THEME 3A- PEOPLE AND PROPERTY IMPACTS

Theme leader: Katharine Haynes

Subproject: Ignition impacts

Subproject lead: Stephanie Samson, Katharine Haynes

OVERVIEW

1. Theme

People and property impacts

2. Project question or problem statement

What ignition sources were the main causes of loss of human life, houses and area burnt in the 2019/2020 bushfire season?

3. Key findings

- Fires attributed to lightning strikes burnt an area six times greater than fires resulting from anthropogenic ignitions (Figure 1)

- Fires ignited by lightning contributed to 58.1% of house losses (Figure 2) and 45.2% of house damage (Figure 3). Fires that were associated with anthropogenic ignition sources contributed to 6.1% of the house losses and 9.3% of house damage. The remaining house loss and damage is attributed to undetermined ignition sources (see limitations section below).

- Only 3.5% of fires began on 23 of the 61 declared Total Fire Ban (TOBAN) days during the 2019/2020 season. The remaining 96.5% of fires began on non TOBAN days. Lightning strikes were the prominent sources of ignitions TOBAN days (Figure 4).

- Fires originating from lightning strikes claimed 19 of the 25 human lives lost in NSW in the 2019/2020 fire season (Figure 5).

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4. Significance of findings in context of previous studies

ℹ Anthropogenic ignitions (accidental and intentional) tend to occur in closer proximity to urban fringes with high population densities (Collins et al. 2015), posing a greater risk to urban areas than lightning ignitions (Penman et al. 2013) that generally occur in remote locations (Dowdy & Mills 2012). For example, a study by Collins et al. (2016) examined 12 years of house loss from fires with known ignition causes in eastern Australia, finding that fires with anthropogenic ignitions contributed to 89% of losses, while lightning ignition fires caused 11%.

However, during the 2019/2020 fire season extreme fuel dryness and fire weather (Nolan, 2020; Clarke, 2020) resulted in an unprecedented, large area burnt. Lightning ignited fires therefore spread out of remote wilderness, reaching and affecting developed areas. During this season fires ignited by lightning caused 45% of house losses while fires with anthropogenic ignitions caused substantially lower losses, approximately 6%.

5. Limitations and remaining knowledge gaps

ℹ The spatial patterns of lighting ignitions during the 2019/2020 were not explored due to the lack of data availability. Long-term trends show increases in dry lightning events (lightning on days of little rainfall) in southeastern Australia (Dowdy, 2020) and the potential for lightning ignitions to increase in response to changing climate (Mariani, et al. 2018). Understanding the spatial patterns of the 2019/2020 NSW bushfire season will provided a better insight for managing lightning ignitions.

Ignition data was available for 49 of the 958 fires (accounting for 64% of houses lost) that occurred during the 2019/2020 fire season, the determined ignition sources are as per the Fire Investigation Unit (FIU) investigations. Due to the recent nature of the fire season, investigations are still in progress hence this report should be considered preliminary work.

6. Implications for fire management

ℹ Lightning ignited fires were the most destructive of the 2019/2020 bushfire season in NSW in terms of loss of human lives, house loss and area burnt. Reducing the risk posed by lightning strikes through the management of areas that pose greatest risk for such ignitions, i.e. ridge tops (Penman et al.

2013), may be essential in mitigating the kind of losses experienced this season.

Comparison with other years is necessary to understand the impact of public messaging in reducing anthropogenic ignitions. However, the data presented on the 2019/2020 fire season suggests that the smaller number of anthropogenic ignitions on TOBAN compared to non TOBAN days indicates that people were receiving and acting on official advice.

7. Figures

Figure 1. Area burnt (hectares) in NSW during the 2019/2020 bushfire season as per Fire Investigation Unit (FIU) determined ignition source. Debris burning may include burning off (legal and illegal), pile burning and containment burning operations. Number of fires = 958.
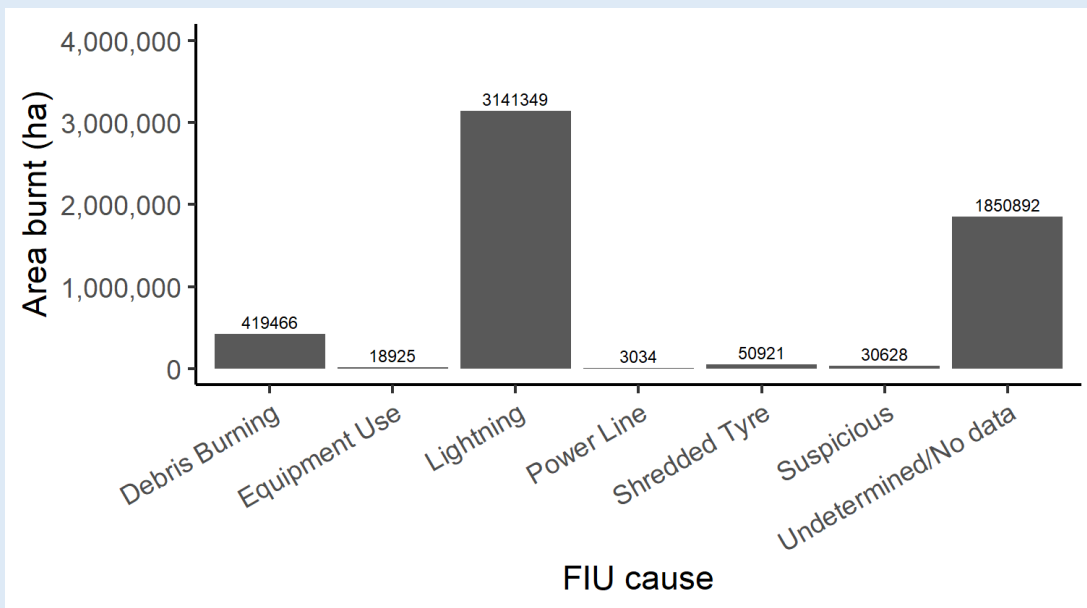
Figure 2. Percentage of houses destroyed in NSW during the 2019/2020 bushfire season as per Fire Investigation Unit (FIU) determined ignition source. Debris burning may include burning off (legal and illegal), pile burning and containment burning operations. Number houses = 2353.
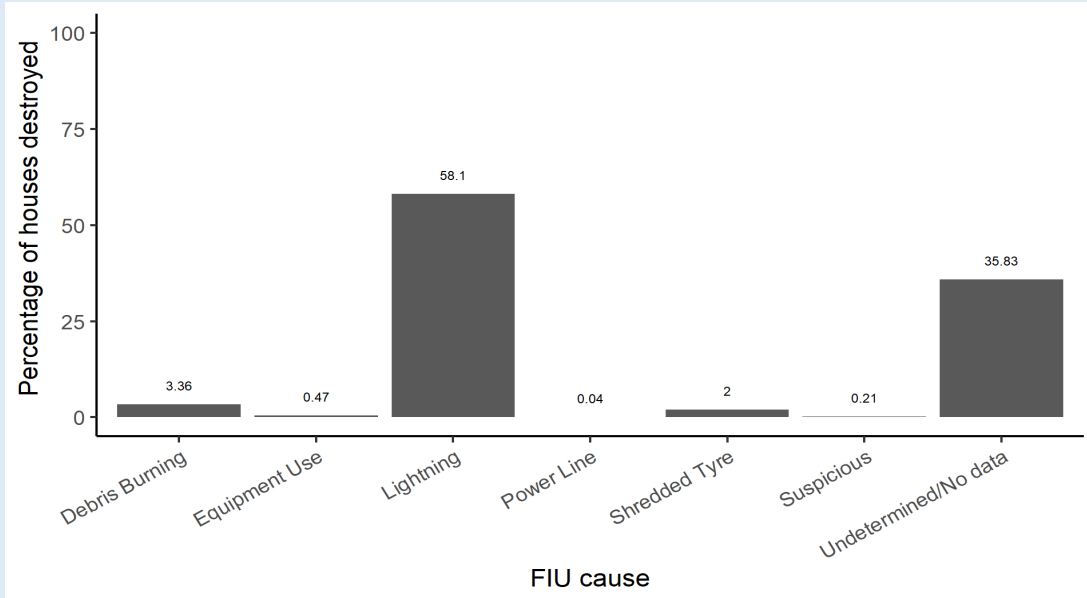

Figure 3. Percentage of houses damaged in NSW during the 2019/2020 bushfire season as per Fire Investigation Unit (FIU) determined ignition source. Debris burning may include burning off (legal and illegal), pile burning and containment burning operations. Number houses=903.
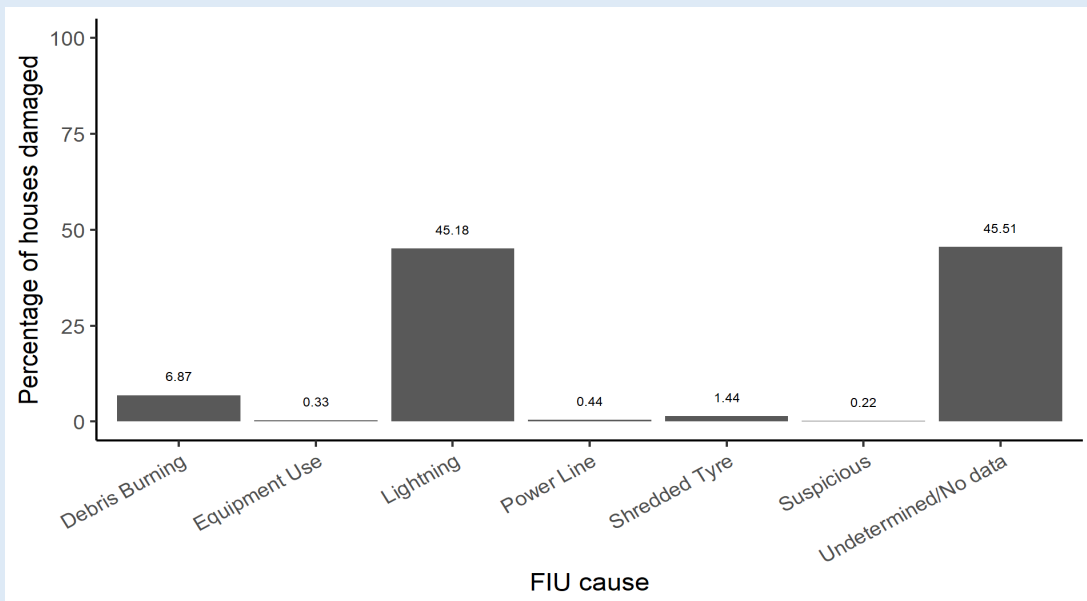
Figure 4. Number of fires that started on total fire ban (TOBAN) and non TOBAN days in NSW during the 2019/2020 bushfire season as per a) fire ignition sources that have been determined by the Fire Investigation Unit (FIU) and b) ignition sources that are undetermined or have no data. Black filled bars represent fires that started on non TOBAN days; grey bars represent fires that started on TOBAN days. Debris burning may include burning off (legal and illegal), pile burning and containment burning operations Number houses = 2353. Number of TOBAN days = 60 (2019-2020 Bush Fire Danger Period lasted 212 days).
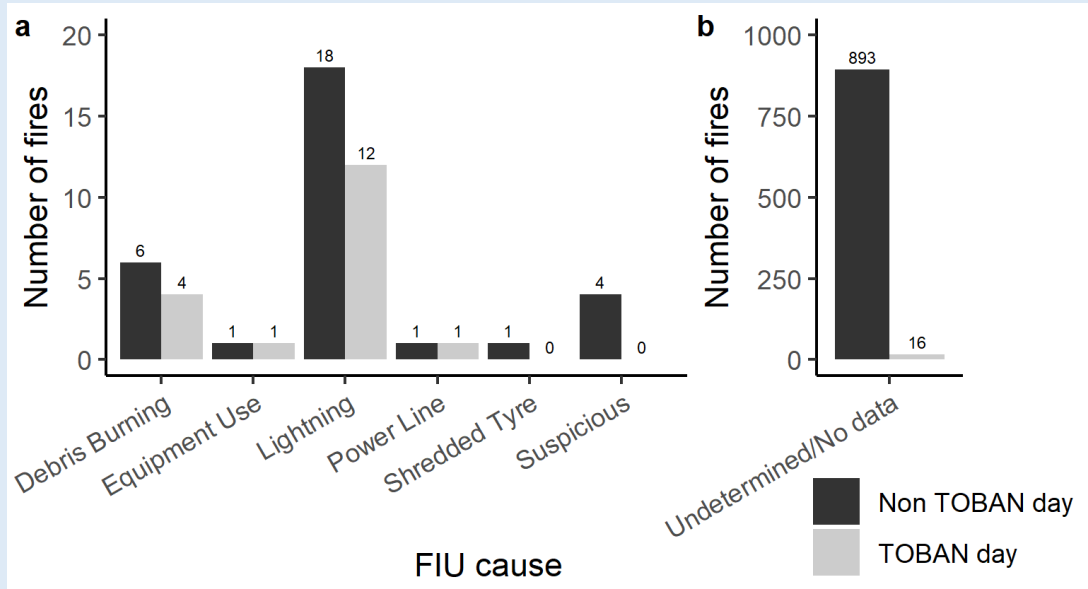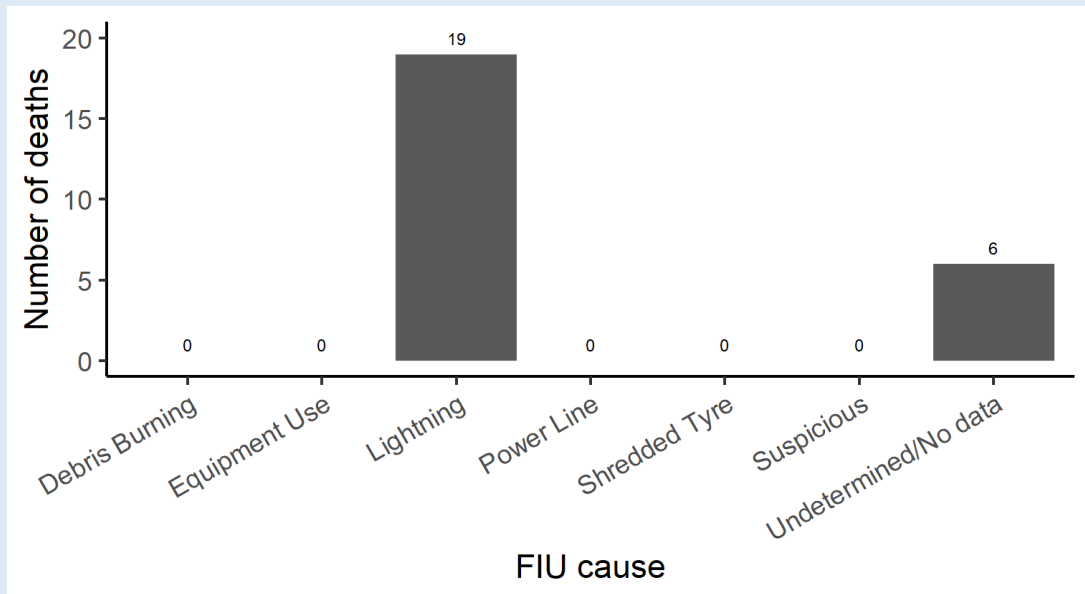

Figure 5. Number of lives lost in NSW during the 2019/2020 bushfire season Fire Investigation Unit (FIU) determined ignition source. Debris burning may include burning off (legal and illegal), pile burning and containment burning operations.

8. Key reference list

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9. Appendix

Methods

Fire ignition, Building Impact Assessment (BIA) and total fire ban (TOBAN) data for the NSW bushfire season 2019/2020 was provided by the NSW Rural Fire Service (RFS). We used the Fire Investigation Unit determined ignition causes (as of data acquisition date March 2020) of 958 fires, 9of which 49 had determined causes of ignitions (Table 1). The BIA data includes impact assessments for 44000 structures, assessments found 2353 houses to be destroyed and 903 houses damaged. Data on house loss and house damage was merged with ignition data to extract each fire's ignition source, area burnt, house loss and damage caused (Table 1).

TOBAN days are declared to reduce the risk of ignitions occurring under unfavorable weather conditions (hot, windy, dry) which are likely to result in substantial fire spread causing damage to life and property. There are 21 NSW Fire Areas, not all may be subjected to a TOBAN on the same day. The TOBAN data was used to determine if fire ignition dates and locations coincided with TOBAN days.

Fatality data was extracted from media releases, primarily the Daily Telegraph report on January 22nd. The location and date of each fatality was used to determine which fire and hence, ignition source resulted in loss of life (Table 1).

Table 1. The number of fires; number of houses destroyed and damaged; number of human lives lost; and area burnt (ha) as per the Fire Investigation Unit (FIU) determined ignition source during the NSW 2019/2020 bushfire season.

FIU ignition cause	No. of fires	Area burnt (ha)	No. of houses destroyed	No. of houses damaged	No. of deaths	No. fires started on TOBAN day	No. fires started on non TOBAN day
Debris Burning	10	419,466	79	62	0	4	6
Equipment Use	2	18,925	11	3	0	1	1
Lightning	30	3,141,349	1367	408	19	12	18
Power Line	2	3,034	1	4	0	1	1
Shredded Tyre	1	50,921	47	13	0	0	1
Suspicious	4	30,628	5	2	0	0	4
Undetermined/ No data	909	1,850,892	843	411	6	16	893
Total	958	5,515,215	2353	903	25	34	924