

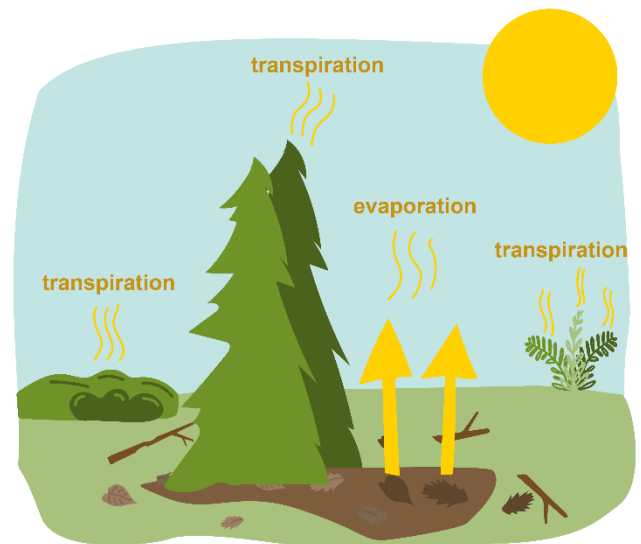


## Forests of northern Ontario and climate change

Forests are home to an abundance of plants, animals and insects, providing traditional food, medicine, and resources like black spruce for canoes, roots, moss, and firewood. Forests are also an important part of the economy in many regions. How will climate change impact the forests of northern Ontario? And what effects are people already seeing?

### Drier forests

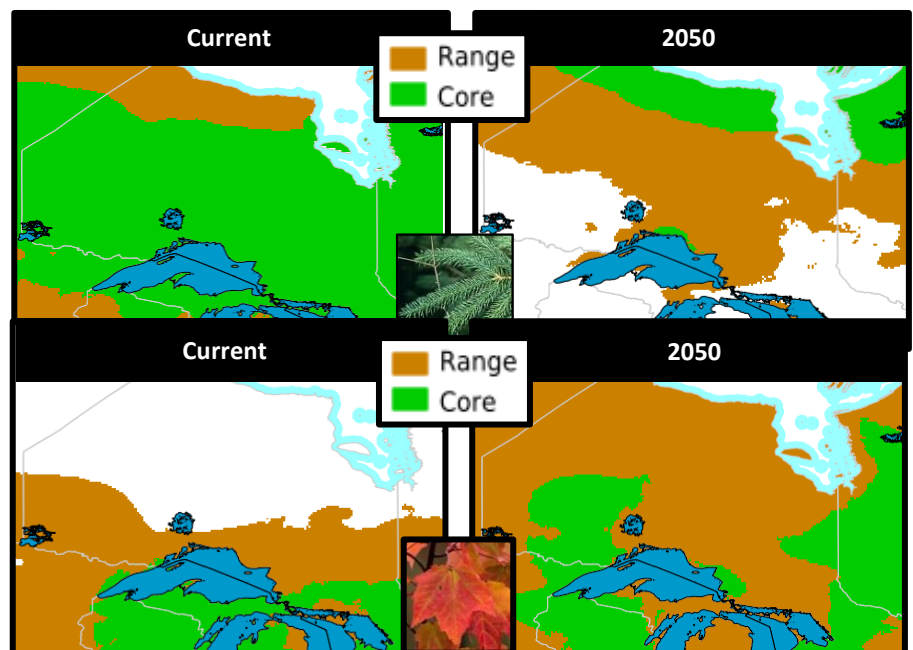
Even though climate change will likely bring more rain to Ontario, forests are predicted to become drier under future conditions. This is because hotter temperatures are also predicted. Heat draws moisture out of plants and soils, an effect called **evapotranspiration**. The hotter it is, the more the plants and soil will dry. Changing climate is also predicted to bring more days of heavy rain. When a lot of rain falls in a short period of time, the land can't absorb it all, and much runs off into lakes, rivers, and wetlands. One study of Canadian forests suggests that for every 1°C of warming that occurs, as much as 15% more precipitation is needed to maintain the moisture levels in forest fire fuels (dead leaves, sticks etc.)<sup>1</sup>. According to the Canadian Climate Atlas, Fort Hope, for example, can expect average summer temperatures to rise by about 2°C by the 2050s, while summer rain is only predicted to rise by 3%. Not only do drier forest conditions increase the risk of wildfire, but drought stress can also make trees and plants more susceptible to disease and insect attacks and can in extreme cases cause their death.



Evaporation (from soil, dead leaves, etc.) + Transpiration (from plants) = Evapotranspiration

### Range Shifts

Plants and animals are well adapted for the environments that they live in. But as climate changes, the areas where species can live (their habitat range) is also going to change. Many species, like the white spruce, are predicted to shift north because the new conditions in the south will mean that they simply won't survive there anymore. This northward shift in the range of plants could lead to a forest that looks quite different to the boreal forest in northern Ontario of today with less spruce, pine and fir and more oaks, ash, and maples.



Core range (species is abundant) and range (species is found) of white spruce and red maple in the recent past (1970-2000) and projected to the year 2050.

Maps from [www.planthardiness.gc.ca](http://www.planthardiness.gc.ca)

<sup>1</sup>Flannigan, M. D. et al. Fuel moisture sensitivity to temperature and precipitation: climate change implications. *Clim. Change* 134, 59–71 (2016).



## Change in timing of events

Many biological processes in both plants and animals are driven by environmental cues. These cues, like temperature, amount of daylight, and precipitation, influence the timing of events like bud burst and leaf out, flowering, migration, breaking hibernation, and breeding. But a changing climate may alter some of these cues, like temperature and precipitation, and events could occur at different times than they have in the past. This could mean that species won't emerge at the same time as their food sources, or that conditions won't be right at breeding time. Changes like these can have big impacts on the health and survival of forest species.



Plants and insects have an important relationship. Flowers provide nectar to insects and while gathering the nectar, pollen sticks to insect bodies and gets transferred from one flower to another. As warmer springs push flowering earlier, the insects that pollinate them will need to keep up.

The caribou breeding cycle is timed by the sun and occurs steadily at the same time each year before the spring thaw. But as the north warms and ponds are thawing earlier, pests like mosquitos can emerge at the same time as the calves are born, stressing both mothers and calves.



## Changes in tree disease and insect pests

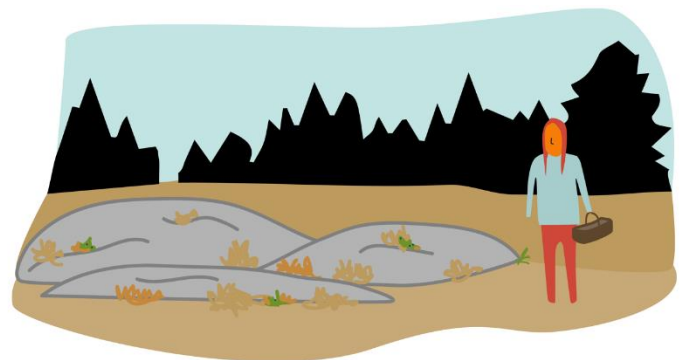
The relationship between tree species and the diseases and insects that prey on them is complex. Changing climate will very likely have an impact on these interactions, but exactly how is hard to predict. Most important tree diseases in Ontario, like root rot, are predicted to increase with climate change<sup>2</sup>. Warmer winter temperatures may allow the survival of pathogens, like stem canker fungi, and forest pests that are usually killed by the cold. Changing conditions could also mean new insects and diseases entering northern forests from the south.

## Economic Impacts

Many communities in northern Ontario rely on the forestry industry but shifting habitat ranges may mean that species currently harvested for profit won't grow in the same areas that they do now. This could mean job and economic losses for some communities. On the other hand, warm weather could be a boost for the tourism industry with more opportunities for outdoor recreation.

## What are people noticing?

Climate change is already affecting the forests of the north. Plants like Canada thistle are being seen in new areas. People on the James and Hudson Bay coasts are reporting that willows are growing more than ever before. And people in First Nation communities across the province are noticing dryer conditions in the bush, which is leading to fewer berries for harvesting.



Forests are changing in northern Ontario and that will impact the plants and animals that live there and the people that rely on the land. Read more

About forests: [http://www.climateontario.ca/MNR\\_Publications/276928.pdf](http://www.climateontario.ca/MNR_Publications/276928.pdf)

About pollinators: <https://www.neefusa.org/nature/plants-and-animals/buzz-changing-climate>

<https://www.sciencedirect.com/science/article/pii/S0960982212000103#bib8>

About caribou <https://www.theatlantic.com/science/archive/2015/09/arctic-mosquitoes-and-the-chaos-of-climate-change/405322/>

<https://royalsocietypublishing.org/doi/full/10.1098/rspb.2015.1549>

<sup>2</sup>Colombo, S. J. Ontario's forests and forestry in a changing climate. *Climate Change Research Report CCRR-12*. (2008).