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Soil fertility is altered by texture and land use in the southeastern United States

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Sampling surface residue in a Virginia grassland. Photo by Alan Franzluebbers, USDA-ARS.

Soil fertility is optimized when a broad spectrum of chemical nutrients is in balance with soil physical and biological properties, allowing plants to grow to their full potential. Conservation management of croplands, grasslands, and woodlands likely alters soil fertility. However, databases to characterize soil fertility when land has been converted to conservation use are not readily available.

Scientists with the USDA-ARS in Raleigh, NC and at Clemson University undertook a comprehensive evaluation of soil fertility conditions across 614 soil profiles from research stations and private farms in North Carolina and Virginia to help interpret how conservation land use can be expected to enrich or degrade soil fertility. Soil fertility was characterized by traditional soil chemical analyses, but also from contemporary soil biological and physical properties often used for soil health analysis.

The researchers found that soil fertility depends on soil texture (sand content) and land use. Soil under no-till cropping had greater capacity to supply nutrients and resist erosion than soils under conventional-till cropping. Soil under perennial pastures had greater potassium supply and enriched biological activity compared with no-till cropland. Soil under woodland was enriched in organic matter yet had lower calcium, magnesium, and potassium levels and was more acidic than agricultural soils. These results will be useful for land-use planners, extension specialists, farmers, and scientists engaged in soil restoration strategies.

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Franzluebbers, A. J., Farmaha, B. S., Zentella, R., & Kafle, A. (2025). Soil-profile fertility is altered by soil texture and land use across physiographic regions in the southeastern United States. *Agronomy Journal*, 117, e70041.

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