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:		The effect of climate and topography on the spatial distribution of boreal peatland
Take-home message:		*National forest inventories provide excellent data to model and predict the spatial distribution of peatland under different climate conditions. Such predictions are very valuable in global carbon circulation models.*
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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

Abstracts will be reviewed by members of our scientific committee and you will be given information on decisions in due time after the submission deadline has passed.

The effect of climate and topography on the spatial distribution of boreal peatland

Jogeir N. Stokland

Introduction: Boral forests represent a major carbon store with a key role in global carbon circulation models. The largest carbon stock is found in the boreal peatlands, including extensive forested peatland tracts. These areas typically represent long-term sinks with net carbon accumulation per unit area. Peatland areas are not spatially stable over long time scales and most of them have expanded during millennia. Theoretically, we can expect both expansion and contraction of future boreal peatlands depending on climate change trajectories. This study aims to elucidate how climate and other factors contribute to the spatial distribution of peatland in order to predict future changes.

Materials and methods: The study analysed the occurrence of peat formation (peat depth > 40 cm) across 14944 Norwegian NFI plots. The plots spanned a climatic gradient across the whole boreal zone and the northern part of the temperate zone (mean annual temperature from -4.3 to 7.8 °C) and precipitation values from 298 to 3829 mm/year. Several topographic parameters derived from a high resolution terrain model were used as additional predictors. The analysis used Boosted regression trees to model the probability of peat formation.

Results: The most parsimonious model included four predictors: terrain slope, topographic wetness index, annual precipitation and average summer (June-August) temperature. The topography predictors had strongest effects on peat formation with highest probability in flat terrain and medium-high topographic wetness index. Annual precipitation was a significant predictor causing sharply increasing probability of peat formation from 300 to 1000 mm/year, then unchanged moderate probability until a threshold of 3200 mm/year, above which the probability of peat formation was distinctively higher. Average summer temperature was a better predictor than average annual temperature. The probability of peat formation increased from summer temperatures of 16 °C (northern part of the temperate zone), peaked at 10-11 °C (in the mid boreal zone) and dropped slightly towards the alpine tree line.

In addition to the effects of individual predictors there were strong interaction effects, especially between terrain slope and several other predictors. The combined effect of all predictors and their interaction effects resulted in a model with excellent predictive performance (ROC score of 0.91). This suggests that the main factors causing peat formation are represented in the model.

Conclusion: Peat formation is a process driven by topographic and climatic factors. There are intricate relationships between topography and climate resulting in the spatial distribution of peatland. Still, it is possible to reliably predict the spatial distribution of peatland at the landscape level based on a digital terrain model and standard climate data of temperature and precipitation. It is also possible to forecast future peat cover under alternative climate change scenarios.

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