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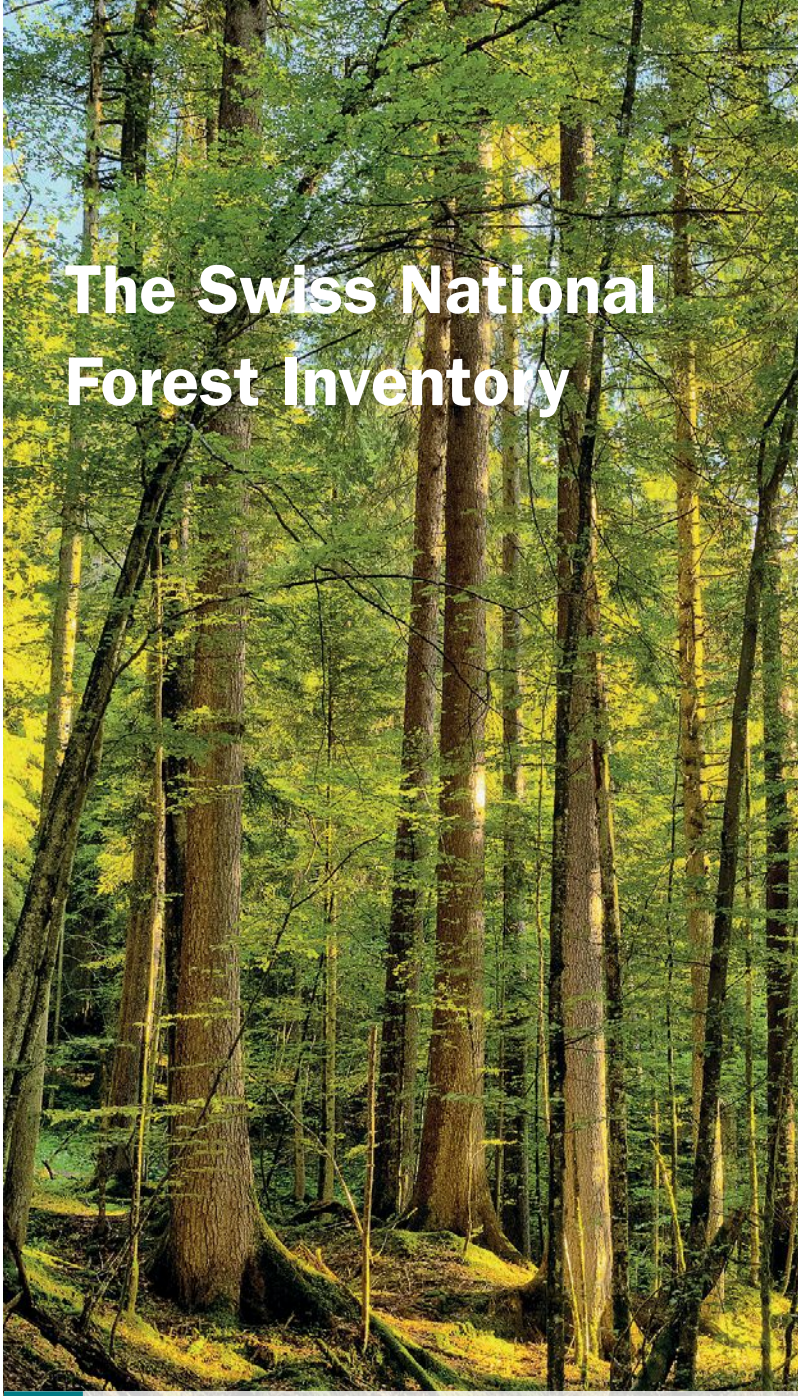

The Swiss National Forest Inventory

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Landesforstinventar
Inventaire forestier national
Inventario forestale nazionale
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National forest inventory

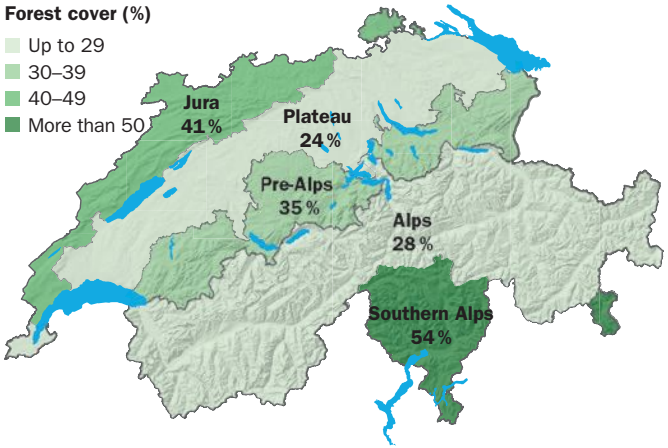
What does the Swiss forest look like and how is it changing over time? The Swiss National Forest Inventory (NFI) helps to answer these questions.

The forest performs many tasks. It provides: protection against avalanches, rockfall and debris flows; wood for building and energy; areas for leisure and recreation, as well as a habitat for animals and plants. For the forest to fulfil these functions, it must be not only protected, but also managed in a targeted and sustainable way. This requires detailed information about its condition – in other words, an inventory. Several inventories, carried out over many years, provide valuable information on how the forest is developing in the long term.

Fifth National Forest Inventory from 2018 to 2026

The first Swiss NFI was started in 1983, the second in 1993, the third in 2004, the fourth in 2009, and the fifth in 2018. A forest inventory is a major project in Switzerland as about a third of the country is covered by forest. The Federal Council decided in 1981 that an NFI was necessary, and assigned the task of carrying it out to the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL), in cooperation with the Federal Office for the Environment (FOEN).

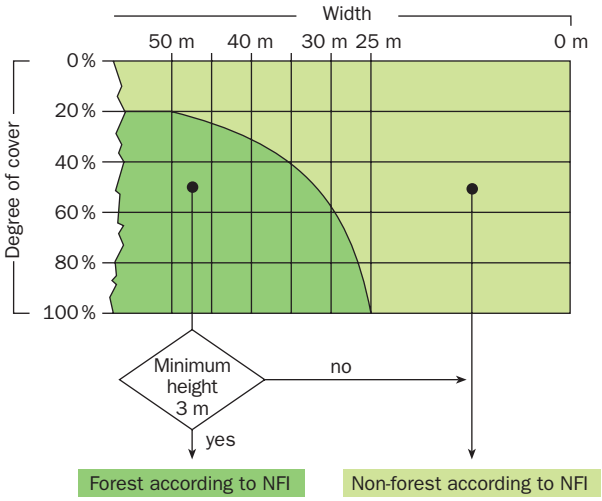
About one third of Switzerland is, on average, forested. The proportion varies regionally between a quarter and more than half.



When do trees and shrubs constitute a forest?

What determines whether an area covered with trees and shrubs is classified as a forest? There is no blanket answer to this question. Different forest definitions are used in Switzerland according to the purpose and motive. Protecting the forest is a clearly expressed goal in the forest laws of Switzerland's cantons. This means defining a minimum area, width and age as appropriate, but if the stocking fulfils important functions, then these minimum quantitative criteria no longer apply. As the NFI is a national project, it cannot take into account all the different forest definitions in each canton.

The forest definition used in the NFI is based on three quantitative criteria: degree of cover, width of stocking and tree height. An area covered with trees and shrubs is considered a forest if it is more than 50 m wide and if the (tree) crowns cover more than 20 % of the ground area. If the woody vegetation is denser, less wide areas are also considered forest. The trees and shrubs should also normally be higher than three metres unless it is an afforestation, regeneration, fire or storm area, or a shrub forest.



Forest definition according to the Swiss National Forest Inventory (NFI).

Taking a bird's-eye perspective

In the NFI, starting an inventory involves interpreting aerial photos. Experts at WSL decide whether the area in question in an aerial photograph is a forest. This decision is made every 1.4 km throughout Switzerland for a total of 21,000 sites. The 'forest decisions' are then later verified in the field.

The people analysing the aerial photos not only make the 'forest decision', but also assess a number of other features. These include checking whether the ground is covered with broadleaved or coniferous trees, shrubs, grass, buildings, roads, bodies of water, rock or glaciers, and how high the objects surveyed are. In comparison with older aerial photographs, it is possible, for example, to determine where a forest is in the process of developing.

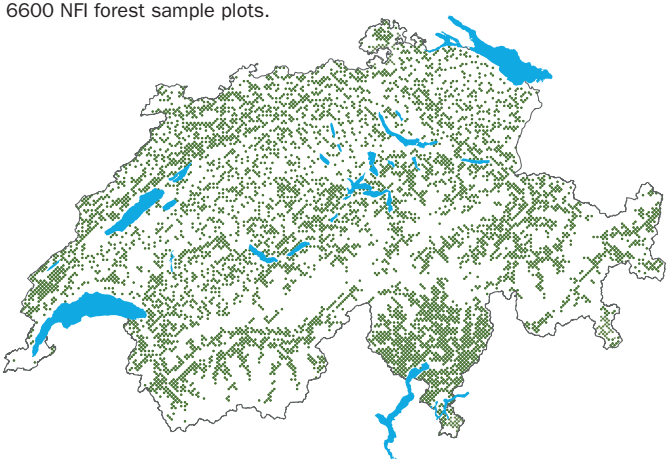
In addition, area-wide vegetation height models with a resolution of 0.5×0.5 m are calculated from the stereo aerial images. These models make it possible to obtain spatial information about the forest and woody plant structures on the site, such as details about the size of gaps in stands, which is a crucial feature for assessing how effective a forest is in providing protection against natural hazards like rockfall or avalanches.

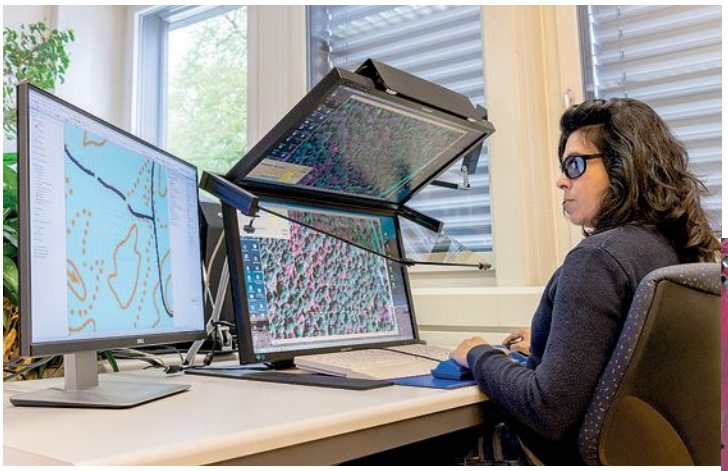
A grid with 6600 forest sample plots

There are about 500 million trees in Swiss forests – far too many to examine them all. Random sampling yields sufficient information. During the first NFI, a kilometre grid was laid across Switzerland. A grid intersection located in a forest area indicated where a sample plot should be established in the field.

In the second NFI, the sampling grid was reduced for cost reasons. Since then, the sample plots have been distributed at intervals of 1.4 km. The resulting sampling grid has around 6600 forest sample plots.

Distribution of the approximately 6600 NFI forest sample plots.





Aerial-photo interpreter at work. With the 3-D glasses, she can view the aerial image spatially – a bit like going to the cinema for work.

Infrared aerial photo showing the square interpretation area and forest boundary lines.

First-hand information from the forest

Over the course of nine years, three teams of two visit all the forest sample plots. Each year, the survey focuses on a different ninth of the sampling grid. The way the sample plots are selected ensures that, each year, they are evenly distributed throughout Switzerland. This means that, should an extreme event occur, representative information can already be provided that same year.

The field teams measure and describe the forest stand and assess the site conditions on the sample plots. The work is back-breaking because they have to collect data on around 300 features per sample plot – often on very steep terrain. To obtain the information the field teams can't acquire directly in the sample plots – such as ownership conditions or timber-harvesting data – they ask the foresters responsible.

Member of a field team measuring the diameter of a sample tree at breast height.

The diameter at a height of 7 m is measured with Finnish calipers.

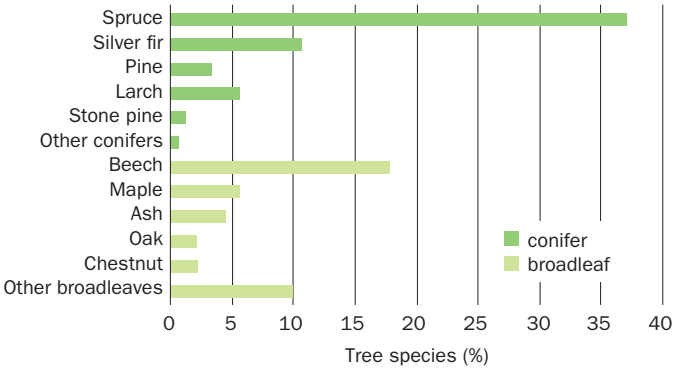
The centre of each sample plot is surveyed using terrain points and a GPS.

Plant heights in the young growth are measured and game browsing, particularly of deer, assessed.

Rootstocks are also recorded.

Just a few tree species dominate the forest

143 different tree and shrub species were recorded in the fourth NFI. Only about ten species, however, are frequent enough to significantly shape the forest structure. These would naturally be mostly beech in the lowlands, and spruce, larch and stone pine in mountain forests.

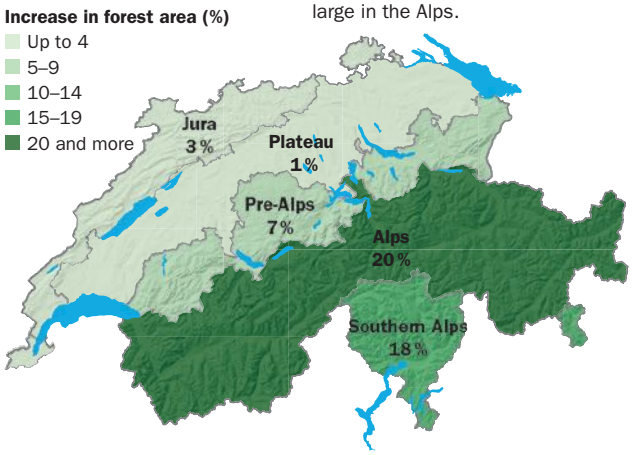


Spruce is by far the most common tree species in the Swiss forest, accounting for 37% of all tree stems.

The forest area is growing, but no longer so rapidly

Switzerland's forest area has increased by 11% or 1300 km² in the 30 years since the first NFI. This corresponds almost to the area of Canton Aargau (1404 km²). Since the third NFI, however, the increase in forest area has slowed down considerably.

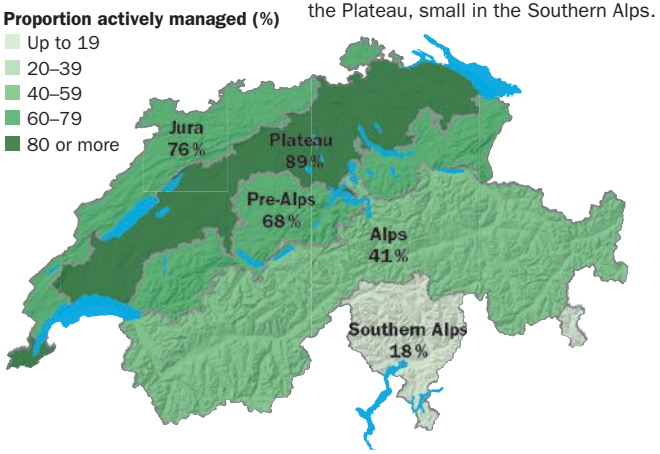
Increase in forest area from the first to the fourth NFI: small on the Plateau, large in the Alps.



The forest is managed

Swiss forests are managed to provide wood as a raw material, to improve the forest's protective effect or to promote certain animal and plant species. Over the last 20 years, management interventions have taken place on 58% of the forest area.

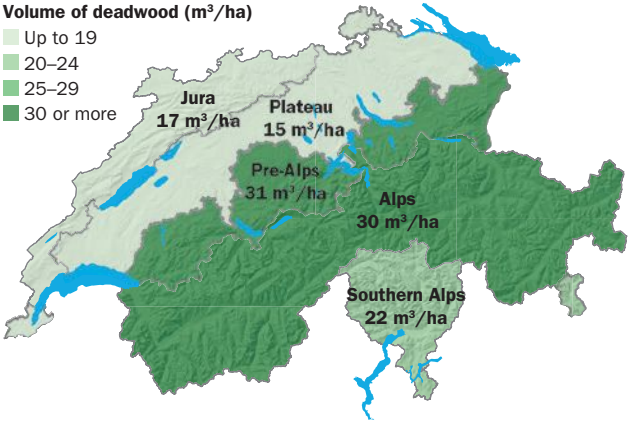
Proportion of forest area actively managed in the last 20 years: large on the Plateau, small in the Southern Alps.



A near-natural habitat

The NFI records not only forest(ry) characteristics, but also many indicators of the forest's quality as a habitat for animals and plants. These include, for example, the volume of standing and lying deadwood. This is higher (24 m³/ha) in Switzerland than in most European countries, but still lower than in virgin forests.

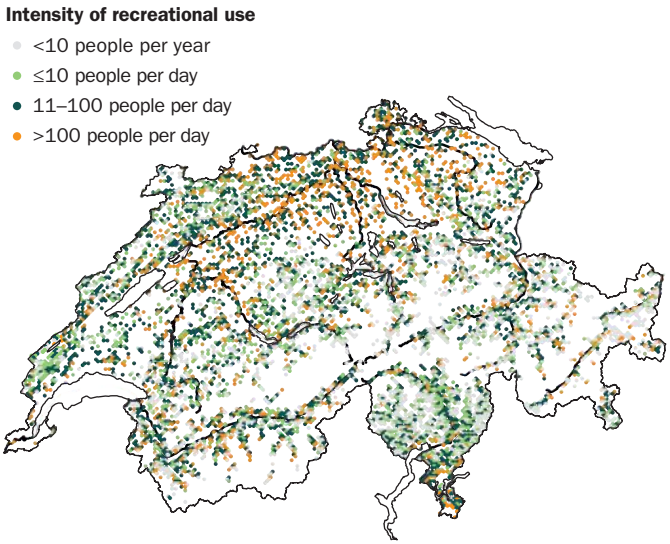
Deadwood volume: high in the Pre-Alps and the Alps, low on the Plateau and in the Jura.



Further results of the fourth NFI

- The growing stock in Swiss forests amounts to 421 million m^3 (350 m^3/ha). On the Plateau it has decreased since the third NFI, but in the other regions it has increased.
- Timber harvesting in the Alps is expensive: on about half of the forest area there it costs more than 100 francs per cubic metre.
- More than 80% of the forest stands in Switzerland are the result of natural regeneration – one of the highest values in Europe.
- 42% of the Swiss forest according to the NFI definition is considered protection forest.
- Game browsing on the silver fir, an important tree in protection forests, has increased markedly since the second NFI.
- The number of particularly thick, i.e. with diameters over 80 cm, trees has doubled since the first NFI.
- Hiking, biking and walking are the three most common recreational and sporting activities in the Swiss forest.

NFI recording years
First NFI: 1983–1985
Second NFI: 1993–1995
Third NFI: 2004–2006
Fourth NFI: 2009–2017
Fifth NFI: 2018–2026



Swiss forests are used quite intensively for recreational and leisure activities in urban areas, but are almost never visited in remote areas.

The NFI responds to customer requests

All NFI inventory data are stored at WSL, where they are analysed and processed to make them accessible for the public, the economic sector, politics and research. The most important results of the inventories can be found in German and French in the NFI books. You can also search for results yourself, download distribution maps or view photos of the sample areas recorded on the NFI website: www.lfi.ch.

Evaluations and data extracts on very specific questions can also be obtained from WSL. To date, NFI staff have provided this service for well over 1000 major commissions and projects in practice and research.

Book with the results of the fourth NFI

You can order the report on the fourth NFI, published in June 2020 in German and French, free of charge apart from the cost of postage from: Swiss Federal Institute for Forest, Snow and Landscape Research WSL, WSL Shop, Zürcherstrasse 111, CH-8903 Birmensdorf, e-mail e-shop@wsl.ch.

Swiss National Forest Inventory. Results of the fourth survey 2009–2017 (title translated).
Brändli, U.-B., Abegg, M., Allgaier Leuch, B. (ed.) 2020, ISBN 978-3-905621-60-0, doi 10.16904/envidat.146 (German); ISBN 978-3-905621-61-7, doi 10.16904/envidat.147 (French).

For a list of NFI publications, see www.lfi.ch/publikationen/