



Conference Abstract

Effect of rotation forestry and continuous-cover forestry on the forest floor microclimate and the growth of dwarf shrubs in boreal forests

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Abstract

Under a changing climate, the use of different forest management practices needs to be critically assessed to ensure functional forest stands. In rotational forestry (RF), similar-aged trees are planted in the stand, thinned several times during the rotation period, followed by a final clear-cut. Recently, the use of RF has caused a wide discussion in Fennoscandia since it has been shown to impact the microclimate, the ecosystem functioning and reduce the biodiversity compared to unmanaged forests. At the same time, alternative forest management options like continuous-cover forestry (CCF) have gained more interest. In CCF, only singular trees (single-tree selection) or groups of trees (gap-cutting) are harvested. The hypothesis is that CCF could maintain a higher biodiversity while it could mitigate the change in ecosystem functioning and microclimate. However, there is still a lack of scientific evidence on how different methods of CCF impact the forest microclimate, its spatial variation, and how that affects the understory vegetation including ericoid dwarf shrubs. Ericoid dwarf shrubs are an essential bioindicator of forests since they provide a habitat for wildlife, contribute to biodiversity,

and impact the regeneration of tree seedlings. We have found contrasting results in the literature on how different forest management methods affect the growth patterns of ericoid dwarf shrubs in boreal forests. While some studies revealed that the shoot mortality of bilberry increased in clear-cut compared to uncut sites (Attegrim and Sjöberg 1996), more recent studies have recorded an increased shoot growth and increased biomass in clear-cutting compared to mature RF stands (Nielsen et al. 2007, Nybakken et al. 2013). Thus, we aimed to shed light into the question on how RF and different methods of CCF (single-tree selection and gap-cutting) affect the forest floor microclimate and the morphology of two common dwarf shrub species (*Vaccinium myrtillus* and *Vaccinium vitis-idaea*) in boreal forest. We conducted our study in two different experimental research areas in Southern Finland. In the first area, we studied four RF and six CCF stands. We classified the stands managed by RF according to the time since the last clear cut, into the age classes 'clear-cut', 'young', 'immature', and 'mature'. The CCF stands were managed by single-tree selection. In the second area, 50 km north from the first area, we studied five stands managed by gap-cuttings, collecting material in six gaps and their surrounding forests. We installed microclimate sensors in all the sites and recorded the soil moisture and soil temperature. In the beginning of August 2022, we sampled one *V. myrtillus* and *V. vitis-idaea* ramet adjacent to each microclimate sensor and recorded the canopy cover of the surrounding forest above each shrub pair. We calculated from each dwarf shrub ramet the specific leaf area (SLA), basal area increment (BAI), mean shoot elongation and total shoot elongation. Ramets of both species showed higher specific leaf areas in young RF stands than in clear-cut stands and ramets of *V. vitis-idaea* showed enhanced BAI in clear-cut stands compared to all other RF age classes and to single-tree selection. Growth traits of both species did not differ between ramets that grew in gap-centre and the surrounding forest. Within gaps, however, *V. myrtillus* showed an enlarged total shoot elongation at the northern-edge compared to gap-centre, and southern edge. We further observed that single-tree selection maintained more similar soil temperatures and soil moistures than mature RF stands, while the microclimate in clear-cut and young RF stands were altered compared to mature and immature RF stands. Gaps showed differing soil temperatures during the winter months, and differing soil moistures over the growing season. Since we could show that growth traits of ericoid dwarf shrubs were affected by forest management methods and by microclimate, we conclude further studies are needed to validate our findings and to ensure a successful forest regeneration.

Keywords

Ericoid dwarf shrub, Continuous-Cover forestry, Rotation forestry, Microclimate, Boreal forest

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Conflicts of interest

The authors have declared that no competing interests exist.

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