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

Dear author. This is a two-page template that in the first page will ask for information on presenter name, topic, and preferred presentation form.

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.

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| **Abstract title:** | | Estimating forest stock age using NFI field data and National Land Survey airborne laser scanning data of Finland |
| **Take-home message:** | | By combining forest age measurements of NFII data and national laser scanning data an accurate large-scale forest age model can be constructed. The study is an example of the joint use of NFI and National Land Survey data and re-use of NFI data in research. |
| **Presenter name:** | | Matti Maltamo |
| **Presenter contact info:** | | University of Eastern Finland, School of Forest Sciences, P.O.Box 111, 80101 Joensuu, email: matti.maltamo@uef.fi |
| **General topic, see website:** (please double click on the check box and activate the relevant one) | ☐ | Improving future NFIs by learning from the past |
| | X☐ | NFIs today and in the future |
| | ☐ | Cutting edge and futuristic inventory techniques and technologies |
| **Preferred presentation form:** | X☐ | Oral presentation |
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| | ☐ | 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.* | | |

# Estimating forest stock age using NFI field data and National Land Survey airborne laser scanning data of Finland

*Maltamo, M., Kinnunen, H., Korhonen, L. and Kangas, A.*

**Introduction:** Forest stock age is a highly important attribute in even-aged forestry. It characterizes the development stage of a stand, it is predictor variable in some growth and yield models, and it is a crucial information in site indexing when applying dominant height/age models. In plantation type of forestry with short rotation age, forest stock age is usually known exactly. However, in boreal managed forests, age is usually not known due to the long rotation times, naturally born minor tree species, and inadequate content of historical stand register data. In forest management inventories (FMIs) forest stock age is also problematic attribute since its visual assessments are usually not accurate, and exact measurement requires costly and slow drilling of a tree or even several trees per stand. Due to these difficulties only a couple of earlier studies consider age prediction by airborne laser scanning (ALS) information (Maltamo et al. 2009, Racine et al. 2014). On the other hand, tree age is one of the traditional attributes measured in National Forest Inventories (NFI) and National Land Surveys collects ALS data systematically all over the countries for digital terrain mapping. The aim of this study is to construct national forest stock age model by the joint use of NFI based age information and National Land Survey based ALS data.

**Materials and methods:** In NFI of Finland, age is measured from increment cores as a sample tree measurement in each field sample plot systematically all over the country. At plot level these sample tree measurements characterize the forest stock age accurately. National Land Survey collects ALS data systematically all over the Finland for digital terrain mapping and the same data are also used in operational ALS based FMI's. Different geographical areas are scanned with different sensors and leaf conditions.

National forest stock age model is constructed by using NFI based age information as independent variable and area based approach metrics from National Land Survey ALS data as predictor variables. Additionally, geographic variables such as slope and altitude are utilized. In the constructed model, different sensor effects are taken into consideration as class-level information and auxiliary information, such as geographical location, degree days and climate attributes are utilized as well. The residuals of the model are analyzed according to different properties of a forest stock, such as main tree species, site class, soil and conservation status.

**Results:** Preliminary results using a small data set from Juuka, eastern Finland show that forest stock age can be estimated from ALS data with a residual error of approximately 9 years if site class is also known. Using only ALS information the error is 10 years. This result is promising and offer good possibilities for the further development of National ALS based forest stock age model.

**Conclusion:** Combination of NFI based age information and National Land Survey based ALS information is a promising method for national forest age model construction. The study is an example of joint use of NFI and National Land Survey data and re-use of NFI data in research.

**References:**

Racine, E.B. et al. 2014. For.Sci.60: 128–136.

Maltamo, M. et al. 2009 EJFR 128: 305-317.

*University of Eastern Finland, School of Forest Sciences, P.O.Box 111, 80101 Joensuu, email: matti.maltamo@uef.fi*