

Linking In-field and Edge-of-Field Water Management to Soil and Watershed Health

STAC Proposed Workshop

Steering Committee Members with knowledge in soil health, field water management, and watershed hydrology, and with energy, interest and commitment to meeting the workshop objectives: Kathy Boomer (TNC, STAC; workshop chair); Amy Collick (UMES, STAC), Jason Hubbart (WVU, STAC) Brian Piazza (TNC), Amy Jacobs (TNC), and Lindsay Thompson (MD Agriculture Associates)

Rationale: With mounting urgency to protect regional waters and promote sustainable agriculture, the role of in-field and edge-of-field water management and its effect on soil health as well as regional water quality remains uncertain. Soil scientists increasingly understand ties between soil carbon content, microbiota health, and soil moisture, but have had limited opportunity to explore how landscape position combined with artificial drainage influence these key factors. At the same time, there is increasing awareness that the vast extent of artificial drainage not only contributes to flashier river systems, but also increases nutrient, sediment, and bacterial loads to regional waterbodies. Advanced in-field and edge-of-field water management may help address these potentially competing concerns. This forum will facilitate cross-disciplinary discussions by bringing together technical experts in soil health, hydrology, and environmental biology to develop a more comprehensive assessment of field-scale, agricultural water management practices, including associated threats, opportunities, and costs to manage soil health, regional water quality, and environmental health risks. Discussions will bridge insights, identify knowledge gaps, and foster future collaborations.

Key questions to be addressed:

- How does soil health and soil water storage capacity influence surface water runoff vs groundwater infiltration?
- Can advanced in-field and edge-of-field agricultural water management practices promote soil health?
- How do in-field and edge-of field water management practices influence nutrient use efficiency and regional water quality?
- What are trade-offs that might influence adoption of water management bmps (potentially including costs, effectiveness, groundwater demands, and environmental public health risks)
- How might climate change affect threats, opportunities, outcomes, costs, and adoption?

Workshop Objectives:

- Outline in-field and edge-of-field water management practices that may affect soil health.
- Identify benefits, limitations, costs, and other concerns that may influence implementation of water management practices and outcomes.
- Assess potential to manage soil health and regional water quality through practices designed to control water within fields.
- Identify research needed to advance watershed management through improved understanding of these pathways

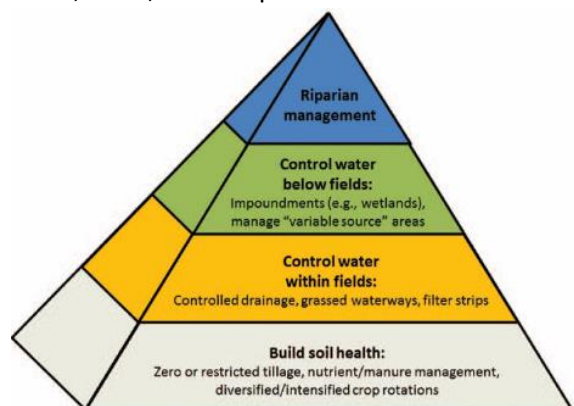


Figure 1. From Tomer et al 2015: "Conservation practices in a watershed, conceptualized as a pyramid. Healthy agricultural soils will improve the effectiveness of practices placed within fields, below fields, and in riparian zones." **Understanding these linkages is critical to understanding and evaluating tradeoffs when considering a full range of watershed practices to advance soil health and watershed protection.**

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Potential Plenary Topics:

- Overview of environmental health risks tied to soil & water management
- Yield and nutrient use efficiency response to soil health and water management practices
- Agronomy-Watershed linkages the key to understanding where management action has the greatest potential to reduce ecosystem and human risks.

Potential Speakers:

Dr. Mark Tomer, USDA-ARS, Ames IO

Dr. Wayne Honeycutt, Director of Soil Health Institute

Dr. Rattan Lal, Ohio State University

Session Overview

I. Soil Health: State of the Science - Current paradigms and research needs

- a. Evolving definition – Importance of soil carbon and soil moisture
- b. Soil health – human vs natural variation over space and time
- c. Soil health and soil biology

Potential Speakers:

Dr. Michael Lehman, USDA-ARS Brookings, SD

Dr. Harold van Es, Cornell University

Dr. Gurpal Toor, University of Maryland

Dr. Charles White, Penn State University

II. Soil Physics and Hydrology - Current paradigms and research needs

- a. Ag management effects on soil water dynamics
- b. Hydrodynamics between the unsaturated and saturated zones
- c. Soil moisture and nutrient use efficiency

Potential Speakers:

Dr. Ryan Stewart, Professor of Critical Zone Physics, VTech

Dr. Robert Ewing, Iowa State University

James Atkins, Delaware Extension

Dr. Robert Kratochvil, Maryland Extension

Andrew McGuire, Irrigated Cropping Systems Agronomist, Washington State University

III. Artificial Drainage: State of the Science - Current paradigms and research needs

- a. Form and function effects on hydrologic connection to fields and regional waterways
- b. Management to optimize field conditions and reduce impacts to downstream waters

Potential Speakers:

Dr. Kevin King, USDA-ARS

Dr. Zach Easton, VTech

Dr. Mark Tomer, USDA-ARS, Ames, IO

Dr. Todd Walters, Cornell University

Dr. Robert Kröger, Mississippi State University

Dr. Keith Shilling, University of Iowa

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IV. Understanding the Full Costs and Benefits of Field Water Management

- a. Ditch, tile, and irrigation costs for installation and maintenance
- b. Long-term impacts of water-management to groundwater resources
- c. Public environmental health risks tied to agricultural water management

Potential Speakers:

Dr. Kalmia Kniel, University of Delaware
Dr. Hannah Birgé, The Nature Conservancy (adaptive management of soil services)
Dr. Rattan Lal, Ohio State University
Dr. Rebecca Schneider, Cornell University, NY

V. Financial Mechanisms to Improve Soil Health and Water Management at a Watershed Scale

- a. Linking soil health and water management through insurance (agricultural and flood prevention)
- b. Tax incentives to support adoption of practices
- c. Implementing cost share practices to watershed outcomes

Potential Speakers:

Sarah Everhart, University of Maryland Agriculture Law Clinic
Kurt Fuchs, MidAtlantic Farm Credit
Rob Davis, Nagel Insurance

Workshop Products: The workshop will include 50 to 75 participants. The final report will provide an updated assessment of costs and benefits associated with in-field and edge-of-field water management practices potentially affecting soil health, crop production, and regional water quality. Results are intended to support the agriculture community and inform the Chesapeake Bay Program’s Water Quality Goal Implementation Team.

Proposed Timeline for January 2020 Meeting (flexible):

- **May 2019:** Initiate steering committee meetings (approximately monthly, by conference calls)
- **May – July 2019:** Refine agenda and candidate speakers/participants, workshop dates, and venue.
- **January 2020:** Host two-day workshop
- **January - March 2020:** Collaborate with steering committee members to draft workshop report.
- **April 2020:** External review of workshop report by participants and CBP STAC.
- **May 2020:** Finalize and submit a final report; Identify additional outlets for findings (e.g., journal or magazine article, blog contribution).

Requested Budget:

Item	Estimated Cost
Venue: West Virginia University/Chesapeake College	\$250
Lodging at \$110/night for 35 invited speakers, steering committee	\$3,850
Transportation for 20 invited speakers, steering committee;	\$5,000
Food	\$900
Total	\$10,000

*Additional matching funds from TNC, for travel, food, and Day 1 social hour (**\$5,600**).

History of previous STAC-sponsored workshop success: As chair of the proposed workshop, Boomer will build on previous efforts to facilitate exchange among researchers and practitioners toward advancing resource management. These include, “Re-plumbing the Chesapeake Watershed: Improving roadside ditch management to meet TMDL water quality goals” (2016), and “Reassessing Habitat Conditions in Sub-estuaries of the Chesapeake Bay and Responses to Resource Management” (pending).