

Bushfire protection benefits of kikuyu turf

Background

Hort Innovation commissioned GHD in collaboration with the CSIRO to undertake a study into the bushfire protection benefits of three common Australian turf varieties. This was performed through a literature review and scientific experiments. The turf types studied were kikuyu, couch and buffalo grass, but the results apply more broadly to other turf types with similar characteristics.



Proven benefits of living turf for bushfire protection

It is common to observe that where bushfires have spread into a community, green turf provides demonstrated benefits from impeding the spread of surface fire from bushfire-prone vegetation to fire-vulnerable assets. Live turf does not sustain surface fire spread as shown in the images above taken by CSIRO in 2020 following a fire in Pentland Hills, Victoria. This kikuyu lawn example has provided significant protection benefits for property, when curing in adjacent pasture was 95% and the Grassland Fire Danger Index was Severe. Even where turf is dead and very dry, the low biomass of mown turf means that to the extent any fire spread is sustained, fire can only burn at very low intensity and is readily controlled and extinguished.

Turf as a component of landscaping for bushfire protection

Living turf has long been recognised by fire agencies as a desirable component of landscaping to prevent or reduce damage from bushfire. Turf has the further benefit of providing a defendable space from which firefighters can seek to protect properties. In the Australian Standard 3959 *Construction of buildings in bushfire-prone areas*, managed turf is not considered a bushfire hazard. Land areas across which the principal vegetation cover is live turf, such as sports fields, maintained lawns, golf courses and other managed grasslands, are termed low threat vegetation. The Victorian CFA's *Landscaping for Bushfire* guide also describes the benefits of turf and its maintenance requirements to reduce bushfire risk. Kikuyu grass grows in summer which means it is able to be maintained in a green, healthy state over the peak bushfire season in Australia. Therefore turf is a very suitable groundcover for use in Asset Protection Zones.

Experimental design of this project

CSIRO conducted experiments in the CSIRO Pyrotron in Canberra attempting to ignite kikuyu turf using simulated embers at a variety of leaf moisture contents, two lengths and using three different wind speeds.

Experimental conditions were designed in order to replicate typical bushfire conditions of hot days and low relative humidity. The ignition source was a lit cotton ball injected with ethanol. Ignitions which spread more than 20 cm were deemed 'sustained ignitions'. The extremely dry samples could only be attained through a process of oven-drying.

Kikuyu maintenance

- ✓ **Water turf** to keep in a green, live state
- ✓ Keep the turf **short – up to 100 mm** height
- ✓ Keep the turf **cleared of leaf litter** and other flammable materials
- ✓ **Install the turf correctly** to promote a well-formed root system, this will make the turf more likely to retain moisture in dry periods

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No live turf samples in a green, or partially green state (suffering severe moisture deficit stress) were able to be lit. Therefore, experiments focused on dead or dying turf, in a very dry state, to establish how dry turf needs to be to sustain fire spread.

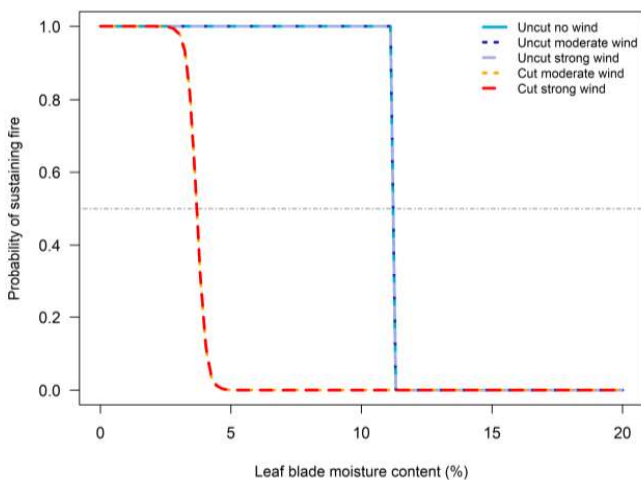
Results of the kikuyu ignition tests

The following table shows the number of sustained ignitions under the three wind speed, two lengths and four leaf blade moisture content scenarios (ODW refers to oven-dried weight). 13 out of the 41 uncut kikuyu ignitions sustained, compared to two sustaining ignitions out of 42 attempts in the short cut kikuyu.

Kikuyu turf (dead) results for uncut (approx. 40 mm) and short cut (approx. 12 mm) samples

Length	Wind speed setting	Extremely dry (<5% ODW)	Very dry (5-10% ODW)	Dry (10-20% ODW)	Dying (>20% ODW)
Uncut	Calm	100% (1 out of 1)	100% (1 out of 1)	45.5% (5 out of 11)	0% (0 out of 2)
Uncut	Moderate	-	-	22.2% (2 out of 9)	0% (0 out of 4)
Uncut	Strong	-	100% (1 out of 1)	33.3% (3 out of 9)	0% (0 out of 3)
Short	Calm	0% (0 out of 3)	0% (0 out of 4)	0% (0 out of 7)	-
Short	Moderate	50% (1 out of 2)	0% (0 out of 5)	0% (0 out of 10)	-
Short	Strong	50% (1 out of 2)	0% (0 out of 5)	0% (0 out of 4)	-

The figure below shows the modelled probability of point ignitions in uncut kikuyu based on leaf blade moisture content in different wind conditions.



Probability of point ignition in kikuyu

Key points

- Live grasses have oven-dried weight ranging from 30% to 260% (CFA *Grassland Curing Guide* 2014). The average moisture content across the turf types tested was greater than 100% upon delivery.
- These experiments showed that kikuyu grass did not catch fire above 20% ODW. In well-maintained live lawns, and even drought-stressed live lawns, fuel moisture content is typically many times higher than 20% ODW.
- Dead grass is less likely to sustain fire spread at shorter lengths, as seen in the kikuyu results.

Further reading:

GHD (2020) *Living turf fire benefits study, literature review*

Plucinski MP (2020) *The combustibility of turf lawns*. CSIRO Land and Water Client Report No. EP201008, Canberra, Australia.

CFA (2011) *Landscaping for Bushfire, Garden Design and Plant Selection*