Adapting to climate change – a major challenge for forests

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Mixed forests help to minimise the risk of deminishing certain forest functions. Credit: Peter Brang (WSL)

Climate change is happening so quickly that a question mark hangs over whether forests can adapt accordingly without human interference and can continue to perform their various functions such as timber production, protection against natural hazards and providing a recreational space for the public. In Switzerland, temperatures have already risen by around 1.9°C since the beginning of industrialisation. Even keeping global warming down to the 1.5-2°C target set by the Paris Agreement on climate change will yield a further increase of 1-2°C.

For the Swiss forests, this warming trend will involve vegetation zones shifting 500-700 metres higher in altitude. Thus, in future, broadleaf trees will increasingly thrive in lower-lying mountain forests which are currently dominated by conifers. Rising temperatures and drought levels during the growing season are exerting stress on trees and are increasing the risk of forest fires and exacerbating attacks by harmful organisms. This affects Norway spruce, for example, which is more susceptible to bark beetle infestation in prolonged dry spells. In future, it will be less common at lower elevations, while the conditions will be increasingly favourable to more drought-tolerant species such as the sessile oak.

Foresters and forest owners should already tailor the management of their forests to these future conditions. With a view to ensuring a sound empirical basis for this, in 2009 the Swiss Federal Institute for Forest, Snow and Landscape Research WSL and the Federal Office for the Environment FOEN launched the Forests and Climate Change research programme (see box 1). The results provide a comprehensive overview, unique for Central Europe, of the effects of climate change on trees and on the various functions of forests.

Safeguarding forest functions against the backdrop of

climate change

The research results show that while forests can adapt to climate change to a certain extent, they are unlikely to be capable of continuing to perform their functions – so natural-hazard protection, the increasingly vital production of timber as a renewable raw material and energy source or their recreational function – everywhere to the extent we have become used to. A major disruptive event such as the forest fire that happened above Leuk in the Swiss canton of Valais in the hot summer of 2003 can undermine forests' natural function of providing protection from natural hazards and can require costly measures such as afforestation and avalanche barriers. It will take decades before the forest's full protective function is restored there. As a result of climate change, such events may become a more frequent occurrence in future.

To avert the loss of such functions, the research programme devised various management strategies adapted to changing climatic conditions. In particular, they result in a greater increase in the diversity of the tree species. How a forest is affected by climate change and what type of management makes it more able to cope with the new climatic conditions depend decisively on the particularities of the relevant site, especially soil depth, water supply and slope exposure. These conditions are changing from site to site and must be viewed in the context of the management of the forest. In this way, for example, areas in high-resolution site maps can be shown where the climate-sensitive Norway spruce can continue to thrive (box 2). Currently, tree-species recommendations are being examined in forest tests along with the cantonal forestry offices and associations of forest owners and environmental and forestry industry associations.

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