

Boreal forest and tundra regions worst hit over next 500 years of climate change, climate model shows

April 8 2024



Taiga Landscape in Quebec, Canada, dominated by Black Spruce *Picea mariana*.
Credit: Wikipedia/CC BY-SA 2.0

The boreal forest, covering much of Canada and Alaska, and the treeless

shrublands to the north of the forest region, may be among the worst impacted by climate change over the next 500 years, according to a new study.

The study, led by researchers at the White Rose universities of York and Leeds, as well as Oxford and Montreal, and ETH, Switzerland, ran a widely-used climate model with different atmospheric concentrations of carbon dioxide to assess the impact climate change could have on the distribution of ecosystems across the planet up to the year 2500. The research is [published](#) in the journal *Philosophical Transactions of the Royal Society B*.

Most climate prediction models run to the year 2100, but researchers are keen to explore longer-term projections that give a global picture of how much humans, animals and plant life may need to adapt to climate change beyond the next century, which is important as long-lived trees adapt at scales of centuries rather than decades.

Modeling climate change over a 500 year period shows that much of the [boreal forest](#), the Earth's northernmost forests and most significant provider of carbon storage and [clean water](#), could be seriously impacted, along with tundra regions, treeless shrublands north of the boreal forest that play a significant role in regulating the Earth's climate.

Tundra regions have already seen new plants colonizing lands that would have once been too cold for them to survive on, and as the planet continues to warm, its ability to cool tropical heat, pushing it back down to the equator is reduced.

This means that if there is not a rapid halt in emitting [greenhouse gases](#), large parts of some of the hottest countries on Earth will become too hot to be easily inhabited and considerable changes would have to be made to daily life to exist there.

The researchers highlight that although we are already starting to see animals and plants migrating as they try to adapt to changing climate conditions, this could intensify in the future. As the study highlights, some species, like trees, migrate much slower than animals and humans can, and so some plants and animals will be lost altogether, threatening the survival of today's ecosystems

Dr. Christopher Lyon, from the University of York's Department of Environment and Geography and Leverhulme Center for Anthropocene Biodiversity, said, "We know now that some aspects of climate change are inevitable and so a level of adaptation is required, but how extensive these adaptations need to be is still in our hands. It is, therefore, useful to look beyond the UN's 2030 and 2050 carbon emission targets, as well as the 2100 climate model predictions, as we know that climate change won't stop there.

"By looking much further into the future—the future that our grandchildren will face—we can see that there is a significant difference between climate change rates, species migration rates, and their migration ability. Trees, for example, will migrate much slower than birds and mammals, and boreal decline radically changes the ecosystems they've formed since the glaciers retreated about 12,000 years ago.

"Those species that can't adapt or move to more suitable locations will radically decline in number and range or even go extinct."

The study highlights that current boreal regions are colder and less densely populated, but changing environments may mean more people migrate to these landscapes as they warm in the future, increasing the pressures on ecosystems and species.

Migration on this scale also relies on political cooperation from countries around the world, and researchers point out that given current global

conflicts and divisions, this could be one of the most significant barriers to successful climate adaptation.

Dr. Lyon said, "What's most important, I think, is that the long-term projections highlight the scale of the change we, and especially our children and grandchildren face—even under the lower warming scenarios—and the need to start thinking very hard now about what it will take for all of us to live justly in those possible worlds."

Dr. Bethany Allen from ETH (Federal Institute of Technology) Zurich, added, "Our study indicates the longevity and severity of the impacts that human-induced [climate change](#) will have on the biosphere. The need to protect boreal forest and tundra biomes is particularly pressing, and our results demonstrate how large-scale geographic shifts in the areas occupied by these biomes might be necessary in order to preserve them over the next few hundred years."

More information: Bethany J. Allen et al, Projected future climatic forcing on the global distribution of vegetation types, *Philosophical Transactions of the Royal Society B: Biological Sciences* (2024). [DOI: 10.1098/rstb.2023.0011](#)

Provided by University of York

Citation: Boreal forest and tundra regions worst hit over next 500 years of climate change, climate model shows (2024, April 8) retrieved 2 May 2024 from <https://phys.org/news/2024-04-boreal-forest-tundra-regions-worst.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private

study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.