Report confirms that lawn provides a bushfire retardant space

In the last edition of the ***Turf Australia*** quarterly magazine we gave a sneak peek into the initial findings of a strategic, levy-funded project exploring the bushfire protection benefits of Australian turf varieties. The project has now concluded, and we take a deeper look at the key findings from the research.

Hort Innovation
Strategic levy investment
TURF FUND

During the 2019/20 bushfire season in Australia more than 18.6 million hectares (46 million acres) of land was burnt. The impact of the fires was estimated to cost $3.9 billion to the economy, with insurance claims estimated to be approximately $1.9 billion. Almost 3,000 homes, and thousands of businesses and other buildings were destroyed (According to the Center for Disaster Philanthropy).

It wasn't the first high-consequence bushfire season and it certainly won't be the last so bushfire planning and preparation remains at the forefront of public policy and the national conversation. A national Royal Commission and several State government inquiries into the fires are currently underway.

Fire agencies have long valued the role that turf (both in public spaces and in private lawns) plays in the strategic management of bushfire risk. However very little research has been undertaken to confirm the scientific importance of living turf for fire protection. Similarly, no work has been undertaken to understand whether synthetic grass has similar strategic properties.

Until now.

Professional services company GHD was engaged by Hort Innovation to undertake a study on the benefits of living turf and its role as a bushfire retardant. The activity formed the strategic, levy-funded project *Conveying the benefits of living turf – a bushfire retardant* (TU17008).

Keep reading for more detail but the good news is that the study confirmed that not only is living turf a natural bushfire-resilient retardant, but synthetic grass does not share those properties.

Research overview

A literature review was initially conducted to review research that was already available in terms of flammability of turf and other materials, and the fire-testing standards of synthetic grass. The literature review also explored the extent to which is turf already being identified as a bushfire retardant.

With the literature review completed, the project moved into the experimentation phase.

> *Ultimately, the experiments proved that living turf, even turf that was under severe moisture stress, was highly resistant to ignition, and had to be in a dead or near-dead state and desiccated to extremely low moisture content levels before it would sustain fire spread.*

Partnering with the CSIRO's Bushfire Behaviour and Risks group, samples of buffalo, couch and kikuyu were all subjected to ignition tests at varying fuel moisture levels to understand the combustibility of these turf types. The experiments were conducted at the high-tech Pyrotron facility at the CSIRO in Canberra, during the hot dry spring and summer conditions affecting major fires in eastern Australia at the time.

The varieties were tested according to different variables such as wind speed, length of grass and moisture levels. Different fuel sources were also tested.

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Continued...

Report confirms that lawn provides a bushfire retardant space *(continued)*

Non-sustaining ignitions

The results

Buffalo

In total, 72 ignition attempts were made in buffalo turf samples.

No live turf samples in a green, or partially green state (suffering severe moisture deficit stress) were able to be lit. Therefore, the 72 ignition experiments focused on dead or dying turf, in a very dry state at moisture contents well below what would be expected for a healthy or even drought-stressed lawn. The majority of testing concentrated on extremely dry conditions typical of a dead lawn on a day with severe bushfire danger.

Despite the extreme testing conditions applied, of these 72 attempts, only six samples ignited and only under incredibly dry and windy conditions. Four of these samples required partial drying in an oven to get them to ignite.

Couch

Couch fared slightly less favourably, with 10 successful ignitions from 66 attempts. However, no live turf samples in a green, or partially green state (suffering severe moisture deficit stress) were able to be lit. The successful ignition attempts were all attempts from the 'extremely dry' or 'very dry' moisture range.

Kikuyu

No live turf samples in a green, or partially green state (suffering severe moisture deficit stress) were able to be lit. 41 ignition attempts were made with 'uncut' kikuyu with 13 of combusting. With uncut kikuyu, there was a clear statistical significance in the level of moisture which would support combustion. All ignition attempts made at moisture contents below 11.2% ODW* were sustainable and those at higher moisture contents did not sustain in all wind conditions. Such moisture content levels are only attainable in dead grass blades, in dry, very low humidity conditions.

*Leaf blade moisture contents are expressed as mass of water as a percentage of oven-dried weight (ODW) of a sample.

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An additional 42 ignition attempts were made with short-cut kikuyu, with distinctly different results than uncut kikuyu. None of the 14 ignition attempts made in calm conditions with short cut kikuyu sustained combustion and only two of the 28 attempts in moderate or strong winds were sustainable, and only then, they were only successful at an ODW of 3.7% which was the driest conditions tested. Such moisture content can only be attained in dead grass, in hot and extremely dry conditions.

The literature review considered what impact, if any, water restrictions would have on the ability of natural lawns to retain its fire-retardant properties.

All but the most extreme levels of restrictions allow for some watering of lawns, whether that be on specific days or only during twilight hours. In almost all cases, this should keep lawns alive, even if visibly under water stress.

Fire resistance in action

While the ignition experiments confirm that live turf has fire retardant properties, how does this align with what has happened in real-life situations? According to Paul de Mar, project lead at GHD, there are many examples where post-bushfire assessment has shown strong alignment with the study.

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"It is common in post-bushfire impacted areas to observe green, or partially green lawns remaining largely undamaged by fire surrounding either unburnt houses, or burnt houses where airborne ember attack has directly impacted the house but the surrounding lawn remains unburnt," Mr de Mar said.

"Live turf is known operationally within fire agencies to both mitigate fire spread, and is a favoured means of providing defendable space near houses, to allow safe defence of properties. Lawns and walkways are a form of firebreak, which interrupt the path of surface fire spread – they can't stop airborne embers but they can provide defendable space from where such embers can be safely put out. During the 2019/20 fire season, and in many previous fire seasons, there are thousands of examples where home-owners, or firefighters, or both, were able to use defendable spaces provided by maintained lawn areas to defend their houses against ember attack, saving their homes.

For example, the Waroona bushfire which burnt through Yarloop in Western Australia in 2016 destroyed 181 houses. Green lawns are evident around destroyed houses (which succumbed to airborne ember attack) whilst others with surrounding green lawns, also subject to ember attack, were saved.

In 2018, Tathra in New South Wales was subjected to a high intensity bushfire which approached from the west through forest, but as shown in the image at right , fire has not spread across maintained lawns. These lawn areas provided defendable space enabling firefighters to extinguish embers and save homes.

The CSIRO's Pyotron in action

Summing it all up

The full scientific results of the experiment can be found on the Hort Innovation and Turf Australia websites.

However, the findings ultimately tell us that watered and mowed lawns are not combustible under any conditions associated with bushfires unless they are completely dead and have extremely low moisture contents. They also don't melt or suffer permanent burn marks or damage.

Maintained lawns provide a healthy and clean environment which can make an important contribution to creating a defendable space around homes and infrastructure in bushfire prone areas.

Jenny Zadro, Market Development Manager, Turf Australia says the findings are significant.

"Put simply, this is one of the most important pieces of research that the turf industry has invested in. To uncover the scientific proof that our product can help protect homes in during Australia's yearly bushfire seasons is game changing.

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"Not only does it add a completely new element to the turf good news story but it opens up additional avenues for us to collaborate with professional and volunteer fire agencies, local government and other community organisations to help keep them safe.

"I encourage you to download all available resources on this project and explore how you can use them in conversations with your customers and stakeholders."

A factsheet has been developed to help summarise the findings. This factsheet can be downloaded from the Turf Australia website and should be used to help you have discussions around this empirical, proven benefit of living grass. The factsheet also appears on the next page of this magazine.

SYNTHETIC GRASS IS NOT A SAFE SUBSTITUTE FOR LIVING GRASS

Synthetic grass comprises a mixture of combustible plastics which are predisposed to melting and ignition. There is a great deal of variation on flammability between products with different types of plastic and additives used.

Owing to the variations of product and lack of international standard for fire testing in artificial grass, burning behaviour is difficult to test and evaluate. In addition, although fake grass sold typically passes legal standards relating to flammability and ignition, the standards are typically based around indoor settings and are significantly less extreme than testing undertaken as part of this project.

However, there have been numerous examples of where materials made by the same types of materials as many synthetic grasses have contributed to catastrophic fire events including the 2017 Grenfell Tower fire in London. The cladding used in this building contained a polyethylene core – a main ingredient in many synthetic turf products.

Separate to the risks around ignition and fire spread it should also be considered that if synthetic grass does ignite or melt, it results in the release of incredibly harmful toxins and chemicals.

For example, many synthetic grasses are made from polypropylene or polyethylene, the smoke from which is considered incredibly toxic. Firefighters will not enter an environment with such smoke without self-contained breathing apparatuses and as many volunteer fire services are not fully equipped with that equipment, other locations will be chosen to defend life and property.