Abstract template for the conference "A century of national forest inventories – informing past, present and future decisions"

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On page two, you are asked to fill in your abstract in the format and font size indicated. Please remember to include authors affiliation information in the footer section of page two. The length of the abstract may not be more than one page including references.

Abstract title:		Standing volume, dead wood and carbon dynamics in coniferous stands older than logging maturity age
Take-home message:		*Annual volume increment is remarkably stable at least up to 50-100 years past the normal logging maturity age in pine and spruce stands. Thus, coniferous forests remain net carbon sinks in this development phase.*
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General topic, see website: (please double click on the check box and activate the relevant one)	☒	Improving future NFIs by learning from the past
	☐	NFIs today and in the future
	☐	Cutting edge and futuristic inventory techniques and technologies
Preferred presentation form:	☒	Oral presentation
	☐	Poster
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Standing volume, dead wood and carbon dynamics in coniferous stands older than logging maturity age

Jogeir N. Stokland

Introduction: The climate regulation by forests has gained increasingly more attention and trade-off assessments have started to address balancing timber harvesting on one side and carbon sequestration and storage on the other. The timing of final felling (termination of a rotation cycle) is a key issue in this trade-off. A typical shortcoming of empirical growth curves is that they last only a few decades beyond traditional rotation length, preventing trade-off assessments in older forests. NFI data from old forest stands are suitable to expand such empirical growth curves. This study explores the volume development and carbon dynamics in stands up to 100 years older than traditional logging maturity age.

Materials and methods: The study analysed the standing volume increment including natural mortality during 15 years across 1379 plots in old coniferous stands from the Norwegian NFI. The plots were selected as older than logging maturity age in the 7th inventory (1995-1999) and without logging operation during the next three inventory cycles. For each stand, the annual volume increment was subdivided in growth (of existing trees), ingrowth and natural mortality. The study documents volume development up to 50, 80 and 100 years past logging maturity age for spruce and pine stands with high, medium and low productivity (site index).

Results: The annual volume increment and natural mortality were remarkably stable with increasing stand age for all productivity levels both in spruce and pine stands. The annual net volume increment (growth of standing trees plus ingrowth of new trees) was 2-3 times higher than natural mortality in spruce stands and 4-7 times higher in pine stands. Thus, there was no tendency that natural mortality balanced out net volume increment 50-100 years past logging maturity age.

The stands varied substantially in stocking and stand density had a clear effect on volume increment. Sparsely stocked stands had annual increment close to zero, stands with densities around 1000 trees/ha had annual volume increment close to the annual average production during a standard rotation period, whereas more densely stocked stands had volume increment above (low-medium site index) or close to (high site index) the average production at standard logging maturity. The natural mortality showed a weak increase from sparsely stocked to densely stocked stands. There was no tendency that mortality started to balance the net volume increment for the stand ages and the stand densities investigated in this study.

Conclusion: Volume increment (annual net volume increment plus annual natural mortality) remains stable at the same level as average annual volume production at logging maturity, at least up to 50-100 years past the logging maturity age. The net volume increment is invariably higher than natural mortality (2-7 times higher, depending on forest type and site index), and hence the stands remain net carbon sinks in a transition phase towards old-growth forest.

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