

## GREEN FIRE-BREAKS

### *A defence against wildfires in a warming world*

Wildfires have always occurred, but predictions of increased fire risk associated with anthropogenic climate change means that massive wildfires, similar to what was experienced in [Port Hills \(2017\)](#) and [Pigeon Valley \(2019\)](#), are likely to become more common in parts of New Zealand. Even more sobering is the recent horrific [bushfire season in Australia](#) that blazed through more than 12.6 million hectares – anthropogenic climate change has been identified as a significant contributing factor.

A concerted response is needed to mitigate the increased risk of wildfires, particularly where large areas of flammable species are planted, such as plantations of mānuka, kānuka, eucalypt species and radiata pine. Not all trees burn the same. Green fire-breaks that are dominated by a mix of low-flammability species as part of a healthy, intact forest ecosystem may be a good tool for helping slow or even stop the spread of wildfires.

#### ***Why is there an increased risk of wildfires?***

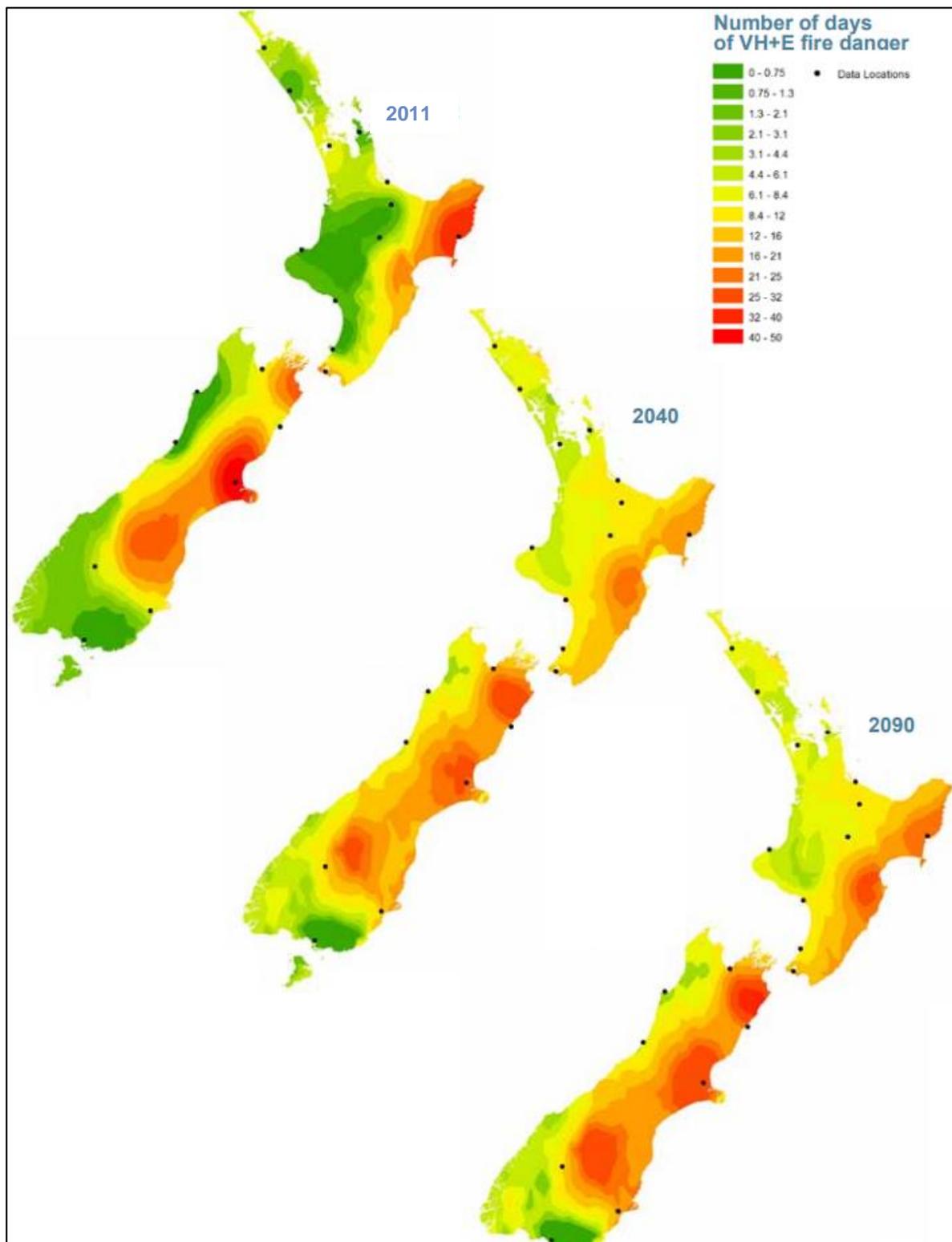
Greenhouse gas emissions have significantly altered the composition of the atmosphere and subsequently changed the global climate. Because of climate change, droughts have become more frequent and severe in many parts of the world and wildfires have become [more severe and frequent](#).



In New Zealand, many of our regions are becoming warmer, drier and windier because of anthropogenic [climate change](#). Because of this, the [risk of wildfires](#) is likely to significantly increase in most areas. A significant increase in fire danger is predicted for most areas as a result of increases in temperature and decreases in rainfall, plus higher wind speeds and lower humidity (Figure 1). The greatest relative changes are predicted where fire dangers are currently comparatively low, eg, coastal Southland and Wanganui. However, fire danger in a few areas will remain unchanged or even decrease due to increased precipitation.

#### ***What can we do about it?***

There is a lot we can do! We can decrease our carbon footprint and support New Zealand's transition to a zero emissions economy, and we can mitigate the risks of wildfires. Green fire-breaks are a fire suppression tool. It involves the planting of strips of low-flammable plant species grown at strategic locations in the landscape – such as in wildland-urban interfaces, around homes and buildings in rural settings, in shelterbelts, or interspersed throughout plantations of more flammable species.

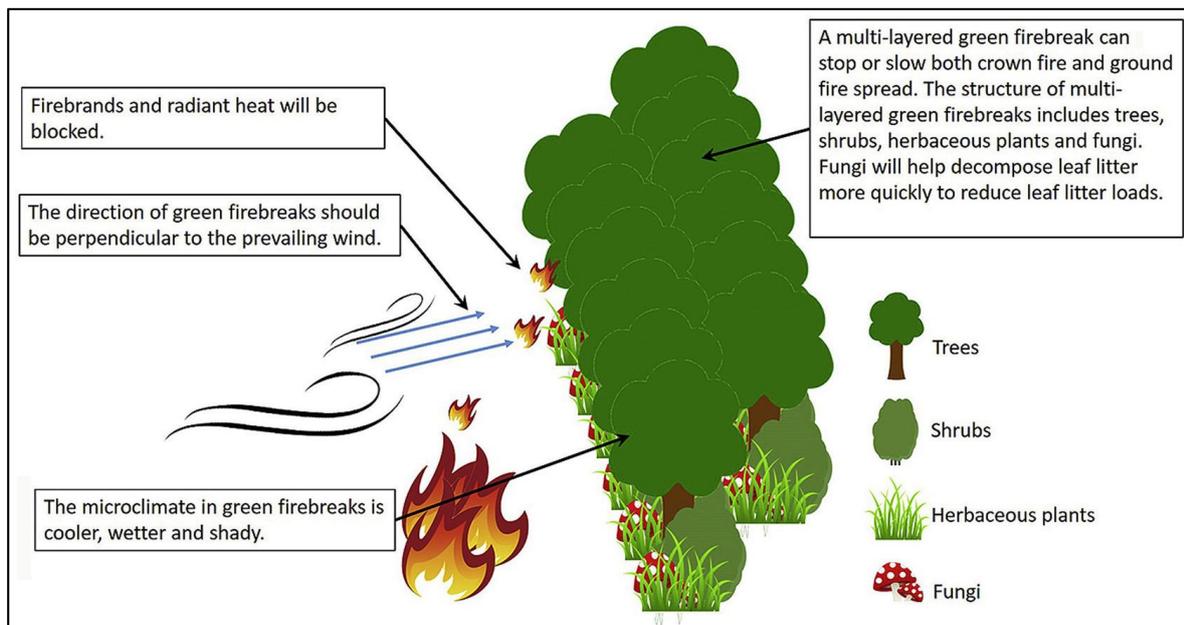


**Figure 1:** Projected changes in the average number of days/year of Very High and Extreme (VH+E) fire danger each fire season (Oct-Apr), **left:** climate in 2011, **centre:** the 2040s, **right:** the 2090s. Adapted from Rural Fire Research Update, Nov 2011, Issue 9, published on the Scion Research website (Scion 2011).

### ***Construction of green fire breaks***

Properly constructed green fire-breaks (Figure 2) are effective, long-term, low-cost tools for fire suppression, which complement more traditional approaches and can potentially meet other objectives, such as biodiversity enhancement. Green fire-breaks are increasingly being implemented in many countries,

particularly [China](#), which has a long history of this means of fire suppression. Over 364,000 km of green fire-breaks had been planted in China by 2016, in response to concerns of the increased risk of fires, and a further 167,000 km has been planned for construction before 2025.



**Figure 2:** Properly constructed green fire-breaks, with a multi-layered structure and closed canopy, are effective, long-term, low-cost tools for fire suppression ([Cui and others 2019](#)).

Chinese research shows that properly constructed green fire-breaks (layered forest structure with a closed canopy, planted perpendicular to predominant wind direction) are more effective than conventional fire breaks. However, they are most effective when used in conjunction with natural and man-made fire breaks, eg, ridges, rivers, gullies, or bare soil. Generally, a width of at least 10 – 12 m is recommended for green fire-breaks, with up to a 60 m width on steep slopes, as fire travels more quickly uphill ([Cui and others 2019](#)).

### ***Suitable species for green fire-breaks***

Effectiveness of green firebreaks largely depends on the selection of suitable plant species. Species rated as having low flammability should be selected. They are regarded as fire-resistant but they are not fire-proof. All vegetation will burn if conditions are very dry and if fires are hot enough and fanned by winds, but inflammable species do not readily ignite and will slow the progress of fires. Generally, they have the following characteristics - moist, supple leaves, little dead-wood or dry material accumulating within the plant, watery sap that does not have a strong odour, and low levels of resin.

Highly flammable plants generally have the following characteristics - fine, dead material contained within the plant, such as dry twigs and leaves; volatile waxes, terpenes or oils; gummy, resinous sap with a strong odour; aromatic leaves; and loose or papery bark.

Guides to [Flammability of Plant Species](#) and [Landscaping for Fire Safety](#) are provided by the Fire and Emergency New Zealand. Both publications have lists of highly-flammable through to low-flammable species.

### **Factors to consider:**

- Many native species have low flammability, eg, kawakawa, lancewood, large-leaved coprosmas (eg, karamu and taupata), marbleleaf, five finger, broadleaf (kapuka and puka), fuchsia, karaka, hangehange, poroporo and hinau.

- Native species also provide other values, such as biodiversity enhancement, pollination services, and cultural values.
- Low flammability exotics include willows, birch, and ash;
- Note the potential for some species to become invasive weeds, eg, willow, and (in some situations) karaka;
- Check availability of local nursery stock.
- Ease of establishment and management is important - select hardy but not weedy species.
- Fast-growing, early successional native plants with low flammability can be useful in quickly establishing cover, eg, large-leaved *Coprosma* species;
- Canopy or sub-canopy species can be included in the initial mix or planted later, eg, kapuka, marbleleaf and hinau.
- Matching species to micro-climates is also important, such as moist gully (eg, kawakawa) or drier ridge (eg, lancewood).
- Another strategy is to encourage natural regeneration that includes lower-flammability species, such as kawakawa and hangehange as understorey tiers and poroporo along forest edges.
- Make sure the species are suitable for the area and that natives are ecosourced - check out the Tane's Tree Trust [general guidelines](#) for native species selection and ecosourcing.

Green fire-breaks can also be a tool to aid natural succession where a 'plant and leave' option is taken, eg, with carbon forestry. As plantations of fast-growing species eventually disintegrate, corridors of green fire-breaks that surround and run through the forests will be a convenient and natural source of seeds for their replacement. Birds are likely to bring in a range of additional species, some of which may not be in the low flammability category but the resulting forest is likely to be far more resistant to fire than the initial plantations.

### ***Maintaining a healthy ngahere***

Healthy native bush is quite resistant to fire in normal circumstances because the understory is thick with shrubs, ferns, seedlings, saplings, lianes, epiphytes, mosses and liverworts. We all know what it is like to walk into intact native forest on a hot, dry day – the cooler, moist air is part of a microclimate created by shade and evapotranspiration. That is why it is important to keep up the good mahi of pest control and fencing to keep out livestock.

In many parts of the country that barely exists; the bush is an eaten out remnant of what was once a self-sustaining forest, and has lots of standing deadwood and dried fern fronds. With pest control and fencing, the understory can begin to re-establish and start to fireproof the bush. This takes time and effort but it is well worth it, not only for the increased fire-proofing but also for all the multiple benefits healthy forest provides.

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