

# Why should we care?

## Anthropogenic greenhouse gas emissions from drained organic forest soils



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What is an organic soil? It is a soil with a high content of organic matter, matter that derives from some living creatures. Soil organic matter is mostly dead remains of plants and soil fauna and microbes, deposited in the soil over a long period of time, that have decomposed to a varying degree.

Organic soil is usually a wetland soil. In wetlands, wetness creates conditions where oxygen is lacking in the soil that is saturated with water. In such conditions, the organic matter, the dead remains of plants and the tiny soil dwellers, does not decompose fully, but more may accumulate from year to year. The most common organic soil is peat, which is practically only organic matter, remains of long-dead peatland plants. Another common organic soil is gleysol, which is a mineral soil with high content of organic matter.

Why are organic soils important? Organic matter has very high carbon content. If you dry organic matter thoroughly, removing all water, about half of the dry matter that remains is carbon. This is the case for most living creatures, and also for soil organic matter

**Organic soils** have many virtues, but nowadays they are often discussed in the context of climate change. Climate change is caused by increasing amounts of greenhouse gases in the atmosphere. Most abundant of these gases is carbon dioxide (CO<sub>2</sub>). When organic matter decomposes completely, CO<sub>2</sub> is formed. We should thus keep organic matter in the soil, and preferably have much more added there, if we want to seriously combat climate change.

What is threatening the organic soils? There are many kinds of organic soils, and some are very good for agriculture and forestry. To be able to use these lands, people have drained large areas of them in places where they live next to them. This means also large areas in the Nordic and Baltic countries.

In undrained wetlands, the wetness and the lack of soil oxygen make the life of trees difficult, and prevent the survival of most crop plants altogether. When drained, the production potential of wetland soils increases.

However, when the water-table level gets lower, and the amount of oxygen in soil increases, also the conditions for decomposition get better! If the organic matter in soil decomposes faster than new dead organic matter comes in, the soil loses carbon to the atmosphere, and contributes to climate change.

**What should we do** to safeguard our organic soils? We should, first of all, find out what is going on in them in different situations. This we have just done in a project funded by SNS. We should identify the situations that are especially harmful, and try to find ways to improve things there. Drained lands that are not urgently needed to sustain people can be rewetted. This is not an easy and fast thing to do, and it may also have harmful consequences if it is done carelessly.

However, in the long run it is the best way to safeguard organic soils. For those lands that cannot be restored currently, we should find some other solutions to improve the situation. Two key issues seem logical: to keep the water-table level in the soil as high as possible without compromising tree growth, and to maintain as high inputs of new organic matter into the soil as possible. In other words: do not drain more efficiently than what is really necessary! Avoid bare soil!

**What can we do in the forests** growing on drained organic soils? We can avoid clear-cuts (bare soil) and digging the ditches very deep “just in case”. In fact, a well-growing tree stand may itself keep the water-table level at a suitable depth. Trees take up a lot of water from soil and transpire it to the atmosphere. Also, tree canopies capture a lot of the rainfall, which then evaporates back to the atmosphere. Thus, all drainage ditches need not necessarily be maintained, if there is sufficient forest cover present all the time! This can be achieved with continuous-cover forest management, which means forestry without clear-cuts. How much this will relieve the soil CO<sub>2</sub> emissions, we do not yet know, but research is on-going.



Peat, organic soil that is abundant in the Nordic and Baltic countries.

Photo: Hannu Nousiainen



Forest growing on drained organic soil (peat) in southern Finland.

Photo: Hannu Nousiainen

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