Scientific and Technical Advisory Committee (STAC)
September 12-13, 2017 Quarterly Meeting Minutes
Westin Annapolis Hotel – Annapolis, MD

Tuesday, September 12 Minutes

Attendance (W: Webinar)

Members: Brian Benham, Donna Bilkovic, John Karl (JK) Bohlke, Kathleen Boomer, Charles Bott, Christopher Brosch, Amy Collick, Alix Dowling Fink (W), Zachary Easton, Lara Fowler (W), Carl Friedrichs, Marjy Friedrichs, Kirk Havens, Carl Hershner, Jason Hubbart, Thomas Ihde, Susan Julius, Hamid Karimi, Peter Kleinman, Martin Lowenfish, Mark Luckenbach, Chanceé Lundy (W), Andrew Miller, Mark Monaco, Steve Newbold, David Newburn, Marc Ribaudo, Adel Shirmohammadi, Kurt Stephenson, Lisa Wainger, Gene Yagow, Weixing Zhu

Guests: Rich Batiuk, Annalise Blum (W), Jeffrey Brainard (W), Sally Claggett (W), Rachel Felver (W), Paul Ferraro, Mary Gattis (W), Lindsey Gordon (W), Morgan Grove, Jeremy Hanson, Caitlyn Johnstone, Dexter Locke, Jamie Mitchell, Scott Phillips, Gary Shenk, Joan Smedinghoff (W), Jennifer Starr (W), Timothy Stephens

Administration: Bill Ball, Rachel Dixon, Melissa Fagan, Elaine Hinrichs

Call to Order – *Lisa Wainger (STAC Chair – UMCES)*

Wainger called the meeting to order at 10:00 am. STAC members and guests introduced themselves. Wainger requested a motion to approve the July 2017 EB meeting minutes; STAC members approved the document. Minutes from the June 2017 quarterly meeting are to be completed for approval in December. STAC Staff Elaine Hinrichs (CRC) presented the 2018 quarterly meeting dates: March 13-14, June 12-13, September 11-12, and December 4-5. Wainger provided the membership with a brief recap of the June quarterly meeting, reflecting that the comparison of other regional waterbody restoration approaches highlighted strengths of the Chesapeake Bay Program (CBP). Wainger then gave an overview of the September STAC quarterly meeting agenda and introduced the meeting theme: integrating ecological and social sciences.

DECISION: **Wainger** requested a motion to approve the July 2017 EB meeting minutes. Result: Motion carried.

ACTION: **Hinrichs** will send calendar invites to STAC members for the 2018 quarterly meeting dates of March 13-14, June 12-13, September 11-12, and December 4-5.

Applying Behavioral Economics to Improve Environmental Programs – *Paul Ferraro (JHU)*

Ferraro, a decision scientist, performs experiments with real world programs in order to improve those programs, and research the underlying mechanisms on how human behavior interacts with environmental programs and policies. Ferraro began his presentation with a group exercise to demonstrate the concept of positive versus negative framing; small changes in wording can influence policy-relevant changes in behavior toward what programs people support. Particularly, when introducing a new program, considerations need to be made on how to best encourage a behavioral change and promote compliance (i.e., implementing a practice, installing a best management practice (BMP), etc.) – a common method is incentivizing. The ultimate utility of incentives depends on how they are introduced and should be weighed from a cost perspective. Ongoing field experiments embedded into actual programs determined that behavioral responses are not being quantified or fully considered. "Behavioral economics" highlights these considerations and their importance in initial program design and expected outcomes. Human behavior is difficult to predict. Psychological biases such as anchoring (starting information – 'anchor points' – will affect future decisions) and affect (emotional responses) strongly influence choices. People react stronger to issues with a stronger emotional basis (e.g., health and safety, water quantity), and often this leads to stronger responses than facts presented by clear and transparent science. Interventions inspired by behavioral sciences can change policy-relevant behaviors, and effective implementation is often cost-effective. STAC members asked Ferraro how to carefully frame the issue to encourage change, but still maintain links to the science. Ferraro noted that changing the scale of the problem by talking about the impact on one person could induce more people to act. Questions on the ongoing field experiments generated discussion on the differences in spatial scale, between urban and agricultural communities, and compensating between individual and group behaviors.

Capacity to Adopt Land Use Policies – *Morgan Grove (USFS)*

Grove is the resident social scientist at SESYNC. The focus of his research addresses the question of the adoption of practices for land conservation and restoration, specifically, getting people to engage in the restoration of the landscape across several different land uses. Grove approaches this issue from a multi-scale perspective – social, economic, and ecological – to help target the 'where' and 'who' of restoration efforts. Grove's work also considers spatial scales in promoting behavioral change toward land use policies: from high resolution land cover across the watershed to land ownership by individuals. Focusing on trees, Grove explains that most trees are on residential lands – when considering where to plant more trees and who is most likely to do so, understanding the market segmentation of your target audience leads to more effective land management policies. Ideally, sets of practices should fit into preconceived social behaviors; Grove used an example of the social pressures of lawn maintenance. For next steps, Grove is interested in both structural changes (trees, forests) as well as behavioral changes in terms of changes in management practices. Marginal changes in the right direction can add up over time, and there is more work to be done on policy, planning, and management questions.

Panel Discussion: Integrating Ecological and Social Sciences
– Paul Ferraro (JHU), Morgan Grove (USFS), and Marc Ribaudo (USDA-ERS)

The morning's speakers, as well as STAC member Marc Ribaudo, participated in a guided panel discussion on how to integrating ecological and social sciences. The panelists were presented the following questions to kick off the conversation: *What are misconceptions that get in the way of social science and how do you overcome them? Can you provide examples of what has and has not worked well?* The following are an excerpt of key takeaways from the discussion.

- Social science is often not viewed as "science", but you can ask social science questions with a more traditional and method-based scientific lens.
- Explaining behavior can go beyond understanding individual perceptions and attitudes (e.g., with a survey) – social data exists that can lead to experiments to understand behavior and decision-making.
- The role in social science is not only to communicate. They ask questions that serve two audiences: scientists and program management. Bringing interdisciplinary teams together and answering questions they are both interested in – such as the impacts of specific programs and policies – can be mutually beneficial.
- While there is an expanding roster of data collection techniques through technology and social media to try to understand patterns of voluntary behavior, these vary widely in scale and application. Some ideas, however, may be transferable to the Bay.
- Assessments of trends through surveys, are the most informative and effective when verified through other information sources. Often, surveys are useful in informing initial program design.
- On the issue of scale – Scientists are starting to have good understanding about where landscape processes are most effective, while encompassing some large-scale spatial variability. The challenge is how to get individual landowners to adopt a practice – more than just economics, there are a lot of perceptions and unknowns that need to be researched to understand what motivates a farmer to take action.
- Geographic region, past activity/history of implementation, and social/political/cultural practices all factor into the relationship between individuals and decision-making – and the effectiveness of tools like incentives. This information can provide context to help understand causal mechanisms into what will or will not work.
- Do we want people to adopt one practice or buy into an approach to protect the Bay? How do you get people to buy into the vision rather than just adopting an individual practice? The programs being adopted may vary, but the things that affect whether people are more or less willing to adopt might be more constant. A critical part of the experiment is finding out what incentives work regardless of the particular practice being promoted.

Membership Announcements, Discussion, and Voting – *All*

Discussion returned to address several STAC business items. Wainger announced that five at-large members – Kathy Boomer (TNC), Alix Dowling Fink (Longwood U), Thomas Ihde (MSU-PEARL), Andrew Miller (UMBC), Adel Shirmohammadi (UMD) – have been reappointed and will all serve a second term on STAC. This meeting also marked the end of both at-large member Marjy Friedrichs (VIMS) and Federal appointee Susan Julius (EPA) tenures on STAC – Wainger acknowledged their service and contributions to the committee. Next, Wainger announced that STAC's Executive Board (EB) nominated Ihde to serve on the board, and requested a motion to approve Ihde's appointment; motion approved. Wainger then informed the committee that Andrew Miller (UMBC) accepted the nomination to serve as STAC's next Vice-Chair and Chair-elect, and requested a motion to approve the appointment; motion approved.

The whole STAC membership moved to discuss nominees for two (2) at-large vacancies, to fill the positions previously held by David Sample (VT) and M. Friedrichs following the close of this September meeting. Prior to the meeting, Hinrichs prepared a comprehensive listing of current STAC expertise, as well as areas of interest previously identified by members. A selection of identified needed expertise included toxic contaminants, statistics, and watershed hydrology. Several STAC members also stated the need for decision-science, interdisciplinary modeling, living resources, or general water quality (coastal carbon as a specific example), while noting that most members have expertise in multiple subject areas. Looking ahead, members also suggested that STAC proactively look to fill upcoming gaps in expertise from members rotating off in June 2018 – including marine ecology, living resources, physical oceanography and marine transport. Others suggested that geographic representation be considered, in order to have an equitable ratio of members between jurisdictions and major institutions. STAC members had previously identified several nominees for the at-large vacancies – individual members lobbied for their nominees and why they would be good assets for the committee. Current Federal appointee Marc Ribaudo (USDA-ERS) will be retiring in December; Wainger proposed shifting Ribaudo to fill one of the at-large vacancies, as his particular expertise incorporates a broad perspective on agricultural policy issues. Members submitted their votes on paper ballots. Past Chair Kirk Havens (VIMS) recommended amending the process to reach consensus on a nominee as a group, then recruit them directly to the committee with a closed ballot. STAC will continue to discuss and refine the at-large voting process on the next EB call and at the March 2018 meeting.

DECISION: **Wainger** requested a motion to approve the appointment of Ihde to STAC's EB. Result: Motion carried.

DECISION: **Wainger** requested a motion to approve the nomination of Andrew Miller (UMBC) for the role of STAC Vice-Chair. Result: Motion carried.

ACTION: **Hinrichs** will distribute election ballots to STAC members not in attendance and request submittal of votes for two at-large vacancies by Friday, September 15, 2017. **Update:** Ribaudo and Tess Wynn Thompson (VT) were elected to fill the at-large vacancies.

Nuffield Farming Scholar Project Goals – *Timothy Stephens (Wessex Water / Nuffield Farming Scholar)*

Dr. Stephens is visiting as part of the Nuffield Farming Scholars Program, in an initiative started in the UK to boost food production by sharing agricultural practices from around the world. His current work on water catchment management serves a population of 2.5 million in the UK; he is pursuing catchment management as an alternative to installing treatment for nutrients (primarily nitrogen) in groundwater and pesticides in surface water. 80% of water in this region is extracted from groundwater, and practices on the ground are working to manage nitrate at the source – in this case, largely from farms and agricultural systems. Nutrient "offsetting" through a nutrient credit/water quality trading program is attempting to implement a "reverse" online auction to meet increasing regulatory pressure. Stephens and Wessex Water work directly with individual farmers and practitioners by conducting trials on cover crops, porous pots, and soil mineral nitrogen (SMN) sampling to generate data to serve as evidence of effectiveness of different nitrate-reducing measures. With the online auction system, farmers bid on a price per kilo of nitrogen reduced. Offering funding to farmers to use less nitrogen can be difficult, so options are being pursued to pay for the reduction in yield. In future work, Wessex Water is looking to pursue options to test phosphorus, as well as engage more farmers and collect better data on different reduction measures.

Hampton Roads Sanitation District's Sustainable Water Initiative for Tomorrow (SWIFT) – *Charles Bott (HRSD) and Jamie Mitchell (HRSD)*

SWIFT (Sustainable Water Initiative for Tomorrow) is a program implemented by Hampton Roads Sanitation District (HRSD) to meet challenges posed to HRSD in order to meet nutrient requirements for the Total Maximum Daily Load (TMDL), as well as manage extensive aquifer recharge efforts. SWIFT was developed to meet several goals, including: treating water to meet drinking water standards, replenishing the aquifer with clean water to provide regulatory stability for wastewater treatment (WWT), reducing nutrient discharges, reducing the rate of land subsidence, providing a sustainable groundwater supply, and protecting from salt contamination. By addressing these goals, SWIFT assists the local community in working toward Chesapeake Bay restoration goals. STAC member Charles Bott outlined the advanced water treatment processes that needed to be added on to the existing WWT plant. Two main approaches – carbon-based and membrane-based – were considered based on effectiveness from a pathogen standpoint and from an organic chemical/emerging contaminant standpoint. Bott reviewed pilot studies that have been conducted using both treatment methods. Results showed that both methods meet drinking water and associated standards, but pathogen removal, total organic carbon (TOC), and emerging contaminants (particularly bromate, 2,4-dioxane, and NDMA) are the largest areas of focus for future research.

Wednesday, September 13 Minutes

Attendance: (W: Webinar)

Members: Brian Benham, Donna Bilkovic, John Karl (JK) Bohlke, Kathleen Boomer, Christopher Brosch, Amy Collick, Alix Dowling Fink (W), Zachary Easton, Carl Friedrichs, Marjy Friedrichs, Kirk Havens, Carl Hershner, Thomas Ihde, Hamid Karimi, Martin Lowenfish, Mark Luckenbach, Mark Monaco, Steve Newbold, Marc Ribaudo (W), Kurt Stephenson, Lisa Wainger, Gene Yagow, Weixing Zhu

Guests: Gopal Bhatt (W), Matt Johnston, Caitlyn Johnstone, Jeni Keisman, Steve Levitsky (W), Lew Linker, Rebecca Murphy, Gary Shenk, Ping Wang, Guido Yactayo (W), Qian Zhang (W)

Administration: Bill Ball, Rachel Dixon, Melissa Fagan, Elaine Hinrichs

Full Membership Discussion: Revisiting STAC Effectiveness – *Rachel Dixon (STAC Coordinator – CRC)*

STAC Coordinator Rachel Dixon (CRC) reviewed the results of the recent survey sent to STAC members on "Revisiting STAC Effectiveness". This goal of this survey was to assess where STAC has been effective in implementing its recommendations through workshops and peer reviews completed since the STAC retreat held in September 2015. The survey asked members (21 respondents out of 45 recipients) a series of questions assessing what activities have been especially effective in addressing specific issues (e.g., Conowingo dam sedimentation, climate change, modeling uncertainty), as well as identifying areas of improvement for STAC activities (workshops and peer reviews) and their resulting reports. If respondents served as chair or lead of a STAC workshop or review, they were asked to reflect on whether they felt the report reached the intended audience, and whether the CBP has effectively responded to the report's recommendations. Finally, the survey asked STAC members whether they felt organizing quarterly meetings has made the meetings more productive (52% of respondents said yes) and to consider alternative meeting structures and methods for staying connected and engaged with the broader CBP. When asked to rate STAC's overall effectiveness on a scale of 1-10 (10 being very effective) since 2015, survey respondents averaged between 7 and 8.

STAC members transitioned into discussion. In regard to Management Board (MB) responses to STAC reports, some members reiterated concerns that the actual letter responses themselves are not very effective. Rather, STAC – as a whole, the EB, and proactive workshop/review steering committees – should endeavor to continue to follow-up with the CBP and stay engaged with the Goal Implementation Teams (GITs) and MB. Ideally, this connection should be done through formal presentations to the CBP, and STAC may want to consider making this a formal requirement for workshops and reviews. This Partnership is most effective when determining priorities, staying "on the radar", and allocating funding or resources to get traction on recommendations that come out of workshops – prioritizing the recommendations in the report can also help the CBP to be responsive. Carl Hershner (VIMS) added that from an

adaptive management standpoint, STAC would benefit from direct feedback from the CBP as our target audience. Given the volume of activities and reports generated over the past two years, STAC should consider a more structured internal review process of products, and identify areas where the committee can be of assistance (for example, identifying uncertainty). Hershner further added that it is critical to keep a running dashboard of past recommendations and what has been/what remains to be addressed – reiteration and persistence have previously led to successful implementation (e.g., multiple models). A "Recommendations Database" has been discussed previously, and STAC Staff committed to reengaging on that task. Several members also expressed support for having workshop leads or review panels present outcomes to the full membership before the report is written, as has been done previously. Moving forward, STAC should assess the best structure for report-outs.

ACTION: **STAC Staff** will re-prioritize the task of developing a database of past STAC recommendations moving forward.

ACTION: **STAC members** should send any additional thoughts or comments on the effectiveness of STAC processes, procedures, or quarterly meeting structure to Chair-elect Brian Benham (VT) (benham@vt.edu). Benham will plan to discuss these ideas further with the EB in advance of the December 2017 meeting.

ACTION: The agenda item "Full Membership Discussion: Expanding STAC Activities" will be postponed to the December 2017 quarterly meeting.

Progress Report: Update on STAC Reviews for the Midpoint Assessment
Representatives from three recent STAC peer review panels presented a brief overview of their respective panel's key findings and recommendations. This was followed by Q&A and an "interview" with representatives from the CBP on how the panel's comments are being addressed and incorporated into decision making for the Midpoint Assessment (MPA). The goal of these discussions was to engage in a thoughtful dialogue and highlight the key findings, how the CBP is responding, any next steps, and lessons learned in the process on both sides of the review. If effective, similar presentations will be planned for another subset of MPA reviews at the December 2017 meeting.

Generalized Additive Model (GAM) Approach for Water Quality Trends in Tidal Waters – *Carl Friedrichs (VIMS) and Rebecca Murphy (UMCES)*

Friedrichs explained that this review was requested as a results of a recommendation from a 2014 STAC workshop that stated GAM methods should be adopted and applied to trend detection and analysis. Friedrichs provided a brief overview of the review panel's findings. The GAM approach is centered on a statistical model in which the expected value of a response variable can be modeled as a constant offset, plus the sum of several different functions of explanatory variables. Friedrichs also highlighted a few questions that the panel had during the process, particularly on the time series used, which is key in determining the significance of a change in water quality over a given period in time. Murphy, the CBP contact for this review,

informed STAC that the CBP is writing up full documentation comparing GAM to the old approach, and are considering adding some additional approaches as recommended by the panel – including using a multiple modeling approach. Both parties described the review as a very positive process, where both sides were engaged and responsive to input.

Nutrient Inputs to the Chesapeake Bay Watershed Model – *Gene Yagow (VT-retired) and Matt Johnston (UMD-CBPO)*

Yagow provided a brief overview of the review panel's findings. This review was focused on manure and chemical fertilizer inputs to the Phase 6 Chesapeake Bay Watershed Model, and how these are distributed across the land surface. The report was completed in September 2016 and the CBP has formally responded. Yagow described the review process as a 'moving target' – the documentation being reviewed was still in draft form in order to be able to allow reviewers' comments to influence decisions being made as the model was developed. The panel generated three main categories of comments to the CBP: 1) improve consistency in parameter evaluation across states; 2) incorporate/update data from existing sources; and 3) modify data transformations and assumptions. Yagow and Johnston with the CBP agreed that the review was a very collaborative process, and Johnston suggested that STAC revisit the revised documentation released in July 2017, as well as the final release in January-February 2018.

Phase 6 Chesapeake Bay Watershed Model – *Zach Easton (VT) and and Gary Shenk (USGS)*

Review panel co-chair Easton outlined the seven major recommendations from the panel on the latest phase of the watershed model. The panel was asked to comment on the Phase 6 steady state model structure, multiple model approach, as well as evaluating each of the model components. Many of the recommendations involved ways to address model uncertainty moving forward – uncertainty surrounding input parameters as well as BMP efficiencies. Since the review report was just released on September 1, the CBP is still working on a response. During discussion, STAC members suggested that the CBP consider ways to simplify or downscale the model, as well as clarifying how the different components of the modeling suite interact. Additionally, keeping the Phase 6 models' application for local decision-makers in mind, the BMP panel may also need to be reimagined – an idea to be further explored by a STAC workshop led by Kurt Stephenson (VT) to be held in November 2017.

Results of Latest Conowingo Analysis – *Lew Linker (EPA) and Gopal Bhatt (PSU)*

Wainger invited Linker to update the STAC membership on the latest results of the Conowingo infill analysis, a process that has been the focus of several recent STAC workshops and peer reviews. Linker informed the committee that the CBP is following STAC's guidance. Numerous research articles have documented and quantified the processes occurring within the reservoir and provided estimates in changes in Conowingo transport; these have been incorporated into the current analyses. In brief, the 2010 version (Phase 5.3.2) of the models used for the initial analysis are consistent with the results being shown in 2017 (Phase 6) for Conowingo. Four key

state of the science decisions have been made in regard to simulation of Conowingo infill: 1) the Lower Susquehanna Reservoirs are now in a state of dynamic equilibrium (no long-term trapping); 2) information on changes in trapping capacity provided by US Geological Survey (USGS) Weighted Regressions on Time, Discharge and Season (WRTDS) should be used in model calibration; 3) constant delivery factors should be used for scenarios involving both increases or decreases in sediment and phosphorus inputs, and 4) the use of a flow dependent dynamic G-series response for the organic – nitrogen, phosphorus, and carbon. The Modeling Workgroup is currently working to estimate the nutrient and sediment delivery with simulated responses for several infill states and time series, and preliminary results will be used to finalize the models. Different representations of the Conowingo state of infill are derived from the dynamic changes (from year to year) in the deposition rate and scour rate. Looking ahead toward the application of these results to management decisions, the Water Quality GIT will be making recommendations on allocating loads to the MB on September 25-26 that will be moved up through the Principal's Staff Committee (PSC) for determination in Phase III Watershed Implementation Plan (WIP) development.

Wrap Up

Wainger concluded by recapping that members were receptive to rethinking the structure of quarterly meetings moving forward, and including more similar report outs from STAC activities. Wainger asked STAC members to email topics and suggestions for the December 2017 quarterly meeting to Benham and Hinrichs. As this meeting marked the end of Wainger's term as STAC Chair, Executive Secretary Bill Ball (CRC) led the committee in thanking Wainger for her service and leadership, and formally inducted Benham as new STAC Chair.

ACTION: STAC members should email agenda topics and suggestions for the December 2017 quarterly meeting to Hinrichs at hinrichse@chesapeake.org and Benham at benham@vt.edu.