

Changes in protected forests in Sweden

Knowledge about succession in nature reserves is crucial in evaluating their efficiency and management needs. We discuss the long-term development in protected forests in Sweden in terms of tree species composition and dead wood volumes. We found that during 60 years the volumes of all tree species were increasing and the amount of dead-wood volume was increasing as well. There was no indication that late-succession species (Norway spruce) is taking over.



Photo: Jörg Brunet

Biodiversity conservation through protected forests

Forests protected from forestry are considered key conservation areas for biodiversity conservation both globally and in boreal landscapes. Since protected forests usually are unmanaged, their long-term development relies on local disturbances and forest management in the surrounding landscape. Forest fire is a disturbance that is central in shaping natural boreal forests, but it has been substantially suppressed in managed landscapes. As disturbance regimes have changed in relative importance from large-scale fires toward smaller scale disturbances, such as wind, pathogens and herbivory, altera-

tions in forest composition and structure may be expected. This implies changes in tree species composition, number of big trees and the amount of dead wood, all being key features for biodiversity conservation. Therefore, with fire suppression and without active management that would emulate natural processes the conditions in protected forests will likely diverge from naturally dynamic stands and reduce the chances of attaining conservation targets. Understanding the trajectories of succession in protected forests is therefore essential for the evaluation of the conservation effectiveness and development of management policies.

Assessing the changes

We used long-term (60 years) data from the Swedish National Forest Inventory, representing all the protected forests in Sweden, to study changes in tree species composition, tree volume and the amount of dead wood in relation to the initial state of the forest. We found that structures important for biodiversity, like number of large trees and the volume of hard dead wood, including both standing and down wood, more than doubled. The overall tree species composition was stable over time. Dead wood increased independently of species, dimensions, and site characteristics. This increase was positively related to the volume of living trees and forest age. During the period of our study the average density expressed by the growing stock increased from 70 to 140 m³ ha⁻¹. This increase concerned both early and late successional tree species and there was no evidence for a faster increase of the late successional species Norway spruce (*Picea abies*). We argue that possible cause of the observed stability in tree species composition can be the generally low number of tree species in northern Europe which limits the number of potential successional pathways.



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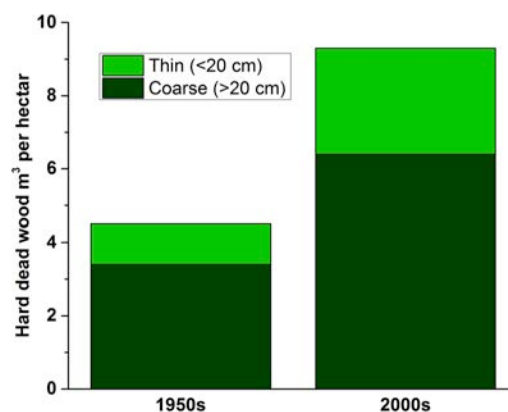
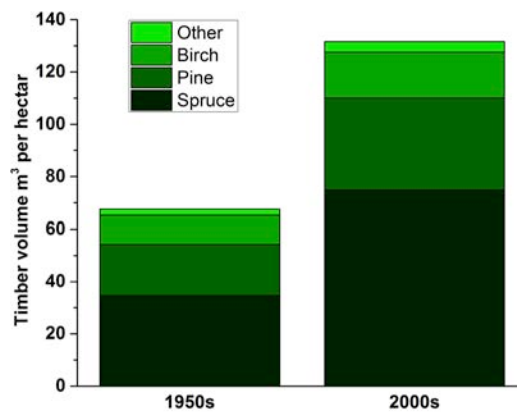


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Conclusions

We conclude that protected forests in Sweden, in the absence of active management and under fire suppression on the landscape scale, still develop structural components that are crucial for conservation of biodiversity. The increase of large-diameter tree stems and increase in dead wood found in our study are positive trends to meet conservation goals. Absence of fire may increase the share of forest with old-growth characteristics and gap-phase dynamics, which may not favour many light-demanding species among understory plants or epiphytic lichens, and thermophilic invertebrates. However, in spite of existing fear that late successional Norway spruce will gradually take over the protected forests, we found that tree species composition remained stable. However, although tree species composition appears stable, present disturbance regimes in the protected forests are considerably different from those in naturally dynamic forests, which may have implications for long-term biodiversity maintenance. We argue that continued lack of active management in protected forests (e.g., prescribed burning) will increasingly demand large-scale measures in production forests to mimic natural disturbances in order to restore all successional phases and forest types to the landscape. More research is needed to understand long-term dynamics of forest ecosystems being subject to altered disturbance regimes and its consequences on biodiversity.



This brief is based on
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