

Project *brief*

Thünen Institute of Forest Ecosystems

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Status and development of forest sites on organic soils in Germany

Steffi Dunger¹, Karsten Dunger¹, Cornelius Oertel¹, Nicole Wellbrock¹

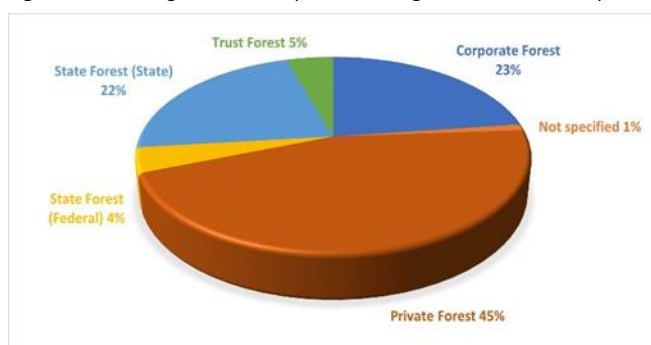
- The methodology currently used in greenhouse gas reporting to calculate emissions from organic forest sites is flawed.
- Investigations of emission factors for organic forest sites are urgently needed.
- For forest management of peatlands, a peat-preserving management is aimed.
- So far, black alder is the only tree species that can be used on completely waterlogged sites.

Background and Aims

As signatory of the United Nations Framework Convention on Climate Change, Germany has to report national greenhouse gas inventories. The inventory reports inter alia on CO₂ emissions from biomass on organic forest soils as well as on emissions from drainage of these soils. In terms of completeness and level of detail, Germany's current reporting needs improvement regarding the calculation of the emission factors for biomass on organic soils. The current report does not explicitly account for the specifics of forest on organic soils.

The objective of the project was to improve the emission estimates from forests on organic soils and to identify climate protection-relevant options for further management and emission reduction and their consequences. Since about 50 % of the forest area on organic soils is privately owned (Figure 1), another project objective was to provide private forest owners knowledge about climate-smart optimizations for their forests, but also to inform about impacts of forest management options.

Figure 1: Percentage of ownership forms on organic soils in Germany.

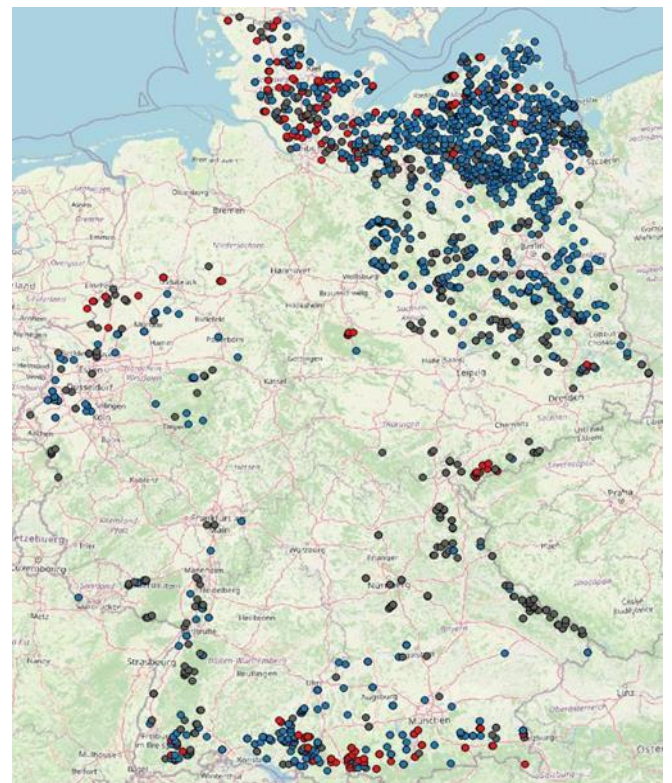


Source: changed after Dunger et al. (2023).

Methods

In a first step, a data set from the German national forest inventory (NFI) (status: December 2020) was combined with data from organic soils (Roßkopf et al. 2015) in order to obtain an overview of how much forest area actually exists and which forest stands occur on organic soils.

Figure 2: Distribution of the sampling units of the national forest inventory on organic sites in Germany.



Source: Dunger et al. (2023) und OpenStreetMap contributors, CC-BY-SA (<https://www.Openstreet.map.org/copyright>).

In a second step, sampling units of the national forest inventory (NFI Plots) based on a specific classification were used to clarify how much of this forest area is actually drained and/or in a near-natural state. The classification was carried out using aerial photographs, inquiries to the relevant authorities and, as third step, on-site inspections. In a fourth step, the information collected on the drainage status of the NFI Plots was compared with the modelled groundwater levels (Bechthold et al. 2014) from the greenhouse gas reporting. Furthermore, an extensive literature research was carried out on the growth of tree species (spruce, pine, downy birch, black alder) on organic soils (see Dunger et al. 2023)

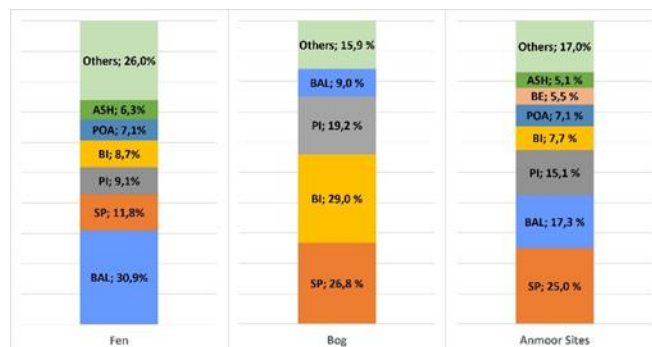
Results

The results of the project indicate that the methodology currently used in greenhouse gas reporting to calculate emissions from organic forest sites is flawed. Small local differences, which often occur in forests, are not taken into account when modeling the groundwater level. For example, sites without streams and/or ditches are calculated as drained, even though they may not be drained from a geographical perspective. Forest sites on organic soils are also not always identified correctly.

In total, 2267 NFI Plots are located on organic soils (fen (blue circles), bog (red circles), inorganic sites (grey circles)) (Figure 2). Most occurrences can be found in the north, northeast, east and south of Germany. Comparative considerations of the forest tree cover proportions show that birch, spruce, pine and black alder are the tree species that occur on fen, bog and inorganic sites (Figure 3). Respectively, spruce (62,986 ha) and alder (55,736 ha) take up the largest part of the forest area on organic soils (252,562 ha) with 25 and 22 %. On the other hand, pine and birch are represented with 15 (37,718 ha) and 13 % (33,776 ha). Black alder showed the greatest increase in stocks with $101 \text{ m}^3 \text{ ha}^{-1}$ in the evaluation period from 2002 (BWI 2) to 2012 (BWI 3) on fen sites. This also agrees with the results of the literature research. A main result of the literature research is that black alder is the only tree species that can be used for forest management on completely waterlogged sites. Further findings are that downy birch is more likely to find its habitat in the edge areas of the renatured areas. According to NFI evaluations, the highest occurrence of the tree genus birch is in bogs with 29 % (see Dunger et al. 2023).

No clear recommendations for action could be found in the literature for spruce and pine. Both tree species are unsuitable for sites heavily influenced by water. This is also shown by the evaluations of the NFI data. Compared to the mineral sites, pine and spruce only cover 6 and 2 % of the stand area on the organic soils.

Figure 3: Sum of the proportion of tree species (based on 100%) in the main stand layer, separated according to the organic soil types fen, bog and inorganic sites (Abbreviations: BAL = black alder, BE = beech, BI = birch, PI = pine, POA = pedunculate oak, SP = spruce).



Source: changed after Dunger et al. (2023).

Conclusion

It is urgently necessary to determine emission factors depending on different groundwater levels for organic forest sites in Germany. These should definitely be based on values for greenhouse gases determined through series of measurements and not, as is currently the case, based on modeled values.

One goal of the National Peatland Protection Strategy of the Federal Republic of Germany is the restoration and sustainable management of drained peatland. The aim for the forestry management of peatland is to achieve peat-preserving management, which can only be achieved with permanent, complete rewetting and the adaptation of forestry use to the hydrological conditions on these areas. Black alder is the only tree species that can be used on completely waterlogged sites. The risk of tree populations dying after groundwater level increases can only be reduced by gradually raising the water level (intermediate storage targets) over several years. This leads to small reductions in emissions, but maintains the growth of the different tree species.

Further Information

Contact

¹ Thünen-Institut für Waldökosysteme
Steffi.Dunger@thuenen.de
www.thuenen.de/wo

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Publications

Dunger S, Dunger K, Oertel C, Wellbrock N (2023):
 Handlungsempfehlungen und Baumarteneignung auf organischen Böden – Ergebnisse aus dem Projekt Moorwald. Thünen Working Paper 221, DOI: 10.3220/WP1694000648000

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