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Scientific and Technical Advisory Committee Workshop
Assessing the Environment In Outcome Units (AEIOU): Using Eutrophying Units for Management

January 2019
Annapolis MD



Workshop Motivation

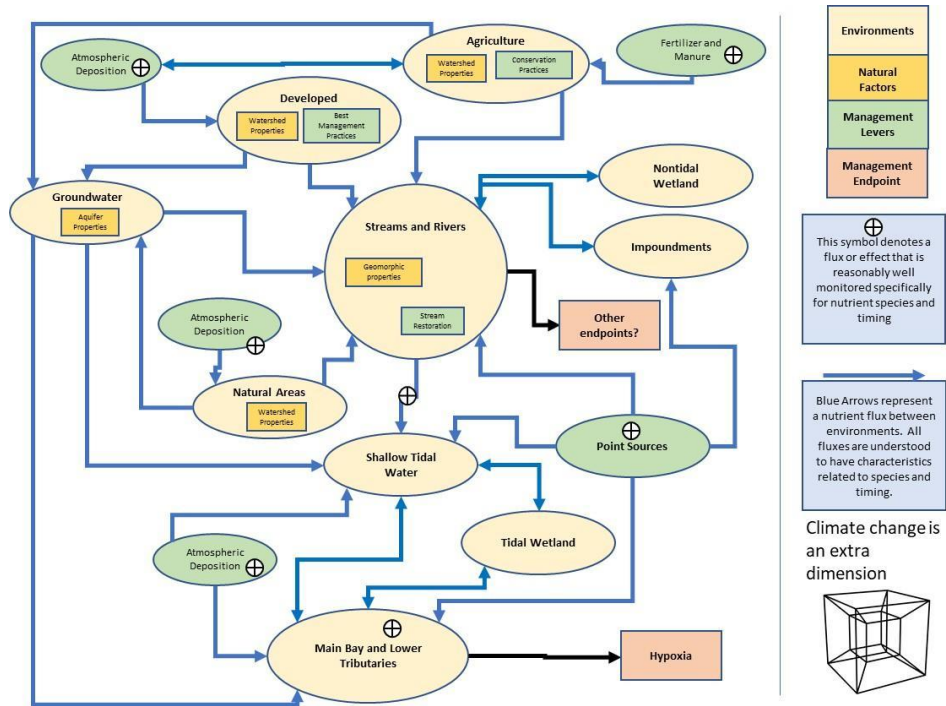
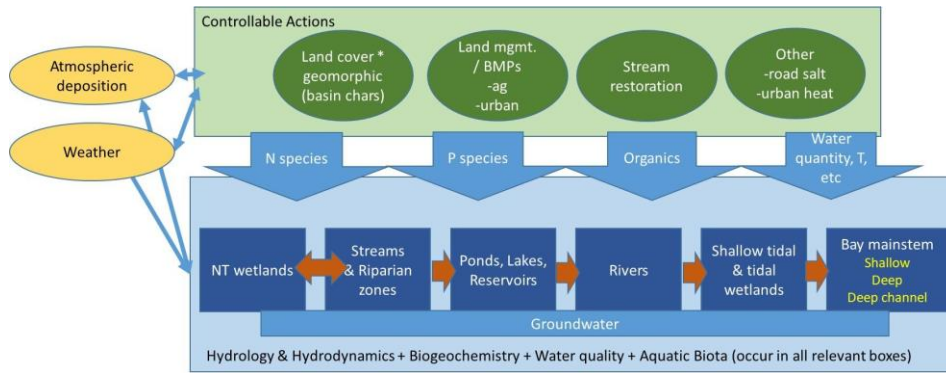
The Chesapeake Bay TMDL sets a cap on total average annual nutrients without regard to the bioavailability or timing of different nutrient species deliveries to the Bay. While this approach creates a metric for the TMDL that is relatively simple for accounting and communication, lumping nutrient species into a total annual average creates inefficiencies and inconsistencies when allocating scarce resources to improve water quality. Specifically, inorganic nutrients may have a greater impact on eutrophication compared to organic forms. In addition, management options may have varying, even conflicting, effects on the fate of different forms of nutrients. Therefore, more direct accounting of nutrient species or fractions could lead to more cost-effective management by making explicit the effects of practices or their location on water quality outcomes.

The TMDL has specific endpoints of dissolved oxygen, water clarity, and chlorophyll, which are related to other important endpoints such as harmful algal species and fish habitat quality. The relationships of nutrient species and timing to water quality and biotic responses can depend on a variety of co-variables including salinity, temperature, sediment load, and soil and aquifer properties in the runoff pathway. The objective of this workshop will be to explore whether the science is ripe and appropriate for calculating *eutrophying units* as a common currency that can be used to compare alternative restoration strategies. Eutrophying units would be comprised of the combined species concentrations of nitrogen (N) and phosphorus (P) using transfer functions that depend on their effect on environmental outcomes. The workshop will facilitate synthesizing the state of knowledge and organizing approaches for developing eutrophying units, reflecting spatial and temporal conditions of the Bay and its watershed.

Workshop Goals

- Does nutrient speciation and timing of delivery to the bay depend strongly on BMPs, land use, watershed characteristics, and the presence or reservoirs?
- To what extent do in-stream transformations and spiraling dominate the speciation and timing of nutrient delivery to the Bay?
- How do nutrient pathways (groundwater, shallow underground flow, surface flow) affect speciation and timing of nutrient delivery to the Bay?
- How do endpoints and outcomes associated with the CBP TMDL or other environmental goals respond to changes in nutrient species and timing and what practical strategies could be used to incorporate such science into BMP performance?
- How do all of the above vary with by salinity, stratification, energy regime, or climate?

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Day 1:

8:30 Sign-In for Attendees, light breakfast (provided)

9:00 Welcome, introductions, and goals – Lisa Wainger

Goals of the workshop – hit on the idea that this is a proactive STAC workshop. The CBP has not asked STAC to discuss this idea, so there will be an emphasis on *why* the CBP need to pay attention to the findings

9:20 The Chesapeake TMDL Calculation – Gary Shenk

The current CBPO calculation of hypoxic response to management actions, the dependence on TN and TP, and the tools used to calculate the responses



9:50 Bay Loading Signatures – Qian Zhang and Rebecca Murphy?

What are the temporal and species characteristics of loads to the Chesapeake?

9:50 Optimal Phosphorus Abatement – Antti Iho

An example using more information about nutrient species.

10:15 Break

10:30 Estuarine Speaker

Marjy Friedrichs, Pat Glibert, Deb Jaisi (1 speaker)

11:15 Stream Process Speaker or Panel

Jennifer Tank, *Bern Sweeney*, Mark Munn, Jason Hubbard, Jeanne Hartzell (nitrogen and phosphorus speakers)

More ideas for speakers (Paul):

Jen Tank (Univ. of Notre Dame)

Wil Wollheim (Univ. of New Hampshire)

Matt Cohen (Univ. of Florida)

Bob Hall (Univ. of Wyoming)

Emily Bernhardt (Duke Univ.)

Emma Rosi (Cary Institute)

12:00 Lunch

1:00 Land Process Speaker or Panel

Risto Uusilato

1:45 Management Practice Speaker or Panel

Andrew Sharpley, Helen Jarvie

Commented [1]: Is this enough time? Will Gary get into how the CBM addresses the issues of this workshop now: the timing, delivery, and substitutions? For instance N and P are already dominated in DO units now. what is assumed in the model and why

Commented [2]: Which one?

Commented [3]: Choose speaker and topic

Commented [4]: We no longer have a BMP breakout group-- still include this?

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2:30 Break

2:45 Instructions for Breakout Groups – Lisa and Gary

Estuarine, Riverine, and Land Management

Each breakout will have a leader/facilitator, and a recorder.

The goal of the breakouts is to produce 2 items:

- 1. Short list of draft recommendations. These should be only the top consensus priorities - descriptions should fit on a single page*
- 2. Longer description of thoughts from discussion to be captured in the workshop writeup*

3:00 Breakout Round-Robins

Informal; each member should come prepared to share their thoughts and ideas on the previous large group discussion in regard to their breakout topic and in consideration of the Breakout Questions below - discuss resource and data needs, advantages and disadvantages for each.

4:00 Focused Breakout Discussion

Discuss alternative development strategies in detail. Narrow the list of strategies based on criteria from the plenary session (feasibility, applicability to management questions, nimbleness, ability to estimate uncertainty, and opportunity for stakeholder interaction)

5:00 Recess

Day 2:

8:00 Light breakfast (provided)

9:00 Focused Discussion of breakout priorities

Breakout groups reach consensus on draft recommendations from the previous day that can be communicated to the plenary group on a single presentation slide. Also begin work on longer descriptions of the draft recommendations.

11:00 Plenary Presentation of Breakout Proposals (20 mins per breakout)

All participants will reconvene, and each breakout group leader will briefly present the single page of recommendations

12:00 LUNCH (provided)

1:00 Compiling Recommendations & Management Response – *Attending managers*

Facilitated discussion of final recommendations presented before lunch focused on compatibility between proposed components with a view toward the most effective

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recommendations for the CBP management. Managers will present their perspectives on the consensus recommendations and their major takeaways.

2:00 Adjourn

2:15 Convene Steering Committee for Workshop Documentation

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Breakout Questions

Why is this important to managers?

A compelling hypothesis is that *there may be a single (or classification) segment of the system where the biogeochemical changes in N and P speciation are most important (or completely control) what the CB ecosystem receives.*

An additional related question may be, *does the speciation of nutrients entering the CB (e.g. organic N vs. NO₃ vs. NH₄) impact the severity of hypoxia?*

a) *Do land use practices, stream/river distance (times of concentration) and vegetation at and in the terrestrial-aquatic interface affect transformation, amelioration, and attenuation of P processing, and if so what are those dynamics?*

b) *How does water-soluble soil organic matter (including detritus, microbes, bacteria, etc.) alter phosphorus adsorption to soil mineral surfaces? Does the presence of such organic materials increase the solubility and bioavailability of phosphorus by affecting mineral bonding?*