



– Wildfire alters forest succession

A Wildfire Resilience Consortium of Canada Research Brief

Canada's forests are changing, and what burns may not be what grows back

Canada's boreal forests evolved with fire from lightning and Indigenous cultural burning. Indigenous peoples have long used fire to renew landscapes and support resilience, and large wildfires are a natural part of this system. However, changes in climate and fire regime are altering how forests recover after fire.

Some forests are not adapted for today's fire regime



- › Climate change impacts (longer fire seasons, hotter and drier conditions, extreme weather) have amplified this shift in fire regime.



- › In some parts of the boreal forest, colonization and 100+ years of fire exclusion and suppression practices have created a **fire deficit**.

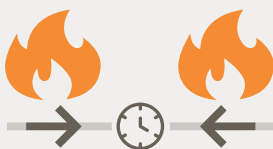


- › These human impacts result in **more frequent, larger, and higher-severity fires** that exceed the forests' ability to recover. **Severe fires can consume mature forests and the natural seeds needed for regeneration.**

Fire deficit: When an ecosystem receives less fire than it historically experienced

Despite colonization, Indigenous fire stewardship practices are being revitalized

Climate change intensifies new hurdles for regenerating forests by:



Shortening the time between lethal fires (e.g., <30 years).



Increasing the severity and longevity of drought. These changes kill young trees and viable seeds.

- › **Black spruce, the dominant boreal tree species, is strongly impacted;** following high-severity fires, nearly four in ten sites show reduced regeneration or a shift to broadleaf species.



Young forests are becoming more vulnerable to reburning

- Historically, recently burned areas offered protection from subsequent burns for several decades, with flammability being lowest early on. More frequent extreme fuel and weather conditions, resulting from climate change, are overwhelming this protection.



Severe reburning weather has significantly increased in over a quarter of the western boreal forest.



On average, 100 000 ha/year reburns in Canada (an area larger than Calgary). Recent years, such as 2023, have greatly exceeded this



Outcome: Conifer forests may transition to a different state (for instance, a broadleaf forest, shrubland, or grassland may grow and persist in its place). This would alter social, cultural, and economic values tied to existing landscapes. Ex: Alberta could see up to 50% conversion of mixed-wood and conifer forests.



Not all conversions may be undesirable. In some cases, this may reduce future fire risk or restore landscapes closer to pre-colonial conditions. Deep, inclusive and community-centred consideration is needed to decide when to resist or accept conversion.

Bottom Line

Boreal forests are shifting rapidly, and **proactive, climate-informed fire management is critical**. Wildland fire managers should recognize that young forests are increasingly vulnerable to reburning, and that forests allowed to grow may look very different from what burned in their place. Strategic fuel treatments, cultural and prescribed fire, innovative silviculture and strategic seed sourcing may guide conversion towards desired ecological and social outcomes.

Stop reacting, start planning.

This WRCC Research Brief was developed in collaboration with Canadian Forest Service research scientists. Original research that informs this work includes:

- Baltzer et al. 2021. doi.org/10.1073/pnas.2024872118
- Coop et al. 2020. doi.org/10.1093/biosci/biaa061
- Stevens-Rumann et al. 2022. doi.org/10.1139/cjfr-2022-0054
- Stralberg et al. 2018. doi.org/10.1002/ecs2.2156
- Whitman et al. 2024. doi.org/10.1111/gcb.17363