Chesapeake Bay Program's (CBP)
Scientific and Technical Advisory Committee (STAC)
June 13-14, 2023 Quarterly Meeting Minutes
Hybrid Meeting: Potomac Science Center; Woodbridge, VA
Meeting Webpage

**Tuesday, June 13th**

**Attendance:**

**W** = webinar

**Members:** Kathy Boomer (FFAR), Chris Brosch (DDA), Tony Buda (USDA-ARS – **W**), Shirley Clark (PSU), Bill Dennison (UMCES), Lara Fowler (PSU), Ellen Gilinsky (Gilinsky, LLC), Kirk Havens (VIMS), Ben Hayes (Bucknell University), Jason Hubbard (WVU), Jeni Keisman (USGS), Scott Knoche (Morgan State, PEARL), Ellen Kohl (St. Mary's College of Maryland), Erin Letavic (Herbert, Rowland, & Grubic, Inc.), Dave Martin (TNC – **W**), Andy Miller (UMBC), Mark Monaco (NOAA), Efeturi Oghenekaro (DOEE), Leah Palm-Forster (UD), Kenny Rose (UMCES), Mike Runge (USGS), Larry Sanford (UMCES), Leonard Shabman (Resources for the Future), Jeremy Testa (UMCES), Tess Thompson (VT – **W**), Weixing Zhu (Binghamton – **W**)

**Guests:** Doug Bell (EPA – **W**), Jess Blackburn (CAC – **W**), Karl Blankenship (Bay Journal – **W**), Charles Bott (HRSD), Nicole Brooks (UMD – **W**), Katie Brownson (USFS – **W**), Sarah Brzezinski (EPA – **W**), Peter Claggett (LUMM – **W**), Kalyanmoy Deb (MSU), Lisa Dewey (VA DEQ – **W**), Alex Echols (Campbell Foundation – **W**), Melissa Fagan (CRC – **W**), KC Filippino (HRPDC – **W**), Darion Fredericks (Fort Lewis College – **W**), Mark Hoffman (CBC – **W**), Amy Hruska (Underwood & Associates – **W**), David Maginnes (Maginnes Productions – **W**), Julie Mawhorter (USFS – **W**), Lee McDonnell (EPA), Kevin McLean (CBP – **W**), Kathleen Michels (Sligo Headwaters Civic Association – **W**), Amirpouyan Nejadhashemi (MSU), Hoda Razavi (MSU), Kristin Saunders (UMCES – **W**), Stu Schwartz (UMBC – **W**), Gary Shenk (USGS), Jennifer Starr (LGAC), Breck Sullivan (USGS), Peter Tango (USGS – **W**), Renee Thompson (USGS), Gregorio Toscano (EPA), Emily Trentacoste (EPA – **W**), Suzanne Trevena (EPA – **W**), D.G. Webster (Dartmouth College – **W**)

**Administration:** Denice Wardrop (CRC), Meg Cole (CRC), Tou Matthews (CRC)

**Call to Order, STAC Business, Announcements** – *Kathy Boomer (STAC Chair – FFAR)*

STAC Chair Kathy Boomer (FFAR) called the meeting to start at 9:35AM. Boomer provided an overview of the committee and responsibilities of STAC, including changes to STAC membership, and outlined the meeting agenda. STAC Members were invited to give an update on any ongoing STAC efforts and/or funded activities, and Boomer asked members to share any announcements on upcoming partnership activities and events of potential interest to the committee.

- STAC Membership: In recent STAC membership changes, Ellen Gilinsky (Ellen Gilinsky, LLC) has resigned from the Executive Board (EB), while Efeturi Oghenekaro (DC DOEE) has taken on the role of the Mayoral Appointee for the District of Columbia. Additionally, Emily Trentacoste (EPA) has been nominated by STAC for the Federal Appointee position, which is currently under review by the Chesapeake Bay Program (CBP). Furthermore, in September, the following at-large STAC members will complete their terms: Lara Fowler (PSU), Andy Miller (UMBC), Jeremy Testa (UMCES), Len Shabman (RFF), and Jay Stauffer (PSU). Lastly, at the upcoming September meeting, Kathy Boomer will transition from the position of Chair to Past Chair, with Larry Sanford (UMCES) assuming the role of Chair.
- Approval Requests:
    - March 2023 Quarterly Meeting Minutes – several STAC Members submitted clarifying comments to Meg Cole (CRC) prior to the meeting. Boomer gave an overview of the March Meeting discussions.
    - April and May Executive Board Meeting Minutes – Boomer relayed that the majority of EB discussion was related to either the Comprehensive Evaluation of System Response (CESR) report or the agenda for the June Meeting.
        - Fowler pointed out that May EB Meeting Minutes indicated eight new members were approved for STAC. Boomer clarified that the call for self-nominations is currently open and EB will confirm new appointees prior to the September Meeting. STAC Staff will adjust the Minutes document to accurately note current membership vacancies.
    - December 2022 Quarterly Meeting Minutes – the approval of these minutes had been deferred at the March Meeting. STAC voted to approve the December Meeting Minutes.

**DECISION:** March 2023 Quarterly Meeting Minutes conditionally approved, STAC Staff will address clarifying comments submitted by STAC Members.
**DECISION**: April 2023 Executive Board Meeting Minutes and May 2023 Executive Board Meeting Minutes approved.
**DECISION**: December 2022 Quarterly Meeting Minutes approved.

- Member Announcements:
    - Kirk Havens (VIMS): The Virginia Institute of Marine Science was awarded their largest grant in history by NOAA to start a national program to deal with the derelict fishing care issue, particularly traps. Funding is available for post-docs, project managers and graduate students.
    - Shirley Clark (PSU): American Study of Civil Engineers is finalizing and implementing an agreement with NOAA to begin to update projected and historical climate data for Atlas 14. This will be made available for infrastructure

design and the project aims for new IDF Curves nationwide in early 2026 with projection scenarios afterwards.
    - Boomer: Conservation Drainage Network held a meeting in April and shared that the USDA approved control drainage and conservation drainage measures as a set of practices to reduce nutrients and address water management concerns.
- Boomer and Cole finished STAC business with a reminder of the upcoming in-person September Quarterly Meeting on September 12 and 13 and the upcoming virtual December Quarterly Meeting on December 12 and 13.

**Discussion of Utilizing Remaining FY23 Workshop Funds on Activities Related to Findings in the Comprehensive Evaluation of System Response (CESR)** – *Denice Wardrop (CRC), Meg Cole (CRC)*

Denice Wardrop (CRC) presented potential next steps for the CESR report. STAC conversation during the March Meeting suggested using remaining STAC FY23 workshop funds for outreach and communication material related to the CESR report. Wardrop reviewed the background of the CESR report, which began four years ago when Zach Easton (VT) and Kurt Stephenson (VT) proposed the report and then-Chair Brian Benham (VT) brought it to STAC. All members of STAC participated in one of the three workgroups: estuary, watershed, or living resources. Each workgroup drafted a resource document which were used as the foundation for the overall CESR report. The main report is a synthesis effort with over 50 contributors. Within the policy implications section, three major opportunities for program management were identified: refocusing water quality management efforts to improve living resource response, improving effectiveness of nonpoint source management, and enhancing adaptive management.

Boomer reported on her presentation of Mike Runge's (USGS) to the Management Board (MB). Boomer prompted STAC to not get caught up in the jargon of multi-loop learning and instead consider who the decision-makers are and how STAC can support those decisions. Single-loop learning discussions might be most relevant to the Goal Implementation Teams (GITs) while double-loop learning might apply more to the Management Board and triple-loop learning targeted towards the Principles' Staff Committee and the Executive Council. Boomer impressed upon STAC to remember the connections between the stakeholder objectives and concerns to identify alternatives, opportunities and strategies to meet STAC's goals.

Wardrop then discussed transitioning the CESR Steering Committee to a CESR Outreach and Engagement Committee, which currently includes members from the CESR Steering Committee, STAC Chair, STAC Vice Chair, and representatives of GreenFin, and other members of STAC are welcomed to join. Rather than following the "loading dock model" of reports that places responsibility on others to access information, the CESR Steering Committee has socialized the messages of CESR over the past two years in an effort to prepare the Partnership for report findings and implications; Wardrop requested that STAC members begin to take on this role of discussing the report and act as a resource for others on key findings. The CESR webpage, which

contains the CESR report and supporting documents, additional related STAC publications, communications presentations, and news articles about CESR, has seen a great amount of web traffic in the month since it has been up and garnered an increase of people interested in joining STAC. The purpose of the CESR outreach plan is to "advance dissemination and understanding of the CESR findings and motivate implementation of the options identified in the report." The new committee will pull in people with relevant scientific expertise to support continued interest in topics that have generated interest and expand adaptive decision-making by evaluating key CESR findings and policy implications that are not receiving attention and then further develop and highlight the topic within the CBP Partnership.

- Havens: The outreach and communication component is vital; previous reports on the future lacked follow-up in reaching others. STAC needs to control the narrative or other groups will create their own narratives based on personal agendas.
- Lee McDonnell (EPA): The report can be intimidating and overwhelming and recipients seem unsure what to do with the information. STAC can help by presenting the information in digestible chunks and giving tangible suggestions. At what level does STAC want to engage first?
- Kristin Saunders (UMCES): There are important concepts in CESR that leadership across the Partnership needs to dig into and understand. Some partners are just receiving news of the report and the timing of the release is perfect for the Beyond 2025 discussions that are taking place. STAC and the Beyond 2025 Steering Committee can work together to introduce the concept of sandboxing and innovation by co-developing ideas what sandboxing can be in the paradigm we work in now and what could happen in a workshop format. Wardrop and Saunders have considered a workshop to look at ways to embed into the Strategy Review System (SRS) suggestions from the CESR report about enhancing adaptive management and moving information to different levels of the Partnership that do not currently have a lot of interaction.
- Kenny Rose (UMCES): Recently having given GIT presentations, noticed that there was a gap between the level of description and concrete illustrations of actions based on CESR recommendations. Rose suggested a few examples of adaptive management in best management practices (BMPs), particularly related to living resources.
    - Wardrop: The living resource document had the most specific examples. The Committee could assign a small team to each of the three categories create more concrete illustrations.
- Fowler: To those who were on the Steering Committee and working close with the information, are there opportunities for people to ask what may be perceived as 'dumb questions?' For example, Penn State has hosted several workshops where people can discuss the science and not necessarily be on public record. How can STAC create this opportunity for dialogue?

    - Wardrop: The CRC Roundtables create a similar experience; though only an hour, half of the time is given to information and the other half is a space to 'be clumsy.'
- Gary Shenk (USGS): Conversations about CESR have been helping the Bay Program realize that current practices are not adaptive management.
- Mark Monaco (NOAA): Consistent messaging within outreach is key. Rose's idea of demonstrating how living resource assessment framework could be implemented would build confidence and trust in the framework STAC is presenting. There is existing data that we can be more innovative with and link back to changes in habitat relative to Total Maximum Daily Load (TMDL).
- Miller: We should be careful about the messaging for CESR. The CESR Outreach and Engagement Committee should take part in developing concrete examples of adaptive decision-making that can be workshopped with decision-makers at different levels.
- Boomer: 1) Feedback to STAC: remember all that we've achieved, highlight what we've learned so far, and convey that we're not talking about abandoning the framework, the TMDL, or all the work that has been done up until today. 2) Concerned about the focus on delivering information and suggested also fostering a dialogue since the intention of adaptive management is to bring together different perspectives to collaborate. 3) Some discomfort with the idea that STAC does not inform policy and suggested presenting policymakers with alternate strategies along with the risks and benefits associated with each.
    - Denice Wardrop: 1) The discussion that the Steering Committee had about transitioning to the Outreach and Engagement Committee was that this report is meant to 'rock the boat' but not so hard that people fall out; the challenge of the committee is to help recipients integrate some innovation into what already exists. 2) For an example of reaching out, a leader – not necessarily a part of the Committee or even on STAC – would go out and gather a group of people to work on a specific topic. 3) While not able to make policy, STAC can inform policy.
- Testa: County commissioners approach Testa to ask about BMPs to implement and want to know how the concepts have been applied. Testa suggested the outreach strategy include example case studies that have tested the sandboxing concept.
- McDonnell: The release of CESR is perfect timing for the upcoming opportunity of Beyond 2025 Steering Committee meetings starting in the next week. The meeting is open and the committee will be putting together an evaluation process of the Partnership structure and its goals and outcomes to determine revisions to the Watershed Agreement. It would be prudent for the Outreach Committee to place CESR before the Beyond 2025 Committee within the next two to three months to inform the evaluation before the research begins.

- Jennifer Starr (LGAC): Kurt Stephenson presented recommendations from the CESR report at the Local Government Advisory Committee (LGAC) June Quarterly Meeting, reaching local elected officials throughout the watershed. Though members are mostly challenged by issues such as infrastructure and public safety, the recommendations from the CESR report resonated with the committee and decision-makers believed the information will help with prioritizing their county budgets. They found the sandbox slide particularly enlightening, and Starr will be searching for the pilots that Testa talked about.
- Jason Hubbart (WVU): To bring CESR outreach to the next level, STAC can unpack CESR to choose which pieces to take to the field, which would be more palatable and impactful for decision-makers.
    - Wardrop: The committee might have had something similar in mind, where teams select pieces to convey. The question going forward is, 'how do we pick out the pieces and the order?' Perhaps the advisory committees and the Bay Program can help evaluate these priorities.
    - McDonnell: The idea of sandboxing can start out at a lower level, like with the GITs, while Management Board and the Principles' Staff Committee can be presented with the bigger picture. Those two things can go on at the same time at separate levels of the Partnership. McDonnell recommended preparing materials for the Beyond 2025 Committee.
    - Sanford: The first thing the Beyond 2025 Committee should question is, *are we doing anything that's getting in the way? If we admit that what we are doing is unlikely to succeed in the foreseeable future, how do we rethink that process?* Beyond 2025 might want to start conversation with the concept and structure of adaptive management rather than dive immediately into specifics.
    - McDonnell: Agree; the group needs to look at how the Bay Program and Partnership is organized.
- Fowler: PSU is working with local communities in Pennsylvania that are unable to apply for the federal and state funding available for institutions. STAC should consider how to help from the bottom up and highlight accomplishments despite the challenges faced. The message to send out is, *we're making a difference, there is progress and there's more we can be doing. It looks like this and here is what local/county/regional governments could do.*

**Indigenous Knowledge Federal Guidance** – *Ashley Spivey (Kenah Consulting)*
STAC began considering how to engage with historically underserved communities and tribal nations at the March Meeting in response to the federal guidance on and implementation of Indigenous Traditional Ecological Knowledge (ITEK). Kenah Consulting was invited to speak with STAC on how to best implement the federal guidance, including increasing representation and consideration of Indigenous groups on STAC. Kenah Consulting is focused on the anthropology

and cultural heritage of working with indigenous communities and works with universities, cultural heritage institutions, and museums that are hoping to establish relationships with tribal communities. They help facilitate engagement to guide outside institutions on respectful and appropriate communication, and how to interact with tribal communities within the correct chain of command.

Executive Director Ashley Spivey and Cultural Heritage Director Lisa Bergstrom shared their insights and experience consulting with tribal communities on ways to increase capacity, economic opportunity, and sovereignty. Spivey is a member of the Pamunkey Indian Tribe, a reservation community located in King William County, Virginia and on the Pamunkey River. Spivey disclaimed that, though she is experienced in working with regional and other tribal communities across the U.S., she is an individual Indigenous voice and cannot speak on behalf of all Indigenous peoples.

The Indigenous Knowledge Federal Guidance has three main tenants: 1) understanding what Indigenous knowledge is and how it can be applied, 2) growing and maintaining mutually beneficial relationships with tribal nations, and 3) consideration, inclusion, and application of Indigenous knowledge in federal research policies and decision-making. The guidance defined Indigenous Knowledge and recognized it as a valid form of evidence for the inclusion in federal policy, research and decision-making; Spivey added that Indigenous Knowledge is also about approach, such as in relationship and partnership building and in sharing knowledge. Spivey highlighted that there is a current lack of effort, resources and funding in building equitable partnerships between researchers and tribal communities, and Indigenous Knowledge cannot be understood or implemented without first establishing these relationships. Funding and supporting capacity building is at the center of building trust in relationships with tribal communities; as tribes are trying to establish their governance and administrative infrastructure to engage with the federal government, they may not be in a place to take on the science at the level that they want to, so researchers must be deliberative and patient in building relationships. The easiest place to start working with tribal communities would be within established and ongoing projects that can benefit a tribal community as these intersections can be opened for Indigenous representatives to lead the initiative or project.

Spivey recommended STAC and the Bay Program approach relationship building with Indigenous communities through the concept of co-stewardship and co-management. She believed that it would be in the interest of STAC and the Bay Program to think about having official tribal recommendation. Next steps in building relationships with Indigenous communities could include auditing current initiatives, program and research endeavors to identify potential intersections where tribal partnerships can be built upon, learning what tribes are currently working on, and potentially establish some guidelines for policies or procedures for respectful, deliberate, and sustainable engagement with tribal communities. Spivey suggested STAC take time to build relationships with one or two communities in the heart of

one of the intersections identified and to use that as a model to learn from in building out the partnership.

- Bill Dennison (UMCES): Are there sacred sites or special places that are critically at-risk given sea level rise? Is there a sense of urgency to protect some of those sites?
    - Spivey: Yes, especially in the tidewater region. The key resources of all these tribal communities are on the waterways. The cultural and natural resources, tied to the economic resources, are being impacted by climate change but work to address these impacts is slow-going with nations working to immediately provide health and housing services.
- Boomer: This is a difficult conversation and politics make it even more challenging.
    - Spivey: One of the key challenges in Virginia is that no environmental or reservation code requires consultation with tribes beside a burial permit law. Cultural Heritage Partners are working for policy and law change so that Virginia state laws are the same as Federal laws that require tribal engagement and consultation.
- Rose: What do you mean by capacity building?
    - Bergstrom: One of the ways institutions can help Indigenous communities build capacity is by auditing grant opportunities; many grants are written in a way that prevents communities from qualifying or prevents communities from utilizing the grants. For example, reimbursable grant programs are difficult for those with low funding capacity to use. Other ways Indigenous communities are trying to build capacity are hiring new staff or learning how to use tools such as ArcGIS. Within Virginia, communities are still trying to establish their governments.
- Havens: Some scientists perceive working with the tribes as a lens to the past; with Beyond 2025, we need to think about what future Bay work looks like for both the tribes and the Bay Program/STAC in co-stewardship activity.
    - Ashley Spivey: This is related to the approach to Indigenous Knowledge in the preconceived notion that it is historical knowledge. It is historical, but it is also applicable to the present and the future and it is constantly being adapted. The knowledge that has been stewarded for a long time brings understanding of how the environment will look in the future and will help agencies and institutions in future planning.
- Lara Fowler: Penn State is a partner in the Cooperative Ecosystems Studies Unit (CESU), which might be able to help tribes in pushing dollars to go a lot further.
    - Spivey: The tribes are aware that an inequitable power dynamic exists with some institutions from the start, so CESU would be a helpful resource.
    - Dennison: CESU is a negotiated federal arrangement with these institute members, you do not have to go through an request for proposal (RFP) and can have a direct relationship with the agency.

    - Lara Fowler: 1) If there were to be tribal engagement with the Bay Program, who or how do you bring in input without excluding other tribes? Is there a regional coordination or organization? 2) Are there grant programs or language that is good rather than just language to omit?
        - Spivey: 1) That is a challenge that the Bay Program may potentially face. In Virginia, there is some consortium development so that there is one entity with all tribal representatives present that could be the partnership program. But it is new and loops back to the idea of capacity building. Current work with STAC member, Havens, seeks to build a Chesapeake-based consortium. Tribes are aware of the Bay Program and some believe that tribes should be officially represented.
    - Bergstrom: The question of who to bring onto a committee goes out to the community to figure out who has interest and capacity. It could be that among the representation being asked, only a few are interested at that moment of time but then ask again the year following.
- Jeni Keisman (EPA): Brian Hamilton (EPA) suggested asking the Steering Committee for the Chesapeake Community Research Symposium if they want to engage; is that separate?
    - Spivey: That is a potential option. The committee is focused on their Indian General Assistance Program (IGAP) efforts, which goes back to capacity funding opportunity. If they do anything outside of that, they need to consider resources and funding to help expand the focus. There is a consortium developing of tribal leaders (ICCA) focused on land acquisition.

**Report Out on the Chesapeake Governance Study: Report of 2021 Decision-Maker Interview Results** – *D.G. Webster (Dartmouth College)*

As part of the "Modeling the dynamics of human and estuarine systems with regulatory feedbacks" research project, D.G. Webster (Dartmouth College) interviewed decision-makers on the design of the CBP. There were a variety of rationales on how individuals viewed the effectiveness of the CBP. Overall, interviewees agreed that increased inclusiveness has caused more inefficiency from the volume of meetings as this requires more resources and potentially worsened political problems. Many specific challenges and opportunities were identified and Webster sorted responses into categories of implementation, partnership, and politics; challenges had a separate category of problem multipliers and opportunities had a category of multiple challenges. Multiple respondents saw the interconnectedness between these challenges and opportunities, such as the same people viewing climate change as both. Among opportunities, emphasis of co-benefits was the most frequently mentioned idea, the top two being reduce flooding and improve local water quality.

Webster recalled that the CESR report emphasizes a shift in thinking about changes in the biological system as potentially better goals than the oxygen minimum layer but believes that

decision-makers may not consider that to be an important co-benefit. Politics was seen as an issue in all phases of the policy process and the cause of other challenges, relating to the issue of the distribution of power and incentives and the problem with equity. Thinking about the centrality of equity to the effectiveness of the CBP is important to improving governance in the system as equity affects legitimacy, buy-in, and implementation. Participants from jurisdictions that do not border the Bay questioned the legitimacy of state level allocation of targets more than those from Bay coastal states. The majority of statements on Watershed Implementation Plan (WIP) design within their state view it as a paper process and the projects do not get implemented or are not implementable. Concern was expressed for reliance on models and model accuracy; the mystery as to why and how the model changes was one of the most common sources of believing the models are less legitimate. Decision-makers also appear to have a different view of what is happening between the models and the real world than reported in CESR.

Webster believes that bringing in equity can help to build more coalition with the willing by empowering those marginalized communities; many who live in the Bay watershed and are most negatively affected by pollution in the Bay feel that they do not have a voice. Residents who do not participate are not necessarily apathetic and building coalitions of the willing can help to improve governance; equity is important to the effectiveness of the CBP and not just a separate goal. Webster predicted that the CESR report, which is pushing for improving cost effectiveness by targeting areas that have a higher potential to reduce loads, will receive major push-back from certain decision-makers for the perceived inequity of resources going to some of their constituents and not to others.

- Scott Knoche (Morgan State, PEARL): Regarding inclusiveness not being efficient, might it be that the cost is obvious and upfront while the benefits are unseen and underappreciated?
    - Webster: In the data on why BMPs are selected for WIP design and why they might be implemented, cost and cost effectiveness are very important. Evidence supports that decision-makers have a similar view to what Knoche expressed.
- Ellen Kohl (St. Mary's College of Maryland): Were you defining equity or were the research participants defining it themselves? Is the definition of equity here social or geographical?
    - Webster: Participants defined equity themselves. For the state level, it was about allocated loading and how loading was allocated. For the local level, it was primarily about funding to different regions.

**Progress on CAST Optimization** – *Kalyanmoy Deb (Michigan State University), Pouyan Nejadhashemi (Michigan State University), Gregorio Toscano (EPA), Hoda Razavi (Michigan State University)*

Kalyanmoy Deb (MSU) and Pouyan Nejadhashemi (MSU) presented on the MSU-Optimization Project, which was initiated after the 2016 STAC Workshop Report "Cracking the WIP: Designing an Optimization Engine to Guide Efficient Bay Implementation" that focused on minimizing cost for WIPs while maximizing co-benefits and load reduction. The objective of this project is to create a platform with an optimization-based system that not only evaluates the cost and loadings of a BMP allocation but can provide solutions that improve water quality at the lowest cost. The team is currently at the mid-point of the 6-year long project; the objectives of the effort are as follows: 1) development of an efficient single-objective optimization procedure for cost-effective BMP allocation, 2) development of an efficient multi-objective optimization procedure for cost-loading trade-off BMP allocation, 3) multi-state implementation using machine learning and parallel computing platforms, and 4) interactive optimization and decision-making using user-friendly dashboard.

The goal of the optimization is to streamline solutions that decision-makers can compare for the best solutions, and to learn the pattern of choosing BMPs to implement. "Innovization", combining innovation and optimization, can help the Partnership on many levels: for farmers, it can provide information for better decision-making for BMP selection; for regulators, it can identify the high priority areas for BMP implementation; and for policymakers, it can help with resources allocation. In a specific example, the optimization model was able to select 7 most effective BMPs from 200, demonstrating the ability to save time for decision-makers. A video walkthrough and explanation of the tool can be found here.

The next step for the project is to incorporate systemic processes that identify trade-off between solutions and compare solutions' distances from a defined aspiration point. Other remaining tasks include completing conversion of BMP types, incorporating the multi-criterion decision-making to choose a single solution, and scaling up to multi-state and watershed optimization. The team plans to complete a number of case studies and host webinars to receive feedback.

- Wardrop: Are there conditional probabilities between BMPs or conditional combinations of BMPs?
    - Nejadhashemi: With the optimization, the team does not worry how the system implements the BMPs because CAST is running everything.
    - Deb: The algorithms used is not a point-based method; it starts with a set of solutions and moves to another set of solutions. The system internally understands the linkages between BMPs.
- Boomer: For clarification, we don't have spatial specificity built into the CAST system?
    - Deb: No, and the optimization algorithm is a solution generator.
    - Nejadhashemi: The resolution is currently at the land use segments.

- Rose: Is there a way to factor in the risk of failure of the BMPs, especially with multi-objective projects?
    - Nejadhashemi: Optimization does not have to factor in risk of failure; looking at decision-making and optimization at the same time, low-cost decision-making is incorporated into the process and baiting is going to be already implemented while the optimization happens. There is no limitation of how to define the problem but the solution must already exist in the CAST system for the optimization to find it.
    - Deb: If CAST can account for the BMP cost, loading, and uncertainty of the loading, it can be factored into the optimization, which will come up with solutions that are less sensitive to the uncertainty. There are a lot of multi-objective techniques that use weighting that are not used in this optimization due to the subjectiveness of assigning weight. The system helps decision-makers to compare criterion between solutions.

**Report Out on State of the Science Workshop Status of Shortcut Nitrogen Removal: Revealing the Outcome of 10 Years of R&D** – *Charles Bott (Hampton Roads Sanitation District)*
Charles Bott (HRSD) shared findings from the Hampton Roads Sanitation District (HRSD) Commission Meeting on December 20, 2022. Bott first outlined the process of conventional nitrification-denitrification for low level nitrogen removal and the process of biological phosphorus removal. Wastewater treatment plants that meet removal requirements are resource, energy, and chemical intensive. HRSD has been working to implement the Sustainable Water Initiate for Tomorrow (SWIFT), which effectively adds a drinking water plant beyond the wastewater plant that recharges the Potomac aquifer. Deammonification through Partial Nitritation-Anammox (PNA) is an effective form of shortcut nitrogen removal that uses the organism anammox to cut out processes of conventional nitrification-denitrification but is very difficult due to challenges in sufficient retention of anammox and nitrite availability for anammox. Partial Denitrification-Anammox (PdNA) is a compromise as it is a more feasible process that can support anammox growth and is almost as effective as PNA. A plastic medium has been found to help facilitate and protect the slow growth of the nitrifying bacteria and Bott's team has been piloting an experiment to lower ammonia concentrations even further.

The major challenge of using PdNA is controlling the ammonia to nitrate ratio and an accurate process is needed to meet the effluent quality requirements. Ammonia Versus Nitrate/Nitrite (AvN) is also needed and three approaches are used: 1) controller adjusts for changes in influent flow only, 2) feedforward model predictive controller from regression analysis of calibrated process model simulations, and 3) hybrid mechanistic and data/ML model with added NH4 sensor. These approaches all require accurate sensors to measure low concentrations of ammonia and to discriminate nitrate from nitrite.

The HRSD workshop focused on implementation topics and research needs. Next steps are continued development and deployment of PdNA with PNA remaining the goal, using wastewater carbon most effectively, further understanding of acclimation and kinetics in low dissolved oxygen (DO), and improving sensors and controls.

- Havens: What does "not a huge capital outlay" mean for HRSD?
    - Bott: The James River second anoxic zone project was 2-2.5 million. The Nansemond was a $300 million capital expansion, and the adder was about 16 million – which is considered a more significant investment.
- Dennison: With the data, sensors and trained personnel required to accurately improve the plants, are there ways to make these plants easier to staff?
    - Bott: There is a small plant-big plant divide and these processes are applicable to the larger plants that can manage them. A workshop last week concluded that the small plants need to just work. Big utilities, especially those with stringent nitrogen limits, should be pushing forwards.
- Weixing Zhu (Binghamton University): Are the issues in understanding how to increase to a larger, industrial scale?
    - Bott: Yes, for polishing PdNA; transitioning to PNA and doing PdNA in the rest of the plant are research topics. A large portion of nitrogen removal is still conventional, and the research topic is converting even more of the nitrogen through anammox pathway.
    - Zhu: A new wastewater treatment plant has been established in the Binghamton area, Zhu is unsure if they are doing anammox or conventional nitrification-denitrification process. Would the cold temperature prevent the anammox process?
    - Bott: Plants that have deployed sidestream anammox have anaerobic digestion and stringent nitrogen or ammonia limits but only a few plants in the world are using PdNA. Anammox growth rates are very slow in winter but the decay rate is also slow, which creates an excess of anammox activity that carries through the winter since the growth rate can't keep up with the rate at which temperatures decline. Bott's team has learned that a process is needed to provide a good biofilm surface for anammox to grow on.
- Fowler: Does anything kill off anammox? Can it be used from manure?
    - Bott: Originally it was though anammox were very sensitive but research in the last decade has shown them to be very tough. With agricultural waste, the most important factor is the ratio of organic carbon and ammonia concentration; the conventional process can be used and anammox as well as long as there is a good biofilm for anammox to grow on.
- Dennison: For the reinjection, do you need to get the nitrogen low? Can you count on some denitrification on the ground water?

- Bott: From a regulatory standpoint, the SWIFT requirement is 5 milligrams per liter tn at the wellhead on a daily basis but a critical control point – which goes to human health and drinking water protection – of secondary effluent tin based on analyzers knocks up 5 milligrams on a 15 minute basis. This ensures that it is always less than 5 at the wellhead.

**Science Needs of the Chesapeake Bay Program: Local Action Cohort and Riparian Buffer Needs –** *Breck Sullivan (USGS) and Outcome Leads Peter Claggett (LUMM), Renee Thompson (USGS), Katie Brownson (USFS), Julie Mawhorter (USFS)*

Breck Sullivan (USGS) briefly reviewed the Strategic Science & Research Framework (SSRF) and the Science Needs Database. The Local Action Cohorts requested feedback from STAC to expand science capacity. Peter Claggett (USGS) briefed STAC on high-priority science and policy needs for the land use outcome, the land use methods and metrics outcome, and the land use options evaluation outcome. Julie Mawhorter (USFS) discussed science needs belonging to the tree canopy outcome and Katie Brownson (USFS) on those from the riparian forest buffer outcome.

- Boomer, land use: Are there plans for post-2018 land use assessments? Any changes to definition of Clean Waters Act and those implications?
  - Claggett: Funding is available to map the watershed with ’21 and ’22 imagery and Claggett’s team is currently remapping and will finish that next summer. There is currently no funding beyond that but Claggett is working with EPA to draft an RFP to extend the monitoring period to enable a ’25-’26 land use data set at one-meter resolution and update the history for classification consistency. An additional element of monthly characterization of vegetation indices would allow for tracking seasonal land use changes. Regarding waters of the U.S., the landscape is very interconnected to streams and the recent Supreme Court decision creates a challenge.
  - Sullivan: The CBP released a monitoring review report last year that assessed all of the CBP monitoring networks.
- Havens, land use: Does your new hydrological data set distinguish perennial intermittent?
  - Claggett: It does not; it has no flow information associated with it. The current National Hydrography Dataset (NHD) modeled estimated flow could be attached to the improved mapping hydrology but the NHD wants to move towards a higher resolution than the USGS does.
- Miller, tree canopy: In Miller’s county, developers that remove trees are required to replace them and post a bond that is returned if the trees are alive after a certain period. There have been issues of mortality for the replacement trees and the County Commission on Environmental Quality is considering extending the duration of the bond

to require longer maintenance. Have you looked at this as in terms of playing a role in net loss?

  - Mawhorter: That is something we need to be synthesizing from different parts of the watershed: what are some of the approaches being used and the needs that aren't being met or need to be strengthened? It is different throughout – Maryland has regulatory structure to work with while other states do not have strict regulation. Our challenge is to find enough examples that address where areas are on that spectrum that makes sense and give them something to strive for wherever they are.
  - Miller: Does the high-resolution monitoring allow you to see how the trees are and detect whether they are surviving?
  - Mawhorter: The first two data sets are able to pick up the losses but newly planted trees can take a decade or more to show up in the data. The technology is improving but not reliable for young trees now.
  - Sullivan: LGAC was invested in the tree canopy fact sheet.
- Fowler, forest buffer: In Oregon, the Freshwater Trust has been working with wastewater treatment plants and drinking water suppliers who are dealing with water quality and temperature to get more green infrastructure; they found that the benefits were worth the cost. We can learn from initiatives and projects elsewhere in the country to speed up and deal with water temperatures.
  - Brownson: We did draw some inspiration from the work out West and thought about how to integrate it into the broader framework of thinking about water quality improvements. We are pushing for greater consideration in the Bay Program as it is a key foundational factor that will influence our ability to meet water quality goals and living resource goals.
- Boomer, forest buffer: 1) The lack of social science needs builds on the concern of policy implications that we've talked about with the Clean Water Act; we want to understand what concerns and opportunities residents see in green infrastructure. 2) Boomer expressed exasperation over the growing, long list of science needs and mentioned the opportunity to think about coalescing and prioritizing the science needs.
  - Brownson: We do have science needs that are specifically social science needs that weren't covered today. Mawhorter and Brownson have a parallel science need of figuring out how to engage with communities and landowners better and tailor outreach materials.
  - Sullivan: For concerns on the long list of science needs, we ask the GITs to prioritize them within their own outcome. The Scientific, Technical Assessment and Reporting (STAR) team does not prioritize the needs due to concerns of bias and prioritizing is something STAR has requested support for from the MB. STAR recognizes that there are trade-offs for the science needs that it finds resources for are the ones it does not and is trying to meet the best way of addressing our

needs that we have at the Bay Program while also addressing the priorities of those who could help us.

- Sullivan: STAR's last meeting discussed the SSRF with a panel of academics; some of the ways they suggested expanding science capacity through academia were a potential CRC Roundtable discussion, have RFPs include students and written to address science needs, and the co-development of science needs with the person who will support in academia and the GIT leads. Another suggestion was hosting workshops at different institutions to go through the Strategy Review System (SRS) and identify finance, policy, science factors and then come to STAC, a reversal of the current system. At the next STAC meeting, Sullivan will discuss with STAC ways to increase STAC's involvement in the SRS.

**ACTION:** If STAC Members' institutions are interested in potentially hosting a workshop, reach out to Breck Sullivan and Denice Wardrop.

**Wednesday, June 14th**

**Attendance:**

**W** = webinar

**Members:** Kathy Boomer (FFAR), Chris Brosch (DDA), Tony Buda (USDA-ARS – **W**), Shirley Clark (PSU), Bill Dennison (UMCES), Lara Fowler (PSU), Ellen Gilinsky (Gilinsky, LLC), Kirk Havens (VIMS), Ben Hayes (Bucknell University), Jason Hubbard (WVU), Jeni Keisman (USGS), Scott Knoche (Morgan State, PEARL), Ellen Kohl (St. Mary's College of Maryland), Erin Letavic (Herbert, Rowland, & Grubic, Inc.), Dave Martin (TNC), Andy Miller (UMBC), Mark Monaco (NOAA), Efeturi Oghenekaro (DOEE – **W**), Leah Palm-Forster (UD), Kenny Rose (UMCES), Mike Runge (USGS), Larry Sanford (UMCES), Leonard Shabman (Resources for the Future – **W**), Jeremy Testa (UMCES), Tess Thompson (VT – **W**), Weixing Zhu (Binghamton – **W**)

**Guests:** Jess Blackburn (CAC – **W**), Sarah Brzezinski (EPA – **W**), Rachel Felver (Alliance for the Chesapeake Bay – **W**), KC Filippino (HRPDC – **W**), Mark Hoffman (CBC – **W**), Amy Hruska (Underwood & Associates – **W**), Lew Linker (EPA), David Maginnes (Maginnes Productions – **W**), Lee McDonnell (EPA), Kevin McLean (CBP – **W**), Kathleen Michels (Sligo Headwaters Civic Association – **W**), Pouyan Nejadhashemi (MSU), Hoda Razavi (MSU), Kristin Saunders (UMCES – **W**), Gary Shenk (USGS), Jennifer Starr (LGAC – **W**), Breck Sullivan (USGS), Peter Tango (USGS), Emily Trentacoste (EPA – **W**), Suzanne Trevena (EPA – **W**)

**Administration:** Denice Wardrop (CRC), Meg Cole (CRC), Tou Matthews (CRC)

**Framing the Discussion: Advancing Living Resource and Habitat Management in the Chesapeake Bay's T-Zone** – *Kathy Boomer (FFAR)*
At previous STAC quarterly meetings, Mike Runge (USGS) has introduced the committee to a framework for advancing the application of adaptive management within system management. STAC has discussed this concept as it relates to soil health, wetland restoration, environmental flows and human health risks. Boomer continues this conversation with facilitating two panels and a discussion on the concept of the terrestrial-estuarine transition zone, or T-zone, defined as "the area of existing and predicted future interactions among tidal and terrestrial or fluvial processes that result in mosaics of habitat types, assemblages of plant and animal species, and sets of ecosystem services that are distinct from those of adjoining estuarine, riverine, or terrestrial ecosystems" by the Goals Project. More information on the T-zone concept can be found in the STAC report "Revisiting Coastal Land-Water Interactions: The Triblet Connection."

The T-zone is a major thread of the work from CESR, which emphasized more explicit management of shallow water living resources. For the Chesapeake Bay, T-zone extends far inland to the freshwater microtidal zone, into Delaware and beyond the fault line of the western shore; triblets are very important locations of habitats of concern. Target submerged aquatic vegetation (SAV) are in both shallow, open waters and tidal freshwater zones and black duck priority restoration and conservation areas are mostly within the T-zone.

**Opening Remarks on Adaptive Resource Management: The Power of (Multiple) Models –** *Byron (Ken) Williams (USGS)*
Ken Williams (USGS) discussed the use of adaptive management models and monitoring to improve decision-making processes. Adaptive management models take action inputs and translates into resource consequence outputs; additional inputs are resource status and environmental conditions that tend to fluctuate through time and additional outputs are cost and benefits that accrue with the decisions and actions. Models of adaptive management are embedded in a context of uncertainty, from the fluctuations of the system through time due to environmental variation and from the function structure that turns actions into consequences. The core focus of adaptive management is on reducing uncertainty and through both management and monitoring. Using an adaptive management process improves managements by encouraging knowledge coproduction and iterative learning.

Williams stated that monitoring is important in adaptive management as it supports both learning and managing. Resource systems can be monitored in a variety of ways and different approaches will result in different views of the system; natural resource systems are infinite-dimensional and with limited monitoring efforts, decisions must be made about what is most important to monitor. Effective and relevant monitoring must have a defined purpose of data collection, concrete data to be collected, and methods of data collection; monitoring should be carefully designed and well-articulated to motivate support. Each monitoring project will vary in

terms of purpose, scale, focus, funding needs, accuracy and standardization requirements, and necessary capacity.

Modeling and monitoring are fit into adaptive management enterprise through sequential decision-making: decisions are guided by management objectives at each time, monitoring is used to track system responses, an assessment is made of the monitoring data with previously collected information, and subsequent decisions are made based on the improved understanding. Key factors of adaptive management are making decisions through time, keeping track of what is learned, using that knowledge to improve decision-making, and managing to promote learning and learning to promote better management. The two phases of adaptive management are the deliberative phase, in which the architecture of decision-making is put in place, and the iterative phase, in which the architecture is used in a feedback sequences in which decisions are made. This second phase is the first loop of double-loop learning, periodically interrupted by a revisitation of the architecture that is the second loop.

Williams suggested that STAC might be familiar with some ongoing work in adaptive management, such as stakeholder engagement and multi-loop learning. Williams views the greatest challenge in adaptive management to be convening partners. Literature and discussion about adaptive management is increasing but limited action has been taken to initiate adaptive management. William believes that many natural resource problems are pre-adapted for an adaptive approach.

- Leah Palm-Forster (UD): As an experimental economist, Palm-Forster does similar work in controlled testing of different programmatic approaches or policy approaches to learn about behavioral response (e.g., how people change their decisions and response to that programmatic change). Have you engaged with experimental economists or do you think that this approach could help accelerate the process of adaptive learning?
    - Williams: While most of the Science and Decision Center is made up of economists, a major challenge is getting economists and ecologists to talk to each other. The comparison of responses to control and treatment actions is part of what the learning process is all about.
- Wardrop: Running this adaptive management cycle on a TMDL that's engaged in a broader policy of the watershed agreement, that policy of the TMDL is putting certain constraints on whole optimization procedure (e.g. rewards are strictly defined in terms of water quality). Have you looked at what having to operate adaptive management within a TMDL does to your broader abilities to do adaptive management and the restoration of the system?
    - Williams: No, but I have worried a great deal about this idea of adaptive management in the context of a scale-based issue where management can occur at one scale, outputs recorded at another scale, and decisions are made at yet

different scale. This is among the list of issues that need to be addressed; it doesn't mean it can't be done but that those scales need to be accounted for.

- Runge: The version of adaptive management you presented has hidden premises that there's a single decision-maker and that the impediment to the decision is uncertainty. The Chesapeake Bay has multiple decision-makers with different objectives and decision-makers do not always cooperate with each other. In some ways, uncertainty is a smoke screen for the real issue of different objectives. In that case, the other versions of adaptive management that focus more on the double- and triple-loop learning are more attractive because it gives partners time to work together without having to finalize agreement about all the objectives; it's a productive process for proceeding while sorting out the real deep differences.
    - Williams: 1) This model assumes that there is *a* decision that is made but not how that decision is made or that there is only one decision-maker. 2) All the elements of architecture are part of a group decision-making process, including stakeholder involvement, objectives, management decisions, predictions, and monitoring. It can't be avoided in big systems and part of the architecture investigation is to figure out ways that the multi-focused group can come to a decision. It may be that the focus at the beginning is not optimizing decision-making but getting to a point where the group can make a joint decision.

**Current and Planned Modeling and Monitoring in the CBP T-Zone –** *Lew Linker (EPA), Peter Tango (USGS)*

Lew Linker (EPA) presented "Application of Multiple Models to Support Chesapeake TMDL" as a review of current progress on Phase 6 and future work on Phase 7 of the CBP Model. The assessment of climate change using various models of Bay metrics resulted in condition predictions for 2025 and 2035; these models helped inform nutrient load decisions in 2020. The STAC Workshop for 2025 and Beyond developed recommendations and some of the guidance has been successful in receiving acknowledgement and being addressed. Linker and his team are currently developing the Main Bay Model (MBM) and the Multiple Tributary Model (MTM), which has improved shallow water modeling and can be used to update all Chesapeake tidal water TMDLs to future climate change conditions with consistency among themselves and the overall Chesapeake TMDL. The final model development is slated for 2025; a review of the models will be conducted in 2026 and the models will be applied in 2027.

Peter Tango (USGS) presented "Monitoring Chesapeake Bay: Recent guidance and investments for dissolved oxygen, SAV, water clarity, and chlorophyll *a*" that reviewed past and current work monitoring indicators of the Chesapeake Bay. Large scale reviews of the Bay Program monitoring program in relation to objectives are done approximately every decade and changes are made over time with the help of advanced monitoring opportunities and recommendations made through related CBP workshops. Tango described the next step on advancing guidance to build out the Next Generation Tidal Bay Monitoring Strategy, which will leverage existing work

and incorporate new science and technologies into the vision, such as using new spatial coverage and temporal density data available.

**Response Panel & Group Discussion –** *Byron (Ken) Williams (USGS), Mike Runge (USGS), Kenny Rose (UMCES)*
With greater understanding of the T-zone and it's influence on living resources of concern, STAC discussed ways to advance science-based resource management in the Bay Program.

- Saunders, to Tango: Can you speak to the intersection of the land use–land cover hyper resolution information, how it nests within the monitoring strategy, and how it might support monitoring and understanding the T-zone at the land-water interface?
    - Tango: The opportunity to link the scale of data for the one-meter scale created by Claggett and his team is new and we are trying to catch up. The management side is targeting research findings, such as the shoreline's influence on SAVs, migratory fish habitat and shellfish habitat, and looking at areas to prioritize for monitoring. An important part is the achievement of getting to the scales asked for on the local level and to continue supporting Claggett and his team as they monitor change over time.
    - Linker: From a modeling perspective, we cannot work effectively at Claggett's scale and the CBP will need to aggregate it up. But the triblets are tidal so one square kilometer inputs to the estuarine model or the MTM is sufficient.
- Boomer: Who do you think of as stakeholders and what are some practical strategies for facilitating engagement?
    - Rose: Stakeholders have different definitions for habitat, so Rose advises to avoid using the word 'habitat' and be very clear in descriptions given to stakeholders.
    - Williams: When investigating and managing a large, multi-scale system like the Chesapeake Bay, identifying the stakeholders that need to be a part of the decision-making and engineering their interactions for collaboration is necessary. These challenges factor into every aspect of the architecture of adaptive management and the structure that the stakeholder community is using to make joint decisions must be revisited and adjusted.
    - Runge: When thinking about stakeholders, particularly in the decision-making setting, Runge is thinking about those that have input in the policy agenda and the Bay-wide objectives. The management actions that are being taken and the policies that are being implemented act not only on the ecological system but the coupled human-natural system, and the behavior of individual human beings as elements of the system, rather than stakeholders, is important. That behavioral response is part of what we need to be able to predict in our models; these are complex systems.

    - Williams: These systems consist of two pieces: the natural system and the human system. And these pieces are intimately tied together. Must think more broadly than the dynamics of a natural resource system and include how management affects both the human and natural relationships.
    - Rose: The silent stakeholders are difficult to identify and engage but they are important to maintaining a balanced view of the systems.
    - Dennison: In human rights circles, there is a distinguishment between rights holders (i.e., those who have a right to clean water and clean air) and duty bearers (i.e., the agencies and the government that provide the rights).
    - Havens: There are stakeholders, particularly Indigenous tribes, who would see no distinction between the natural resource and human cultural component.
- Sanford: River keeper organizations around the Bay have been incorporating citizen science in monitor programs. Would the Bay Program be able to increase stakeholder engagement and expand its ability to monitor shallow water systems if it created a protocol for citizen science?
    - Tango: Over the years there had been some disparate attempts but in 2015, funding was placed in the Chesapeake Monitoring Cooperative formation and since 2016, the Alliance for the Chesapeake Bay has been leading the effort. There has been investment and application of citizen science and incorporation of the data. The Mid-Atlantic Volunteer Monitoring Conference in Carlisle, PA on June 29-30 will cover citizen science-related monitoring support.
    - Linker: To expand on Tango's comments, it is a constant struggle to get the information needed for the models. The information moves the models forward and comes from disparate sources like citizen monitoring. Linker's team is considering an automated process that would draw from the information sources such as USGS stations, local stations run by an aggregate department, and citizen monitoring with sufficient protocols.
- Fowler: In Pennsylvania, the multitude of decision-makers and decisions are finally gaining traction. There are groups that are prepared to help; when reporting on CESR and in the Beyond 2025 discussions, think about how to frame the concrete next steps.
    - Boomer: The Eastern Shore stakeholders are perceiving the conversation as: what matters is upstream of Conowingo and individual actions in other places are insignificant. Outreach has to create balance, especially with the realization that the T-zone is particularly important.
    - Fowler: Reframing the language as the following: we are all important in this and we all matter, but speaking with different groups will be context specific for the challenges and solutions.
- Keisman: Going back to what Runge said about needing to predict human actions, how do we tackle that understanding?

    - Palm-Forster: Trying to predict and understand human behavior is challenging for many reasons. In terms of this group, it likely involves bringing more panelists to STAC meetings to talk about the work that is being done in this area; social science seems to be a small part of STAC discussions while it is a big part of the challenges and potential solutions.
    - Havens: Fundamentally, it's money that changes human behavior.
- Wardrop: Would it be helpful if STAC constructed an example of a pilot that demonstrates adaptive management and new approaches in a T-zone with certain characteristics discussed today?
    - Miller: When we want to make the case to various levels about the adaptive management issue, we need concrete illustrations of how it can work. A question about the T-zone: the land-water boundary of the T-zone is moving and will continue to move with sea level rise; tidal marshes are going to migrate or disappear. The modeling and monitoring aspects play an important role as part of the modulation of what moves between the land and the water, so where do they fit with the moving land-water boundary?
    - Boomer: If STAC were to illustrate a pilot, the first step would be to consider all the diverse perspectives regarding the T-zone: its role, how it behaves, and how it responds to human actions. STAC would need to think about practical ways to collect those perspectives in a way that could inform the development of the pilot project.
    - Runge: Who are the decision-makers in the T-zone and how do we empower and motivate them? If STAC were to find a county commission to do a pilot with, we would have to ask what they are trying to achieve and how it is not represented in what we're already doing? CESR highlights that there are other objectives stakeholders care about that do not pass through the TMDL or water quality standards. So how do decision-makers view the objectives and predictions made by the Bay Program? Do decision-makers have predictive tools to help them make decisions and know the impact of different policies they might put in? Boomer framed the pilot as gathering all the stakeholders to get a perspective of what they care about in the T-zone; Runge suggested finding a decision-maker working in the area and work through them with what they and their constituents care about. BMPs are a particular kind of government structure where the actors are not held accountable for the outcomes. Would a system that credits the outcome and performance-based standards create innovation? There are ways to think about these pilots to pull in elements from CESR and adaptive management that will empower decision-makers to take action.
    - Williams: Finding potentially useful pilots and developing those pilots is an effective idea. Programs with pilots advance more effectively; it is difficult to engage stakeholders without examples. From listening to STAC's discussions this

morning, Williams has noticed two major reoccurring issues to continuously consider: collaboration and scale.
    - Wardrop: Part of designing an effective pilot is identifying the questions it needs to answer.
    - McDonnell: 1) Currently, responsibility for implementation lies with the seven jurisdictional partners and if STAC goes to a county decision-maker, the scale needs to include the next level up. 2) Living resources is tied into the water quality analysis but that can be changed. Should we shift to looking at just living resources and start to steer away from water quality? Or are we trying to bring all the stakeholders under the same umbrella?
- Kohl: In addition to scale, spatiality is important in the discussion of pilots with the different impacts of built and natural environments. Adding to Runge's comment on the ways of assessing success, many governance structures and laws are based on intent while the impact is concrete and affects goal achievement.
    - Keisman: If we have a pilot created for what the stakeholders and decision-makers care about, it would need to be based on the outcome rather than the intent. We would also need to add an outcome that can be observed in the timeframe of that pilot in the selection criteria for that pilot.
    - Palm-Forster: Agree that multiple pilots is critical as a single pilot would not provide all the desired information with confounding variables. In a future meeting, STAC can have a conversation about which entities at different levels may have the flexibility within policies and programs to try pilots.
    - Boomer: There may be collaborations in place to provide that first order pilot, such as The Nature Conservancy and other watershed initiatives.
    - Gilinsky: Planning districts might also be amenable.

The STAC September 2023 Quarterly Meeting will take place in-person on Tuesday and Wednesday, September 12th and 13th, 2023 at the Fredrick Douglass-Isaac Myers Maritime Park in Baltimore, MD. The theme will be *Institutional Learning: Informing Watershed Management Through an Inter-Regional Program Comparison*.

*Minutes Conditionally Approved by STAC at the September 2023 Quarterly Meeting*
*Finalized after STAC Staff addressed clarifying comments submitted by STAC Members*