Scientific and Technical Advisory Committee Workshop

Assessing the Environment in Outcome Units (AEIOU): Using Eutrophying Units for Management

March 20-21, 2019
The Westin Annapolis
100 Westgate Circle
Annapolis, MD 21401

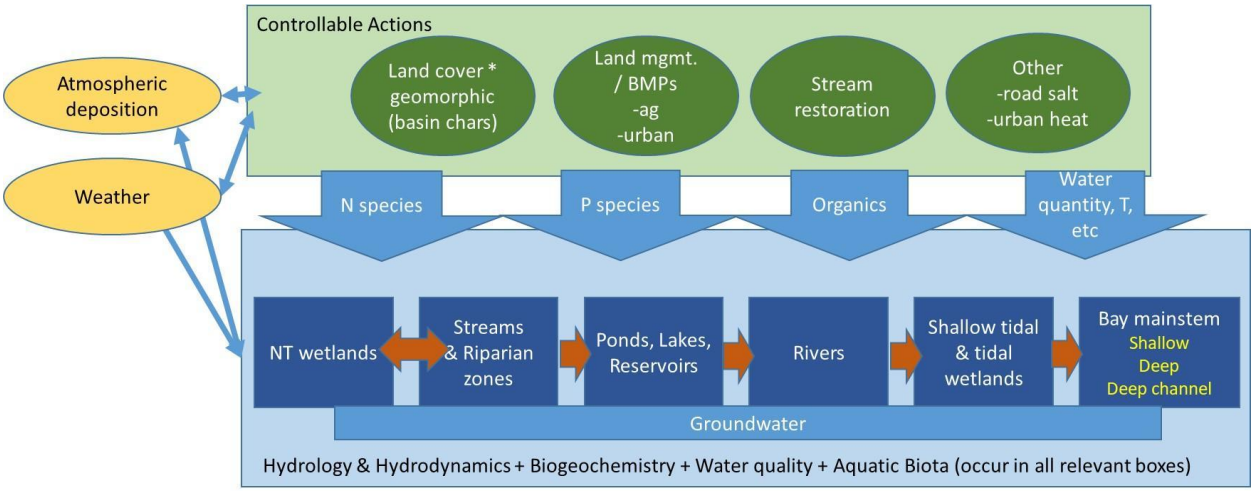
Workshop Motivation

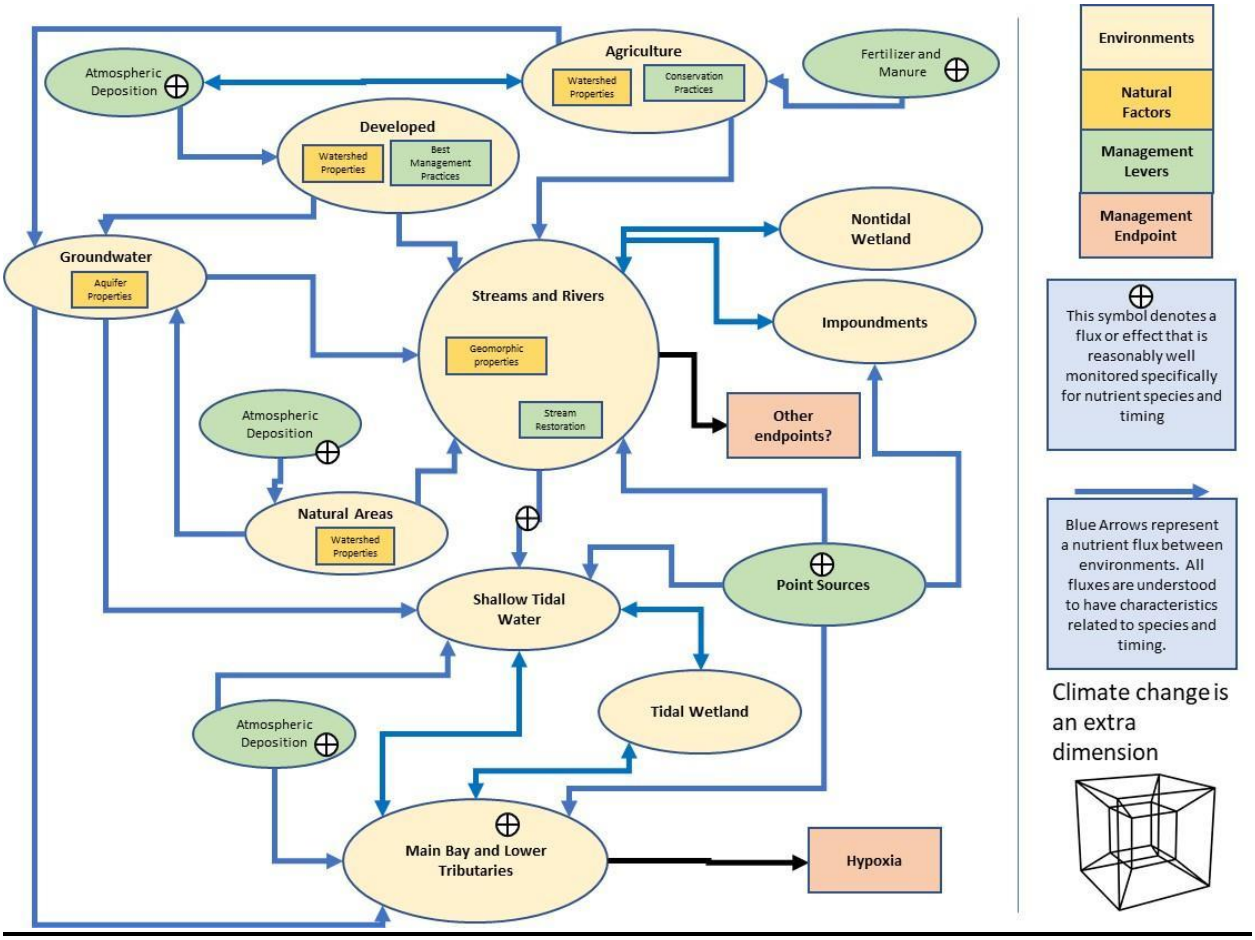
The Chesapeake Bay TMDL sets a cap on total average annual nutrients without regard to the bioavailability or timing of different nutrient species deliveries to the Bay. While this approach creates a metric for the TMDL that is relatively simple for accounting and communication, lumping nutrient species 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 covariates 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 could be calculated from 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 Questions

- 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 salinity, stratification, energy regime, or climate?





System Components to consider in assessing drivers and outcomes

Day 1: March 20th

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

9:00 Welcome, Introductions, and Goals – Lisa Wainger

9:20 Optimal Phosphorus Abatement – Antti Iho
An example using more information about nutrient species leading to cost effective solutions.

9:50 The Chesapeake TMDL Calculation – Gary Shenk
A conceptual description of speciation in the Chesapeake system. The calculation of hypoxic response to watershed management actions designed to reduce total nitrogen and total phosphorus and the extent to which the spatial differences in load effectiveness are taken into account.

10:15 Break

10:45 Bay Loading Signatures – Qian Zhang
An overview of the characteristics and temporal trends of nutrient and sediment loads to Chesapeake Bay from its non-tidal rivers.

11:10 Riverine Processes - Doug Burns
Discussion of riverine nutrient transformations

11:35 Estuarine Biological Responses to Nutrients – Pat Glibert
Estuarine biological processes including phytoplankton response to different forms and loads of nutrients.

12:00 Lunch

1:00 Estuarine Nutrient Cycling – Jeremy Testa
Estuarine processes describing how input loads and internal cycling of nutrient species affect hypoxia in the Chesapeake

1:25 Management Practice Effects on Phosphorus – Peter Kleinman
Effects of management practices on the speciation of nutrients delivered to downstream points

1:50 Landscape and BMP Nitrogen Processes – Jason Kaye
BMPs and Landscape properties and their effects on nitrogen speciation in loads delivered to streams.

2:15 Break

2:30 Instructions for Breakout Groups – Lisa Wainger and Gary Shenk

Estuarine, Riverine, and Land Management

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

The goal of the breakouts is to produce 3 items:

1. *A list of questions for other breakout groups*
2. *A powerpoint slide with high level recommendations*
3. *Longer description of thoughts from discussion to be captured in the workshop writeup*
   - *What do we know*
   - *What do we need to know*
   - *Why should managers care*

3:00 Breakout Groups

Internal 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.

Focused Breakout Discussion

By the end of breakout discussion you should have created an extended list of recommendations and a list of questions crossing breakout boundaries

5:00 Recess

6:30 Optional Dinner at the Light House Bistro (202 West St, Annapolis, MD 21401)

Day 2: March 21st

8:00 Light breakfast (provided)

8:45 Cross-Breakout Requests (Breakout Leaders)
Quick articulation of priority questions crossing breakout boundaries.

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 taking into account questions from other breakout groups. Also work on longer descriptions of the draft recommendations.

10:30 Break

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 slide 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 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
Focused messages for managers relevant to hypoxia and other environmental endpoints

Overarching Breakout Questions

A. What do we know?

In the expert opinion of the people in the breakout group, what can be said about the factors that cause differences in speciation? What can be said about effects on hypoxia, living resources, or other environmental endpoints of different speciation or timing of delivery?

Are there important locations or times of the year for nutrient speciation or effects, such as hyporheic zones, freshets, or summer bottom water?

What is the relative influence of the different factors?

The breakouts may create a prioritized list of existing knowledge.

B. What more do we need to know?

In the expert opinion of the people in the breakout group, what are the most important research questions regarding speciation, timing, and their environmental effects on hypoxia, living resources, or other environmental endpoints?

The breakouts may create a prioritized list of research topics.

C. Why is this important to managers?
The management community are used to dealing with goals of TN and TP. Why should they move to a different metric?

How could they incorporate the knowledge from this workshop?

Why should they support research on these topics?