Fast recovery of Norway spruce trees after thinning from above on a drained peatland forest site

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BACKGROUND

Continuous cover forestry (CCF) has been promoted as an environmentally sustainable option for drained boreal peatlands. The CCF management has also been challenged due to potentially lower tree growth compared to traditional even-aged management, especially with suppressed trees that are released during CCF selection harvest thinning.

OBJECTIVES

- To quantify the time lag of stem diameter growth response of suppressed Norway spruce trees (*Picea abies*) after a CCF selection harvest thinning.
- To test if the carbon (C) assimilation uptake of these trees increased immediately after selection harvest thinning, due to the reduction in stand density.

METHODS

We obtained radial increment cores from suppressed Norway spruce trees at a CCF managed area and a control area of the Lettosuo experimental site (Fig. 1).

- Ring-widths were used to determine the time lag of stem diameter growth by comparing the two sections.
- Intra- and inter-annual carbon isotope composition ($\delta^{13}C$) of tree rings, as determined using laser ablation (LA-IRMS, Fig. 2), was used to study impact of thinning on C sequestration.

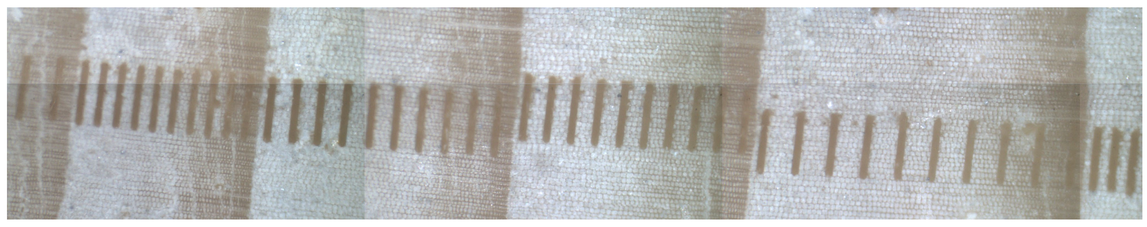

Figure 2. Photo of tree rings after laser ablation $\delta^{13}C$ analysis, which were conducted at the Stable Isotope Laboratory of Luke (SILL).

RESULTS

For suppressed trees, there were the following average tree ring responses to selection harvest:

- delay of 2 years for only a slight response of the diameter growth (Fig. 3)
- delay of 3-4 years for the most significant stem growth-enhancing effect
- immediate 2.5 ‰ increase of $\delta^{13}C$ values, which indicate the ratio of assimilation rate to stomatal conductance (Fig. 4)

CONCLUSIONS

Our results show that carbon uptake increased immediately for suppressed Norway spruce trees after selection harvest, but the harvest did not induce a clear increase in stem diameter growth during the first years after harvest.

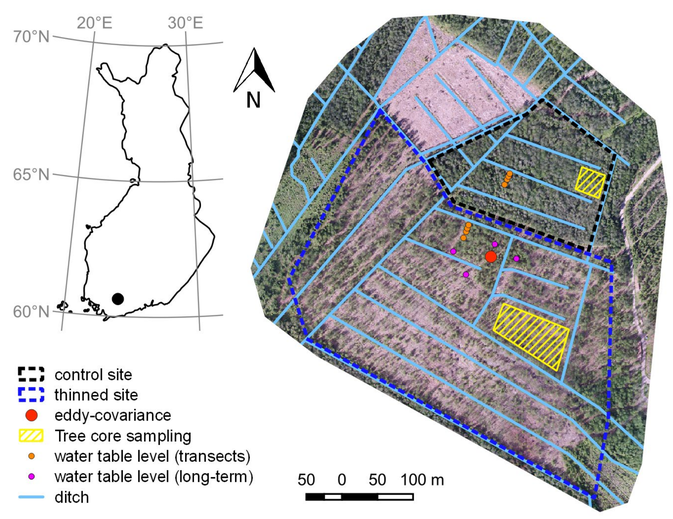

Figure 1. The study was conducted in Lettosuo experimental site on drained peatland in southern Finland.

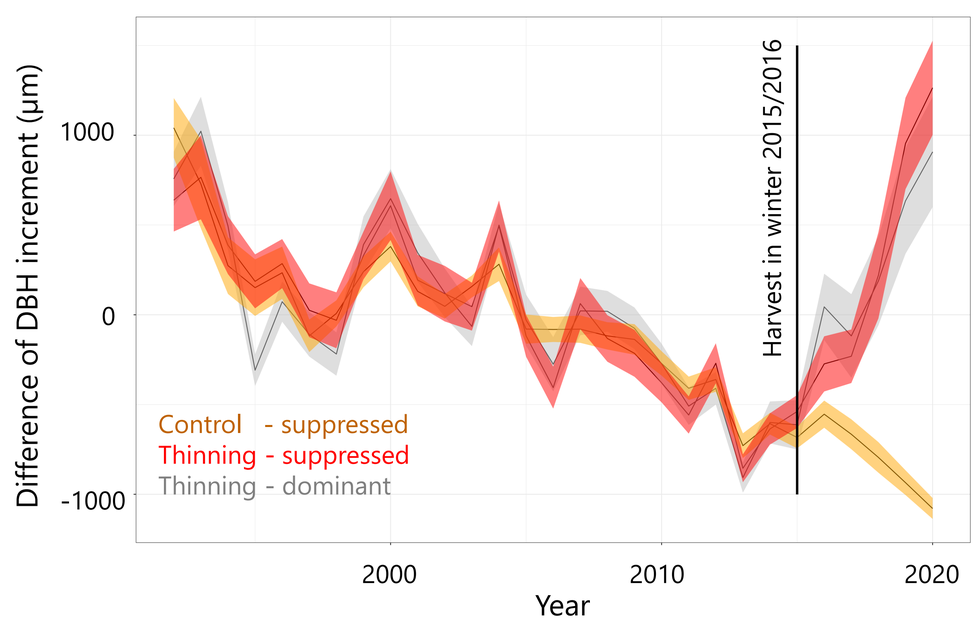

Figure 3 Mean ring-width difference compared to the 1991-2015 mean ring-width (before harvest).

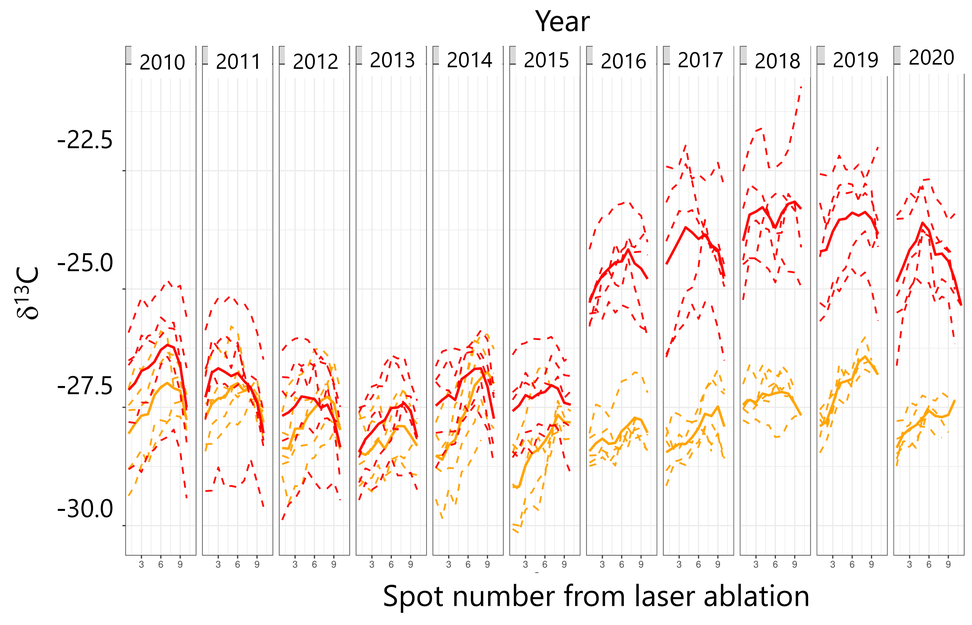

Figure 4. $\delta^{13}C$ results from laser ablation of tree rings. Red lines indicate trees in the area that was thinned in winter 2015-2016. The control area trees are in yellow. Continuous lines represent the average of five trees.

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