Explaining Trends in Aquatic Conditions: Identifying Critical Insights and Gaps for the Next Generation of Synthesis and Application

STAC Responsive Workshop Proposal

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Requested by:

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Proposed Workshop Steering Committee

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Need and Description of Workshop

In recent years, there has been a concerted effort in the Chesapeake Bay research community to synthesize and advance our understanding of factors affecting trends in aquatic conditions of the Chesapeake Bay watershed and estuary. However, distilling complex information into key insights, as well as clarifying and prioritizing critical gaps into actionable plans, remains challenging. The proposed STAC workshop will provide a venue for a focused, disciplined exchange among scientists involved in these efforts on not only the current state of knowledge and remaining uncertainties, but also on the prioritization of research for the next cycle of synthesis to inform adaptive management.

The workshop will follow a structured format in which participants use a pre-defined template to present their findings, followed by breakout discussions focused on synergies, remaining uncertainties, and the continued adoption of advanced analytical approaches to address them. Prioritization based on the needs of the management community will also be discussed. Specific goals of the workshop are:

- To foster the identification and pursuit of synergistic insights that, when combined, advance our understanding of ecosystem response to environmental and anthropogenic factors;
- To articulate and prioritize those uncertainties and gaps that most limit the advancement of our understanding of ecosystem functioning;
- To accelerate the adoption of advanced analytical techniques (such as structural equation modeling, generalized additive models, and other approaches identified in the 2014 STAC MEOWQT workshop) to address these gaps.

The workshop format will include:

- Summary presentations following a pre-defined format, that describe:
    - Existing conceptual models of estuarine and watershed response to changes in land use and nutrient and sediment inputs across the Chesapeake Bay's heterogeneous landscape

    - How recent research has ***confirmed, informed, and/or changed*** our paradigm of ecosystem functioning and response to change
    - Most critical remaining uncertainties and obstacles to further understanding
- Breakout discussions to discuss presentation content, with an emphasis on ***complementary, contradictory, and/or synergistic insights***
- Discussion of next steps to reduce those uncertainties that are most relevant to managers' decision-making

Urgency of the Workshop:

Natural resource managers are currently engaged in a historic effort to develop and implement frameworks that will guide management of the Chesapeake Bay watershed and estuary through 2025 and beyond. Adaptation of these strategies depends not only on use of the best currently available information in the near term, but also the ability to incorporate better information as it becomes available in the future. In order to maximize their effectiveness, it is critical for engaged scientists to hone their ability to boil complex information down to its most essential elements and to understand the relevance of this information for affecting management decisions. Furthermore, targeting the next round of research to explicitly address critical uncertainties enhances partners' understanding of the relevance of ongoing scientific inquiry to their work. Finally, the format of this workshop is based on lessons learned from the December, 2017 STAC workshop on "Integrating Recent Findings to Explain Water Quality Change: Support for the Mid-Point Assessment and Beyond." We aim to build on the interest and momentum gained at that workshop, but this time with a more focused exchange that will guide future research and synthesis directions. Research areas represented at the workshop will reflect the identified needs of managers. Example research areas identified at the December 2017 STAC workshop, which will be refined during workshop planning include:

- Implications of groundwater residence times for detecting effects of change;
- Local co-benefits of BMP implementation;
- Reducing uncertainty of insights on critical drivers and responses;
- Impacts of sediment inputs on aquatic conditions and living resources;
- Approaches for evaluating BMP implementation before effects can be detected, such as by evaluating targeting effectiveness;
- Novel analytical approaches for linking non-point source BMPs to load reductions and estuarine response.

Questions to be Addressed During the Workshop

1. What complementary insights across the participating disciplines can be integrated to advance our understanding of how environmental setting and human activities affect watershed and estuarine conditions?
2. In what areas do conceptual models of functioning and response conflict with each other?
3. How can we apply new analytical techniques to investigate causality among variables (such as those identified in the 2014 MEOWQT workshop) to advance our understanding of factors affecting changes in aquatic conditions and ecosystem health?

Workshop Outcomes:

The steering committee will collaborate with workshop presenters to:

- Pursue additional interdisciplinary synthesis of findings to inform ongoing adaptive management of the Chesapeake Bay watershed and estuary, including but not limited to WIP implementation efforts;
- Identify opportunities to apply promising analytical approaches to push the limits of our ability to explain changes in aquatic conditions;
- Identify opportunities to integrate insights from the social sciences to improve the effectiveness of environmental research efforts for informing adaptive management;
- Produce a STAC workshop report summarizing the workshop and providing recommendations for supporting the outcomes described above.

Targeted Workshop Participants

The target size for this workshop is approximately 30 participants, and will include the steering committee, up to 4 regional experts and/or lead investigators of the selected research areas described above, and a representative manager from each jurisdiction in the watershed to help maintain managers' needs as a component of research discussions.

Workshop Logistics, Timing, and Location

The workshop will be scheduled for January/February 2019. This timing allows for adequate advance planning and communication among participants, which is necessary for distillation of key findings and uncertainties, as well as for effective use of the presentation template. Preferred locations for the workshop include venues such as SERC, the National Conservation Training Center in Shepherdstown, WV, or available conference facilities in the Annapolis area.

Estimated Budget

Venue: $1500; Food: $3000, Travel/lodging for speakers: $4500; Total requested: $8500

Past STAC Workshops and Peer Reviews Related to this Proposal

The March 2014 MEOWQT STAC workshop laid a foundation for the larger explaining trends work underway across the watershed and estuary. The 2017 STAC Expert Panel review of the application of Generalized Additive Models (GAMs) for explaining trends in water quality supported continued application of this approach. The December 2017 STAC workshop "Integrating Recent Findings On Water Quality Change: Support for the MPA and Beyond" began a fruitful discussion among scientists across disciplinary and watershed-estuary boundaries, along with representative managers, with recognition that this dialogue must continue to in order to improve synthesis of scientific insights in support of adaptive management.