# 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:** | | Using data from the Swiss National Forest Inventory to assess the economic efficiency of the Swiss forest road network |
| **Take-home message:** | | Our spatially explicit model analyses timber accessibility, based on the current forest road network, in the entire Swiss forest, taking into account different harvesting methods and transport routes. |
| **Presenter name:** | | Marielle Fraefel |
| **Presenter contact info:** | | marielle.fraefel@wsl.ch |
| **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.* | | |

# Using data from the Swiss National Forest Inventory to assess the economic efficiency of the Swiss forest road network

*Marielle Fraefel, Leo Bont, Christoph Fischer*

**Introduction:** Efficient forest management, and wood production in particular, requires a forest road network of appropriate density and carrying capacity. Apart from affecting the choice of a suitable harvesting method, the road network determines the length of the transport route out of the forest, while the roads' dimensions define the vehicle type that can be employed. Road densities and road dimensions in Switzerland vary strongly. We present a model that helps evaluate an existing forest road network, providing detailed information about which forest areas have satisfactory accessibility, and where timber harvesting and transport is not economic, thus facilitating road network design and maintenance.

**Materials and methods:** We assess the economic suitability of the forest road network in the entire Swiss forest, an area of about 13'000 $km^2$, using the Swiss National Forest inventory's (NFI) forest road dataset. This dataset is based on information collected in an interview survey with the local forest services and includes all forest roads in Switzerland capable of carrying trucks, together with their carrying capacity (categorised). Other NFI data include forest cover and growing stock maps. Our model assigns the most suitable harvesting method to every forest parcel (10m x 10m) and identifies the corresponding landing on a forest road. From the landings, possible transport routes out of the forest are identified and compared, taking into account the travel distances as well as the roads' dimensions, because they determine the number of trips necessary for transporting wood out of the forest. Finally, harvesting options and transport routes are analysed together, thus examining the entire logging process to find the best combination.

**Results:** Model results include a range of maps, such as the most suitable harvesting method; harvesting costs; hauling costs; and a suitability map based on a combination of the results with a user-defined classification scheme. While the larger part of the Swiss forest is classified as "suitable" for economic harvesting operations, significant portions also fall into the "limited suitability" and "not suitable" categories, respectively. However, these proportions vary strongly between regions, mainly as an effect of topography. The model also determines locations where road dimensions decrease in the direction of transport (bottlenecks), as well as timber volume flows (based on the growing stock map) for every road segment.

**Conclusion:** Our analysis provides a reproducible, country-wide, spatially explicit assessment of timber accessibility. It combines the analysis of harvesting and transport and produces a suitability map, thus helping to identify areas where timber harvesting is economic using the current forest road network. Areas with excessive accessibility and areas currently unsuitable for economic wood harvesting and transport can also be identified. The model results can be compared to information about the currently practised methods collected in the Swiss NFI; they can also be used in road network planning and management, for example by comparing road-network re-design scenarios.

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