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New report sets out how climate change may change NWT forests

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New report sets out how climate change may change NWT forests

Sophie Kuijper Dickson · May 25, 2022



An area of boreal forest near the Thaidene Nene National Park Reserve. Photo: Amélie Roberto-Charron

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The Northwest Territories's climate has warmed by two degrees in the past 70 years. Parts of the territory have seen warming up to four times the global average.

A report **released last week** offers the first comprehensive analysis of how those rising temperatures and shifting precipitation patterns are affecting the territory's forests.

“Northern forests are driven by disturbance, meaning they need some level of

disturbance, like fire or insect outbreaks, to renew themselves. This is how they have functioned for millennia,” explained report contributor Jakub Olesinski, an ecologist in the NWT government’s forest management division.

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This month’s report, a collaboration between the GNWT and the Canadian Forest Service, establishes the current ecological conditions as a point of comparison against future changes in the environment.

This baseline will be essential to recognizing exactly how climate change affects the forests of the future, beyond the usual cycles of disturbance.

The report explains that as the climate warms, forests will see increased permafrost thaw, a subsequent flooding and drowning of trees, the spreading of insect and disease

outbreaks farther north, and more frequent wildfires of greater severity.

“An increase of say, two degrees, in average annual temperature may not sound like very much. But for forests, that can be pretty significant,” said Erin Fraser-Reid, climate change and adaptation lead at the Northern Forestry Centre, the Alberta division of the forest service.

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Importantly, not all changes will happen everywhere. The scale and intensity of change will vary across fairly specific ecological regions.

More fires

“In general, the NWT is getting warmer and the growing season is becoming a little bit longer. Whether that’s a good thing for trees or a bad thing really depends on the precipitation,” Fraser-Reid said.

As the growing season becomes warmer and longer, trees will want to grow faster.

The catch is precipitation patterns are shifting across the territory, becoming increasingly different from one valley to the next. A forest’s ability to take advantage of a warmer climate will depend on whether it wins the precipitation lottery.

Trees that don’t receive enough water to match their growth rate will dry out, becoming weaker and more vulnerable to the northerly spread of forest disease and insects, and to forest fires.

“In general, larger and more intense wildfires are predicted for across the boreal forest,” Fraser-Reid said.

As has been **previously studied**, if wildfires continue to grow in size and severity, the territory’s boreal forest may begin emitting more carbon than it captures, accelerating climate change rather than mitigating it.

Forest fire regrowth in the South Slave. Sarah Pruys/Cabin Radio

Thawing permafrost

The most productive forests, largely spruce, are found in the southwestern corner of the territory, in the South Slave and Dehcho regions.

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The permafrost in these regions exists in scattered patches.

When forest fires thaw permafrost ice in the uplands, as they did in 2014's large-scale fires, melted ice drains into the forests of the lower regions, flooding their root systems and drowning their trees.

Permafrost thaw unrelated to forest fires, in lower-elevation areas of the Dehcho and

South Slave, is also contributing to increased water levels in soils.

Most permafrost south of Fort Simpson lives under peat plateaus – large areas elevated up to three metres above the surrounding landscape. The peat layer creates ideal summer and winter conditions for the permafrost that lives beneath it.

When this permafrost thaws, the structure and support that the ice once gave to the land collapses, creating sinks in the soil that fill with the water of the thawed ice. The report refers to these as collapse scars.

“It can change from a spruce forest into a wetland,” Fraser-Reid said.

Permafrost study took place primarily at the Dehcho’s Scotty Creak research station, south of Fort Simpson. Findings from that research are particular to the Dehcho and cannot be applied to other parts of the territory.

A graphic from the report shows how permafrost thawing beneath a peat plateau can create a collapse scar.

Adapting to changes

Most communities in the territory live in forested areas.

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Fraser-Reid explained that as forests change, “the values and services that humans can get from their forests will change too.”

Dieter Cazon is manager of lands and resources for the Lı́ıdlı́ Kúę First Nation in Fort Simpson, on the northern border of the Dehcho region.

He first saw signs of thawing permafrost in a helicopter ride he took above the Mackenzie River in 2017, when he noticed the banks of the river had collapsed and were sliding down into the water.

This kind of land subsidence, he explained, happens when water from thawed permafrost oversaturates and breaks down the land.

When he shared these observations with the First Nation's members, they asked that he find out more.

His work now includes collaborating with scientists at the Scotty Creak research station to understand how, exactly, a thawing permafrost will affect his community, and how residents might need to mitigate and adapt to these changes.

"Climate change will affect every aspect of Dehcho life, be it how it affects traditional hunters and harvesters, food security issues, or changes in weather patterns," Cazon said.

The mature spruce forests in the South Slave and Dehcho are an important habitat for about half of the boreal caribou population, currently on the territory's species-at-risk list.

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Collapse of peat plateaus into wetland bogs would mean the loss of forest lichen, an essential winter food source for the animals.

Part of the research under way at Scotty Creek involves studying ways to rebuild the permafrost in winter months.

“We have history in this area, so it’s our responsibility to try to understand the problems that are affecting it,” Cazon said.

Many variables, many unknowns

There is no fast and easy explanation of how the changing climate is affecting the territory’s forests.

“This is a really complex system with many moving variables,” Olesinski said.

“The most concerning part is that we don’t know which direction it’s going to go.”

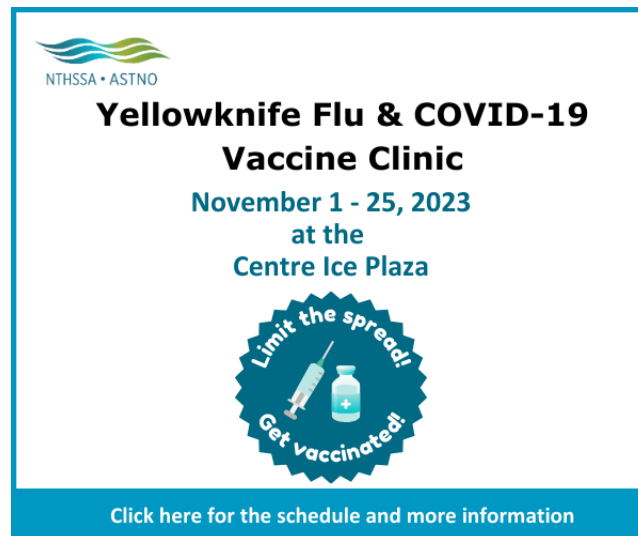
The studies included in the Canadian Forest Service report show a complicated network of cause-and-effect relations between the various symptoms of the warming climate, in which one symptom both causes and is caused by the next.

As the report explains, “wildfires increase the rate of permafrost thaw, while permafrost thaw changes the hydrology and water table level of an area and therefore also affects wildfire dynamics.

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“Both wildfires and permafrost thaw then affect carbon sequestration and caribou habitat, among other things. These and other interactions are complex and will lead to various types of feedback and unexpected outcomes.”

At this point, Olesinski said, it’s near impossible to predict how these various effects will interact with each other to change the territory’s forests.

“The best explanation of what climate change means is that we can expect huge variation, going from one extreme to the other,” Olesinski said. “But the challenge is to predict it, right?”

What is most significant, according to Olesinski, is the work this report does to highlight the persisting research and knowledge gaps and collect them in one place.

“We have several unique components that we still don’t have enough information about,” he said. This report will help to establish the questions future research must address.

The baseline report is the first step in a larger collaboration between the GNWT and the forest service that will assess exactly how vulnerable the territory’s forests are to the rapidly changing climate.

While this initial report offers information on all forest ecosystems across the territory, the final vulnerability assessment will focus on the more southerly Dehcho and South Slave regions, where most of the territory’s largest and most productive forests are found.

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