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:		Analysing the reproducibility of Swiss NFI field survey measurements
Take-home message:		*Thorough analysis of field survey data quality, based on measures of reproducibility, is key to correctly interpret final NFI results.*
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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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Analysing the reproducibility of Swiss NFI field survey measurements

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Introduction: The data for national forest monitoring is largely derived from experts' observations of variables recorded on a high number of sample plots. Data quality is of paramount relevance in all forest monitoring endeavours, including the Swiss National Forest Inventory (NFI). Extensive quality assurance measures have therefore been implemented since the beginning of the first NFI cycle with the goal to avoid systematic observation errors and reduce random errors. Studies of data quality in forest monitoring programs have focused particularly on the reliability and comparability of the collected data (e.g. Gasparini et al. (2006)). The Swiss NFI revisits approximately 8-10% of its sample plots (repeat survey) during each inventory cycle to assess the quality of fieldwork in order to evaluate the reproducibility of survey measurements.

Several questions arise when analysing repeat survey data: what are the appropriate (statistical) methods to assess reproducibility of field survey measurements? Is the sample size (10%) sufficient for all types of measurement? How can data quality objectives (DQO) -determined by experts- be standardised and translated into effect sizes for power analyses or critical margins in equivalence tests? And does the detected data quality allow to evaluate changes between inventory cycles? Our study addresses these questions by focusing on plot-level tree species richness and composition.

Materials and methods: We examined data of several measurements of species richness and composition (tally trees in upper storey, ingrowth trees, species at forest margins, and understorey trees) from Swiss NFI1-4. We estimated richness differences as well as pseudoturnover (PT) (Nilsson & Nilsson 1985) derived from the repeat survey (within NFI comparison) and from successive inventory cycles (between NFI comparison). Judgement about significance, sample size calculation and power analysis were based on statistics derived from equivalence tests ('two-one-sided t-tests'; TOST). The critical TOST margins were derived from the DQO, which define the margins of allowed differences between regular and repeat survey values in combination with an expected frequency of observations that should fall within these margins.

Results: We demonstrate how DQOs, as determined by field instructor teams, can be transformed into critical margins and effect sizes to conduct equivalence tests and power analyses. Our analyses show that the quality of species richness and composition measurements increased between survey circles. We further contrast the observed data quality in each survey with changes in richness and composition between survey cycles.

Conclusion: Our results reflect the level of precision achievable under current Swiss NFI fieldwork conditions. The repeat survey provides important information on achieved data quality in terms of the overall reproducibility of attributes, but it cannot attribute any systematic deviations to a specific observer group or individual. Equivalence tests on PT and richness differences provide a sound basis to evaluate data quality of plot-level species richness and composition measurements and, thus, also provide a basis to assess the quality of biodiversity indices based on these measurements.

References:

Gasparini P, Bertani R, De Natale F, Di Cosmo L, Pompei E (2009): J Environ Monit 11:761-768

Nilsson I.N., Nilsson S.G. (1985): J. Ecol. 73 65-70

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