



Ongoing change of site conditions important for sustainable forest management planning

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Observed tree mortality of the last decades has shown that the vulnerable forest ecosystems are especially affected by the recurrent, long lasting droughts, heat waves and their consequences. From all site conditions climate is changing the fastest, in this way it can be the largest threatening factor in the 21st century. Beyond climate, soil characteristics are playing an important influencing role. Until now, silvicultural technologies and species preferences of many countries are prescribed by binding regulation based on climate conditions that are assumed to be constant over time.

Therefore the aim of our research was to investigate the ongoing and projected change of site conditions that are considered to be of primary importance in terms of tree species selection. For a case study region in Hungary (Keszthely Mountains, near to Lake Balaton) long-term climate tendencies have been determined for the period 1961-2100, as well as a detailed soil sample analysis has been carried out including ~100 sites.

Results show a 0.5 degree increase of temperature and a 6-7 % decrease of the precipitation amount for the summer months in the last decades. For the future, significant warming and drying of summers is expected. Decrease of the summer precipitation sum can exceed 25 % until the end of the century, probability of extreme hot days may increase. These tendencies together with the unfavourable soil conditions and biotic damages can be the reason of the ongoing forest dieback. One of the characteristic soil type of the region is rendzina with a thin topsoil layer and an unfavourable water holding capacity. These properties are limiting the amount of available water for plants, especially in case of intense precipitation events. Black pine stands planted on rendzinas after many years of grazing; therefore erosion may have played a significant role. Not only microclimate conditions but also soil types show a large diversity within a relatively small distance. However, tree mortality has been observed also in stands on favourable soils (rusty brown forest soil, brown earth, lessivated brown forest soil) because these soil sites can only mitigate the damage of extremes.

Consequently, there is ongoing change of site conditions that are important for the sustainable forest management planning. Therefore it is an urgent need to rethink regulations considering the changing climate and soil conditions in order to decide about sustainable tree species preference and to maintain forest cover.

Keywords: climate change impacts, forest mortality, adaptation, sustainable forest management planning

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