



Boreal Forest

A tipping element in our climate system



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What boreal forests look like today:



Figure 1: The boreal forest today (5)

Temperatures in the boreal zone are predicted to increase at a much higher rate than the average global temperature.

Rising temperatures lead to following changes in the disturbance regime (2):



Increase in fire frequency and severity



Drought induced mortality



insect outbreaks



Windthrow due to extreme weather events



thawing of permafrost



faster decomposition of organic matter

WHAT ARE BOREAL FORESTS?

Boreal forests grow between **latitude 45° and 70°N**, forming a green belt around the north pole. They cover **30% of the global forested area** and large parts of it are still **primary and unmanaged**. About one third of their extend is underlain by **permafrost** and they are **dominated by Gymnosperms** like *Abies*, *Pinus*, *Larix* and *Picea*. (1,2,3)

HOW BOREAL FORESTS AFFECT OUR CLIMATE

Radiation balance

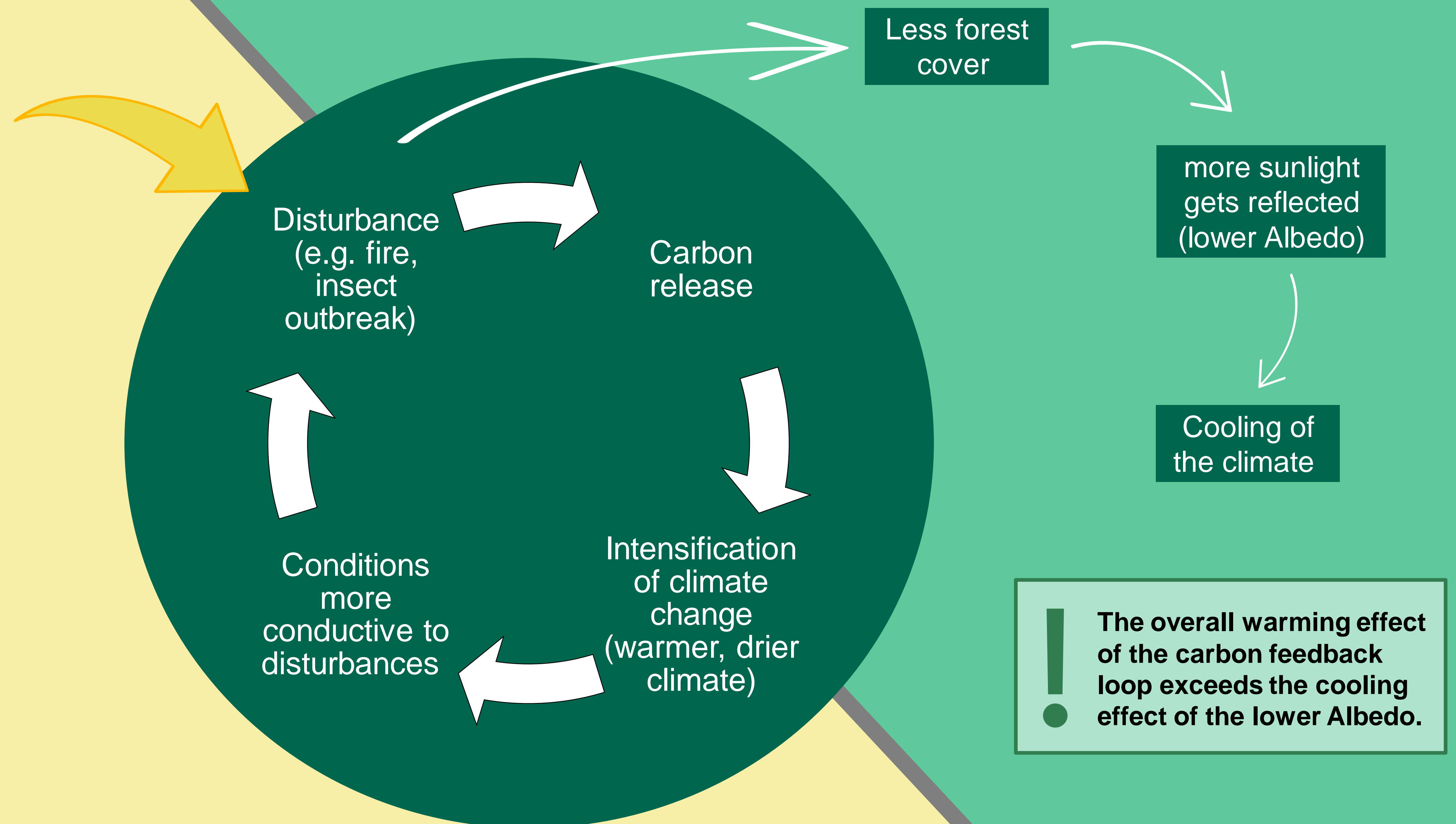
- absorbs a large part of solar radiation, turning it into heat
- facilitate cloud formation through emission of organic vapours

Carbon cycle

- large reservoir of biogenic carbon (one third of the global terrestrial carbon stocks)
- high capacity to store C in soils due to the slow microbial decomposition of organic matter under cool conditions (2,4)



Figure 2: The boreal forest belt (6)



POSSIBLE REACTIONS OF THE BOREAL FOREST TO CLIMATE CHANGE

The northward expansion of the boreal forest is limited because climate zones are shifting northward faster than the trees can migrate. Temperate tree species also won't be able to establish in interior boreal regions, where winters can be still very cold. A more likely scenario is the transformation into new ecosystems, like **open woodland or shrubland**, and the **extinction of species** with limited capacity to adapt. (2,3)

CONCLUSION

Boreal forest die-back is one of the nine possible global "tipping elements". Once a critical threshold is passed, the process may result in a positive feedback loop which causes **runaway warming** – in this case by the release of huge amounts of carbon into the atmosphere. (2,4)

What boreal forests are turning into:



Figure 3: Aspen parkland (7)

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