

Mapping forest road properties: From pen-and-paper to digital data collection in a GIS

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Abstract:

In the Swiss National Forest Inventory (NFI), information about the current condition and the changes of the Swiss forest is regularly collected (Brändli et al. (2020)). Data collection consists of on-the-ground surveys, remote-sensing analyses and an interview survey with the district foresters. The interview survey takes place every nine years and includes an update of the current situation of the forest road network, consisting of roads that can be used for wood extraction and transport. Information on the location of roads and their characteristics, such as the suitability for different vehicle classes, is important to assess the accessibility of the forest and to estimate costs for wood harvesting and transport.

In all forest road surveys conducted up to now the forest road network was updated by drawing lines and writing pre-defined codes on paper maps by hand. In the third and fourth survey, information on road properties was later combined with existing digital road geometries, producing a spatial digital road dataset which could be analysed in a GIS (Fraefel and Fischer (2019)). However, the process to transfer the mapped properties from the paper maps to the digital road geometries (scanning, georeferencing, attribute entry) was very time-consuming. In addition, the growing number of road properties in the survey made it difficult to clearly display all the existing information on a fixed-scale paper map.

For the current (fifth) NFI forest road survey, we have therefore developed a procedure that allows the interviewer to collect information about road network changes directly in a GIS, together with the forester, at the forester's office. This requires a user interface that plays together with a touch interface to make data entry similar to pen-and-paper mapping, easy to use even for non-GIS-specialists. At the same time, the system should be sufficiently mobile to be transported by car and offer a large screen for the clear representation of the previously collected information and easy map navigation within the survey area. Various tests and comparisons included different ways of manipulating existing features and drawing new ones; different touch interfaces; the display of information in the map; and the set-up of the user interface with, for example, custom buttons.

The resulting tool has a number of benefits, compared to a survey on paper maps: no scanning and georeferencing is required (cost reduction); faster attribute assignment (from digital lines to existing road geometries); value domains and consistency constraints for data entry; the possibility to alert the interviewer to specific locations by turning layers on and off; and faster data availability through online transmission, if required. A drawback of the method is the need for additional hardware (screens and pen tablets) and some training with regard to the hardware and GIS software.

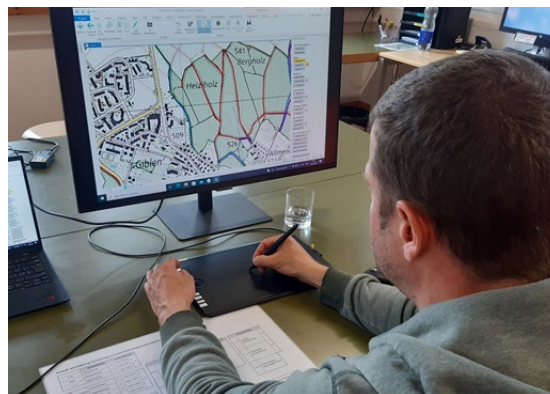


Figure 1. Mapping changes in the forest road network in a GIS, using a digital pen.

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