SERDP
Strategic Environmental Research and Development Program
Improving Mission Readiness Through Environmental Research

Disturbance of Soil Organic Matter and Nitrogen Dynamics: Implications for Soil and Water Quality

ERDP's SEMP
Ecosystem Management Project

Background:

The deterioration of soil quality can lead to dramatic and long-term changes in terrestrial ecosystems, but little is currently known about what thresholds may exist that prolong or prohibit the recovery of soil quality following ecosystem disturbance. This project is ongoing at Fort Benning, Georgia, within the framework of the SERDP Ecosystem Management Project (SEMP) to evaluate the short- and long-term effects of land use change and terrestrial ecosystem disturbance on two key measures of soil quality: soil organic matter and soil nitrogen dynamics.

Objective:

The overall objectives of this study are to: (1) describe how soil carbon and nitrogen dynamics are affected by current land use activities and disturbance regimes, (2) evaluate the potential for short- and long-term recovery of soil quality in disturbed environments, (3) use existing GIS resources for analysis of spatial patterns of soil carbon and nitrogen, and (4) predict the effect of site disturbance and/or land use change on nonpoint sources of nitrogen pollution.

Approach:

The research project will assess the potential impact of military activities, ecosystem disturbance, fire, and land use change on soil quality and terrestrial nonpoint sources of nitrogen to surface receiving waters. Soil organic matter and soil nitrogen dynamics have been compared at sites with different disturbance histories. We have also measured soil carbon and nitrogen stocks in ecosystems along gradients of disturbance and land use change for the purpose of mapping key measures of soil quality using a geographic information system. Short- and long-term studies of soil carbon and nitrogen dynamics will be undertaken at field sites. Where possible, we will use models of soil carbon and nitrogen dynamics to predict the potential recovery of soil organic matter, soil carbon sequestration, and potential terrestrial sources of nitrogen to aquatic ecosystems following soil disturbance.

Benefits:

This research will help site managers predict the impacts of various land uses on two key determinants of soil quality at Fort Benning. It will also contribute to a better general understanding of soil organic matter and soil nitrogen dynamics in different land use/land cover categories, the effects of soil disturbance on organic matter and soil nitrogen dynamics, and how land management decisions may impact soil quality and the potential for recovery of degraded lands.

Technical Progress:

Results from the first year indicate increasing soil bulk density, decreasing soil carbon and nitrogen stocks, and decreasing soil nitrogen availability are all associated with areas supporting heavy training use. These parameters appear to be good indicators of soil quality for use in follow-up studies (i.e, they are sensitive, easy to measure, and predictable). Results from soil sampling at 40 locations (close to LCTA plots) in March 2000 established baselines for (1) assessing future changes in soil quality under different land use/land cover categories and (2) landscape based modeling of soil quality at Fort Benning. Historically disturbed sites that have been remediated appear to exhibit recovery for some aspects of soil quality.

For more information, visit the SEMP website
http://www.denix.osd.mil/SEMP

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Conservation
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