

Protecting and Restoring Soil Resources to Enhance Human and Ecological Health

Impact Statement

INVESTIGATORS

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SUMMARY

Soils are critical to supporting agriculture, industry, natural environments, and human health. However, **soil degradation threatens agricultural production, profits, environmental quality, and human well-being**. The School of Environment and Natural Resources conducts research and disseminates timely information to **improve soil management, improve soil and water quality, and increase production efficiency**. Further, teams are pursuing the concept that the health of soil, plants, animals, people and ecosystems is one and indivisible.



SITUATION

Soil resources contribute critical ecosystem services (including maintaining biodiversity and productivity, filtering, and storing water) and contributes to the hydrologic cycle, nutrient cycling, carbon sequestration, and provides support for plants and engineering structures. **The long-term health of the soil resource is threatened** by human-induced and climate change impacts: decline in soil structure, accelerated soil erosion, soil compaction, soil contamination, soil organic matter (SOM) loss, replacement of soil with impervious surfaces, and impairment of soil physical, chemical, biological and ecological functions. **Soil functions support a number of industries and activities**, including agriculture, forestry, and recreation, with important economic consequences. Significant water resource challenges including water quality are responsive to soil conditions and management. **Maintaining soil health is critical to sustaining human and ecosystem health and quality of life.**

RESPONSE

We address soil resource health through integrated applied research in the laboratory and field, outreach, and classroom venues.

OUR MAJOR SOIL FOCUS AREAS:



Soil resource management for sustainable agriculture:

We research soil carbon sequestration, efficient nutrient management, use of by-products for enhancing soil conditions, soil microbial systems and enzymes in the rhizosphere, tillage systems and cover crops, and soil information systems.



Soil health in the urban space:

We develop methods for assessing soil health in disturbed and managed environments, research bioavailability of contaminants such as lead and arsenic, analyze soil contributions to the carbon cycle, and soil restoration for urban farming.



Soil services in natural ecosystems:

We develop methods to assess soil resilience and disturbance using remote sensing, soil condition assessment, and restoration strategies in wetlands, forests, grasslands, croplands and other habitats/ecosystems.

IMPACT

Our research provides the basis for a **new phosphorus index** used by producers and policymakers to target practices on fields impacting nutrient runoff. We are working with farmers to revise agronomic fertilizer recommendations to **increase profitability and improve water quality by minimizing over-application of fertilizers**. Research on reuse of wastes has established that dredge materials can be used effectively in soil blends for application in urban agriculture. **Digital soil mapping research** has contributed to improved spatial information for land use planning, and remote-sensing methods for mapping crop residues. Research on carbon sequestration has increased understanding of climate change mitigation and adaption potential. We are working with industry/private sector representatives to meet their goal of emission neutral products. In Senegal, research has shown that intercropping with native shrubs contributes to carbon sequestration, and productivity. **Work on active fractions of soil carbon** has advanced our understanding of how rapid and affordable tests could be used by landowners and farmers to better manage soil. We have focused outreach efforts on soil health and **have started a new Extension signature program, *Healthy Soils, Healthy Environment***. **Innovative outreach workshops** have targeted Ohio State county soil and water educators in soil health and urban soil management (125 participants), and on-site wastewater system designers (100 participants).

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