshop Report
April 25-26, 2018
Richmond, VA

STAC Publication 18-006

Federal Partner Priorities

NOAA: habitat and fisheries productivity

- Office of Habitat Conservation concerned with Essential Fish Habitat
- Examples of NCBO funded projects:
  - Six projects and over $1M in fish habitat research and assessments for black sea bass, summer flounder, and forage
  - Nine projects and over $1M quantifying ecosystem services including fish habitat value of restored oyster reefs
  - Shoreline threshold analysis for forage fish and blue crab
- Cooperative Oxford Lab role

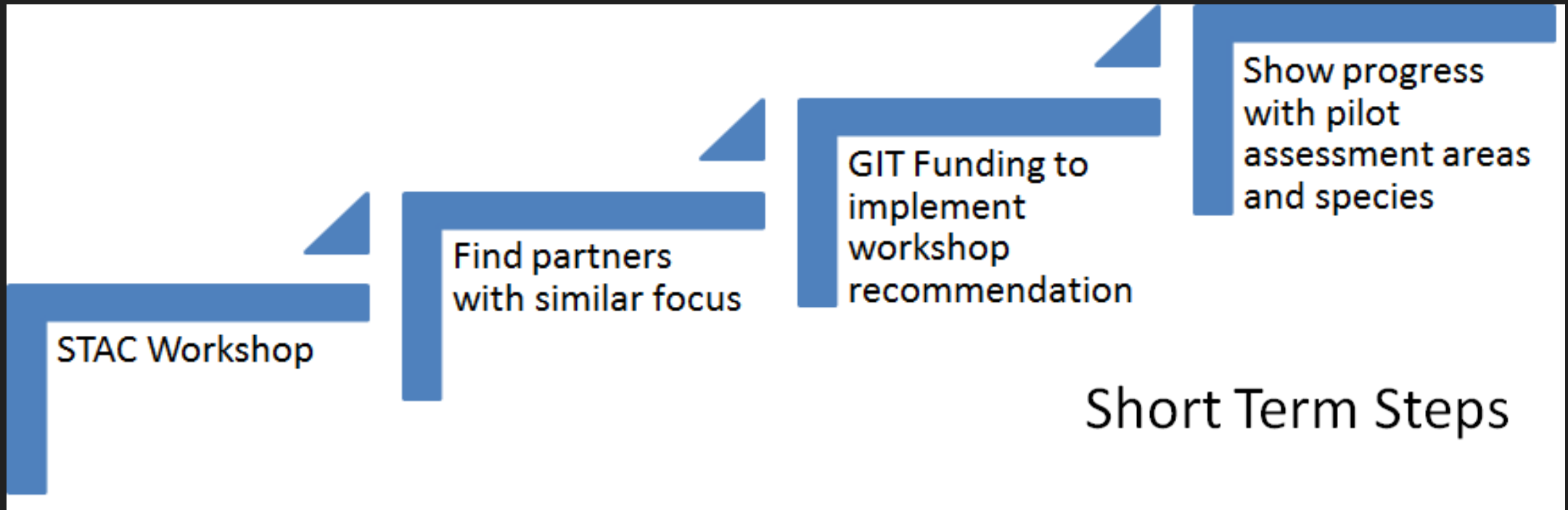
USGS: freshwater habitat conditions and fish health

- Focused science efforts on overarching goals of the CBP watershed agreement that align with the Department of Interior mission
  - Fisheries, waterfowl, people
- USGS 4 themes:
  - Fish habitat, health, and aquatic conditions
  - Coastal habitats and waterbirds
  - Land change and forecasting
  - Integrate and engage stakeholders

How are we starting to address the need?

GIT Funding

- Build from STAC workshop recommendations
- Need for further inventory of biological and environmental response data
- Developed RFP to hire a contractor for to complete estuarine data inventory, analyze data
- Use this analysis to inform future pilot assessments



Regional Partnerships

Assessment fits within broader context of complementary, concurrent efforts

- Southeast Fish Habitat Assessment
  - Led by ASMFC
  - North Carolina to Florida

- Northeast Fish Habitat Assessment
  - Led by MAFMC
  - Maine to North Carolina with mid-Atlantic focus
  - NOAA engagement with developing inland and offshore workplans

Next steps to address assessment science need?

This is a multi-year, multi-partner effort. May require many short term steps to achieve long term goal.

- Gather resources and partners to contribute to assessments
  - Identify and interact with state and academic partners who may want to participate in pilot assessments
- Conduct pilot assessments
- Develop short-term products/decision-support tools
- Communicate tools to the right users (local planners)

Climate Resiliency Workgroup
Climate Research Needs
Prioritization

JENNIFER DOPKOWSKI, NOAA CHESAPEAKE BAY OFFICE
CBP CLIMATE RESILIENCY COORDINATOR

March 14, 2019

Chesapeake Bay Program
Science. Restoration. Partnership.

Climate Resiliency Workgroup Background

- As part of the framework for addressing climate change impacts in the Phase III Watershed Implementation Plans (WIPs), the PSC requested that the Climate Resiliency Workgroup (CRWG) determine how climate change will impact the BMPs included in the WIPs and address these vulnerabilities beginning in the 2022-2023 milestones

Climate Resiliency Workgroup
Strategic Review System request

- During the CRWG SRS presentation it was pointed out that the workgroup really did not have the means to fully meet this PSC request without Management Board support.
- During the ensuing Management Board discussion, the CRWG was asked to provide a prioritized list of climate research needs for consideration.
- It was requested that the CRWG also get STAC input into the research needs list.

Climate Resiliency Prioritized List of Climate Research Needs

- Based on the Climate Resiliency Workgroup's (CRWG) previous science prioritizations that have been done over the last few years

- Two rounds of prioritization done by the CRWG

Climate Research Needs

- Design and function of BMPs under new climate reality 100 % *
- Better understanding of precipitation changes with regards to intensity, annual amounts, seasonal impacts, storm events and stormwater management 56% *
- Social Science - human behavior - implications of the human response (positive and negative) to climate change, flooding, sea level rise as well as motivation and needs of communities to adapt 50%*
- Better Understanding of sea level rise and subsidence impacts in changing climatic conditions 44%*

*percent represents the number of high priority votes received for each topic out of the total number of votes

Climate Research Needs

- Green infrastructure performance including increased sediment due to climate change 33%*
- Changing Climate Conditions and their impacts on wetlands 19% *
- Climate Impacts to key aquatic fish species abundance, life cycle and habitat 13%*
- Changing climate conditions and their impacts on SAV 6%*
- Changing Climate conditions and their impacts on invasive species 0%*

percent represents the number of high priority votes received for each topic out of the total number of votes

Climate Resiliency Workgroup's request of STAC

- CRWG presentation to Management Board on climate research priorities in February 2019

- CRWG, Water Quality GIT and other interested parties meeting on March 25, 2019 to address top research need
  - "Design and function of BMPs under new climate reality"