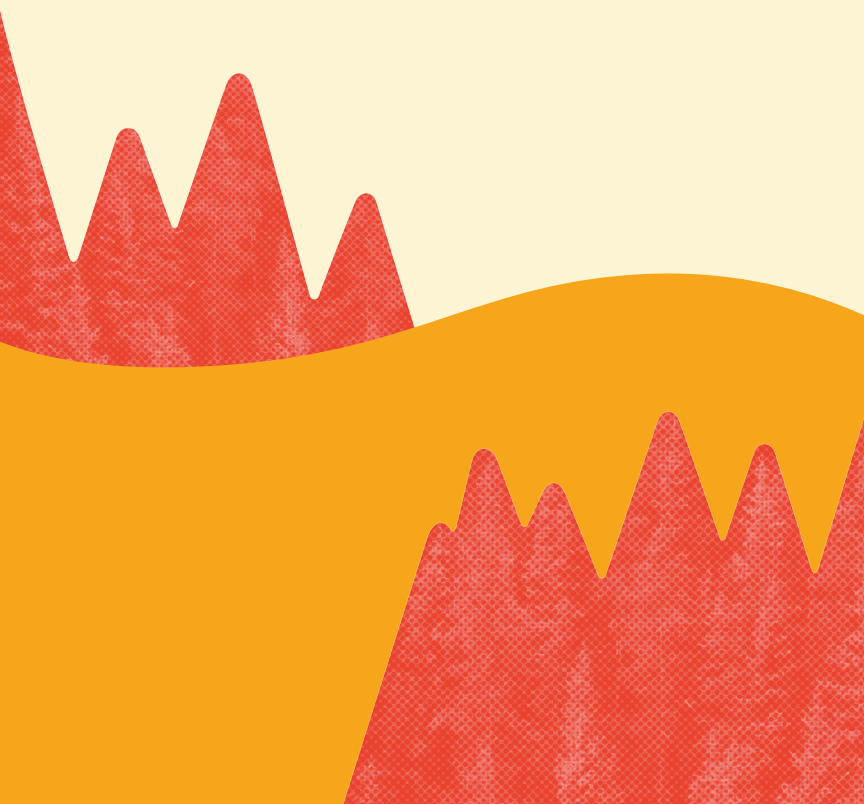
Fire

The Forest Steward Handbook

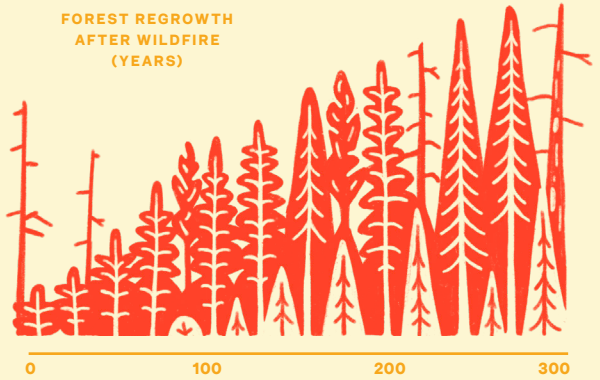


The Difference Between Fire and Logging

Logging and wildfire differ greatly on both a stand and landscape scale. Logging tends to target older, more accessible tree stands, while wildfire is relatively indiscriminate and occurs randomly on the landscape. Natural forest stands have a diverse structure and composition that is derived from multiple disturbance sources such as different size and intensity fires, windfall, or insects. This results in a complex forest structure with diverse tree and understory species, ages, and physical structure, including dead, standing, and fallen trees. Logging, however, simplifies the structure and composition of the stand through targeting only specific species and age classes that are easily accessible by machinery.

AGE

Fire results in a more diverse tree ages across the landscape, logging results in trees all of a similar age. Fire can occur anywhere, as it is mainly driven by weather. Logging on the other hand, regardless of method, specifically targets older, more accessible stands as these trees are more marketable.



After a forest in southern Alberta reaches 80-100 years it is considered ready to harvest. These two illustrations show the difference in forest structure and diversity following natural disturbance (above) and logging (left). This pattern affects diversity at both the stand and landscape scale.

WILDLIFE

Differences in how wildlife use burned vs. logged areas can be attributed to the type of habitat created after each. Standing live and dead trees, snags and woody debris left on the ground, and the type of vegetation that grows after a fire create different habitats used by different species. For example, in post-fire sites, large diameter trees and snags provide habitat for cavity-nesting birds, mammals, and large raptors; additionally, fallen trees and debris provide habitat for small mammals which are not available in post-harvest clearcut sites. In fact, two thirds of all wildlife species use snags or other woody debris that is present at post-fire sites at some point in their life cycles. Additionally, the presence of roads following logging activities dissects the remaining wildlife habitat into smaller patches. The habitat fragmentation associated with these linear disturbances such as logging roads has important implications on how wildlife use and move across the landscape following forest harvest.

There are some forest species that are completely adapted to post-fire sites. For example, fire morel mushrooms, Bicknell's geraniums, jewel beetles, and black-backed woodpeckers only live in post-fire areas. For species like these, logging cannot substitute fire in the creation of their habitat. Over the long-term, mammal species appear to use both post-fire and logged sites. However, roads created for harvest are often avoided by wildlife and can increase the risk of mortality for many mammals.

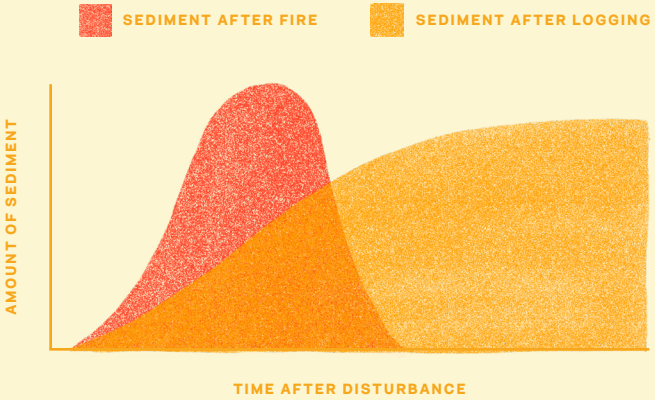
> ***Many wildlife species use snags or other woody debris that is present at postfire sites at some point in their life cycles.***

VEGETATION

Regrowth after fire results in diversity of plant species. Replanting after logging often results in a monoculture of the most profitable tree species.

WATER

Logging and small fires can have similar effects on water: including temperature, sediment, streamflow and chemistry, depending on the severity of the fire. However, logging does not emulate natural disturbance by wildfire in terms of impacts on water. Some differences do exist between logging and fire in relation to sedimentation. The main difference between the two is the presence of logging roads through the forest. The presence of these roads creates a continuous source of fine sediments that enters the waterbodies; therefore, resulting in increased sediment loads over the long-term.



Sedimentation after a fire event is often short and intense until natural regeneration and bank stabilizing can occur. The sediment load generally tapers off quicker than after a logging operation.

Sedimentation after logging mainly comes from roadways. This sediment enters waterways more slowly than after a fire but lasts longer and persists as long as the road exists - often after it is officially closed.

> ***Clearcut logging does not emulate natural disturbance by wildfire in terms of impacts on water.***

FOREST FLOOR:

Following natural disturbance by wildfire, the forest floor is covered in both coarse and fine woody debris of different sizes and species, creating a very diverse structure of microsite conditions. Logging, however, removes most of the organic material from the site, and leaves only unmerchantable debris on site. This can have important impacts on wildlife, microclimate, and water filtration capabilities.

SOIL

The impact that fire has on soil, for example, depends largely on the severity of the fire. For low-to-moderate severity fires, much like those of prescribed burns, the impacts on soil properties are in general beneficial. However, when fire becomes higher intensity or more severe, these beneficial soil processes mostly disappear.

During logging operations, the use of heavy equipment and machinery can cause rutting and soil compaction, creating an increase in surface runoff and gullying. Given the difference in disturbance mechanism, it is unlikely that logging emulates fire with respect to soil properties.

Wildfire is an important process for regenerating soil fungi organisms, as moderate intensity fires will initiate new colonization and succession of these species. Additionally, some species, such as nitrogen-fixing bacteria which help with soil fertility, have been known to increase following fire. Logging, on the other hand, has been found to reduce the activity of soil organisms for approximately 2-3 years post-harvest. Clearcut logging does not emulate wildlife in terms of soil processes. Soil composition, compaction rates, nutrients, and organisms following forest harvest are not the same as those following wildfire.

Typically sees an increase in nitrogen fixing bacteria and is colonized by new species. It is a 3D landscape with varying sizes of debris.

Typically sees a reduction in activity of soil organisms and no regrowth for 2-3 years. This is often accompanied by soil compaction.

Clearcut logging does not replace natural wildfire. Thus, while logging might be appropriate in some areas, it should be acknowledged that it is not merely replacing a natural disturbance, but impacts the soil, water, vegetation and wildlife differently than wildfire and therefore needs to be managed as such. Forest management must account for these differences in forest disturbance and long-term function of the ecosystem prioritized above all else.

Fire Risk Factors

Logging practices in which most, or all, of the trees in specified areas of older forests are cut down (i.e. clearcut logging) are often justified on the grounds that removing these mature trees reduces the potential of catastrophic fire. However, this assumption is rarely backed up with peer-reviewed literature and cannot be applied uniformly across all forests or landscapes.

Fire is an important natural disturbance in most of Canada's forests and is integral in determining the biodiversity and health of these ecosystems. Wildfires are important for sustaining ecosystem services such as stimulating vegetation regeneration, promoting landscape diversity in terms of vegetation types, and creating habitat for many species that would not exist without fire. Severe fire is not necessarily ecologically catastrophic, but rather a natural mechanism of renewal and diversity.

In general, logging can influence wildfire extent and/or severity under certain conditions. However, commercial logging is not done in a way that decreases the risk of subsequent fire or protects communities.

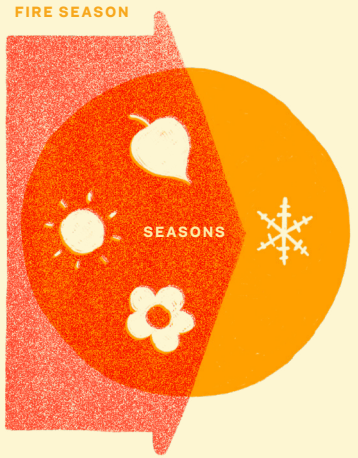
The likelihood and severity of wildfire is determined by:

WEATHER/CLIMATE CHANGE

Given the coniferous dominance and relatively low diversity of forest types in the montane and subalpine forests of the Southern Eastern Slopes, the literature shows that weather is a more important factor in determining fire risk in this landscape than forest type or age.

Climate change has emerged as an important driver of increased forest fire activity as the climate shifts toward higher than average spring and summer temperatures, and drier than average summers in the Southern Eastern Slopes region. Human-caused climate change has lengthened the annual fire season.(i.e., the window of time each year with weather that is conducive to wildland fires).

Fire seasons are getting longerwith the mounting effects of climate change and forest mismanagement. Warmer, drier weather is causing earlier and later fires and more frequent fires than we have seen in recent history.



> ***Past wildfires can tamper the spread of fire across the landscape, due to the fact that previously burned areas have fewer available surface fuels for fire spread.***

FOREST FUEL

While older forests do have a greater amount of large fuels that influence the intensity of crown fires, fine, dead, and cured fuels actually play a larger role in the spread rate and intensity of fires on the front line.

Forest harvesting can increase the amount of fine fuel debris on the ground such as tops, limbs, unmerchantable stems and logs left on a clearcut site, leaving more available to burn. In contrast, past wildfires can tamper the spread of fire across the landscape, due to the fact that previously burned areas have a fewer available surface fuels for fire spread.

FOREST TYPE

Coniferous forests, regardless of age, are more likely than deciduous forests to have more frequent and higher intensity fires than deciduous-dominated forests.

FIRE PASSING THROUGH A MONOCULTURE CONIFEROUS FOREST

FIRE PASSING THROUGH A DIVERSE MIXEDWOOD FOREST

The presence of deciduous trees can help limit the spread of fire across a landscape.

These trees are not as profitable as conifers. They are typically not replanted following logging.

FOREST AGE

Older forests are often pointed to by foresters as a higher fire risk, however there is little substantiating evidence for this in coniferous-dominated forests.

Young, dense stands of pine and spruce are at high risk of burning on extreme weather days, whereas mature pine forests support crown fires only on the most extreme fire days. Logging could actually increase fire size and overall area burned on the landscape, through conversion of more of the landscape to young, dense, highly flammable forest types.

Regeneration after clearcut logging differs from regeneration after fire, and may further increase fire risk — likely due to differences in tree density, deciduous regrowth, and increase in available surface fuels such as tops, branches, and broken boles left on the ground immediately after harvest.

> ***Clearcut logging in southern Alberta is not an effective tool for decreasing fire risk across the landscape.***

ROADS

Road networks required for logging increase human access into forested areas for unmanaged recreation including motorized vehicle use and campfires, which can increase the number and frequency of human-caused wildfires.

The evidence suggests that clearcut logging in southern Alberta is not an effective tool for decreasing fire risk across the landscape. In fact, studies propose that logging strategies focused on maximizing timber production could increase the risk of fire on the landscape over time. We must move away from timber-driven clearcut logging and toward forest management that effectively protects ecosystem values and minimizes wildfire risk where needed.

Management techniques such as prescribed burning and land use planning can help to reduce fire risk to nearby communities. Decades of fire suppression may have altered natural fire patterns, therefore it may be necessary to implement new approaches to fire management. More proactive approaches that emulate nature age structures could reduce risk to communities and property.

For sources and more information visit:
cpaws-southernalberta.org/forest-stewards/