

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:		Trade-offs and synergies between preventing disturbances and the provision of ecosystem services in Swiss forests
Take-home message:		<i>We present a nationally representative approach to evaluate forest management scenarios in terms of disturbance predisposition and ecosystem services provision based on the Swiss NFI. Timber harvesting may reduce the predisposition to storm but not necessarily to bark beetle disturbance and traded-off with biodiversity indicators. Disturbance predisposition was higher in forests with high protection value against avalanches and rockfall.</i>
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General topic, see website: <small>(please double click on the check box and activate the relevant one)</small>	<input type="checkbox"/>	Improving future NFIs by learning from the past
	<input checked="" type="checkbox"/>	NFIs today and in the future
	<input type="checkbox"/>	Cutting edge and futuristic inventory techniques and technologies
Preferred presentation form:	<input checked="" type="checkbox"/>	Oral presentation
	<input type="checkbox"/>	Poster
<i>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.</i>		

Trade-offs and synergies between disturbance predisposition and the provision of ecosystem services in Swiss forests

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Introduction: Scenario analyses that evaluate management effects on the long-term provision and sustainability of forest ecosystem services and biodiversity (ESB) also need to account for disturbances. The aim of this study was to reveal potential trade-offs and synergies between ESB and the predisposition to storm and bark beetle disturbance for forests in Switzerland. We asked how management may affect trade-offs or synergies between disturbance predisposition (DP) and 1) timber production, 2) old-growth forest characteristics as biodiversity proxies and 3) protection against rockfall and avalanches.

Materials and methods: We applied the empirical forest management scenario model MASSIMO that is based on the Swiss National Forest Inventory (NFI) to simulate forest development and management from years 2016 to 2106 on 5086 NFI sample plots (Thürig et al. 2005) assuming constant environmental conditions. We included a business-as-usual (BAU) scenario and four scenarios of increased timber harvesting. Model output was evaluated with indicators of storm and bark beetle disturbance predisposition (Netherer and Nopp-Mayr 2005) and with indicators for timber production, old-growth forests characteristics and protection against rockfall and avalanches (Blattert et al. 2017). We used the DP indicators as predictors for observed storm (Vivian in 1990 and Lothar in 1999) and insect (mostly bark beetle) damages in logistic regression models (LRM) to scrutinize the DP indicators prior to the scenario evaluation.

Results: All DP indicators were significant in at least one of the LRMs, which yielded AUC values between 0.71 and 0.86. Increased timber production was generally accompanied with decreased DP (storm: >-11%, beetle: >-37%, depending on region), with the exception of a scenario that promoted conifers where predisposition to beetle disturbance increased (e.g. +61% in the southern Alps). Decreased DP traded-off with decreases in the biodiversity proxies deadwood volume and density of large trees in scenarios of increased timber production where growing stock decreased. In contrast, under BAU management growing stock increased along with a reduction in conifer proportions, which resulted in a reduction of beetle DP that in turn was accompanied by an increase of old-growth forest indicators. Disturbance predisposition was slightly elevated in NFI plots with high protection value.

Conclusion: Combining NFI-based forest development modelling with disturbance and ecosystem service indicators allowed assessing ecosystem service provision and its sustainability with respect to disturbance risks on a sampling grid representative for Swiss forests. The application of the framework extended previous assessments of potential future timber availability by considering the ramifications of forest policy scenarios for non-timber ecosystem services and disturbance risks. Future amendments may include climate-sensitive forest modelling (Rohner et al. 2018) and the consideration of disturbance-induced tree mortality to strengthen decision making in national forest policy making.

References:

- Blattert et al. 2017, *Ecol Indic.*, 79, 391–409
- Netherer and Nopp-Mayr 2005, *For Ecol Manag.*, 207, 99–107
- Rohner et al. 2018, *Eur J For Res.*, 137, 29–44
- Thürig et al. 2005, *For Ecol Manag.*, 204, 53–68