Assessing the Accuracy of Soil Carbon Inventories in a Forested Watershed Using Conventional and Advanced Approaches

Mark G. Johnson, Donald W. Ebert, Maliha Nash, Matthew Fillmore and Jonathan J. Maynard

Soils provide a number of vital Ecosystem Services (ESs) that society depends upon. Carbon held in soils contributes to a number of ESs including the production of food and fiber; water recharge, storage and purification; nutrient cycling, reducing soil erosion and climate regulation. Globally, forested soils contain approximately one-third of the carbon stored in Earth's terrestrial ecosystems. Consequently, forested soils are vital to the provisioning of ESs. Accurate inventories of soil carbon are needed to assess and monitor the extent of soil carbon-based ESs provided by forested ecosystems. While soil surveys and linked laboratory data can provide estimates of soil carbon, these data often lack specific local detail as soil physical and chemical information is often obtained from soils that were collected in other locations. This paper describes a study in which we used standard STATSGO and SSURGO soil maps to estimate the soils carbon inventory of a forested watershed in Oregon Coast Range Mountains. We hypothesized that an improved soil carbon inventory could be generated by including local terrain attributes and environmental variables (e.g., slope, aspect, solar radiation, temperature, precipitation) in an unsupervised classification and regression tree (CART) analysis, "trained" using SSURGO soil carbon values assigned to the centroid of each SSURGO map polygon. The accuracy of each soil carbon inventory map (STATSGO, SSURGO, CART analysis) was tested against soil carbon stocks quantified at 35 sampled pedons distributed across the watershed. Detailed methods and results of this analysis will be presented and discussed; recommendations will also be presented.