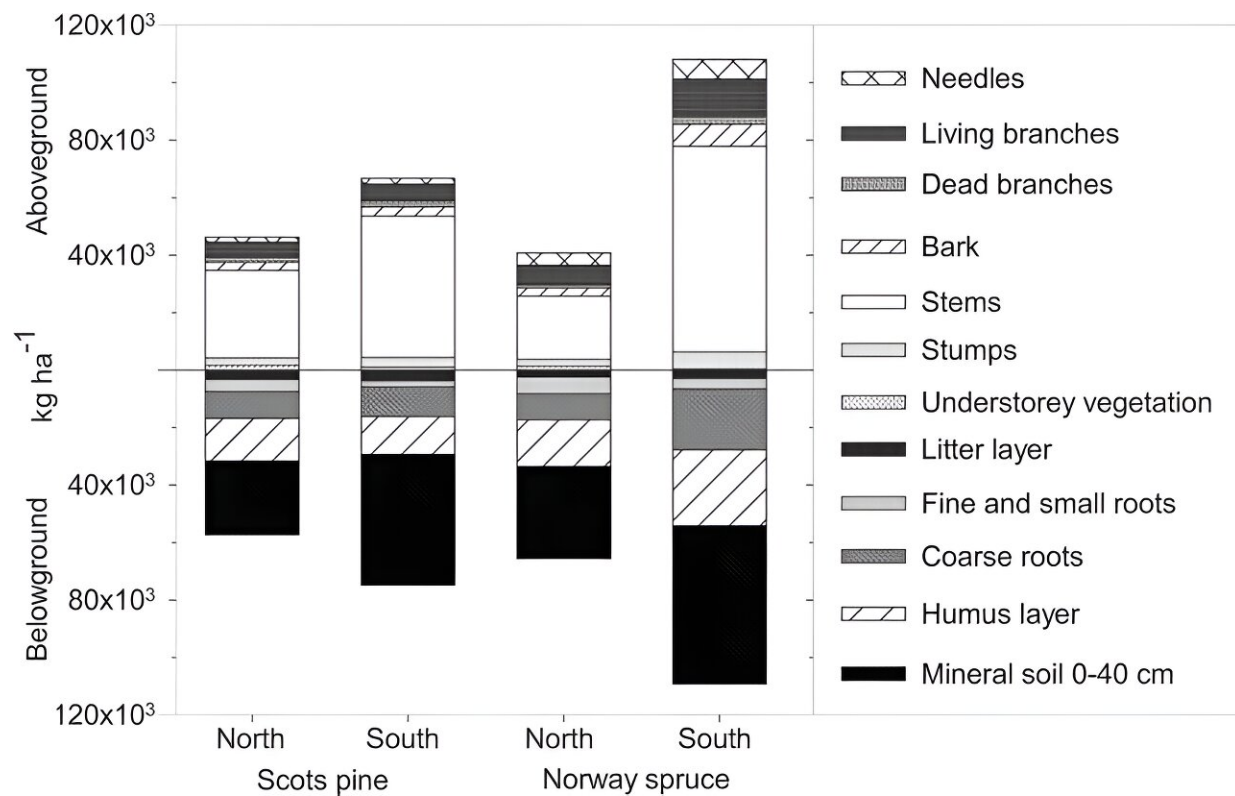


Study finds almost the same amount of carbon is sequestered in mineral soil and stems in heath forests

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The C stocks on the studied northern Scots pine and Norway spruce sites (n = 3 in both) and on southern Scots pine and Norway spruce sites (n = 4 and 5, respectively). Credit: *Ecosystems* (2023). DOI: 10.1007/s10021-023-00879-5

A recent study from the Natural Resources Institute Finland (Luke)

examined the size of carbon stocks in heath forests and their distribution into different compartments of the forest ecosystem both above and below the ground level. The carbon flux moving through tree litter and the water flux was also measured. The largest carbon stocks in the heath forest ecosystem were measured in spruce-dominated forests in Southern Finland and the smallest in pine forests in Northern Lapland. The highest carbon volumes were sequestered in stems and mineral soil.

The study included seven [pine forests](#) and eight spruce forests that belong to the UN's International Co-operative Program on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests). The majority of the monitored sites were located in managed forests. The stands were aged 55–200 years and their stem volumes corresponded to average stem volumes in mature forests. The findings are [published](#) in the journal *Ecosystems*.

The study's monitoring sites ranged from the northernmost parts of Lapland to Southern Finland. Carbon stocks in the [forest](#) ecosystem were smallest in a [pine forest](#) in Northern Lapland (81 tons per hectare), whereas the largest carbon stocks were measured in a dense spruce forest in Southern Finland (260 tons per hectare). The carbon stocks of many biomass compartments were larger in the south than in the north. As an exception, the carbon volume sequestered in fine roots and understory vegetation was higher in the north than in the south.

"In the rough northern conditions, trees compete more fiercely for nutrients than for light. This is why plants invest more in roots than in Southern Finland to secure a sufficient supply of nutrients and water," says Päivi Merilä, Principal Scientist at Luke.

Carbon in stems and soil: Total carbon stocks larger in spruce forests than pine forests

The largest carbon volume (on average 30% of total carbon [stock](#) of the study sites) was sequestered in stems. Alongside stems, soil played a significant role as a long-term carbon stock. An average of 28% of carbon stocks in forest ecosystems were sequestered in mineral soil and a smaller part (roughly 13%) in the humus layer.

"Special focus must be placed in the future on carbon stocks in mineral soil below the humus layer and on monitoring its development," says Antti-Jussi Lindroos, Senior Scientist at Luke.

As site fertility was higher on spruce sites than on pine sites, total carbon stocks in spruce forests were 40% higher on average than in pine forests, with carbon stocks in most biomass compartments thus being larger in spruce forests than in pine forests. Exceptions included understory vegetation and the litter layer, in which carbon stocks were larger in pine forests than in spruce forests.

"Information about carbon stocks in the forest ecosystem is needed, for example, to assess the impact of forest management on the [carbon](#) sequestration capacity of forests and to validate models that simulate changes in [carbon stocks](#) in stands," Päivi Merilä says.

More information: Päivi Merilä et al, Carbon Stocks and Transfers in Coniferous Boreal Forests Along a Latitudinal Gradient, *Ecosystems* (2023). [DOI: 10.1007/s10021-023-00879-5](https://doi.org/10.1007/s10021-023-00879-5)

Provided by Natural Resources Institute Finland (Luke)

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