

# New research challenges assumptions about effects of global warming on mountain tree line

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For years, many scientists believed that forest tree lines on mountains everywhere would shift to higher elevations as the planet's temperature increased due to global warming.

It's not that simple, new University of Calgary research has shown.

Even in a warmer world, local geologic/geomorphic conditions – including slope steepness, exposure and [soil depth](#) – will limit trees being established and growing on mountainsides, the research found.

The disruption caused by a shifting tree line could fragment alpine ecosystems and potentially threaten certain species. But temperature alone "cannot explain high-elevation [tree cover](#) over a more than 100-square-kilometre (study) area in the Canadian Rockies," says the research, published this week in the *Proceedings of the National Academy of Sciences* journal.

"You can't just take a mountain range and say that in every place the tree line is going up," says Edward Johnson, professor of Biological Sciences and study co-author with then-postdoctoral researcher, Marc Macias-Fauria – now at Oxford University.

"We have to caution that it depends on how much suitable habitat there is above where the tree line is now," says Johnson, who's also director of

the U of Calgary's Biogeoscience Institute.

The two researchers looked at tree cover in the Marmot Creek Research Watershed, located next to the Nakiska ski hill in Kananaskis Country west of Calgary.

Using a supercomputer at Oxford University, they ran regional and global computer climate models, and also did remote sensing and on-the-ground investigation of the study area.

They then used the model to forecast tree cover based on [moderate climate](#) warning predicted for the late 21st century.

Even with warmer temperatures, "there are lots of places in the present alpine where the conditions are simply not suitable for trees," Johnson says.

"Between six to 18 per cent of the present alpine area is either too steep, has bedrock, cliffs and talus or some other local terrain conditions that will limit trees being established," he adds.

The researchers now plan to develop a new model that includes all the local geologic/geomorphic factors, and which will identify the inter-related causes of why trees do or do not get established and grow in specific mountain areas.

Provided by University of Calgary

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