



Harvesting temperate forests reduces soil carbon

A new analysis of temperate forests has estimated that, on average, tree-felling and the removal of tree biomass reduces carbon levels in the soil by 8 per cent. The reduction is greatest in the forest floor layer where about 30 per cent of carbon is lost.

About half of the Earth's carbon is stored in forests and approximately two-thirds of this amount is stored in the soil. This is significant in the global carbon cycle and for forest productivity. Improving our understanding of factors that affect forest soil carbon storage is important in anticipating changes in ecosystem goods and services, ranging from forest products and water resources, to greenhouse gas mitigation.

The study carried out an analysis on 75 sets of data on the impact of harvesting (tree-felling and the removal of biomass) on the soil carbon of temperate forests around the world, including forests found in Denmark, France, Germany and Spain. Temperate forests are those with moderate temperatures and high rainfall. It estimated that harvesting reduced the amount of soil carbon on average by 8 per cent.

The carbon stored in the forest floor layer of soil is most vulnerable to harvesting and, on average, there is a loss of 30 per cent from this layer. The forest floor layer stores significant amounts of carbon, but the deeper mineral layers of soil, found below the forest floor, store much more. The impact of harvesting did not lead to an overall loss of carbon from the mineral soil layers. At the deepest level of the mineral soils, carbon concentration actually increased by 19 per cent after harvesting. This could be due to downward distribution of carbon after harvesting and the fact that deeper soils are not disrupted by surface tilling.

This impact of harvesting varied with forest and soil types. Hardwoods tended to lose more carbon from the forest floor (36 per cent) than coniferous or mixed forests (20 per cent). The greatest reduction tends to be from the Spodosol type of soil (often called 'podzols' in Europe) which tends to be acidic and of lower fertility than other soil types. Spodosols store large amounts of carbon in the forest floor layer and take 50 to 70 years to recover soil carbon loss from harvesting.

For mineral soils, the impact on carbon largely depended on the type of soil: there is greater loss from Inceptisols, which are poorly developed soils (13 per cent loss) and acidic Ultisols (7 per cent loss). The research indicated that these losses are recovered over time and recovery may be aided by avoiding tilling, as tilling accelerates carbon loss. Alternative management practices for preparing forest sites which do not involve tilling include burning or retaining the tree residue left after harvest.

Source: Nave, L.E., Vance, E.D., Swanston, C.W. & Curtis, P.S. (2010). Harvest impacts on soil carbon storage in temperate forests. *Forest Ecology and Management*. 259:857-866.

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