Consider the **Secret Sauce** of a good outcome

Excerpt from *Retrospective on Lessons Learned from the Chesapeake Bay Program Strategy Review System's 3rd Cycle with Suggested Adaptations to Address the Issues*

A good outcome is:

- Clear in its objective
- Measurable
- Has a monitoring program that supports the status and progress, and reinforces the outcome
- Has partner commitment
- Resources are identified and/or available to support the efforts necessary to achieve the outcome.
- Centers the work on benefits to people and living resources, not solely water quality.

Soil Health Outcome Consideration

Agricultural Workgroup Meeting: March 20, 2025

Ruth Cassilly UMD CBPO

Nonpoint Source Policy Analyst

Beyond 2025 Climate Small Group Member

Climate Small Group Recommendations Connecting to Soil Health:

<u>Recommendation</u>: Promote Carbon Stewardship as a Holistic Approach to Climate Mitigation

- Advance understanding of carbon stewardship science
- Improve consideration of carbon in land use planning and decision-making.
- Improve regional coordination around carbon stewardship using natural climate solutions

<u>Recommendation</u>: Promote Strategies for Healthy and Productive Ecosystems Under Changing Climate Conditions

- Enhance the confidence and use of nature-based solutions through improved science on the performance and design under changing climate conditions that will promote multiple ecosystem services benefits while minimizing vulnerabilities to changing climate conditions.
- Pursue the development of a CBP soil health outcome and ways to support and incentivize achievement. Soil health is the basis for overall healthy ecosystems that will enhance resiliency for living resources and biodiversity.

<u>Recommendation:</u> Promote regenerative agricultural production and regionally based food systems in the CBW

- Increase collaboration with the growing network of producers, processors, distributors, local, state, and federal government, businesses, nonprofits, and institutions working to develop and support a regenerative and regionally based food system.
- Use educational, behavioral science and marketing resources to ensure that producers and consumers understand the value of regenerative ag
- Develop mechanisms to address issues of regional carrying capacity and nutrient mass imbalance to support healthy and equitable food access and incentivize a circular approach to food and manure waste management.

- **Proposed Soil Health Outcome**: Maintain and improve soil health, the foundation for healthy ecosystems and productive working lands. By 2035, develop and implement an approach to assess and incentivize actions to improve soil health, including modeling the soil health impacts of current water quality BMPs and identifying additional BMPs and other priority actions that support both soil health and water quality.

- **Rationale:**
  - Majority of the remaining nutrient and sediment reductions are expected to come from agriculture, need to accelerate progress
  - Soil is foundational for healthy, productive ecosystems and working lands, improvements simultaneously improve environmental and economic outcomes and improve the resilience of working lands to changing environmental conditions
  - Emphasis on soil health in agricultural production mitigates risk to farmers from changing environmental conditions
  - A soil health outcome related to agriculture would help focus the efforts of the AgWG and Agricultural Advisory Committee and prioritize efforts and resources

P3 WIPs, C23 Growth Analysis, 2023 RPI- EPA CBP, CAST, CESR

Soil health- The continued capacity of soil to function as a vital living ecosystem that sustains plants, animals and humans (NRCS)

Determines the capacity of soil to perform essential functions such as:

- Nutrient cycling
- Water regulation (infiltration, availability)
- Filtering and buffering (nutrients, toxics)
- Sequestering and storing carbon

Outputs: direct and indirect

- Improved water quality, air quality
- Improved water management
- Improved climate adaptation
- Improved productivity and profitability
- Reduced GHG emissions, pesticide and fertilizer use
- Improved plant health, human health, animal health

Frontiers

Taos SWCD

Economics of Soil Health Management Systems

- **Adopting soil health practices can increase yield and decrease input costs, leading to a return on investment of $3 for every $1 spent. (AFT Soil Health Case Study Analysis)**

- **NACD and SHI Study: 30 Producers, including 25 NACD Soil Health Champions, soil health management systems (SHMS) on a range of different crop types, soil types, geographies, weather patterns, management practices**

  Key findings:

  - On average it cost producers $14/acre less to grow corn, $7/acre less to grow soybean, and $16/acre less to grow all other crops.
  - Reduced expenses and increased net farm income: 29 farms increased net farm income by an average of $65/acre.
  - Yield increases were reported for 42% of farms growing corn, 32% of farms growing soybean, and 35% of farms growing other crops.
  - Cover crop seed costs averaged $21/acre for corn, $16/acre for soybean, and $25/acre other crops.
  - Four farms grazed cover crops, increased revenue by an average of $26/acre.
  - Additional benefits included decreased erosion and soil compaction, earlier access to fields in wet years, and increased resilience to extreme weather, among other benefits.

- **Outcome alignment with administrative goals and legislative mandates of CBP partners**:
  - **States:**
    - **WIP strategies** for climate adaptation and agricultural water quality improvements emphasize the capitalizing on the co-benefits of soil health initiatives and support soil health educational outreach and consideration in BMP prioritization efforts
    - **Legislative Initiatives:** supports/compliments state level healthy soils, food resiliency and sustainable/regenerative agricultural legislative initiatives, passed and pending
    - **Administrative goals:** supports climate action plans, agricultural conservation and local water quality improvement efforts
  - **Federal agencies:** Supports multiple agency recommendations and action plans that promote soil health as key for achieving beneficial agricultural outcomes while promoting ecosystem services and producer livelihoods.

State and Federal Soil Health Related Plan Examples:

Entity	WIP- Agriculture & Changing Env. Conditions	State Plans, Programs & Legislation	Federal Plans & Legislation
DE	Yes	DE Soil Health Partnership (Coalition)	
MD	Yes	Healthy Soils Program, Bay Legacy Act (pending) State Climate PRPS: MD Example	
NY	Yes	Soil Health and Climate Resiliency Act	
PA	Yes	Sustainable Agriculture Act	
VA	Yes	VA Soil Health Coalition (PA, MD, NY) Graze 300 Initiative	NRCS Strategic Plan for Soil Health Promotion
WV	Yes	Soil health education priority	
USDA			USDA: Climate-Smart Food and Forestry Practices, Case Studies
EPA			EPA-FRRCC Report
other			**Federal:** 5th National Climate Assessment Soil Care Act 2023- pending

Value of CBP resources to this Outcome:

- Focuses attention on soil health and facilitates collaborative ways to achieve progress-connects, supports, enhances and expands existing agricultural conservation efforts
- Connects to other outcomes and leads to better adaptation options and management approaches used to achieve agricultural health, watershed health and climate adaptation
- Expands capacity, coordination and resources to identify needs and implement scientific, technical, economic and social mechanisms that lead to sustained soil health improvements

Suggested Management Strategies for meeting the outcome:

- Facilitate CBP stakeholder/partner participation in assessing existing resources and approaches: identifying needs/gaps/barriers, areas of overlap, and potential to expand resources and capacity through coordination and collaboration by 2027
- **Adopt a set of metrics to evaluate the impacts of agricultural conservation and management practices on soil health** by 2027
- Identify key practices (BMPs) and approaches that provide maximum return on investment in terms of efficacy, cost and multiple benefits- support those programmatically by 2030
- Improve and expand soil health education (include strategic planning, demonstration sites, field days, mentoring opportunities), communication and outreach to key stakeholders by 2033

  6 principles of soil health: Living roots, covered soil, minimize disturbance, animal integration, consider context/geophysical properties in production planning decisions – “whole farm planning” approach and suitability mapping
- Incentivize the incorporation of soil health standards in soil related management activities including food, fiber, and forestry production, may include pay for outcomes, ecosystem service markets, cost support, direct market support, corporate investment, and transitional risk abatement by 2035

Ex. Consider management practice impacts on soil microbial composition: **fertility source**, tillage, cover crops

Source: **Legumes**, manure, fertilizer

ASSESSING SOIL HEALTH

1. Is the management moving toward healthier soil?

Indicator of progress
Toward a soil health target

2. Is the soil performing each job to the best of its ability? Functional outcomes

- Storing carbon
- Cycling carbon
- Cycling nitrogen
- Water storage
- Water infiltration
- Erosion resistance
- Suppressing diseases and pests
- Reservoir of biodiversity

SOIL HEALTH INSTITUTE

3

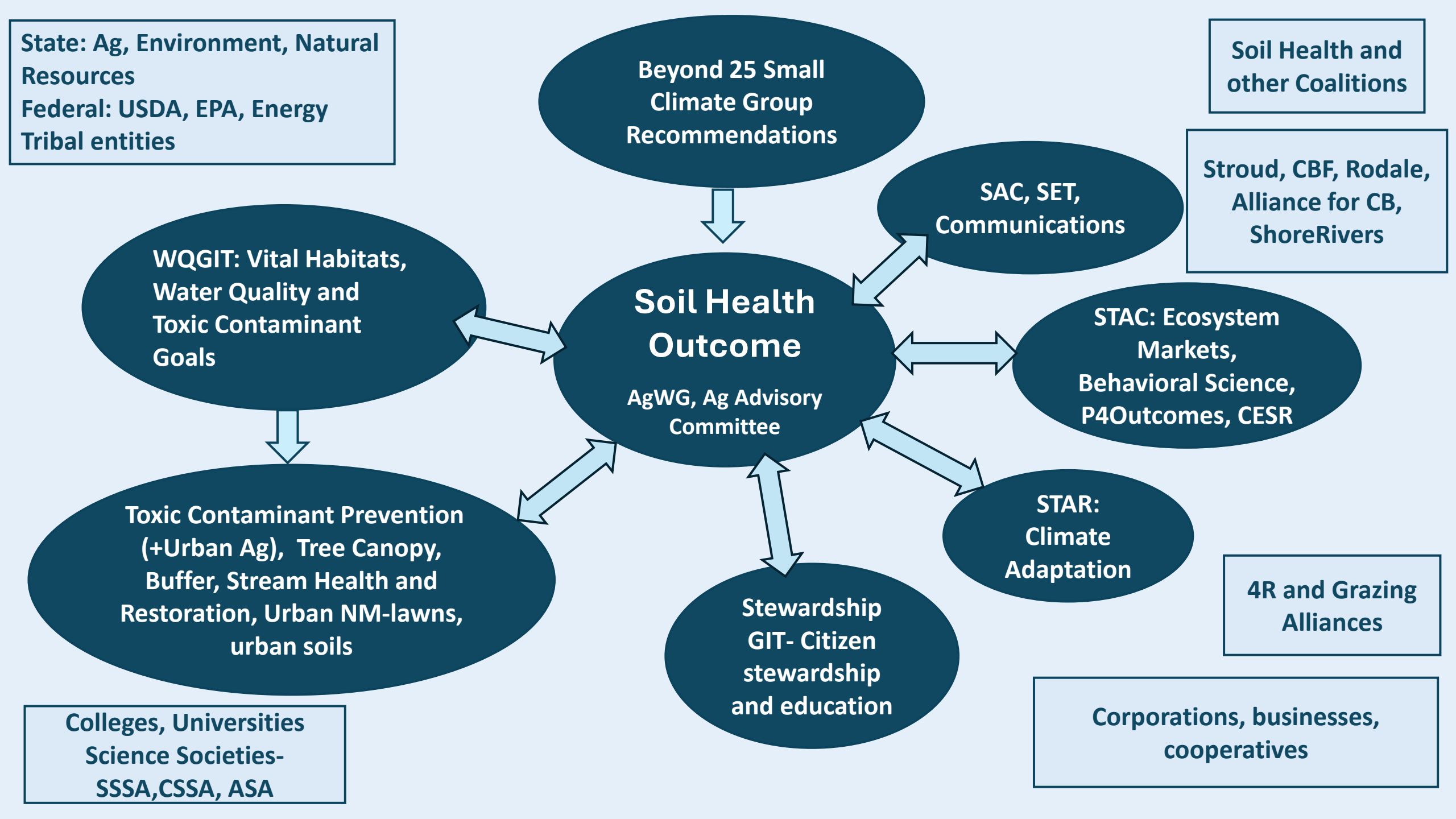
KEY OUTCOMES

- Soil organic C concentration, C mineralization potential, and aggregate stability represent a cost-effective, minimum suite of soil health indicators for North America.
- Equations can be used to predict changes in available water holding capacity as soil organic C concentration changes.

https://doi.org/10.1016/j.agee.2024.109002

Measuring Progress (SMART: Specific, Measurable, Achievable, Realistic, Timebound)

- **What to measure:** Implementation of key practices with multiple benefits, consider soil metrics (organic carbon, aggregate stability, microbial respiration, infiltration capacity) measures
- **How to measure:** Track practice implementation & management approaches associated with soil health improvements, make use of existing soil health metric data, explore modeling options
- **Implementation partners:** Collaborate with farmers, corporate partners, NGOs, nonprofits, universities, state and federal agencies, agribusiness organizations, ecosystem service buyers, institutional and tribal entities
- **Funding sources:** Use existing resources, explore additional funding strategies with implementation partners listed above
- **Incentives/rewards:** Decreased reliance on agricultural inputs, improved profits, farm health and land productivity, ecosystem/human/animal health, grants, cost-share, payment for outcomes, market-based rewards


State: Ag, Environment, Natural Resources
Federal: USDA, EPA, Energy
Tribal entities
Beyond 25 Small Climate Group Recommendations
Soil Health and other Coalitions
SAC, SET, Communications
Stroud, CBF, Rodale, Alliance for CB, ShoreRivers
WQGIT: Vital Habitats, Water Quality and Toxic Contaminant Goals
Soil Health Outcome
AgWG, Ag Advisory Committee
STAC: Ecosystem Markets, Behavioral Science, P4Outcomes, CESR
Toxic Contaminant Prevention (+Urban Ag), Tree Canopy, Buffer, Stream Health and Restoration, Urban NM-lawns, urban soils
STAR: Climate Adaptation
Stewardship GIT- Citizen stewardship and education
4R and Grazing Alliances
Colleges, Universities Science Societies- SSSA,CSSA, ASA
Corporations, businesses, cooperatives

Soil health effects on a typical watershed

Better forest harvest and construction management practices

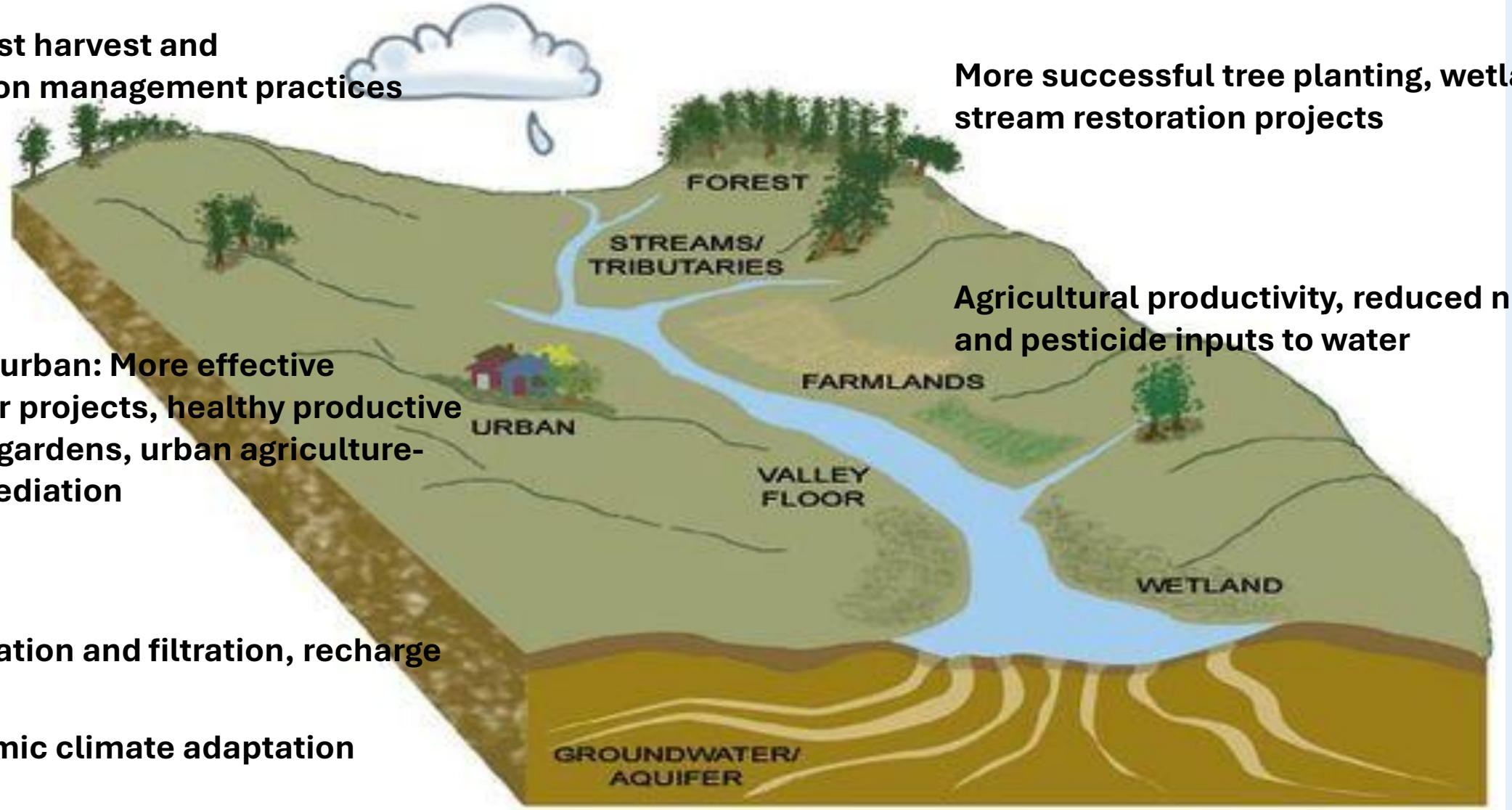
More successful tree planting, wetland and stream restoration projects

Agricultural productivity, reduced nutrient and pesticide inputs to water

Urban/Suburban: More effective stormwater projects, healthy productive lawns and gardens, urban agriculture-toxics remediation

Water regulation and filtration, recharge

Systemic climate adaptation



The quality and success of tree and buffer plantings, stream restorations, forest harvest and construction effects, working lands productivity , urban landscaping/stormwater green infrastructure/lawncare/gardening, toxics prevention and climate adaptation all depend on the degree to which the health of the soil is ensured.

2025-26 Planning and Prioritization Document: Planning for the Future of the Agriculture Workgroup

What is the purpose and role of the AgWG moving forward?					
Discussion Topic	Brainstorm areas of interest, future deliverables	CESR Report	*Beyond 2025	*Agriculture Advisory Cmte and other CBP entities	Prioritization of interests, focus areas, at in-person meeting
Guiding Questions	What would you like to see the AgWG accomplish in the next two years?	How should findings presented in the CESR report influence the direction of the AgWG?	How might Beyond 2025 influence the direction of the AgWG?	How do we engage with the AAC, other groups, to best support our purpose and goals?	

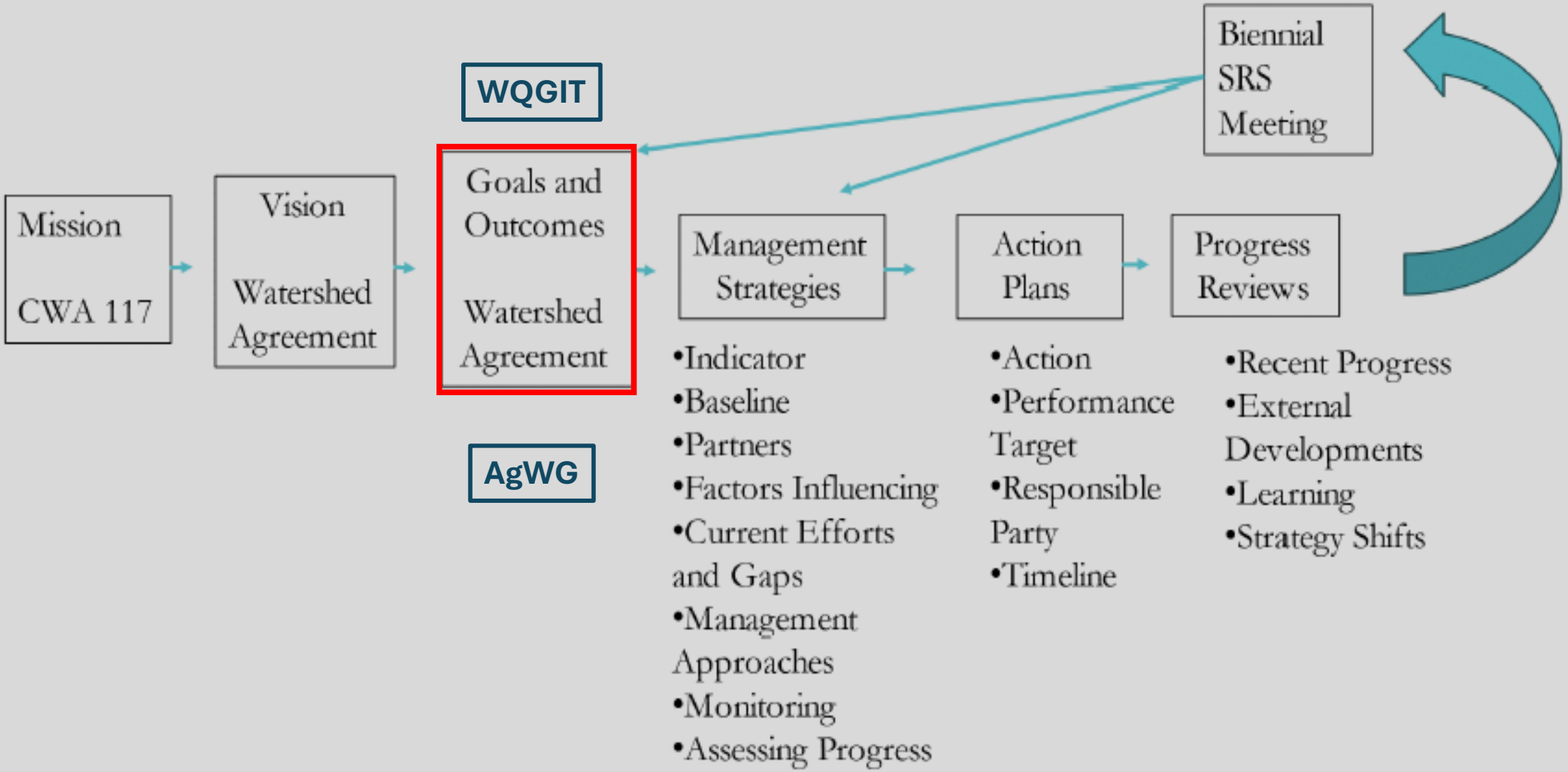
https://www.chesapeakebay.net/files/documents/AgWG-2025-26-Prioritization-Document-Jan-2025.pdf

Suggested Functions and Priority Topics

- AgWG should serve as a forum for information exchange among stakeholders
- AgWG should be a platform where farmers' voices are amplified, and we should learn, directly from the folks "on the ground", what does and does not work to help us move toward our water quality goals
- AgWG should work with other CBP entities and support existing initiatives to ensure meaningful representation of ag stakeholders in CBP activities
- The AgWG should host discussions with folks advancing cutting-edge, innovative ag research, technology, stakeholder engagement programs, etc.

What should we strive to accomplish?	Topics for discussion:
Evaluate innovative implementation strategies	Ag Climate Work Agroforestry
Share programs/policies effective in conservation and restoration	Pay-for-Performance/Outcomes Models
Identify what works well and build on successes	Farm Resiliency (Maximize Farm Profit and Health) On-Farm Water Management
Support increased implementation of effective BMPs	BMP Clarification BMP Valuation
Provide leadership in Beyond 2025 effort	Farmer Input Mass Balance
Support sustainable agriculture	Carbon Cycling
Explore cutting-edge research, technology, and programs	Nutrient Use Efficiency Nutrient Applications
Create policies/programs that minimize admin. burden on states	Challenges facing small farms Climate Resiliency

CBP Logic-Based Strategy Management System



Considerations:

- Valid concern from jurisdictional partners that creating an outcome will mean additional reporting requirements and burden on state staff – perhaps related to the “has a monitoring program that supports the status and progress and reinforces the outcome”
- There is flexibility in how we choose to monitor progress towards an outcome
- Focus on and use existing efforts in more effective ways to make better decisions regarding management approaches and practice implementation- to maximize benefits
- Direct CBPO collaborative and technical resource capacity more effectively towards outcome achievement, draw attention to subject
- Encourage an SRS-like process for the AgWG, ensuring that the focus remains on the stated priorities and making progress
- **Discussion: Does the AgWG want to adopt/support the Soil Health Outcome as written?**

References:

- **Effects on Microbiome: Nutrient Source, Tillage, Cover Crops: July 2024 Stroud Research Study: Agricultural practices influence soil microbiome assembly and interactions at different depths identified by machine learning**

  Second journal same study

  https://doi.org/10.1016/j.agee.2024.109002

- **Beyond 2025** Small Group Findings Report and Draft Priority Projects List

- **Chesapeake Progress**: https://www.chesapeakeprogress.com/clean-water/watershed-implementation-plans

- **CAST P3 WIPs and Trends Over Time**

- **Written Comments from: A Critical Path Forward for the Chesapeake Bay Program Partnership Beyond 2025 Comments from Thriving Ag Project Scientists, American Farmland Trust, and Choose Clean Water Coalition Beyond 2025 Steering Committee Report and Public Comments**

- **STAC Report Ecosystem Services**

- **Soil health economic study USDA, NRCS, NACD, SHI**: **https://www.nacdnet.org/about-nacd/what-we-do/soil/shms/**

  StoryMap to browse the project participants based on geographic distribution. Individual fact sheets can be accessed on SHI's Economics Webpage.

  - https://soilhealthinstitute.org/our-work/initiatives/economics-of-soil-health-systems/ (midwestern farms)

- **USDA: Framework for Shoring Up the Food Supply Chain and Transforming the Food System to Be Fairer, More Competitive, More Resilient:** https://www.usda.gov/media/press-releases/2022/06/01/usda-announces-framework-shoring-food-supply-chain-and-transforming

- **EPA's Potential Role in Supporting Soil Health FRRCC Report to the Administrator**: https://www.epa.gov/sites/default/files/2017-01/documents/frrcc_report_to_the_administrator.2016_002.pdf

- **Regional Analysis of Nitrogen Flow within the Chesapeake Bay, Watershed Food Production Chain Inclusive of Trade-** Paniz Mohammadpour and Caitlin, *Environ. Sci. Technol.* 2023, 57, 4619−4631 Grady*

- **USDA Climate Solutions**: https://www.usda.gov/climate-solutions

References:

- **Rutgers University Extension**: **Soil Health Purpose and Management**
- **AFT, Rodale, Stroud**
  - https://farmland.org/soil-health-case-studies/
  - https://soilhealthinstitute.org/our-work/initiatives/economics-of-soil-health-systems-on-30-u-s-farms/#overview
  - https://stroudcenter.org/projects/healthy-soils-healthy-streams-training-and-technical-assistance/
  - https://stroudcenter.org/press/pennsylvania-establishes-soil-health-coalition/
  - **Update on the DE River Watershed Impact Trial**: https://www.youtube.com/watch?v=rBBfReGxPos
  - In collaboration with Stroud Water Research Center and with funding from the William Penn Foundation, Rodale Institute is researching the links between farm management practices, soil health, and water quality. Different organic and conventional management practices will promote or degrade soil health, which can affect downstream water quality.
- **Soil Health Institute:** https://soilhealthinstitute.org/app/uploads/2022/10/SHI_SoilHealthMeasurements_factsheet.pdf
- **5th National Climate Assessment**- US Government's preeminent report on climate change impacts, risks, and responses. U.S. Global Change Research Program, Washington, DC, USA. Full report available online at: nca2023.globalchange.gov
  - https://doi.org/10.7930/NCA5.2023.CH11
  - https://nca2023.globalchange.gov/chapter/11
- **CESR Report (Ch 3 & 4)**: https://www.chesapeake.org/stac/cesr/: Pay for Outcomes, BMP prioritization, Ecosystem services
- **CEAP**: https://www.nrcs.usda.gov/ceap
- **USDA: Using climate-smart food and forestry practices:** https://www.usda.gov/climate-solutions
- **UMD Animal Waste Technology Fund Assessment Report**: https://extension.umd.edu/resource/animal-waste-technology-fund-assessment-report/

References:

- **Chesapeake Bay Forest Restoration Strategy**: https://d18lev1ok5leia.cloudfront.net/chesapeakebay/cst91_chesapeake_forest_restoration_strategy_web_508_final.pdf
- Understanding Ag: Soil Health Principles https://understandingag.com/the-6-3-4tm-explained/
- Inamdar, S. P., Kaushal, S. S., Tetrick, R. B., Trout, L., Rowland, R., Genito, D., & Bais, H. (2023). More Than Dirt: Soil Health Needs to Be Emphasized in Stream and Floodplain Restorations. *Soil Systems*, *7*(2), 36. https://doi.org/10.3390/soilsystems7020036
- **Conservation innovation fund-** ecosystem services for corporate purchasing https://www.conservationinnovationfund.org/our-mission
- The Food System | Food Systems | Washington State University
- University of Michigan: https://css.umich.edu/publications/factsheets/food/us-food-system-factsheet
- Reimagining Public Food Procurement in the 2023Farm Bill: EESI

EESI- Environmental and Energy Study Institute- Nonprofit Think Tank https://www.eesi.org/agriculture-and-climate-series

- Johns Hopkins Center for a Livable Future:

https://clf.jhsph.edu/projects/food-system-resilience/resilience-planning-guide

- **Lawns and gardens:** To the degree that we can implement management methods that improve soil health, we can create a system that is sustainable and considers the soil microbes as a key component that drives productivity. For example, increasing a soil's organic matter content in flower, fruit, and vegetable beds will reduce the need for supplemental fertilizers. Each 1% of soil organic matter releases approximately 1/2 – 1 lb. of available nitrogen per 1,000 sq. ft. Garden soils that are >4% soil organic matter will need relatively little additional fertilizer. https://extension.umd.edu/resource/improve-soil-health-climate-resilient-garden/
- **Food Systems Transformation Supporting Information: Healthy Food Access Policy Compendium for Metropolitan Washington (MWCOG)** https://www.mwcog.org/committees/food-and-agriculture-regional-member-policy-committee-farm-/
- **The Chesapeake Foodshed Assessment:** Create a Chesapeake Regional Food System "brand" and unified certification system.

  https://agnr.umd.edu/sites/agnr.umd.edu/files/files/documents/Hughes%20Center/2019__Chesapeake-Foodshed-Assessment_02.pdf
- **CBP Short Video** https://www.chesapeakebay.net/discover/videos/chesapeake-climate-regenerative-farming

Additional detail soil health related efforts:

Introduced in Senate (10/04/2023)- Soil Conservation And Regeneration Education Act of 2023 or the Soil CARE Act of 2023: pending

- Soil Care Act 2023: This bill directs the Department of Agriculture (USDA) to establish a training program for biological soil health management in Natural Resources Conservation Service (NRCS) programs.
- Under the bill, *biological soil health management* means land management methods used to increase and balance soil biology, such as microbial biomass and macrofauna, for the purpose of improving biological functions, including forming and stabilizing soil structure, cycling nutrients, controlling pests and disease, and degrading or detoxifying contaminants.
- The training program must (1) provide education, resources, and technical support to USDA personnel and third-party providers on the rapidly evolving methodologies, science, and practices for improving soil health; and (2) assist USDA personnel and third-party providers in supporting agricultural producers in understanding and implementing biological soil health management systems that regenerate farmland.
- The training program must be available twice every two years in each NRCS region and include both an online curriculum and in-person training workshops.
- The training program must be developed and delivered through cooperative agreements with entities with biological soil health management systems expertise and experience working with and training producers.
- The bill includes minimum curriculum requirements for the training program, including specific units on soil health and diversified production systems.

DE: The Delaware Soil Health Partnership (DSHP), led by SCD, is a collaboration of farmers and NRCS, DNREC, University of Delaware, and Delaware State University.

MD: Chesapeake Bay Legacy Act- support for healthy soils and regenerative practices