RESTORING SOIL HEALTH: EFFECTIVENESS OF SHORT- AND LONG-TERM CONSERVATION PRACTICES

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Abstract

Soil health is the ability and capacity of soil to function within environments and ecosystems to promote plant and animal health, sustain biological productivity, and maintain environmental quality. Intensive agricultural land use has been widely shown to degrade soil quality and health. Functional and structural integrity of the soil can be improved or potentially return to pre-disturbance conditions with soil conservation practices. The goal of this work was to 1.) quantify the effects of land conversion from native vegetation to agricultural cultivation and 2.) measure the rate and degree of soil recovery from both short-term (less than 15 years) and long-term (greater than 15 years) soil conservation practices. Conservation measures ranged from management modifications that maintain crop productivity including practices such as conservation tillage and cover crops to removal of sensitive land from crop production through the Conservation Reserve Program (CRP). A variety of soil physical, chemical, and biological parameters were investigated including bulk density, aggregate stability, infiltration, total organic carbon, carbon dioxide flux, and microbial biomass. Results show land conversion slightly impacted (less than 20% change from pre-disturbed condition) aggregate stability, moderately impacted (20-50% change from pre-disturbed condition) bulk density, total organic carbon, and carbon dioxide flux, and severely impacted (greater than 50% change from pre-disturbed condition) infiltration and microbial biomass. Both short and long-term crop management modifications (cover crops and conservation tillage) showed minimal recovery of soil quality indicators. CRP enrollment showed some recovery of soil quality indicators in the short-term with more significant recovery over longer timescales; however, even 30 years of grassland management was not sufficient to recover all parameters to their pre-disturbed state. Our findings reinforce the importance of investing in significant long-term conservation initiatives.

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