
This book on forest soils is the third in a series, with the first two books focusing on the potential of U.S. cropland and grazing lands to sequester C. The information provided serves mostly policymakers, soil managers, and scientists interested in soil C sequestration as a means to mitigate global climate change. Thus, the focus is on improving forest management practices to increase soil C in forested ecosystems, which cover about 33% of the total land area in the USA, including alpine and permafrost-affected ecosystems, tropical and subtropical systems, natural and managed temperate forests, wetlands, and urban forest systems. Whereas most of the reported literature is on the C pool of forests in the forest floor and aboveground biomass, this overview considers the hidden belowground C. Surprisingly, soil C is the largest C store in most forests. All authors have a demonstrated expertise in soils, global climate change, or forestry, with a collective focus on C budgets and cycling.

Briefly, terrestrial ecosystems can be a major sink or source for C depending on soil environmental conditions. The soil acts as a sink for C, by removing CO₂ from the atmosphere by photosynthesis, leading to subsequent storage of organic C through plant and microbial biomass and by soil C. While it is estimated that the total global terrestrial biomass is almost as large as the atmospheric C pool, the soil C stock is about equal to the sum of these two major C stocks, with its magnitude depending on the considered soil depth. On the other hand, the soil system is a major source of CO₂ through soil and root respiration processes, as well as by biomass removal such as by forest clearing and forest fires. Net primary production (NPP), defined as the difference between photosynthesis and respiration, as opposed to gross primary productivity, generally decreases from the equator towards the high-latitude boreal forests. However, the amount of stored C in forest soils generally shows the opposite trend, with boreal forest soils possibly accounting for the largest inventory of global soil C.

The decrease in U.S. forested land from about 46% in the 1600s to about 33% currently has been the result of conversion of forests to agriculture land. This conversion of forestland to cropland (deforestation) led to dramatic changes in soil C content and major emissions of CO₂ in the past. Hence, it is natural to suggest replanting of cropland to forests (i.e., reforestation) or changing land use from non-forest to forest (afforestation), thereby bringing C back into the soil. As the C stock in forested systems is generally larger than in croplands or grazing lands, with large above- and belowground C stocks, forests have the potential to increase soil C at the long term because of its long residence time. The text provides much needed information to make informed decisions, as well detailing the benefits of forest management practices on the C cycles.