**Forestry and fungi – a neglected relationship**

**https://nordicforestresearch.org/blog/2018/05/30/forestry-and-fungi-a-neglected-relationship/**

[Networks](https://nordicforestresearch.org/blog/category/networks/), [News](https://nordicforestresearch.org/blog/category/news/)

**The consequences of forestry on fungal communities are seldom up to discussion in the debate, but new results indicate that logging have long-term impacts on important fungal groups. Disturbing the fungal balance may even lead to nutrient deficiency and reduced tree growth. This topic is one of many where researchers in the NEFOM network are involved.**

**Text: Mats Hannerz, Silvinormation**

Fungi important in boreal forests

Fungi have particularly important roles in boreal coniferous forests. The bacteria and earthworms that are important decomposers in richer soils are much less abundant in the acid soils of boreal ecosystems. Instead, fungi are the key decomposers of organic material and major agents in nutrient cycling.

Degradation of the top layer of the forest soil, the litter, is strongly dependent on saprotrophic fungi that release enzymes capable of efficiently decomposing not only simple substrates but also tough polymers such as lignin. Below, in the more decomposed humus layer, ectomycorrhizal fungi are responsible for much of the nutrient turnover.

Ectomycorrhizal fungi are essential in all forest ecosystems. They receive carbohydrates from the trees and pay them back by improving supplies of nutrients and water to their roots. But mycorrhizal fungi are not a homogenous group: some release more efficient degradative enzymes than others, which may have different functional roles.

Clear-cutting disturbs the fungal balance

When trees are cut, mycorrhizal fungi lose their symbiotic partners. Recent studies have shown that mycorrhizal species decrease after a clear-cut, and instead give room to free-living fungi with more efficient decomposition. This accelerates decomposition during the decade following clear-cuts resulting in a nutrient flush. Some mycorrhizal species recolonize the new forest stand, but others seem to be suppressed for longer times.

Fungi of the genus *Cortinarius* are particularly sensitive. Some of these fungi, despite being ectomycorrhizal, can produce strong enzymes which make them efficient scavengers of nutrients bound in organic matter. The nutrient peak after a clear-cut probably disfavour these fungi. In the long run, the balance between various groups of fungi will be disturbed.

Risks of nutrient deficiencies after clear-cutting

When the *Cortinarius* species decline, there is a risk of nutrient turnover slowing down as less efficient decomposers replace them. This may impair nutrient supplies to the trees.

Studies of chronosequences of managed pine stands in Sweden have shown that the fungal community is affected for a long time after clear-cutting. When all trees are cut, mycorrhizal fungi almost disappears. The fungi return slowly, but other species are dominating the young forest compared to the older. It is not until an age of 60 years or so before the community resemble that of the old forest.

The studies have for example shown that *Cortinarius* and *Russula* species are absent for several decades, and increase only slowly after that.

Single retention trees is not the final solution

What can be done to prevent the long decline of certain mycorrhizal fungi? Some of the studies have considered effects of retention trees. However, results have indicated that leaving single trees, like in a seed-tree stand, does not preserve the ectomycorrhizal composition. The fungi nearest the tree may still have a diversity resembling the old forest, but this is not enough to restore the fungal community in the whole stand.

It is probably more efficient to leave retention trees as forest patches. Uneven-aged forestry, avoiding clear-cuts, could also be effective.