

Hiding from a warmer climate in the forest

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A data logger measuring near-ground temperature in the forest. Credit: Caroline Greiser

When studying the effect of climate change on biodiversity, it is important to consider the climate near the ground (microclimate) which



a plant or an animal actually experiences. Deep shady depressions, dense old forests or places close to water for example are always considerably cooler than their surroundings.

"Knowing where cold climate refugia are in the landscape means we can protect these cold spots and help cold-adapted species to survive a warmer climate. Knowing how colder microclimates are generated means we could even create colder spots by wisely managing our forests", says Caroline Greiser, PhD student at Department of Ecology, Environment and Plant Sciences.

The scientists found out that summer maximum temperatures at the <u>forest</u> floor can differ more than 10°C over only 100 meters.

"We also found out that the forest plays a dominant role in controlling warm near-ground temperatures in the summer, more than local topography. In other words, the <u>temperature</u> differences between open and dense forest stands are larger than the differences between the sunny and the shady side of a hill" says Caroline Greiser.

The researchers produced forest <u>microclimate</u> maps for an area of 16 000 km2 in central Sweden (covering parts of Värmland, Örebro län, Västmanland and Dalarna) with the help of small temperature data loggers, not larger than a finger nail. The data loggers were spread out across the area and measured near-ground temperatures over one year.





Installing the temperature data logger in field. Credit: Lina Widenfalk

They made maps for different months of the year and for both minimum and maximum temperatures, because the microclimatic landscape appeared to be changing across the year. The research group will further investigate what kind of microclimates the species need for survival. The maps can be used not only for further climate and forest research, but also for conservation and land-use planning.

"We hope this study raises the awareness that forest density has a large impact on the microclimatic landscape and that forest management has the potential to slow down biodiversity loss. Concrete steps could be to reduce forest fragmentation or to create buffer zones around cold places so they remain cold, when close-by forest is cut down", says Caroline Greiser.



The article "Monthly microclimate models in a managed boreal forest landscape" is published in the scientific journal *Agricultural and Forest Meteorology*.

Microclimate is the climate near the ground which can be colder or warmer than in the free atmosphere, depending on local topography (e.g. north vs. south side of a hill, higher vs. lower elevation) and vegetation (e.g. young sparse vs. old dense forest).



Cold microclimates in forests are for example created by local depressions and dense forest. They are sometimes visible by remaining snow patches in spring. Credit: Caroline Greiser



More information: Caroline Greiser et al, Monthly microclimate models in a managed boreal forest landscape, *Agricultural and Forest Meteorology* (2017). DOI: 10.1016/j.agrformet.2017.12.252

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