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I am making this submission as

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| Submission type | Personal |
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Organisation making the submission (if applicable)

Your position in the organisation (if applicable)

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| Consent to make submission public | Public |
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| Your story | <p>I am 80 years old. I started fighting fires in the RFS in the 1980s, although I have long retired from active fire fighting I still retain interest on the District Bush fire Committee. I have formal training in chemistry, physics, botany, and management. I have been actively involved in environmental issues much of my life. 1990s I was chair of the Georges River Catchment Management Committee. and have been on a NPWS District Advisory Committee.</p> <p>I live in a fire prone area</p> |
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1.1 Causes and contributing factors

1.2 Preparation and planning

**1.3 Response to
bushfires**

1.4 Any other matters

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The-mechanics-of-bushfires-AutoRecovered.pdf - [Download File](#)

THE MECHANICS OF BUSHFIRES

The first point in understanding fire is

THE FIRE TRIANGLE



These three elements are necessary to maintain a fire

Remove any one element and you extinguish the fire,

Conversely by increasing the availability of any element the intensity of the fire increases.

Types of Wildfires

Ground fire. A fire that is burning at ground level only, this includes grassfires and fires only burning in the understory of wooded areas.

Crown fires when the crown, the upper foliage of trees is burning.

Understory fires (ground fires), vs Crown fires

In grasslands we only have ground fires

in wooded areas we can have fires in the understory but have not hot enough to light the upper canopy, these are common and can be contained by normal firefighting techniques (not necessarily easily)

When the conditions are suitable, fuel oxygen and heat, the canopy can ignite (A Crown Fire).

Crown fires are extremely hard to contain due to the height and energy being produced makes it hard to even approach the fire, and the amount of water needed to quench the fire is beyond or normal equipment.

To avoid crown fires and reduce the intensity of ground fires we have been Hazard Reducing areas, usually by burning with low intensity fires during cooler periods, to reduce the fuel load on the ground.

Normally if you cut a branch from a tree (eucalypt), and put the branch on a fire, it will initially slow the fire, or even put the fire out, due to the water in the leaves and stems needing to be evaporated before the wood is available to burn. Normally it requires considerable heat from the understory to get the crown to burn.

DROUGHT

Due to drought, and lowering of water tables, accentuated by mining, and river management, etc, the canopies of our forests had become dehydrated, as could be seen when the leaves hang down vertically, caused by the petioles (leaf stem) slackening and allow the lamina (the leaf blade) to hang down due to lack of water , and hence turgidity in the leaf and stem cells. cates that the whole leaf is dried and more easily burned.

Mid December(2019) I did try lighting an individual leaf taken from a eucalypt, (done inside an indoor fireplace).The leaf lit easily, and maintained the flame without added heat. The importance of this is that the canopy was flammable without the support of an understory fire, also the leaves being lighter, and not self-extinguishing could add to ember attack.

When the canopy has attained flash point, ie once ignited, it can maintain the burning without help from the understory, so it will keep burning even if there is no fire in the understory.

HIGH WINDS

Contribute two factors; oxygen an physical movement.

Oxygen is one requirement of fire. The more oxygen that is available the more intense the fire. (That is why we blow a fire to make it burn up.)

The sagging of the leaves, opening of the crown, also allows the easier entry of the wind onto the canopy, giving more oxygen, thence higher fire intensity.

The high winds we have been experiencing have as well as highly intensifying the heat, have been spreading the fires more quickly by ember attack and by blowing the heat rising from the fires sideways (like turning a blowtorch sideways instead of pointing upwards), both advancing the fire more quickly, but also stopping firefighters approaching the fire front and so allowing the fire to spread and grow larger

Because the fuel (leaves twigs etc.) were drier, larger pieces were able to be caught in the updraught, and could travel kilometres and still be alight so with high winds and drier fuel the area of ember attack was greatly increased.

The high winds also lead to structures, (houses sheds etc) which might have been thought to have had reasonable radiation zones, coming under attack by conducted heat, ie extremely hot wind and gasses or open flame, as well as ember attack that they were not designed to withstand.

BUILT ASSETS

The Built Assets, houses sheds have suffered greatly due to the high winds and higher heat intensity due to several factors;

The older structures were built before fire protection design rules were implemented

The structures and bushfire preventive measures were not maintained to satisfactory levels

The bushfire preventive design measures were not adequate for the extreme circumstances.

The catastrophic fires have redefined ember attack zones to mean anywhere.

Designated Fire breaks and radiation zones, should be only on areas under control of the property owner.

Gas bottles should be held only in bunded areas away from houses, (when a gas bottle explodes the house is lost)

FIGHTING BUSHFIRES DURING CATASTROPHIC CONDITIONS

With Global Warming we can expect more Catastrophic Weather Conditions in the future. Hopefully only once in a decade or more. But we must prepare now.

When I started bushfire fighting four decades ago our practice was, when a fire was reported ,one brigade was despatched, and if it became beyond that brigades capacity, to call in more help. A number of times I attended the start of fires that got out of hand and were declared a section 44 incident, partly due to not calling in help soon enough.

More recently during extreme fire conditions, the Bushfire Stations will be manned , (at least in Macarthur Area), and when a puff of smoke is reported, three brigades respond immediately. This has resulted with the perception, by some, that there had not been any fires in the area. Unfortunately many rural areas are so large and have fewer resources they cannot respond so quickly and with such power.

I recommend that during catastrophic conditions, we must anticipate bushfires being caused by lightning strikes in remote areas, and be prepared with helicopters of sufficient size and number to be able to quench any resulting fires before they can take hold.

The helicopters need to be equipped with heat detection equipment so they can ascertain if and where there are remnant embers

The high temperatures and high winds mean that a fire can be the source of ember attack kilometres away. Under cooler conditions and lower winds, it can be considered safe to blackout a perimeter of only a couple of hundred meters deep around a fireground ,but in extreme conditions any remnant ember is a threat.

Aeroplanes are still needed in case fire get larger as they have greater capacity and can treat a larger area.

Helicopters have the advantage however that they can hover and drop their load on a more precise and limited area, ie like pouring a bucket of water on the fire, rather than a plane which drops more like heavy rain

Helicopters would need to be stationed within half an hours travel of possible ignition points.

If crews could be taken in to assure complete extinguishing of a fire that would be ideal, but in many cases heat detecting surveillance would have to suffice in remote areas.

Because of the number of aircraft required and the occasional nature of their use, Helicopters and planes used normally for other purposes would need to be adapted and brought into service.

Private companies, air force, navy, army, security, and other government agencies are places, aircraft could be sourced from, but they would have to be suitably equipped, and crews trained prior to the extreme events, and put under total control of the fire control agency (RFS in NSW) . It would

not be satisfactory, for say, an air sea rescue helicopter to leave its appointed watch area to do a rescue, without it being replaced by another.

A fuel dump or a tanker next to a water source might satisfy a helicopter, but fixed wing aircraft require landing strips. It is important that the aircraft available should be used as efficiently as possible and not have to travel from Richmond Airforce Base to the Snowy Mountains and back to do a waterbombing run. Some roads and highways could be closed off for landing strips, but bypass roads for motor traffic should be anticipated and prepared before the event.

As happened this year the southern hemisphere and northern hemisphere fire seasons overlapped, so we must be prepared to be self sufficient.

At present the most effective way of reducing crown fires seems to be water bombing .

To increase the efficiency of the water bombing the use of “retardants” are used.

We need to make sure that the retardants do not have long term adverse environmental effects.

The fire retardant water will often be dropped on people, fire fighters and residents (Hornsby a whole Street was turned red). Benign compounds need to be sourced (alginates etc) rather than more toxic but maybe more efficient compounds) for use in the water bombing.. The water used must likewise not have adverse effects (eg sea water)

The costs of preparation will be high but cheap compared to the possible damage by not adequately preparing!

“HAZARD REDUCTION “

In broad terms is the reducing the risk of wild fire ignition, and if fire does happen, measures to reduce its intensity and spread and aid extinguishing of the fire

The burning of, or mechanical removing of undergrowth, is widely practised but has limited effect during catastrophic fires, and if done too often changes the vegetation from woody plants, to grasses, creating a greater hazard.

My observations are that this process is done well by the RFS. Unfortunately if an area is to be hazard reduced every 5 years, some times a wild fire will occur there when it is 4 years since last treatment. The areas being hazard reduced are organised in a matrix so the areas next that area will have been treated more recently.

The neglected areas of hazard reduction are;

maintaining of ground water levels, to maintain the hydration of the vegetation, and so lower its flammability.

It is well documented that land clearing lowers rainfall, also stopping natural water flows in rivers and streams, lowers the water table, as does excessive use of bores.

We should be planting trees to encourage rain, and also slow winds, which dry the ground.

The thinning of forests is more likely to increase the intensity of any wild fire, and speed its spread due to allowing greater access for breeze (oxygen), and so should be discouraged.

Although it would be best if all fires could be contained and extinguished at inception, we must be prepared for uncontained fires, and so we must also ensure that our built assets are fire resistant and defensible.

Building regulations need to be revised to take into account the greater intensity and range of wild fire effects. Also once built a mechanism to ensure the standards are maintained. Fire protection should be self contained , not relying on a neighbour, ie asset protection zones should be wholly on the land of the asset.