



Soil Biodiversity And Ecoregions – Temperate And Boreal Coniferous Forest

Coniferous forests are made up of cone-bearing trees whose leaves are small, mostly evergreen, needle- or scale-like. They are extensive in the northern hemisphere. Boreal coniferous forests are found between 50 °N to 70 °N and are conditioned by long dry, cold winters and short, warm summers. Temperate evergreen forests are common in the coastal areas that have mild winters and heavy rainfall, or inland in drier climates or montane areas. Temperate conifer forests sustain the highest levels of biomass of any terrestrial ecosystem and are notable for the massive proportions of trees in temperate rainforests. The dominant tree species of the boreal forests are spruce, pine, fir and larch, while cedar and redwood.

Soils in coniferous forests are often podzolic due to the acidic litter, and characterised by the leaching of nutrients downwards into lower soil horizons. The litter layer is composed of acidic and dry needles and fallen twigs, which decompose very slowly. Forest soils take around 1 000 years to form a 25 mm soil layer. The acidic forest soils also shape the habitats of soil organisms, and the largest organism group in boreal forests is fungi. There can be several thousands of metres of hyphae in one gramme of soil, and fungal hyphae can extend over large distances. Fungi are important in forests as they produce extracellular enzymes that can decompose woody material and degrade both lignin and cellulose. The diversity of fungi enables the turnover of carbon and other nutrients in forests soils.

Coniferous forest soils contain a wide range of animals ranging in size from nematodes to enchytraeids (segmented worms) and ants. The largest groups are enchytraeids and earthworms, followed by mites, spiders, beetles, nematodes, collembolans, protists, rotifers and dipteran larvae. Nest-building ants are common and can form large colonies, using the pine and spruce needles for nest building. In the boreal forests of Europe, the enchytraeid species can be the dominant soil animal species. The acid tolerant earthworm *Dendrobaena octahedra* may contribute significantly to the soil animal biomass, but occur usually in productive forests and at more southern latitudes.

Food webs in coniferous forests are dominated by fungi, and soil fauna has a much smaller biomass in food webs. However, when considering the different parts of the food webs in terms of functions such as decomposition, the soil fauna has a larger impact on carbon and nitrogen cycling than their biomass indicates. The number of organisms and their part in the food web can thus influence the decomposition rate of organic matter. Furthermore, natural or human-caused changes in the forest ecosystem can influence ecosystem functions.

The most abundant mycorrhizae in boreal forests are the symbioses between trees and ectomycorrhizal fungi. Coniferous forest trees are highly dependent on their fungal partners, and symbioses contribute greatly to tree growth. Ectomycorrhizal fungi also protect trees from parasites, predators, nematodes and other soil pathogens. Ectomycorrhizal fungi are important for the storage of carbon in soils, and it has been estimated that 10 - 50 % of all the carbon assimilated by the trees is translocated into fungal hyphae. More than half of the carbon stored in the soil originates from roots and mycorrhizae and, therefore, on a global scale the boreal forest soils are large carbon sinks, driven by ectomycorrhizal fungi.

Farming Secrets says: Be Aware That Soil Fauna Has A Large Impact On Carbon And Nitrogen Cycling

Ref: A Global Atlas of Soil Biodiversity p79