

Are trees in Central Europe defying climate change?

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Scots and black pines are exposed to drought and heat under experimental conditions.

Over 200 researchers from Europe and around the world are currently meeting in Zürich to share the latest findings on the topic "Climate Change: Tree responses in Central European forests". One key question is this: How can we structure forests to enable them to continue to fulfil

their many functions? One concept that is mentioned increasingly frequently is 'plasticity' – forests' ability to adapt to environmental changes. The conference in Zürich is being organised by the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL), in collaboration with a number of partner institutions.

Plasticity is a groundbreaking concept in the context of forests and [climate change](#), and Thomas Wohlgemuth, leader of the Ecological Disturbance group within WSL, is convinced of its validity. The geobotanist heads up the organisational team for the international conference ClimTree 2013: "Climate Change: Tree Responses in Central European forests" to be held from 1-5 September 2013 in Zürich. No wonder, then, that forests' adaptability features prominently in the event's many lectures. WSL, ETH Zurich and the Swiss Federal Office for the Environment (FOEN) have invited to the conference.

"Within the framework of climate change, increasingly frequent instances of drought pose one of the biggest challenges to our forests", says Thomas Wohlgemuth. "However, in recent years we have noticed that forests have reacted in an surprisingly '[plastic](#)' manner to extreme events such as the summer of 2003 – in other words, they have shown a remarkable ability to adapt." Trees and forests can withstand temporary shortages of supply as drought thanks for a deep [root system](#) and by limiting [evaporation](#). In extreme situations, trees will drop leaves and needles to keep [moisture loss](#) to a minimum. In the long term, forests may also adapt to new [environmental conditions](#) via a change in the species composition.

Forests in the future: more leaves, fewer needles

Research today appears cautiously optimistic about the future of forests. In terms of Central Europe, at least, no imminent catastrophes are expected. "However, we we must be prepared for the fact that in the

coming decades forests as we know them today will change irrevocably", says Thomas Wohlgemuth. In dry areas, forests will grow more sparsely and will produce less biomass. Species such as the oak and Douglas fir, which are drought-tolerant, may drive out more tender species such as the spruce and Scots pine at lower elevations, where deciduous forests will likely feature increasingly prominently in the landscape.

Nevertheless, the ability of forests to adapt is limited. If the environment changes at as fast a pace as is anticipated during the 21st century, several species of trees will be pushed to their absolute limit. "The two key forestal species in Europe – the beech and the spruce – can only withstand periods of drought for a limited time" explains Heinz Rennenberg, Professor of Tree Physiology at the University of Freiburg im Breisgau. "In areas which are already dry – for example areas where the soil is shallow and chalky – prolonged periods of drought can cause major problems since trees in such areas only take up a limited amount of nutrients anyway. In the long term, those trees will be unable to compensate for the increasing shortage of water."

One pressing question is therefore the following: "How can we structure forest to enable them to continue to fulfil their many functions despite the onset of climate change? Forests provide protection against natural hazards, are a source of wood, supply clean drinking water, purify the air, alleviate climate change, and provide recreation areas for human beings and habitats for plants and animals. Based on current knowledge, Thomas Wohlgemuth advocates forests with a wide variety of structures and tree species. After all, the more diverse a forest the greater its ability to adapt to change and withstand extreme climatic events.

Forestry: from theory to practice

In the context of forest management in particular, where the timeframes involved are often 100 years and longer, it is crucial that the groundwork

for the future be laid as early as possible. "From the point of view of Switzerland as a whole, it is vital that cantons and forest owners have the tools they need to apply scientific knowledge in practice", says Rolf Manser, head of the Forestry division of the FOEN. "The aim of the Forestry and Climate Change research programme being run by the FOEN and WSL is to develop the basic knowledge required by decision-makers in the political and forestry spheres and to provide the corresponding bases for decisions. Scientific gatherings such as the ClimTree conference play a crucial part in this."

Dialogue between scientists and those working in the field is thus becoming increasingly important. "Sound forestal training at academic level, such as that offered by ETH Zürich, is especially important against the backdrop of climate change", adds Harald Bugmann, Professor of Forest Ecology at ETH Zurich. This is a prerequisite for new research findings to be used in practice, be they regarding assessing the effects of climate change on forest ecosystems and forest management, or developing strategies to enable forests to withstand higher temperatures and more acute drought.

Deeper understanding thanks to long-term studies

The significance of [forest](#) plasticity throws up a number of fresh questions: Which species of trees are capable of adapting flexibly and under what conditions? How and how quickly do they acclimatise? At what point does productivity start to decline and the die-off rate increase? To be able to answer such questions, researchers must look back many years into the past, for forestry dynamics is a slow, long-term process.

"The data series produced by WSL through long-term studies are therefore invaluable", explains Andreas Rigling, member of WSL's management team. "For example, for decades we have been recording

via the National Forest Inventory (LFI) and Long-Term Forest Ecosystem Research (LWF) programmes how forests have reacted to environmental changes." Using this as a basis, researchers have already been able to glean important knowledge about forests' ability to withstand climatic conditions, which is crucial in assessing how forests will develop in the future. The ClimTree conference will mark a further milestone, giving us even greater insight into forests' ability to adapt and how best to help them do so.

Provided by Swiss Federal Institute for Forest, Snow and Landscape Research WSL

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