Potential Water Quality Benefits of Soil Health in the Chesapeake Bay Watershed

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Soil Health Management Systems Include:

What is it?		What does it do?
Conservation Crop Rotation Growing a diverse number of crops in a planned sequence in order to increase soil organic matter and biodiversity in the soil.		• Increases nutrient cycling • Manages plant pest (weeds, insects, and diseases) • Reduces sheet, rill, and wind erosion • Holds soil moisture • Adds diversity so soil microbes can thrive
Cover Crop An un-harvested crop grown as part of planned rotation to provide conservation benefits to the soil.		• Increases soil organic matter • Prevents soil erosion • Conserves soil moisture • Increases nutrient cycling • Provides nitrogen for plant use • Suppresses weeds • Reduces compaction
No Till A way of growing crops without disturbing the soil through tillage.		• Improves water holding capacity of soils • Increases organic matter • Reduces soil erosion • Reduces energy use • Decreases compaction
Mulch Tillage Using tillage methods where the soil surface is disturbed but maintains a high level of crop residue on the surface.		• Reduces soil erosion from wind and rain • Increases soil moisture for plants • Reduces energy use • Increases soil organic matter
Mulching Applying plant residues or other suitable materials to the soil surface to compensate for loss of residue due to excessive tillage.		• Reduces erosion from wind and rain • Moderates soil temperatures • Increases soil organic matter • Controls weeds • Conserves soil moisture • Reduces dust
Nutrient Management Managing soil nutrients to meet crop needs while minimizing the impact on the environment and the soil.		• Increases plant nutrient uptake • Improves the physical, chemical, and biological properties of the soil • Budgets, supplies, and conserves nutrients for plant production • Reduces odors and nitrogen emissions
Pest Management Managing pests by following an ecological approach that promotes the growth of healthy plants with strong defenses, while increasing stress on pests and enhancing the habitat for beneficial organisms.		• Reduces pesticide risks to water quality • Reduces threat of chemicals entering the air • Decreases pesticide risk to pollinators and other beneficial organisms • Increases soil organic matter

Source: https://www.nrcs.usda.gov/wps/PA_NRCSConsumption/download?cid=stelprdb1049264&ext=pdf

USDA's Take on Cover Crops and Nutrients

- As a "trap crop", a cover crop will store nutrients from manure, mineralized organic nitrogen or underutilized fertilizer until the following years' crop can utilize them, reducing nutrient runoff and leaching.
- When a cover crop is managed for its contribution to soil nitrogen, the application of a nitrogen fertilizer for the subsequent crop may be less, thereby lowering costs of production, reduced nitrogen losses to the environment and reducing the use of purchased nitrogen fertilizer…

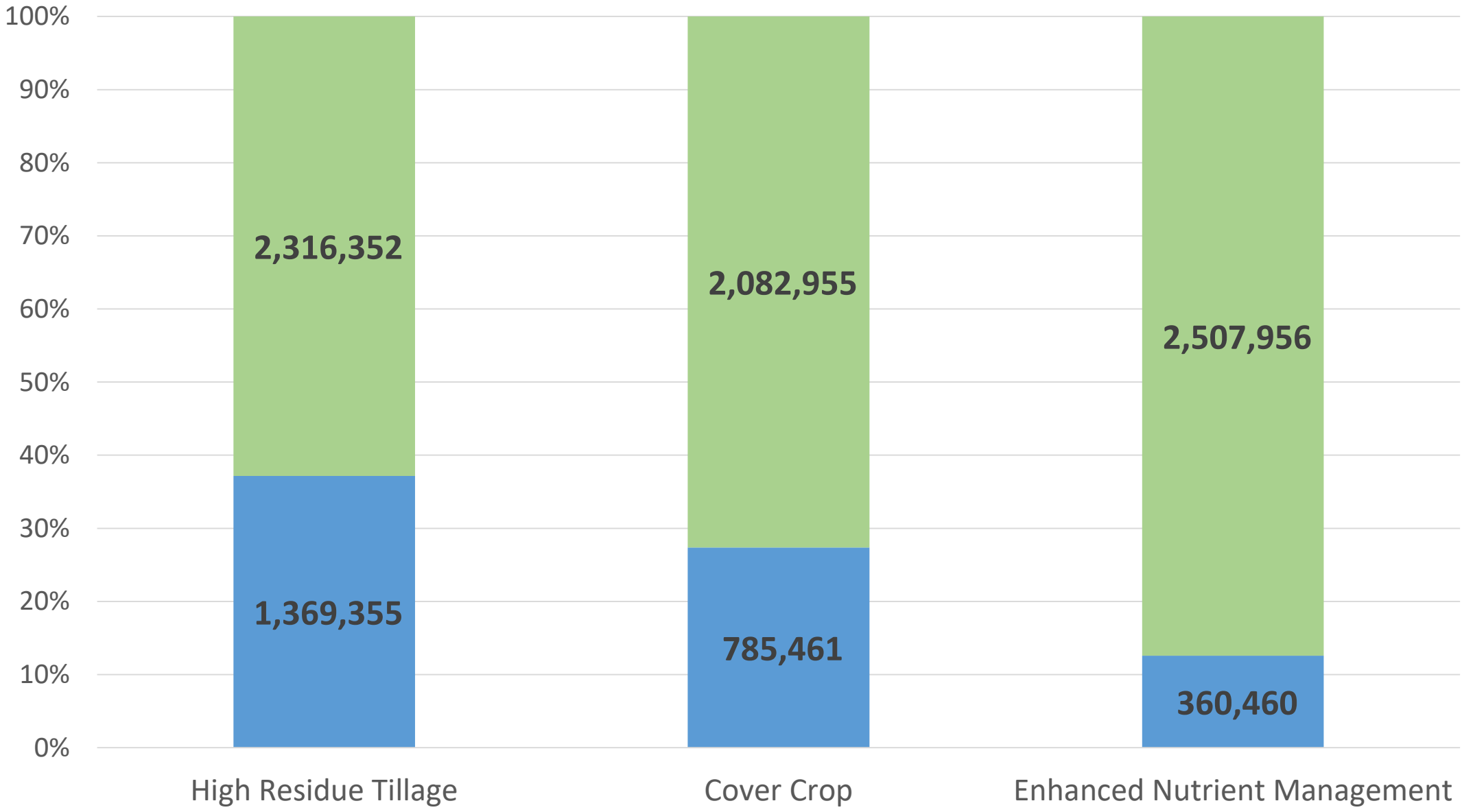
Source: https://www.nrcs.usda.gov/wps/portal/nrcs/detail/ny/technical/?cid=nrcs144p2_027252.

Soil Health (One Possible Definition)

Farmers protect existing soil from erosion and enhance soil structure, infiltration rates, organic content, microbial health through the use of practices such as **cover crops**, **conservation tillage**, manure and fertilizer **injection**, and **prescribed grazing**.

After multiple years of practice implementation, farmers are able to **reduce nutrient applications** as soil health increases crop productivity.

Soil Health Implementation and Remaining Opportunity Across CBW in 2017



Land Use Domains: High Residue Tillage placed upon all crops excluding silage; Cover Crops placed upon all crops excluding double crops, small grains and silage; Enhanced nutrient management placed upon all crops excluding double crops, small grains and silage

Agricultural Recommendations

Performance of Practices for Improvement of Soil Health:

Management and Use of Cover Crops

- Planting and management of non-harvested
  - Cover crop on 33% of land used for production of silage crops that receive fall manure application
  - Cover crop on 50% of non-sileage crop land that receives a fall manure application
  - Cover crop on 50% of crop land that does not receive a fall manure application

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Agricultural Recommendations

Performance of Practices for Improvement of Soil Health:

Prescribed Grazing

- 50% of land used for pasture follow prescribed grazing plans, including, where appropriate, sufficient fencing to exclude animals from streams

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Agricultural Recommendations

Enhanced NM Planning – Lands Not Receiving Animal Manure

- Attainment of 20% of crop land not currently receiving animal manure managed
  - pursuant to a nitrogen-based and phosphorus-based nutrient management plan
  - with plans that both: (i) address both nitrogen and phosphorus; and (ii) implement enhanced nutrient management practices for rate, timing, and placement of land application of nutrients

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Reductions from Agricultural Scenarios

Scenario	N	P	Percent N Achieved/ Cumulative N Achieved	Percent P Achieved/ Cumulative P Achieved
Reductions Needed from 2017	52,700,000	2,030,000	NA	NA
Compliance	8,113,000	236,000	15%/15%	12% / 12%
Soil Health	7,689,000	327,300	15% / 30%	16% / 28%
Expanded NM	817,000	44,200	2% / 32%	2% / 30%
Manure Storage	7,058,000	303,900	13% / 45%	15% / 45%
Dairy Feed Management	610,000	61,200	1% / 46%	3% / 48%
Buffers	8,070,000	1,001,400	15% / 61%	49% / 97%
Manure Transport	957,000	181,500	2% / 63%	9% / 106%

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