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:		Remote sensing based mapping and monitoring of natural forests in Norway
Take-home message:		*Ecological applications combining remote sensing and NFIs provide an important step forward for managing forest biodiversity.*
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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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Remote sensing based mapping of natural forests in Norway

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Introduction: Forests display a large variation in age- and size distributions. This provides habitat for a high diversity of species, including many threatened species. Forest management, especially the choice of harvesting methods, changes the forest structure and affects the biodiversity in these habitats. Managed forests regenerated after clear-cuts show a small variation in age- and size distribution of the trees. Forests regenerated after selective logging, on the other hand, have a structure that more similar to natural, old-growth forests. Old-growth boreal forest displays a heterogeneous age and size structure, and much higher amounts of dead wood (Siitonen 2001). This gradient of naturalness from managed to near-natural is important in forest biodiversity management. Providing both wall-to-wall maps and area estimates of the amount of these near-natural forests is essential information for the management forests. Recent large-scale aerial photograph and airborne laser scanning data acquisitions and the increasing data from satellite missions such as Landsat and Sentinel might provide means to provide such information. The aim of this study was to evaluate different remote sensing data sources for mapping and estimation of near-natural forest cover over large areas.

Materials and methods: The study was conducted in Oslo and Akershus counties in south-eastern Norway. Field reference for the study was provided by the Norwegian National Forest Inventory (NFI). Remotely sensed data from 16 airborne laser scanning (ALS) projects were used, as well as optical satellite imagery from Landsat 8 images and Sentinel-2. Logistic regression was used for modeling the presence and absence of natural forests based on different definitions. Area estimates were provided using the methodology described by McRoberts (2010), which were compared to a purely field based estimate.

Results: The satellite data (Landsat 8 and Sentinel-2) provided more accurate models than the models based on ALS in predicting near-natural forest according to three of the five definitions tested for such forests. For the other two near-natural forest definitions, the models based on ALS data outperformed the models based on multispectral data. In general, the estimates based on remotely sensed data were more precise than the corresponding field-based estimates (in 20 out of 30 cases). Among the types of remotely sensed data, the Landsat 8 seems to be the best with improved precision in 9 out of 10 cases. It is clear that optical data better capture definitions based on age, while ALS better captures definitions based on forest structure.

Conclusion: Remotely sensed data improve the precision of near-natural forest estimates. In general, the results based on Landsat 8 were most promising for discerning the natural forest, although ALS provided models with similar or even better accuracy.

References:

McRoberts, 2010. Remote Sens. Environ. 114, 1017–1025

Siitonen, 2001. Ecol. Bull. 49, 11–41.

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