




Article

# Managing Fire and Biodiversity in the Wildland-Urban Interface: A Role for Green Firebreaks

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**Abstract:** In the wildland-urban interface, the imperative is often to protect life and property from destructive fires, while also conserving biodiversity. One potential tool for achieving this goal is the use of green firebreaks: strips of low flammability species planted at strategic locations to help reduce fire spread by slowing or stopping the fire front, extinguishing embers or blocking radiant heat. If comprised of native species, green firebreaks also have biodiversity benefits. Green firebreaks have been recommended for use throughout the world, including the Americas, Europe, Asia, Africa and Australasia. However, despite this widespread endorsement, there has been little empirical testing of green firebreaks, particularly with field experiments. This knowledge gap needs addressing. Green firebreaks should be considered as part of the revegetation strategy following recent extensive wildfires in places such as New Zealand and Chile.

**Keywords:** biodiversity conservation; fire ecology; green firebreaks; plant flammability; wildland-urban interface

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Kelly and Brotons [1] provided a timely and insightful discussion of the role of fire in biodiversity conservation, but what if the land management imperative is to inhibit fire spread?

Plant species differ in their inherent flammability [2,3], and boundaries of less flammable vegetation can stop or slow down wildfire, or extinguish embers being blown ahead of a fire front [4]. Based on these principles, ‘green firebreaks’ are strips of low flammability species, planted at strategic locations across the landscape to reduce or slow fire spread [5], and have the potential to protect human life, property and infrastructure. If green firebreaks are comprised of native species, they can deliver biodiversity benefits such as the provision of food, habitat and dispersal opportunities for native fauna.

Also known as fire greenbelts, green firewalls, green strips, and living fire breaks, green firebreaks have been recommended for use in landscapes around the world, including the United States [5], New Zealand [6], China [7], Indonesia [8], West Africa [9], Peru [10], and Europe [11]. However, despite their extensive use, there has been little empirical testing of green firebreaks, particularly with field experiments; a knowledge gap that needs addressing. While field-based experiments should be considered the gold standard for testing the effectiveness of green firebreaks, useful insights can be gleaned using laboratory experiments, especially those that retain plant architecture by burning shoots [12,13] or whole plants [14]. Such tests could burn multiple species together to determine the relative contribution of low or high flammability species to the resultant fire [15], and hence help assess just how much biomass of low flammability plants is required to extinguish a fire that is burning a high flammability species.

While green firebreaks hold promise as a fire management and biodiversity conservation tool, they should be used in conjunction with other active and passive fire-fighting approaches, especially in extreme fire conditions. Green firebreaks comprised of native species should be considered as part of revegetation and ‘fire-resistance’ strategies in landscapes where natural succession may be slow or unlikely, such as the Port Hills, Christchurch, New Zealand (Figure 1), or Chile [16].



**Figure 1.** Fire consumes a plantation of non-native *Pinus* sp. near a house during the Port Hills fires, Christchurch, New Zealand, in February, 2017. Local authorities are exploring the use of green firebreaks as part of the revegetation strategy following the fires. (Photo: Joseph Johnson/Fairfax NZ)

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