



Tasmania

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The first part of this chapter provides **contextual information** on Tasmania, including basic information about its climate, geography, land use and population. It also provides an outline of the bushfire regimes, historically important bushfire events, and overview of fire services in Tasmania. The second part represents an **analysis of data** provided by the Tasmanian Fire Service. Although the Tasmania Fire Service attends many types of fire incidents, this analysis exclusively refers to vegetation fires, unless otherwise indicated.

For an explanation of the key terms, limitations and methodology refer to the introduction, glossary and methodology chapters.

Introduction

The state of Tasmania comprises a group of islands to the south of Victoria. It is separated from the mainland by the 240 km wide (on average) Bass Strait. Tasmania is bounded by the Southern Ocean to the south and west and by the Tasman Sea on the east. The island spans 296 km from north to south, and 315 km from east to west at its greatest extent.

Geography

The western half of Tasmania is dominated by a rugged mountain range that extends from the southwest coast to further inland and northward (Figure 1). This mountain range reaches approximately 1,600 m at its highest point. A plateau that was largely shaped by glacial activity during the last ice age dominates the central west. This region has numerous lakes and represents the starting point for many of Tasmania's rivers, including the Derwent, which flows southeast to Hobart; the Esk, Tamar and Mersery, which all flow north; and the Franklin and Gordon Rivers, which flow west. The eastern half of the state is generally lower in altitude and has lower relief, although there are several notable mountain ranges in the east.

Figure 1: Map of Tasmania



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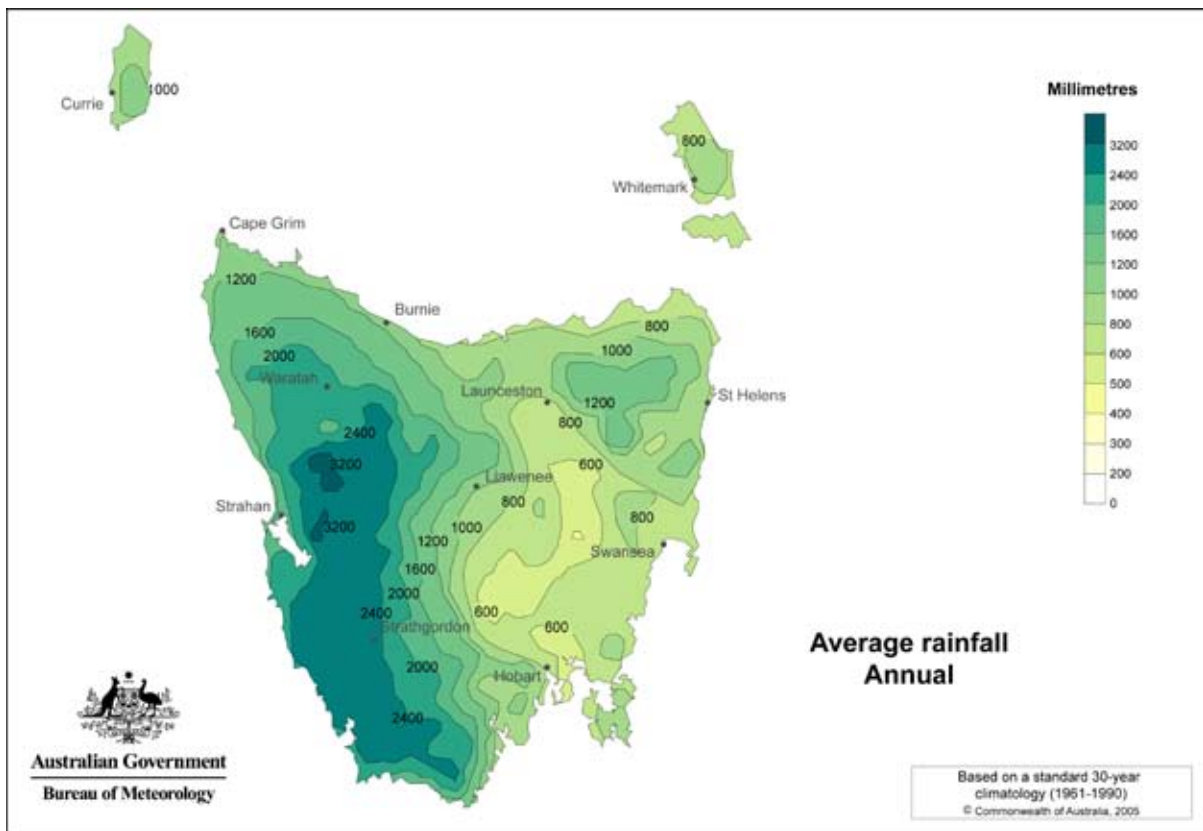
Climate

Overall, Tasmania is the coolest and wettest of Australia's states. At latitude 42° south, Tasmania lies directly in the path of the Roaring Forties, a band of strong winds that encircles the Earth. In winter the movement of cold fronts from west to east across the state largely shape Tasmania's climate, as cold air masses move from Antarctica toward the equator. Cold fronts have less influence on Tasmania's weather in summer as a band of high pressure pushes them further south. During an average week Tasmania experiences extremely variable fluctuations in both temperature and wind speed.

Tasmania experiences a temperate climate with four distinct seasons. Summer days are typically warm and sunny and are characterised by mild evenings. Thunderstorms commonly occur early in the season and temperatures can reach up to 35°C, but in general will be between 20 and 30°C. Tasmania's classic autumn features clear cool days and very cool to frosty nights, during which deciduous trees display autumn colours and lose their leaves. Winters are characterised by sudden storms, shorter daylight hours and snow on the higher peaks. Winter temperatures may reach lows of -10°C in the highlands, but coastal areas rarely go below freezing (Australian Bureau of Meteorology 2007a).

The southwest has exceptionally high rainfall (2400 mm; Figure 2), owing to precipitation from moisture-laden air masses, cooling as it passes over the central plateau. The ensuing rain shadow effect, results in warmer and drier conditions on the east coast. Hobart, located in the southeast, has an annual average rainfall of just 625 mm (Australian Bureau of Meteorology 2007b).

Figure 2: Average annual rainfall for Tasmania



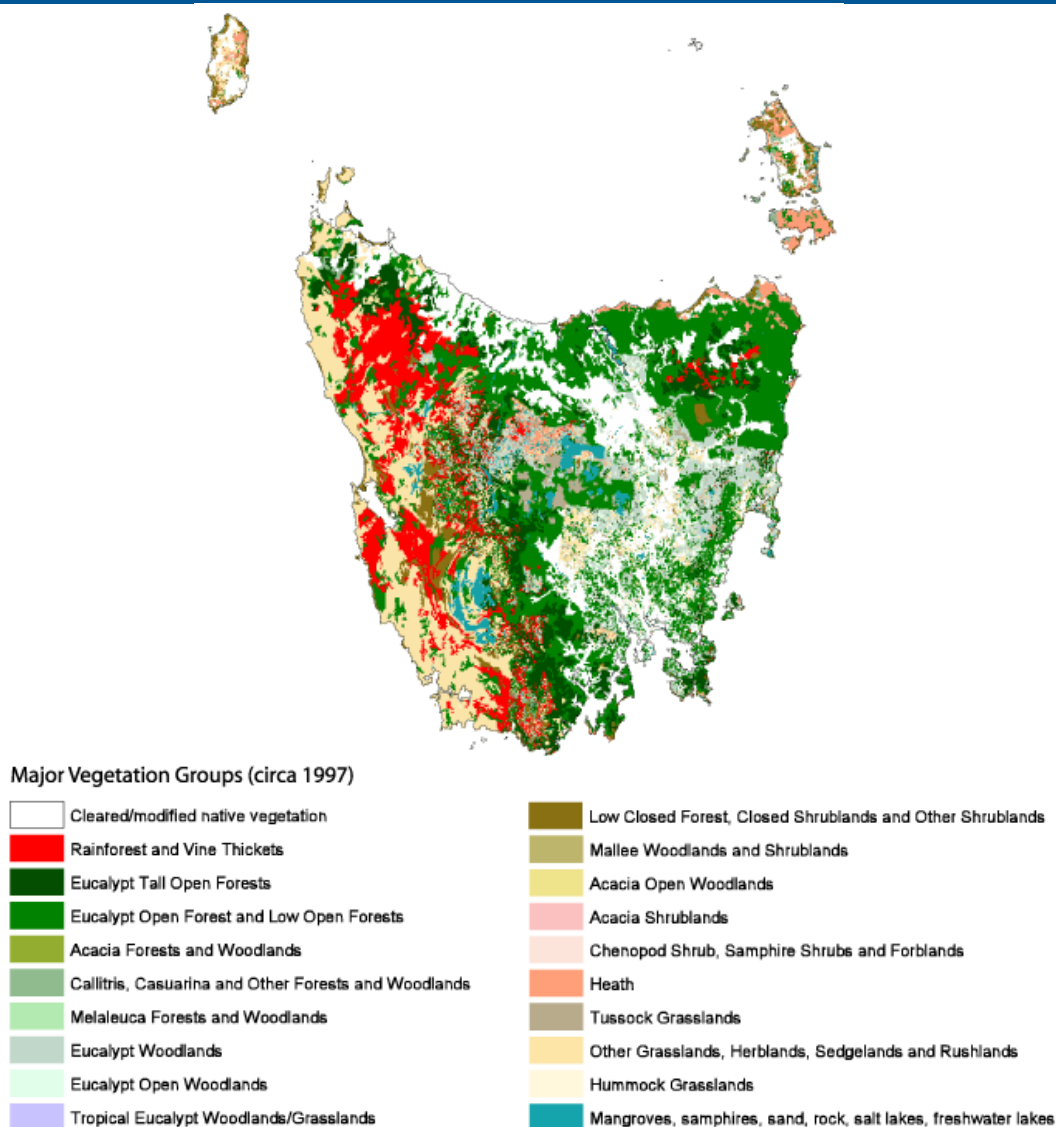
Source: Australian Bureau of Meteorology 2007b
 © Australian Bureau of Meteorology

Native vegetation

Vegetation in Tasmania is exceptionally diverse including tall evergreen Eucalypt forests, alpine heathlands and large areas of cool temperate rainforests and moorlands. Many species of flora are unique to Tasmania, and in many cases show greater similarities with species in South America and New Zealand than in mainland Australia species.

Eucalypt tall open forests, which often rise to 100 m, eucalypt open forest and low open forest dominate the north and east, although much of the central east and northwest have been modified by, or cleared for, agriculture (Figure 3). Rainforests and vine thickets are abundant in the wetter parts of Tasmania, namely on the west coast and to a lesser extent the northeast. The west coast also contains abundant grasslands, closed shrublands, some Eucalypt forests and small areas of heath. Grasslands, including tussock grassland also occur throughout the Central Highlands, and much of the northwest. Extensive heaths are found along the northern coast of eastern Tasmania in on major neighbouring islands (Australia. Department of Environment and Heritage 2001b).

Figure 3: Major vegetation groups (c. 1997)

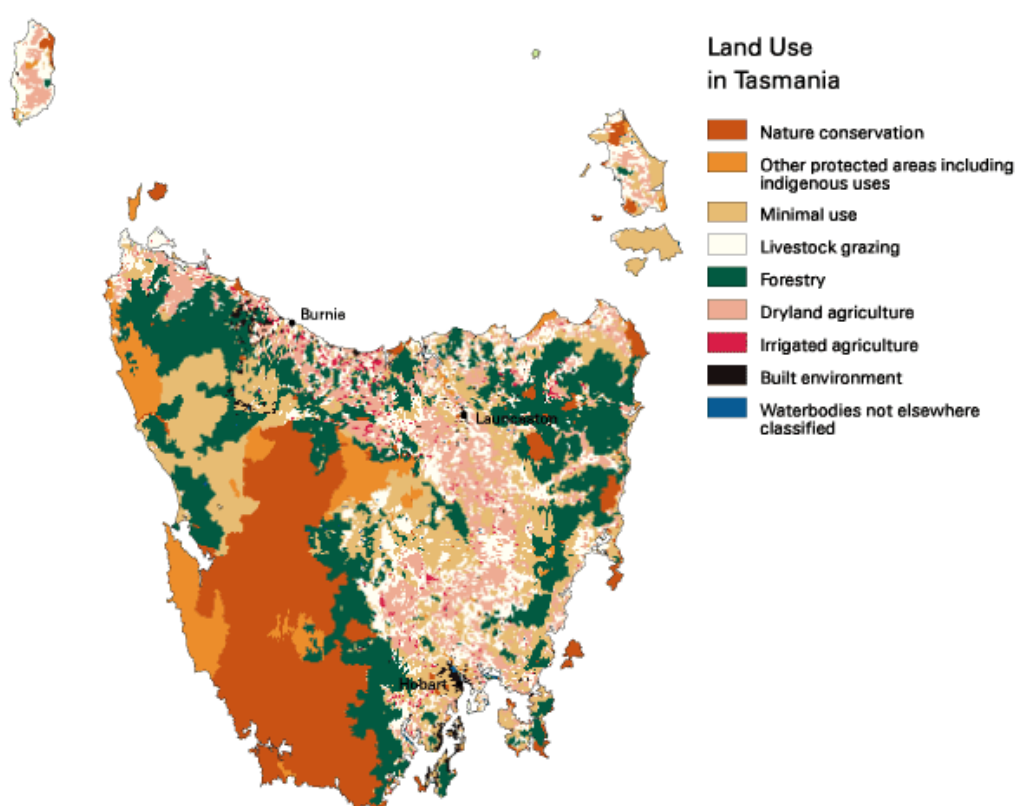


Source: Australia. Department of Environment and Heritage 2001b
 © Department of Environment and Heritage

Land use

In 1996–97, commercial forestry was the largest single land use in Tasmania, covering around 24 percent of the state (Figure 4). This mainly occurred in native hardwood forests, though there are increasing areas of plantations of both exotic softwoods and native hardwoods. Collectively, nature conservation (21%), which mostly occurs in national parks, and minimal use areas (21%), which largely consist of remnant vegetation cover, accounted for almost half the state. Tasmania has the highest density of land preserved in reserves, national parks and World Heritage Sites of any state in Australia. The overwhelming majority of these sites are located in the southwest. Dryland agriculture, interspersed with livestock grazing and isolated patches of irrigated agriculture, occurs through the central north–south band of the island, along the northern margin, and to a lesser extent in the east. Collectively, agriculture occurs on just over one-quarter of Tasmania (Australia. Department of Environment and Heritage 2001a).

Figure 4: Land use (c. 1996–97)



Source: Australia. Department of Environment and Heritage 2001a
© Department of Environment and Heritage

Population

Tasmania's population, as of 30 June 2006, was 488,900, accounting for just 2.4 percent of the country's population (ABS 2006). The population is roughly equally divided between north and south. Approximately 42 percent of the state population lives in Hobart statistical subdivision. Major regional centres in the north include Launceston, Burnie and Devonport. Launceston and Burnie statistical divisions accounted for 21 and 16 percent of the state's population in 2005 (ABS 2005a).

The median age of the resident population, as of 30 June 2005, was 38.7; 2.1 years higher than the national average (ABS 2005a). The highest median age was in the Southern statistical subdivision (40.6

years), followed by Mersey–Lyell (39.2 years), Northern (38.5 years) and Greater Hobart (38.2 years). Nevertheless, the highest proportion of people aged 0 to 14 live in the Southern (21.0%), Mersey–Lyell (20.4%), Northern (20.1%) and Greater Hobart (19.3%) statistical subdivisions. Local government areas with the lowest median ages and the highest proportion of children aged 0 to 14 years included Brighton (31.5 years), West Coast (36.1 years) and Circular Head (36.8 years).

Bushfire regimes

Bushfires in Tasmania are most commonly associated with dry conditions during summer and autumn. Bushfires may occur from November to mid May, although the exact timing of peak bushfire danger varies between seasons, depending on the rainfall distribution over late spring to autumn. Large differences in rainfall distribution across the state affect not only the bushfire regimes, but also the susceptibility of the vegetation to fire. The wetter areas of the southwest may rarely experience fire, because it is only under extreme drought conditions that vegetation dries sufficiently to allow fires to spread. Areas in the north and east (excluding some around Ben Lomond) receive lower rainfall and are more prone to bushfires under hot, dry summer–autumn conditions.

Although Tasmania is not renowned for bushfires, it is periodically vulnerable because:

- much of the state is vegetated, which poses inherent difficulties for fire suppression
- it represents one of the least urbanised states in Australia, with the population spread over much of the east and north of the state
- high rainfall–low evaporative conditions give rise to abundant vegetative growth and high fuel loads; managing fuel loads may be difficult owing to disruptions from intermittent rains during spring and early summer
- extreme fire conditions are not uncommon during seasons dominated by drought, but equally may occur after a short period of extreme bushfire weather that follows generally dry conditions
- fires in certain parts of the state may have devastating environmental impacts, as many of the species in the generally wetter regions (particularly southwest) are fire sensitive, being ill equipped to survive fire events (Tasmania Parks and Wildlife 2006).

Bushfire history

The most adverse bushfire events and seasons in Tasmania are summarised in Table 1. The devastating fires of 1967 are discussed in detail below.

1967: Black Tuesday – 7 February – Wet conditions in southeastern Tasmania in late winter late and spring were followed by a period of exceptionally dry conditions – beginning in November – resulting in the curing of the luxuriant growth that the previous wet weather had promoted. Although January was not particularly hot, there were extreme temperatures and low humidity on the four days leading up to Black Tuesday. During this time numerous fires burned to the north of Hobart. Exceptionally hot conditions, low humidity and very strong northwesterly winds – fire index of 96 – brought suburban Hobart and neighbouring settlements under direct attack from bushfires, with devastating effect. The fires resulted in 62 deaths and 900 injuries; as well as the deaths of 500 horses, 1,350 cattle, 60,000 sheep, 24,000 chickens, 600 pigs, and other animals. Over 3,000 buildings were destroyed, including 1,293 homes and 128 other major buildings (factories, churches, schools, post offices etc.). Also lost were 80 bridges and thousands of power poles, 1,500 vehicles, and 5,400 km of farm fences. A total of 265,000 ha were burned, including 20 percent of the state’s fruit crop as well as other crops, pasture and forest. The total estimated cost was approximately \$45 million (1967 values). Of the 110 fires that burned on 7 February 1967, only 22 were accidental. Some had been deliberate lit for back burning despite the extreme weather conditions at the time (EMA 2006, Ellis, Kanowski & Whelan 2004).

Table 1: Fire history of Tasmania

Date	No. of deaths	Area of fire (ha)	Losses	Location(s)
1897, 1898, 1912				Well-timbered western part of state, northwest coastal region; Huon, Channel, Hobart and New Norfolk districts
1913–14 season			Orchards, buildings, stock	Mount Wellington, Huon
1920				Northwest
1921				Northeast
1927				Southeastern districts, Tasman Peninsula
1933–34 season				Florentine, Derwent Valley, northwest forests and west coast
1939		9,600	Forests, orchards, pastures	Huon, Derwent Valley, west coast, King Island
1940		16,000		Hobart
1945–46 season				Mount Wellington
1951			Hundreds of thousands of metres of marketable timber	Huon
1960–61 season				Parattah, Perth and through Midlands
1963–64 season			Pine plantations	Cambridge, Hobart, Snug, north coast
1966–67 season	62	264,270	Greater than 1,400 houses, 128 major buildings, 1,500 vehicles, 50,000 sheep, 1,350 cattle, 1,000 pigs, 4800 km of fences	Southeast, Hobart
1977				Zeehan
1980		40,000		Launceston, Hobart, Zeehan
1981			6 houses	Pelverata, Bonnet Hill
1982	1	>40,000		Launceston, Hobart, Broadmarsh
1998		3,000	6 houses	Hobart's southern suburbs
2003		41,000		

Source: Ellis, Kanowski & Whelan 2004

Fire services

Three major agencies provide fire services in South Australia. They are the Tasmania Fire Service, Tasmania Parks and Wildlife Service and Forestry Tasmania.

The **Tasmanian Fire Service** attends a diverse range of emergencies including bushfires, structural and vehicle fires, hazardous material incidents, urban search and rescue and high angle rescue, as well as other types of incidents. It incorporates over 230 fire brigades across Tasmania and its islands. Approximately 250 career firefighters and approximately 4,800 volunteer firefighters provide coverage for most urban and rural districts (Ellis, Kanowski & Whelan 2004, see also <http://www.fire.tas.gov.au>).

The **Tasmanian Parks and Wildlife Service** is responsible for managing national parks and other conservation reserves (Ellis, Kanowski & Whelan 2004, see also <http://www.parks.tas.gov.au/manage/fire/index>).

Forestry Tasmania is responsible for managing the state forests (Ellis, Kanowski & Whelan 2004, see also <http://www.forestrytas.com.au/forestrytas>).

The following analysis is based on vegetation fires attended by the Tasmanian Fire Service from 1999–2000 until 23 November 2004. The database provided complete coverage for all urban and rural areas that lie outside of national parks and state forests (approximately half the state). However, the Tasmanian Fire Service has mutual aid arrangements with Tasmanian National Parks and Wildlife and Forestry Tasmania, to ensure major bushfires are adequately resourced and managed. Hence, at least some, and presumably the largest, fires that occurred in national parks and state forests were recorded within the Tasmanian Fire Service database.

Tasmanian Fire Service analysis

Background about the TFS dataset and its analysis

Important information about the TFS dataset and the methodology used to analyse it is summarised as:

- Data were sourced from the Tasmanian Fire Service (TFS).
- The data provided included vegetation (wildfires) fires only.
- The dataset included fires from 1999–2000 until 23 November 2004.
- The database used Australian Incident Reporting System (AIRS) variables and codes.
- The cause of fires was based on the ignition factor variable.
- Deliberate vegetation fires refer to all vegetation fires classified as incendiary (AIRS ignition factor code 110 or 120) or suspicious (AIRS ignition factor code 210 or 220). The majority of fires were labelled as incendiary; only two vegetation fires were classified as suspicious.
- Natural fires refer to all fires where the ignition factor codes were 800 to 890, that is, any fires that resulted from any natural condition or event. The breakdown of TFS was; high wind 57 percent, high water including floods 0.5 percent, lightning 24 percent, and fires resulting from any other natural condition 19 percent.
- Information about the form of heat of ignition was not included within the supplied database
- Smoking-related fires included all fires where the ignition factor = abandoned or discarded materials (Ignition Factor code 310).
- All fires attributed to children and discussed in the text were classified accidental in origin. This may only be a small subset of fires started by children, as malicious fires started by children are incorporated in the incendiary or suspicious categories and cannot be identified. Information about the age of the child was supplied.
- The regions used in the TFS analysis were based on Australian Bureau of Statistics (ABS 2005b) tourism regions. The ABS defines tourism region based on smaller statistical areas so ABS tourism regions potentially crosscut suburbs and postcodes. In this study, assignation was based on the highest levels of concordance between postcodes and suburbs and tourism regions. Hence, there is not an exact correspondence between tourism regions used in this analysis and ABS tourism regions.
- The dataset included information about the area burned.
- No information was available regarding fire restrictions or fire danger index.

For more detail about these methodologies see the methodology chapter.

Overview

Fires attended by the TFS can be summarised as follows:

- The TFS attended 13,083 vegetation fires from 1999–2000 until 23 November 2004. Yearly fluctuations in fires numbers were small, with fire numbers varying between a minimum of 2,175 in 2003–04 and a maximum of 2,813 in 2002–03 (Figure 5). Although the peak number of fires occurred during 2002–03, the number of fires during this year did not substantially exceed those recorded in 1999–2000 or 2000–01.
- Increased cooperation between fire agencies, police, emergency services agencies and the media and increased engagement with local communities was a feature of 2002–03. The fire service's message was that communities and individuals needed to be more responsible in protecting their own properties (Ellis, Kanowski & Whelan 2004). It is unclear to what extent increased community awareness affected total and deliberate vegetation fire frequencies in 2002–03 or subsequent years.
- TFS fires occurred in a diverse range of environments including urban, rural and conservation areas; the majority were within or in close proximity to urban environments.
- Almost three-quarters of fires were grassfires, with approximately 10 percent occurring in forest or woodland settings.
- Thirty-six percent of all vegetation fires were deliberately lit.
- Approximately 190,000 ha were burned in vegetation fires in Tasmania during the observation period. The majority was grassland in regional areas. Deliberate causes were attributed to 6.6 percent of the total area burned.

Cause

Incendiary causes were singly the largest 'known' cause of TFS-attended vegetation fires, accounting for 36.3 percent of all fires (Figure 6). Only two fires (0.02%) were classified as suspicious. Hence, collectively, deliberate causes (incendiary and suspicious) accounted for 36.3 percent of all fires. Accidental causes accounted for a further 23 percent of all fires, with 4 percent resulting from reignition/exposure, 1.7 percent from natural causes, and another 3 percent result from other causes. The cause of 31.6 percent of all fires was unknown. Hence, deliberate causes accounted for 53 percent of known causes.

The proportion of deliberate fires increased from a low of 26 percent in 1999–2000 to approximately 40 percent in the years incorporating 2001–02 to 2003–04 (Figure 7), although lower rates of deliberate fires in 1999–2000 and 2000–01 may be obscured by the overall lower rates of causal attribution. The relative proportion of fires started by other causes remained comparatively stable over the five-year period.

Specific ignition factors

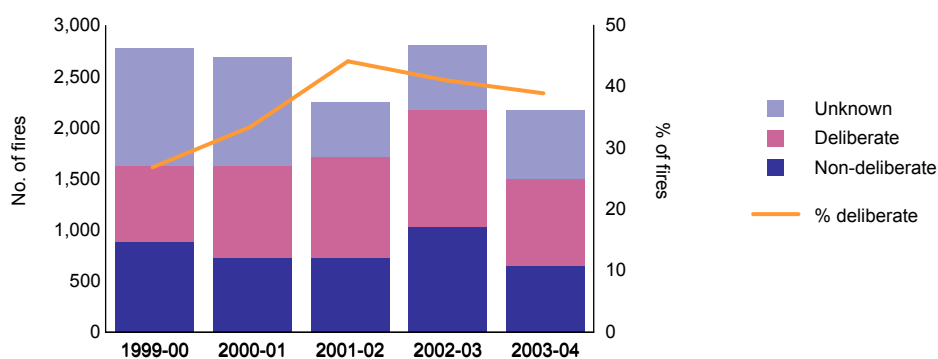
Ignition factor: Due to the structure of data available, it is not possible to attain more specific information about the ignition factors involved in deliberate fires. Of non-deliberate fires, the majority arose from misuse of heat of ignition and 'other' factors (Figure 8). Most fires within the 'other' category resulted from reignition (43%), vehicle fires (24%), and other ignition factors, not further classified (31%). Comparatively few fires resulted from mechanical causes (0.9%) or operational deficiencies (1.4%). Little temporal variation occurred in the relative contributions of individual ignition factor types at a gross scale (Figure 9).

Child and adolescent fires: Approximately 1.3 percent (n=172) of all vegetation fires the TFS attended were attributed to children younger than 16 years of age playing. This is unlikely, however, to reflect the total number of fires attributed to or started by children. All fires that are malicious in origin are classified as incendiary or suspicious within the AIRS database, and cannot be further delineated. Moreover, in

order for a fire to be attributed to a child, it requires evidence that a child was involved, for example, being sighted near the fire at the time it occurred. Hence, the actual number of fires attributed to children is likely to be substantially higher than has been observed. The number of non-deliberate child fires increased with age, with 0 to 5 year-olds accounting for three percent of fires and 13 to 16 year-olds 58 percent of fires (Figure 10).

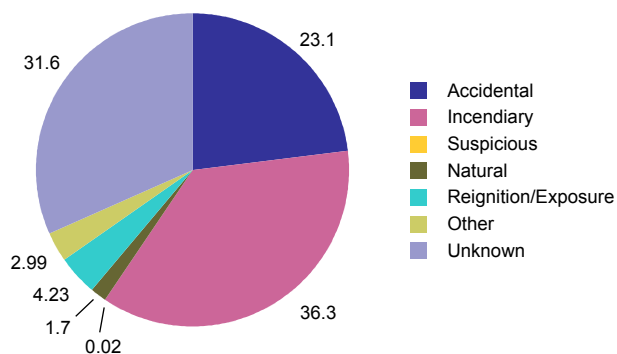
Smoking-related fires: Smoking-related fires accounted for 3 percent (n=403) of vegetation fires the TFS attended. This is equivalent to the proportion of cigarette-fires reported for rural or land management agencies in other jurisdictions, but is generally lower than that recorded by most urban-based brigades. These lower rates may in part reflect the fact that for the TFS smoking-related fires only refer to fires where the ignition factor code was ‘abandoned and discarded materials’. Evidence from other jurisdictions indicates that such fires form a subset of smoking-related fires and their definition is based on ‘form of heat of ignition’ factor codes. This is because in the latter definition fires are also variably classified as ‘misuse of heat of ignition’, incendiary, etc. within the ignition factor variable.

Figure 5: Cause of fires each year



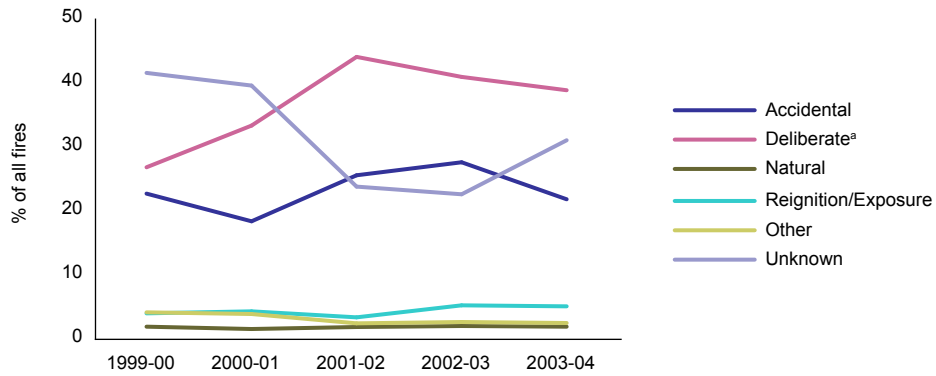
Source: TFS 1999–2000 to 2003–04 [computer file]

Figure 6: Fire cause (percent)



Source: TFS 1999–2000 to November 2004 [computer file]

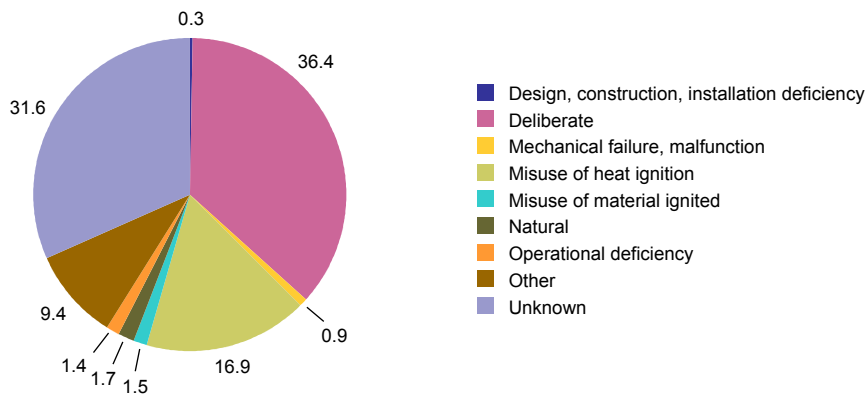
Figure 7: Cause of fire by year (percent)



a: in this, and all subsequent relevant figures, incendiary and suspicious fires are combined to yield a deliberate category.

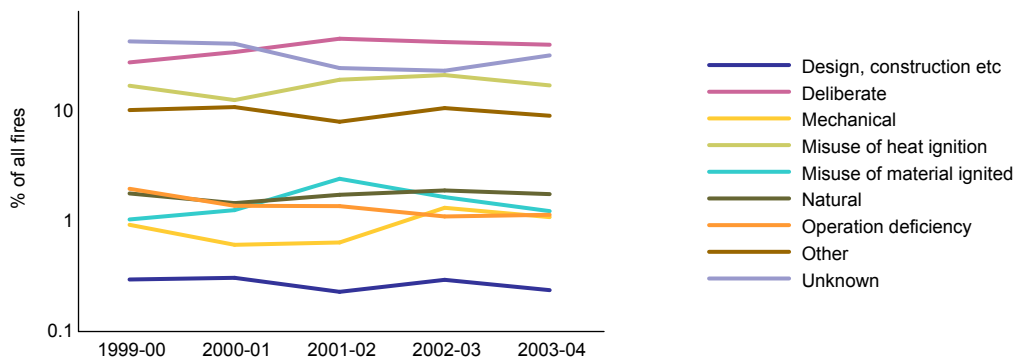
Source: TFS 1999–2000 to 2003–04 [computer file]

Figure 8: Ignition factor (percent)

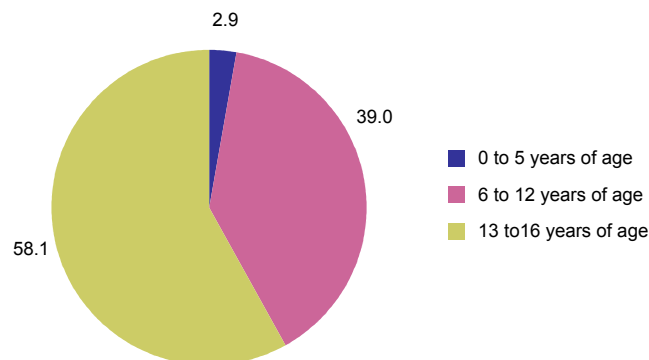


Source: TFS 1999–2000 to November 2004 [computer file]

Figure 9: Ignition factor by year (percent)



Source: TFS 1999–2000 to 2003–04 [computer file]

Figure 10: Non-deliberate child vegetation fires by age (percent)

Source: TFS 1999–2000 to November 2004 [computer file]

Location

The location analysis incorporates information about the distribution of fires at a regional level, at a postcode and suburb level, as well as the distribution of fires across Tasmania relative to the distribution of the population.

Region

Fires the TFS attended were assigned to one of six tourism regions based on the postcode and suburb in which the fire occurred (Figure 11). The majority of all fires occurred in or near major urban centres, with 44 percent occurring within the Greater Hobart region (Figure 12). A further 17 percent occurred in the Greater Launceston region. The TFS attended comparatively few fires in the East Coast and West Coast regions.

The total number of deliberate vegetation fires strongly correlated with the total number of vegetation fires within each region ($r = .98$, $p < .001$). Nevertheless, some variation was evident in the percentage of deliberate vegetation fires in each region. The highest percentage of deliberate fires occurred in the Greater Launceston (47%) and Greater Hobart regions (48%). Fifty-nine percent of all deliberate vegetation fires the TFS attended occurred in Hobart. Twenty-three percent of all deliberate vegetation fires occurred in the Greater Launceston area.

Collectively, only 18 percent of vegetation fires that occurred outside the Greater Launceston and Greater Hobart regions were attributed to deliberate causes. The highest percentage of deliberate fires in regional Tasmania occurred in the West Coast (26% deliberate) and North West (25% deliberate) regions (Figure 12). Comparatively lower rates of deliberate fires occurred in the Northern region, a reflection of the high proportion of both accidental and unknown fires.

Approximately three-quarters of non-deliberate **child fires** occurred in the Greater Hobart region (Figure 13). Overall, there was a moderately strong correlation between the numbers of non-deliberate child fires and total vegetation fire numbers occurring in each postcode ($r = .86$; significant at $p < .001$). Hence, suburbs or postcodes documenting high total numbers of vegetation fires also typically recorded high numbers of vegetation fires started by children. Due to the low frequencies of child fires, such trends need to be treated with caution. However, they may provide a working basis for tackling the issue of child fires in some areas of Tasmania.

The greatest number of fires started by abandoned or discarded materials (**smoking-related fires**) occurred in the Greater Hobart, North West, and Greater Launceston regions. These regions accounted for 22, 17 and 16 percent of documented smoking-related TFS-attended fires, respectively (Figure 14). Nevertheless, smoking-related fires accounted for the highest proportion of all fires within a region in the East Coast (10%), and to a lesser extent Northern, North West and Greater Launceston areas (approximately 5%; Figure 14). Smoking-related fires were responsible for less than two percent of fires in the Southern and Greater Hobart region. Based on results from other jurisdictions it is somewhat unusual that the highest proportion of smoking-related fires occurred in regional as opposed to metropolitan areas.

Postcode

All vegetation fires: There is a large degree of heterogeneity of fire incidence at a postcode level. One postcode in the Greater Hobart region recorded in excess of 1,000 vegetation fires (all causes) in the five years, accounting for 28 percent of all vegetation fires in the Greater Hobart region and 13 percent of all TFS-attended vegetation fires in Tasmania over the five-year period (Table 2; Figure 15). A further four postcodes, two each in the Greater Hobart and Greater Launceston regions recorded 200 to 499 fires during the same period. Postcodes recording 200 to 499 fires accounted for two-thirds of fires in the Greater Launceston, and just over one-quarter of fires in the Greater Hobart region (Table 2; Figure 15). The five postcodes recording in excess of 500 fires in five years accounted for 38 percent of all vegetation fires the TFS documented.

A further eight postcodes recorded 200 to 499 fires – Greater Hobart (3), Greater Launceston (1), North West (3), Southern (1) – and 18 postcodes recorded 100 to 199 postcodes in five years. The 31 postcodes having 100 or more fires accounted for 38 and 77 percent of all TFS-attended fires for the five-year period (Figure 15).

Table 2: Number of postcodes within specific fire frequency ranges for 1999–2000 to 2003–04 for each region

Suburbs	Tasmania		G. Hobart		G. Launceston		North West		Northern		Southern		East Coast		West Coast	
	No. suburbs	% fires	No. suburbs	% fires	No. suburbs	% fires	No. suburbs	% fires	No. suburbs	% fires	No. suburbs	% fires	No. suburbs	% fires	No. suburbs	% fires
All vegetation fires																
>1000	1	13.3	1	28.1												
500–999	4	24.5	2	27.4	2	67.6										
200–499	8	19.2	3	18.0	1	10.7	3	46.5			1	25.9				
100–199	18	19.5	6	13.6	1	5.5	5	36.7	2	26.5	3	35.0	1	54.4		
50–99	18	11.1	4	5.9	3	10.3	1	4.3	8	44.6	1	8.3	1	34.1		
<50	64	12.3	16	7.0	4	6.0	4	12.4	14	28.9	21	30.9	1	11.5	4	100
Deliberate vegetation fires																
>500	2	36.2	2	59.7												
200–499	3	24.4	1	9.0	2	83.4										
100–199	6	16.4	3	14.2	1	11.8	2	56.2								
50–99	3	4.9	2	5.6							1	28.3				
25–49	12	8.6	5	6.0	1	3.9	3	22.5			3	36.7				
<25	70	9.4	17	5.5	5	0.9	8	21.3	15	100	18	35.1	3	100	4	100

Deliberate vegetation fires were more highly concentrated within specific locations than total fire frequencies. This is illustrated by the statistics that show:

- Two postcodes in Tasmania recorded in excess of 500 deliberate fires in five years. Both were located in the Greater Hobart region. These two postcodes accounted for 60 and 36 percent of all deliberate vegetation fires the TFS attended in the Greater Hobart region and in Tasmania respectively (Table 2; Figure 16).
- Two postcodes in the Greater Launceston region recorded more than 200 deliberate fires in five years. These two postcodes accounted for 83 percent of fires in the Greater Launceston region.
- Two postcodes in the North West region recorded more than 100 deliberate fires in five years. These postcodes accounted for 60 percent of all deliberate fires in the North West region.
- Overall, the 11 postcodes in Tasmania with more than 20 deliberate fires per year (100 deliberate fires in five years) were responsible for more than three-quarters of all deliberate fires the TFS attended in Tasmania.

Broadly, there was a tendency for the percentage of deliberate vegetation fires to increase as the number of vegetation fires within individual postcodes increased (Figure 17). Commonly, between 50 and 80 percent of fires were deliberate in postcodes recording in excess of 200 deliberate vegetation fires in five years. The few suburbs that documented high numbers and high proportions of deliberate fires markedly affected the statistics for deliberate fires observed in those regions. For example, if postcodes with greater than 500 fires are excluded, the percentage of deliberate fires in the Greater Hobart region drops from 48 to 32 percent.

Population analysis

The general tendency for the highest numbers of vegetation fires to occur in areas where there are the greatest numbers of people breaks down under detailed examination. The analysis in this section examines the relationship between fire incidence and population.

All vegetation fires: Both regional and urban postcodes experienced a broad range of fires on a per-person-per-year basis (Figure 18). Collectively, individual postcodes in Tasmania (TFS fires only) recorded seven to 380 vegetation fires per 10,000 people per year. Overall, the numbers of fires per 10,000 people per year decreased with increasing population size, principally because of the highly diverse nature of the rates calculated for small communities. That smaller communities (postcodes) commonly experienced a higher number of fires than larger communities on a per-person basis is not surprising as:

- The lowest rate of fires per person is defined by a single fire event within a postcode in five years. A single fire in a small community will necessarily lead to higher rates than in a larger community. A longer observation period is required in smaller communities to yield adequate sampling statistics.
- The causes of vegetation fires are not mutually exclusive; one fire started by a cigarette does not prevent another from starting naturally, or by accidental causes or arson. Again this most strongly affects small communities.
- Greater expanses of vegetation and the higher probability that residents will undertake activities that may ignite fires (e.g. land maintenance activities like slashing, welding, back burning, forestry, etc.), means multiple fire origins will most strongly affect postcodes in regional areas. This might explain the comparatively high rates of fires per person within the Northern region.

Nevertheless, not all small communities were characterised by higher rates of fires per person and conversely not all large communities are characterised by low rates of fires per person. The three postcodes in the Greater Hobart region that recorded in excess of 500 fires in five years had rates of 100 to 400 fires per 10,000 people per year, well above that observed in other densely populated urban areas

in Tasmania. This was not evident for the two Greater Launceston postcodes that recorded more than 500 vegetation fires in five years.

Deliberate fires: A single deliberate fire within a postcode in five years determined the lowest natural, non-zero, limit for deliberate vegetation fires per person per year (Line A, Figure 19). Hence, the minimum rate of deliberate fires per 10,000 people per year decreased with increasing population size. Nevertheless, this decrease only occurred up to a point, beyond which the rate of deliberate vegetation fires per 10,000 people increased with increasing postcode population. For Tasmania this critical point occurred for a postcode population of approximately 5,000 people. The location of this point is determined not only by the length of the observation period but also by the general level of deliberate firesetting within the region or jurisdiction. The increase in the minimum rate of deliberate fires per 10,000 people, beyond the critical point, is likely to be a function of the natural growth constant. That is, as postcodes grow beyond 5,000 people there is a predictable lower limit to the number of deliberate fires that are likely to occur each year.

In contrast to the trend observed for vegetation fires generally, the maximum rate of deliberate fires per 10,000 people typically remained stable across postcodes with highly diverse populations. The notable exceptions were two postcodes within the Greater Hobart region and to a lesser extent two postcodes within the Greater Launceston region. That the two postcodes within the Greater Launceston region record higher rates of deliberate vegetation fires but not exceptionally high rates of vegetation fires generally (all causes) on a per person basis is indicative that a high proportion of all fires in those postcodes were deliberate in origin. Postcodes that experienced greater than 100 fires per year were rare, and occurred exclusively within the Greater Hobart and Greater Launceston regions. Both postcodes from the Greater Hobart region had elevated numbers of vegetation fires in general.

The lines included in Figure 19 provide a guide to the relationship between rates on a per 10,000 person basis and the actual number of deliberate vegetation fires that occurred in different sized communities (postcodes). For example, a rate of 0.001 fires per person translates as one fire every 10 years, one fire per year and 10 fires per year in communities of 100, 1,000 and 10,000 people respectively. The Greater Hobart, Greater Launceston and North West regions have the greatest number of postcodes with populations exceeding 5,000 (i.e. most populated regions) and hence account for the majority of postcodes that experienced greater than five deliberate lightings per year. The implication is that the level at which deliberate fires is considered problematic may need to be adjusted to take into account differences in population densities.

Although within the range observed elsewhere, the rate of deliberate fires per 10,000 people per year was consistently high for postcodes in the Southern region, with higher rates observed across both small and large (exceeding 10,000 people) populations. That deliberate firesetting is potentially an issue in this region becomes more apparent if one takes into account that the cause of 37 percent of fires in this region was unknown.

As would be expected, the rate of fires resulting from **inadequate fire control** per 10,000 people per year was lowest in the Greater Hobart and Greater Launceston postcodes (Figure 20). Nevertheless, two Greater Hobart postcodes experienced an average of more than five fires per year resulting from this cause. The highest rates of fires resulting from inadequate fire control per 10,000 people per year occurred in the Northern and North West regions (Figure 20).

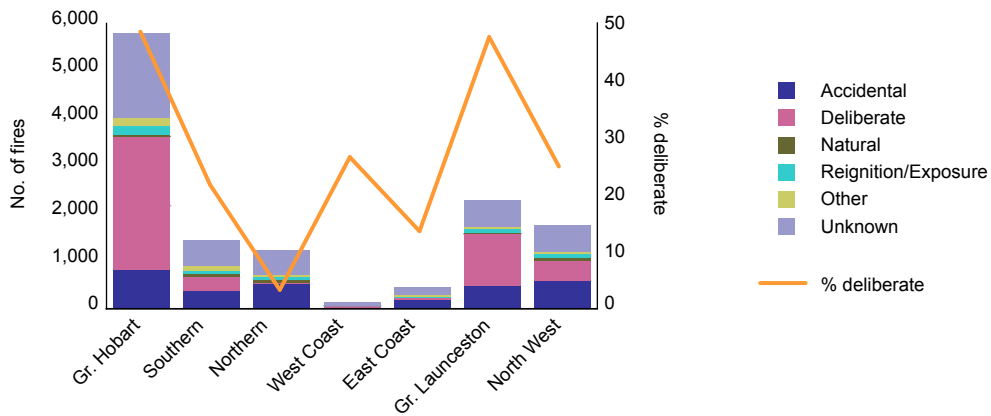
Overall, the rate of **smoking-related fires** per 10,000 people per year decreased with increasing population size (Figure 21). This is not unexpected given that smoking-related fires accounted for the highest proportion of all fire causes in many regional areas. Three postcodes in Tasmania experienced an average of more than five smoking-related fires per year; one each from the East Coast, North West and Greater Launceston regions. More than half the postcodes within Greater Hobart and Greater Launceston experienced between one and five smoking-related fires per year.

Figure 11: Tourism regions of Tasmania



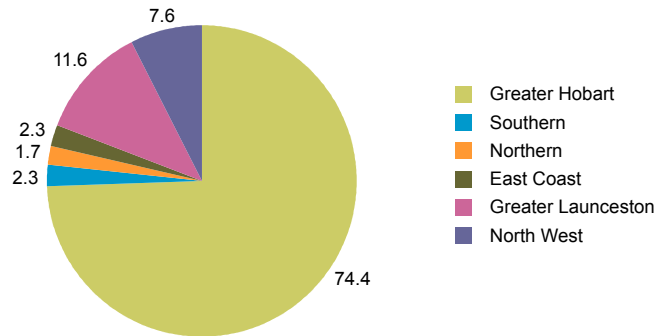
Source: ABS 2005b
 © Australian Bureau of Statistics

Figure 12: Cause of fires in each region



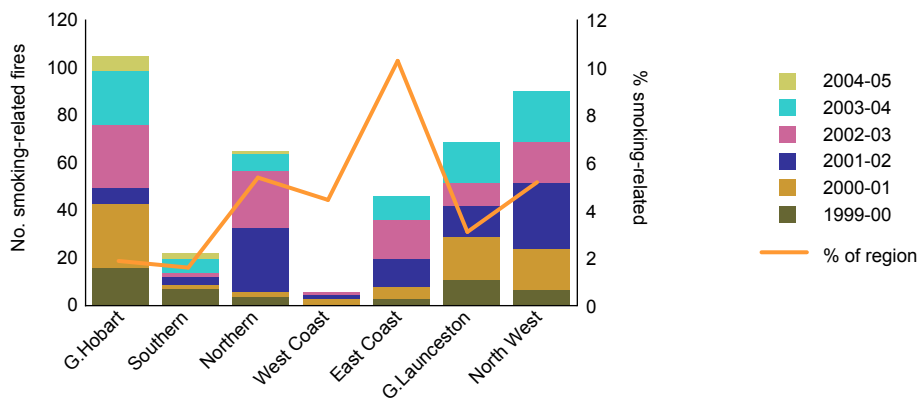
Source: TFS 1999–2000 to 2003–04 [computer file]

Figure 13: Non-deliberate child fires by region (percent)



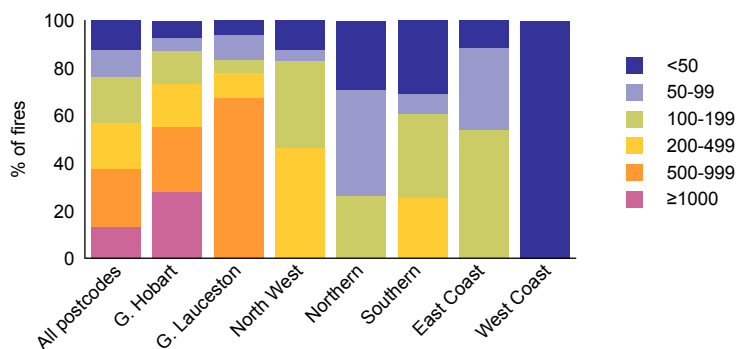
Source: TFS 1999–2000 to November 2004 [computer file]

Figure 14: Smoking-related fires by region



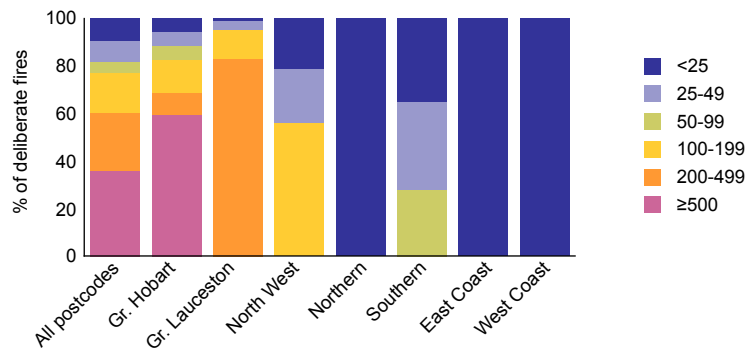
Source: TFS 1999–2000 to November 2004 [computer file]

Figure 15: Fire frequency distribution (all causes) for postcodes within each region (percent)



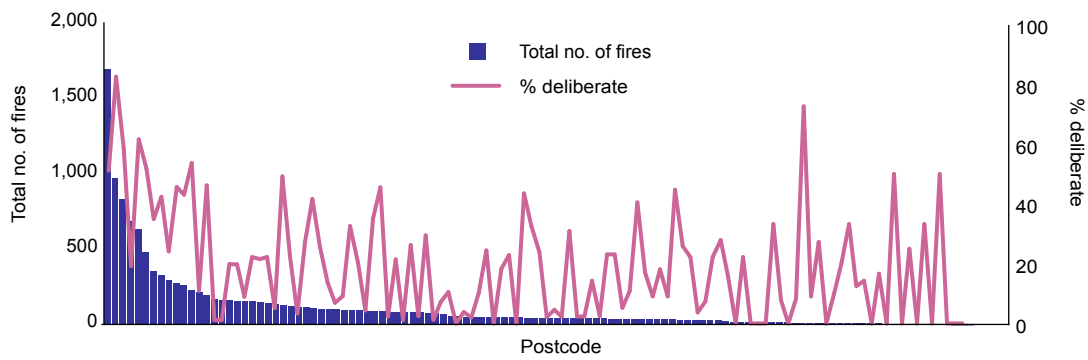
Source: TFS 1999–2000 to 2003–04 [computer file]

Figure 16: Fire frequency distribution (deliberate causes) for postcodes within each region (percent)



Source: TFS 1999–2000 to 2003–04 [computer file]

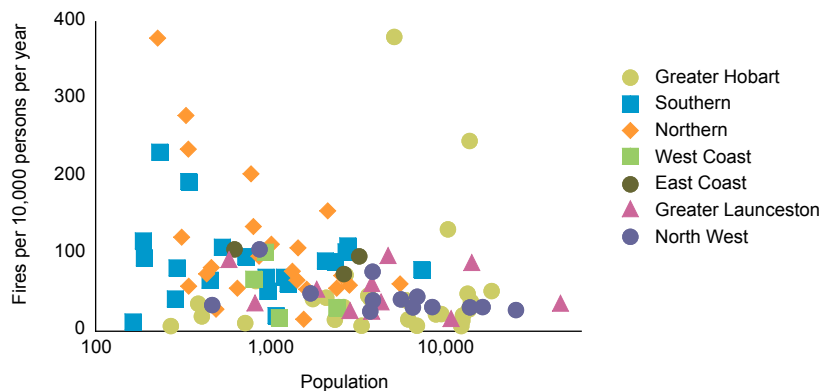
Figure 17: Number of fires (all causes) and percentage deliberate fires by postcode^a



a: postcodes are not identified and are arranged in order of decreasing numbers of fires

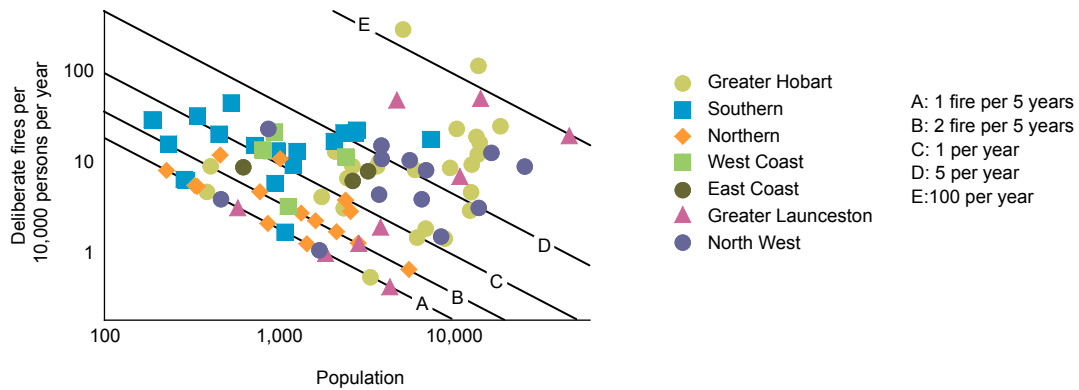
Source: TFS 1999–2000 to 2003–04 [computer file]

Figure 18: Fire densities by population for each region (number)



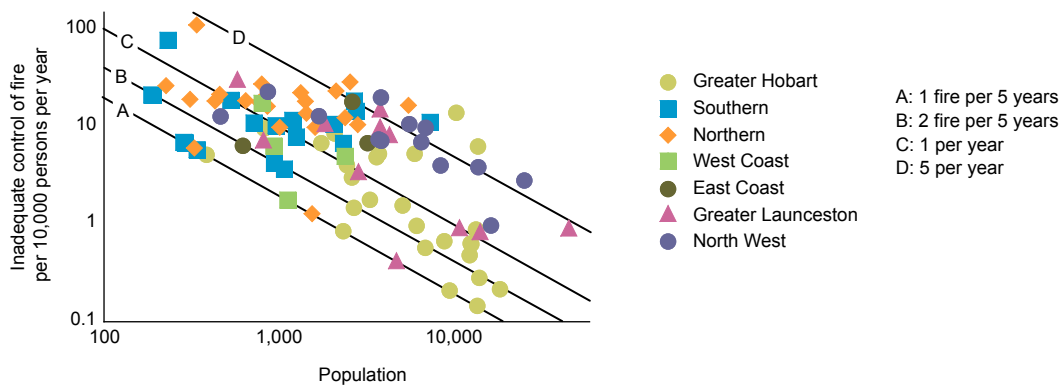
Source: TFS 1999–2000 to 2003–04 [computer file]; ABS 2004. Population by post office area, 2001 [computer file]

Figure 19: Deliberate fire densities by population for each region (number)



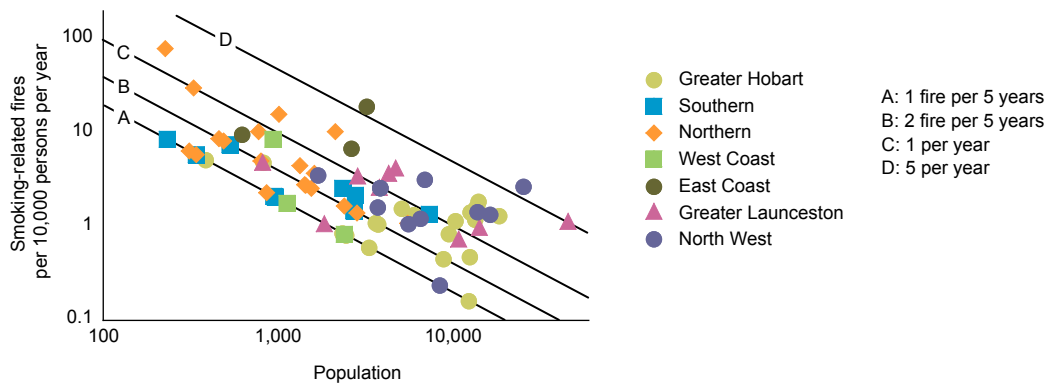
Source: TFS 1999–2000 to 2003–04 [computer file]; ABS 2004. Population by post office area, 2001 [computer file]

Figure 20: Density of fires resulting from inadequate control of a fire by population for each region (number)



Source: TFS 1999–2000 to 2003–04 [computer file]; ABS 2004. Population by post office area, 2001 [computer file]

Figure 21: Density of fires resulting from discarded/abandoned materials by population for each region (number)



Source: TFS 1999–2000 to 2003–04 [computer file]; ABS 2004. Population by post office area, 2001 [computer file]

Timing

The timing of fires is examined by week of the year and day of the week.

Week of the year

The majority of vegetation fires, irrespective of cause, occurred between November and mid April (Figure 22). The distribution of fires varied markedly between years (Figure 23) depending on the amount and timing of spring/summer/autumn rainfall (Figure 24), consequently:

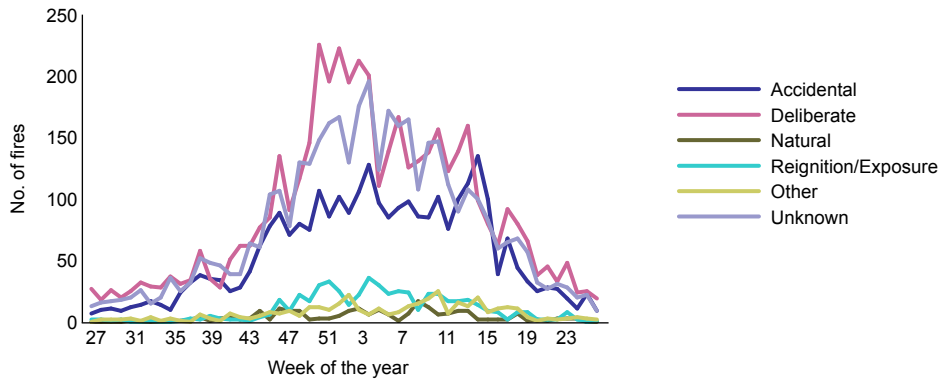
- Comparatively low rainfall in 1999–2000 resulted in elevated fire numbers from December to mid April.
- The year of 2000–01 was similar to 1999–2000, except that in March 2001 rains shortened the bushfire danger season.
- Higher spring and summer rainfall in 2001–02 resulted in lower total vegetation fire numbers during November–January. Fire numbers subsequently increased in February and peaked in late March to early April, coincident with the lower rainfall observed during that period.
- In 2002–03 fire frequencies increased rapidly in late October and peaked during December and January, coincident with an exceptionally dry period that lasted from November to February.
- The 2003–04 bushfire season was marked by three separate peaks in fire activity. The season started early with a massive increase in fire frequencies during weeks 45 and 46 and exceptionally low October–November rainfall. The timing of this peak coincided with the early start observed for 2002–03. Comparatively low fire frequencies occurred in December owing to increased rainfall in that month. The second spike in fire frequencies began in late December but principally occurred in January, despite January recording comparatively high average rainfall figures overall. The third, smaller, peak occur in late March–early April following low February–March rainfall.

Overall, there was strong correlation between timing of non-deliberate and deliberate fires in a given season; that is, increases and decreases in deliberate and non-deliberate fires typically occurred simultaneous and, to a similar degree, commonly. The most notable discrepancy occurred for fires in weeks 50 to 6 (Figure 22), coincident with Christmas school holidays, and the first two weeks of the school term. During this period the number of deliberate fires noticeably outweighed the number of non-deliberate fires. This was not observed in all years, but was most evident during 2002–03 (Figure 25) and, to a lesser extent, 2003–04 (Figure 26) and 2000–01. These were all years in which more adverse bushfire weather conditions coincided with the Christmas school holidays.

In December 2002, the number of deliberate fires was more than double that observed for non-deliberate fires during the same period. Such a high rate of deliberate fires during an adverse bushfire season is obviously of concern. More promising was that the numbers of deliberate fires decreased rapidly in January, despite the likely increased media coverage of the devastating fires in northeast Victoria, southeast New South Wales and the Australian Capital Territory. It is unclear what precipitated this turnaround, whether it reflected an awareness of the severity of the bushfire danger, public awareness campaigns relating to inherent bushfire danger, increased police involvement, or some other cause. An alternative explanation, at least for one of the postcodes, is that fire frequencies were affected by the presence of a large fire in the neighbouring area (Broadmarsh).

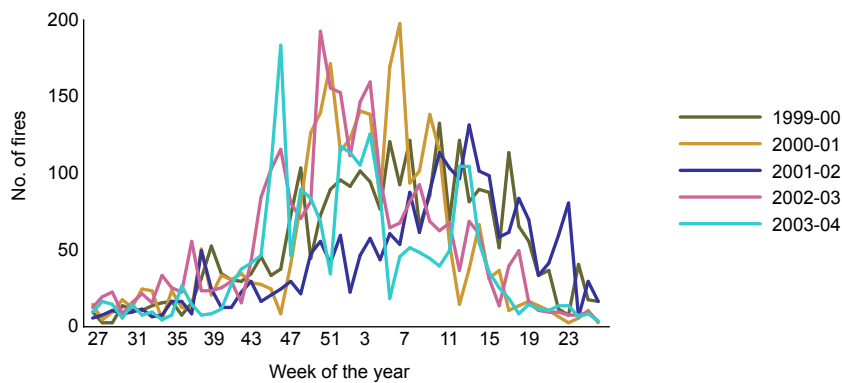
Accidental fires lit by 6 to 12 year olds and 13 to 16 year olds spiked during weeks 3 and 4, coincident with the end of the Christmas school holidays (Figure 27). This subtle increase in fire numbers was evident for all five years surveyed, although the overall increase was small. In two of the five years there was an additional spike in the number of accidental fires lit by 13 to 16 year olds in weeks 47 and 48 (late November–early December). This may be coincident with the end of term for some children within this age group.

Figure 22: Week of the year^a, by cause (number)



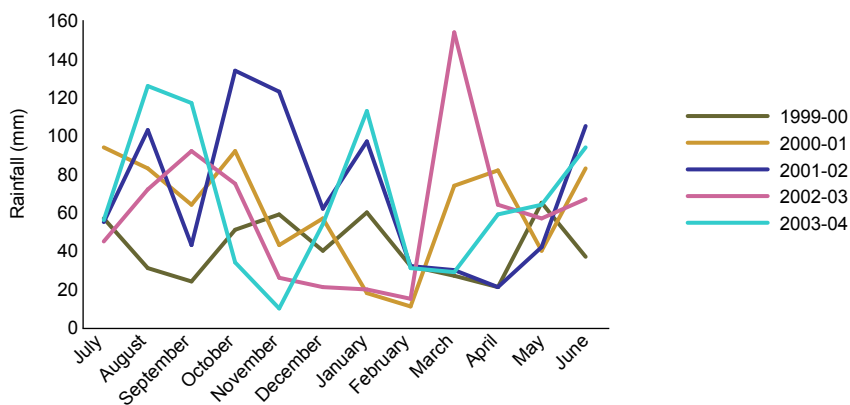
a: week 1 refers to the first calendar week of the year
 Source: TFS 1999–2000 to 2003–04 [computer file]

Figure 23: Week of the year each year (number)



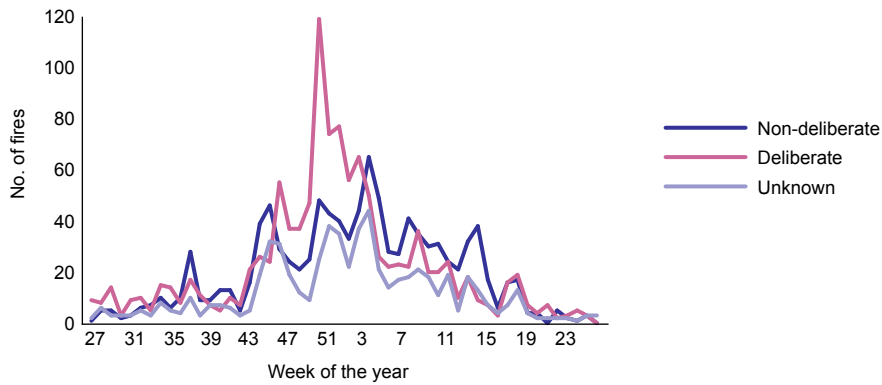
Source: TFS 1999–2000 to 2003–04 [computer file]

Figure 24: Southeast Tasmania – district rainfall average^a, 1999–2000 to 2003–04 (number)



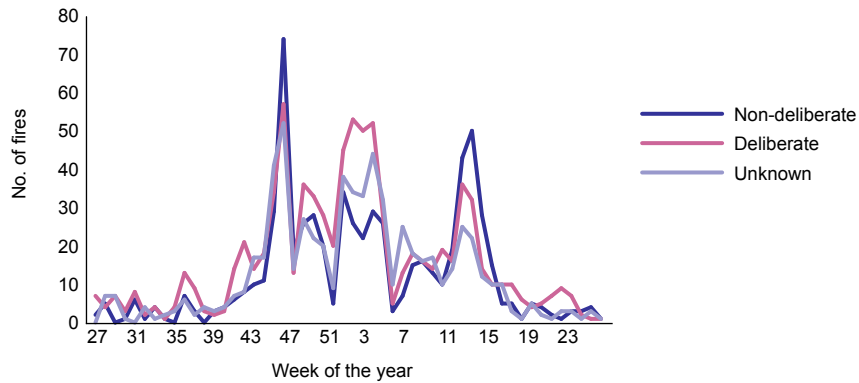
a: monthly gridded rainfall data
 Source: Australian Bureau of Meteorology [computer file]

Figure 25: Week of the year, by cause, 2002–03 (number)



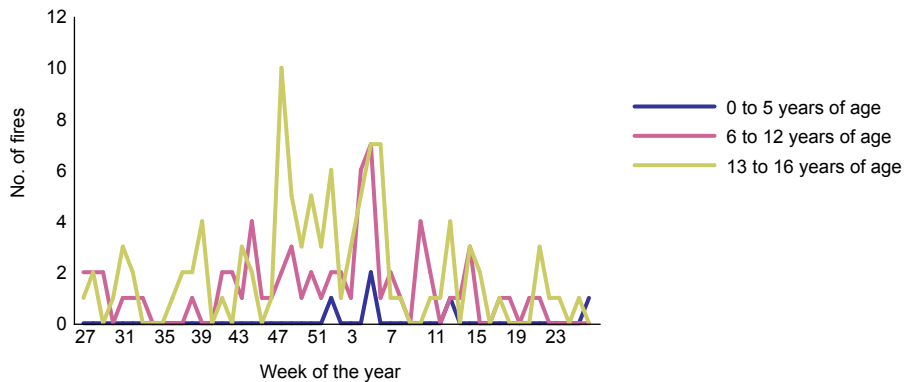
Source: TFS 2002–03 [computer file]

Figure 26: Week of the year, by cause, 2003–04 (number)



Source: TFS 2003–04 [computer file]

Figure 27: Non-deliberate child fires, by week of the year and child's age (number)



Source: TFS 1999–2000 to November 2004 [computer file]

Day of the week

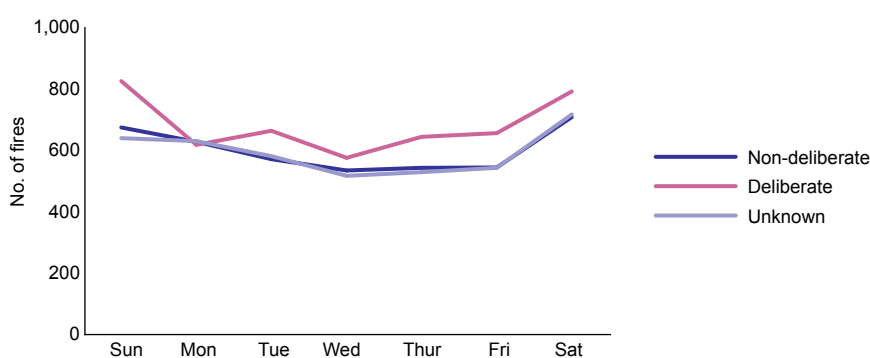
Overall, 26 percent more fires occurred on Saturday and 22 percent more fires occurred on Sunday relative to the weekday average. The numbers of non-deliberate and unknown causes decreased throughout the week before climbing sharply on Saturday, whereas the numbers of deliberate fires were consistently higher (25 to 31 percent higher) on both Saturday and Sunday than all weekdays (Figure 28). Overall, the number of deliberate fires that occurred on weekdays was comparatively uniform.

The propensity for weekend fires varied on both regional and local scales. In Greater Hobart, vegetation fires of all causes were 28 percent higher on Sunday and 22 percent higher on Sunday, relative to the weekday average. In Greater Launceston vegetation fires (all causes) were 27 percent more likely on Saturday and 40 percent more likely on Sunday (Figure 29). Higher numbers of Saturday fires, relative to the weekday average, were observed across all regions, whereas higher average numbers of vegetation fires on Sunday occurred only in the North West and Northern regions.

The trends presented for any one region were necessarily an aggregation of many different trends that occurred on local scales. The postcodes recording the highest number of fires in the Greater Hobart region did not generally have a strong weekend bias; fires could occur on any day of the week (Figure 30). In contrast, some suburbs had decidedly more fires on weekends than during the week whereas others were characterised by higher numbers of fires during the middle of the week (Figure 31). Clearly, the timing of fires needs to be examined in detail on a local scale, to identify the specific causes of increased fire numbers in each area and to enable the most appropriate fire reduction strategies to be implemented.

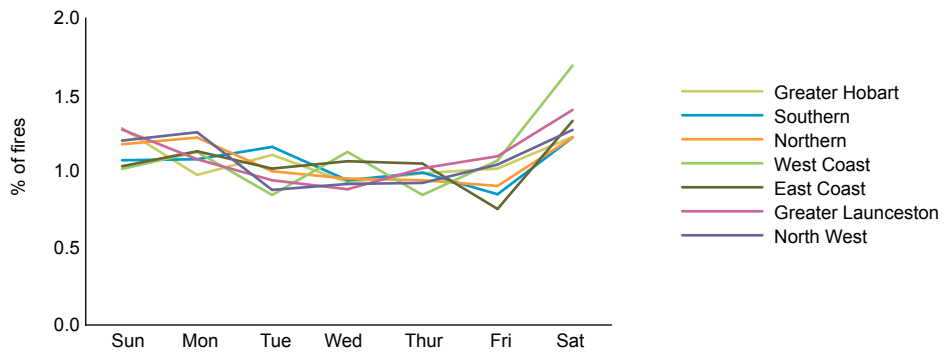
Accidental fires lit by children aged 6 to 12 were most commonly documented on Friday and Saturday, as compared to the middle of the week. In contrast, the greatest frequency for 13 to 16 year olds occurred on Sunday and Monday (Figure 32). These trends need to be treated with caution given the low frequency of child fires in general, but may be relevant to addressing the issue of child fires in some areas of Tasmania.

Figure 28: Day of the week, by cause (number)



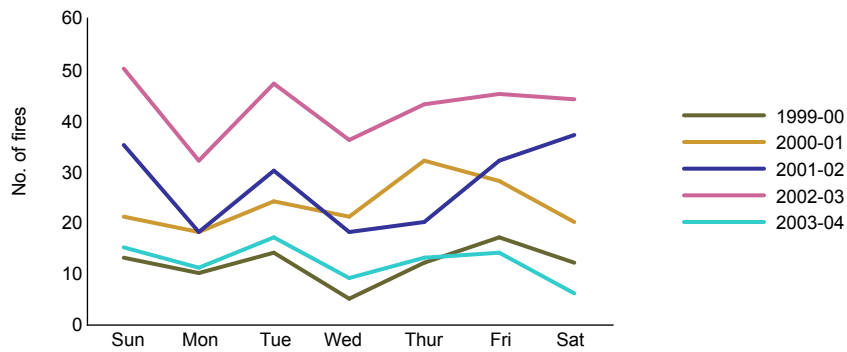
Source: TFS 1999–2000 to November 2004 [computer file]

Figure 29: Day of the week, by region (number)



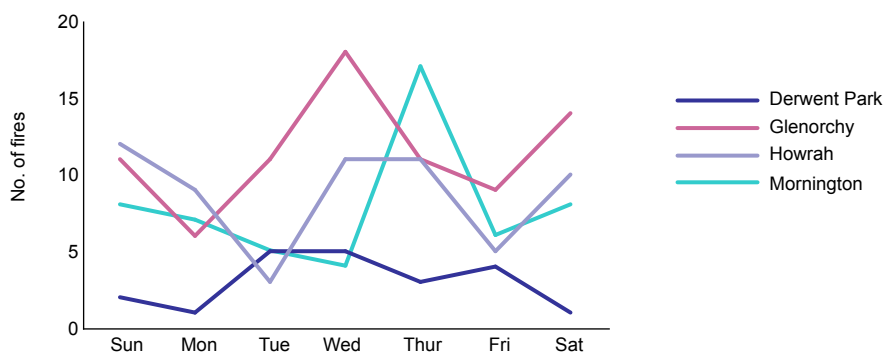
Source: TFS 1999–2000 to November 2004 [computer file]

Figure 30: Day of the week for one neighbourhood in the Greater Hobart region that experienced high numbers of fires, by year (number)

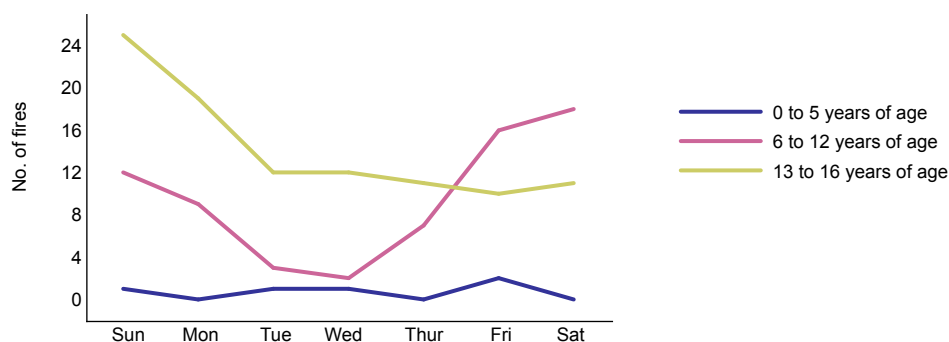


Source: TFS 1999–2000 to 2003–04 [computer file]

Figure 31: Day of the week for selected Hobart suburbs (number)



Source: TFS 1999–2000 to November 2004 [computer file]

Figure 32: Non-deliberate child fires, by day of the week and age group (number)

Source: TFS 1999–2000 to November 2004 [computer file]

Area burned

The size of most TFS-attended vegetation fires was small, with the frequency of fires decreasing with increasing area burned. Nevertheless, the characteristic hump for fires in the 10 to 50 ha range remained (Figure 33). Although, this general trend occurred, irrespective of cause, subtle differences were evident in size distribution of vegetation fires of different causes.

Overall, natural causes accounted for an increasing proportion of fires with increasing fire size (Figure 34), and fires started by lightning were the only known cause of fires greater than 5,000 ha in Tasmania between 1999–2000 and 2003–04. In contrast, there was a tendency for deliberate fires to account for a small proportion of fires within an area burned category as the size of the area burned increased (Figure 34). Although these results are consistent with the trend observed in most other jurisdictions, caution should be exercised when interpreting the results, as the proportion of unknown fires also increased with increasing fire size. That is, there was a greater probability that the cause of larger fires was unknown, compared to small fires.

Collectively, around 190,000 ha were burned in TFS-attended fires between July 1999 and November 2004. This does not represent the total area burned in Tasmania during the observation period, as the TFS database does not include all Forestry Tasmania or Parks and Wildlife Service fires.

The area burned in any one year was highly variable, ranging from 5,000 to 15,000 ha from 1999–2000 to 2001–02, up to 50,000 to 100,000 ha in 2002–03 and 2003–04 (Figure 35). Large fire events dominated total area burned statistics. More than half the 56,480 ha burned in 2002–03 was as a result of two fires; a fire started by lightning burned 17,500 ha on Flinders Island (Ellis, Kanowski & Whelan, 2004) and a fire of unknown origin burned 14,300 ha in the Southern region. In 2003–04, a large fire of unknown origin and another attributed to lightning burned approximately 70,000 and 8,900 ha, respectively in mid November (week 46) in North West Tasmania. This week corresponded to a particularly adverse week when a high number of vegetation fires occurred across many parts of the state (Figure 24).

Although 36 percent of vegetation fires the TFS attended between July 1999 and November 2004 were deliberate, these fires accounted for only 6.6 percent (12,756 ha) of the total area burned (Figure 36). The greatest total area burned by deliberate fires occurred in 2003–04 (5,332 ha) and 2002–03 (3,790 ha; Figure 35). However, deliberate fires only accounted for five to seven percent of the total area burned in those two years owing to the large areas burned by other fire causes. Deliberate fires tended to burn the greatest proportion (up to 19%) of land in years characterised by low total areas burned (Figure 35); that is, less adverse fire seasons. This is not to understate the potential danger posed by deliberate fires. There were two instances where deliberate fires burned greater than 1,000 ha, the largest having burned

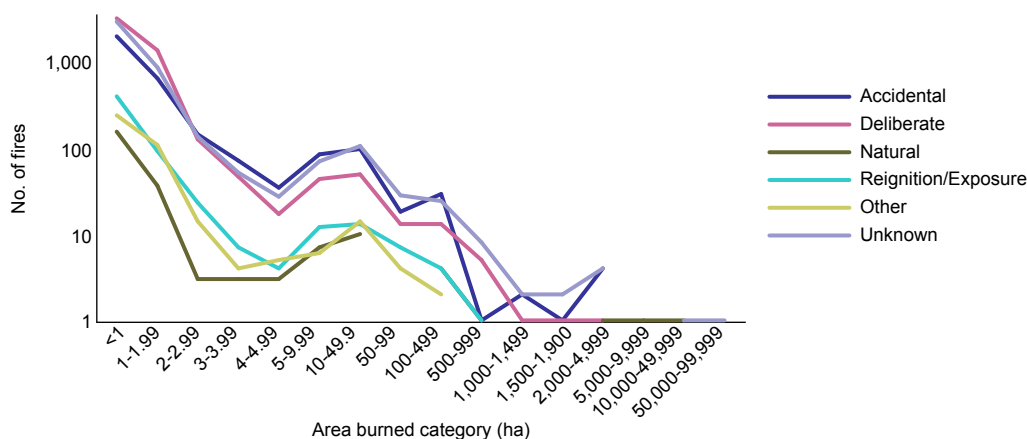
2,100 ha. Moreover, almost one-third of fires in the 500–1,000 ha range were incendiary in origin (n=5); 82 deliberate fires burned greater than 10 ha.

It is not surprising given their size distribution that natural fires and fires started by lightning in particular, accounted for the largest area burned by a known cause (17% of the total area burned; Figure 36). Accidental fires accounted for a further 13 percent of the total area burned. The cause of the many large fires in Tasmania was unknown, with unknown causes accounting for almost two-thirds of the total area burned.

The majority of the total area burned in Tasmania (at least in TFS-attended fires) occurred in the North West (44%), Southern (25%) and Northern (21%) regions. Vegetation fires in the Greater Hobart and Greater Launceston regions accounted for just three and four percent of the total area burned, respectively (Figure 37).

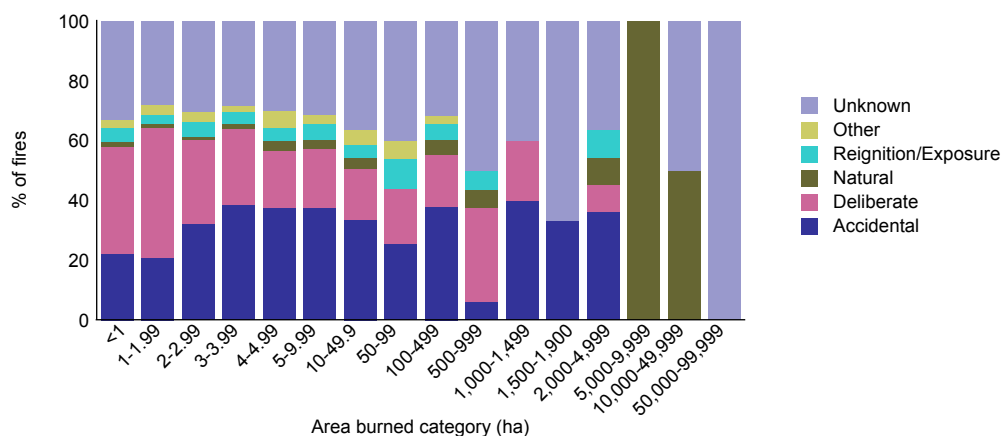
In the North West, Southern and to a lesser extent the East Coast regions fires of unknown cause were a major contributor, whereas in the Greater Hobart and West Coast regions deliberate fires made larger contributions. Natural conditions accounted for a high proportion of the total area burned in both the Northern and Greater Launceston regions. Proportionally, accidental factors were most significant in the East Coast and Greater Hobart regions, but did not feature, to any known extent, in the North West (Figure 38).

Figure 33: Area burned category, by cause (number)



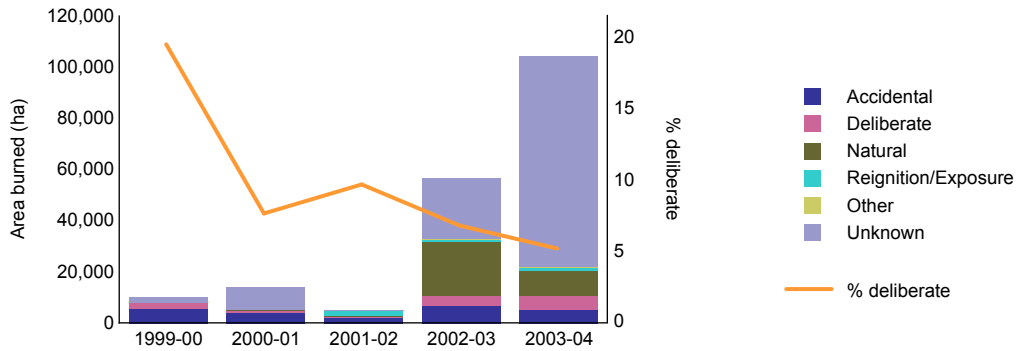
Source: TFS 1999–2000 to November 2004 [computer file]

Figure 34: Area burned category, by cause (percent)



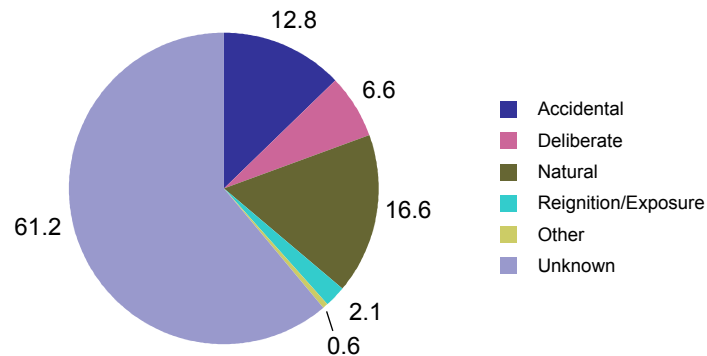
Source: TFS 1999–2000 to November 2004 [computer file]

Figure 35: Area burned, by cause each year



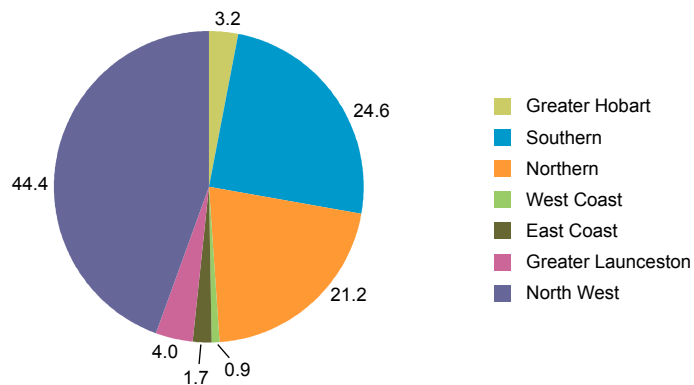
Source: TFS 1999–2000 to 2003–04 [computer file]

Figure 36: Area burned, by cause (percent)

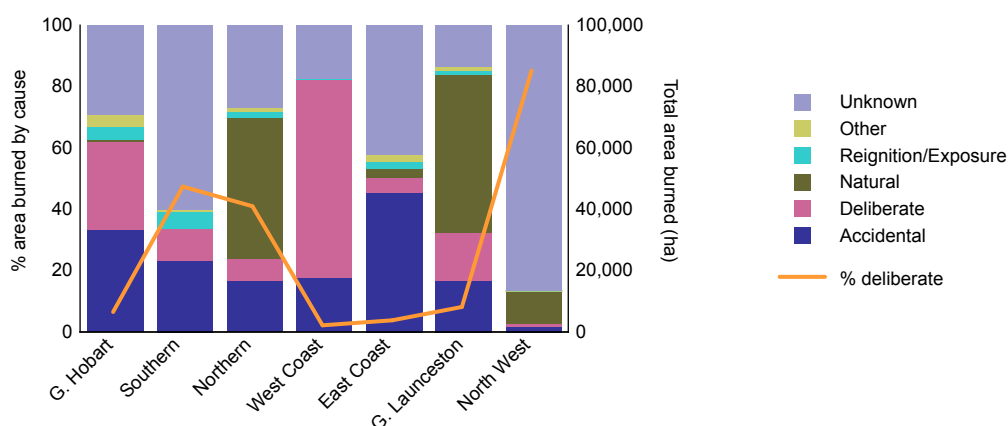


Source: TFS 1999–2000 to November 2004 [computer file]

Figure 37: Area burned, by region (percent)



Source: TFS 1999–2000 to November 2004 [computer file]

Figure 38: Area burned in each region, by cause

Source: TFS 1999–2000 to 2003–04 [computer file]

Vegetation burned

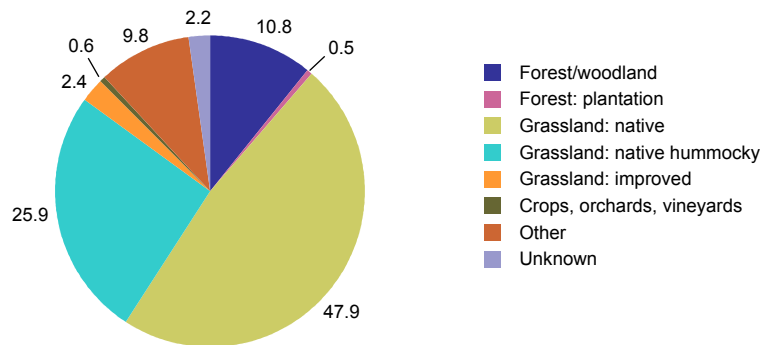
The majority of fires the TFS attended between 1999–2000 and November 2004 were grass fires. Almost three-quarters of fires attended occurred in native grasslands (Figure 39), with one-third of those fires being in hummocky native grassland. Only 11 percent of fires occurred in forest or woodland; less than one percent was in forestry plantations; 10 percent occurred in other vegetation types.

Overall, the proportion of fires attributed to each cause varied across vegetation types (Figure 40). Subtle variations included a higher proportion of deliberate fires and a lower proportion of accidental fires in native hummocky grasslands and lower proportions of deliberate fires, but higher rates of accidental fires in forest plantations.

The size distribution of fires within each vegetation type paralleled that observed for fires generally, with fire frequency for individual vegetation types decreasing with increasing size (Figure 41). Although this general pattern was observed across most vegetation types some difference in size distribution were noted. For example, fires in hummocky native grasslands tended to account for a decreasing proportion of fires with increasing fire size, whereas fires in forest or woodlands accounted for a higher proportion as fire size increased. However, no woodland or forest fire exceeded 5,000 ha. All large vegetation fires greater than 5,000 ha occurred in native grassland.

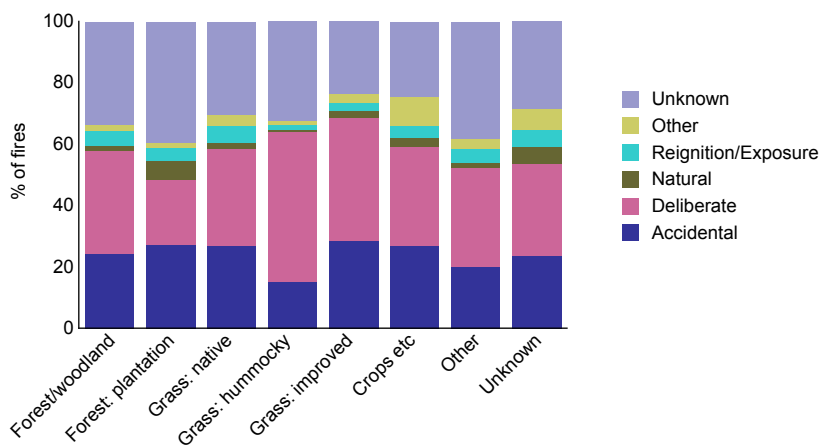
The size distribution for fires in hummocky native grasslands is more readily understood if the regional distribution of fires is examined. Namely, more than 60 percent of fires in hummocky native grasslands occurred in the Greater Hobart region, where fire size tended to be small. The low incidence of deliberate fires in forest plantations is understandable in light of the fact that few plantations are located near the major urban centres of Hobart and Launceston (Figure 43).

Figure 39: Vegetation type (percent)



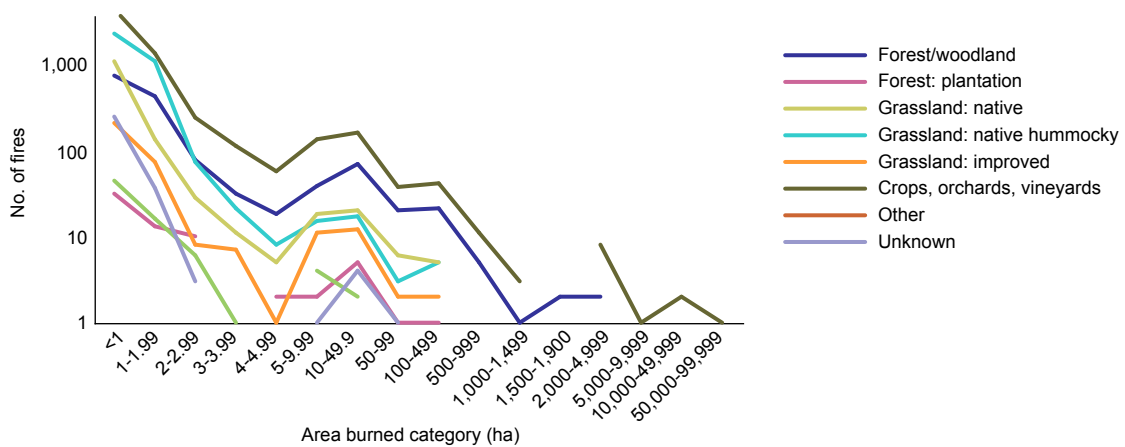
Source: TFS 1999–2000 to November 2004 [computer file]

Figure 40: Vegetation type, by cause (percent)



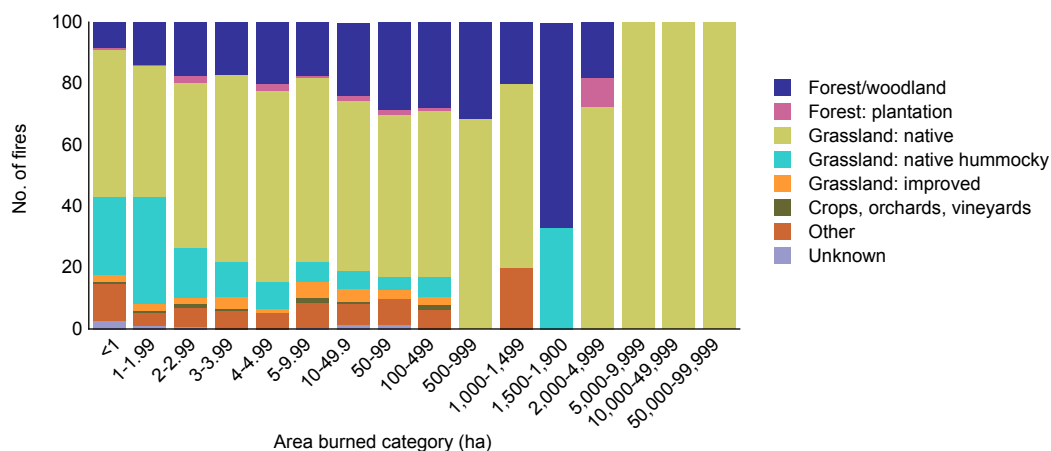
Source: TFS 1999–2000 to November 2004 [computer file]

Figure 41: Area burnt category, by vegetation type (number)



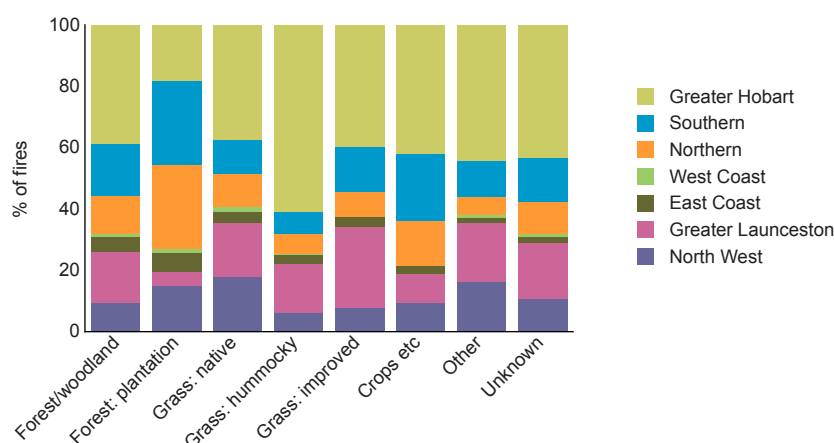
Source: TFS 1999–2000 to November 2004 [computer file]

Figure 42: Area burnt category, by vegetation type (percent)



Source: TFS 1999–2000 to November 2004 [computer file]

Figure 43: Vegetation type, by region (percent)



Source: TFS 1999–2000 to November 2004 [computer file]

Deliberate fires during peak fire danger

Periods of more adverse bushfire conditions occurred in both 2002–03 and 2003–04. Patterns of deliberate firesetting during these two periods are examined below.

In **2002–03** Australia experienced some of the driest conditions on record, and bushfires burned extensive areas of Victoria, New South Wales and the Australia Capital Territory during January 2003. Although not the worst on record, 2002–03 was clearly more severe than the previous couple of years in Tasmania. During week 50 of 2002 (mid December) there was a massive increase in the number of fires. Of the 192 fires that occurred in this week, 119 were deliberate, and of these 90 percent occurred in two postcodes in the Greater Hobart region, postcodes that overall recorded very high frequencies of fires. All deliberate fires in these postcodes were small, with no fires exceeding two ha in size. The largest deliberately fire, in week 50 of 2002–03, occurred in the Southern region.

The total number of fires remained high until week 3 of January 2003, coincident with the devastating bushfires in other states, when media coverage of bushfires was likely to have been high. However, by

week 3, the number of deliberate fires was half that recorded in week 50 (before the intense media coverage of fires in Victoria, New South Wales and the Australian Capital Territory). Moreover, only half the fires that occurred in week 3 occurred in the two postcodes that recorded large numbers of fires in week 50 fires. The reason for the abatement of fires in those two postcodes is unclear, although in one of those areas, neighbouring fires, at Broadmarsh, may have played a part.

The vast majority of the area burned in **2003–04** occurred in a two-week period in November (weeks 45 and 46). As noted, extremely low rainfall occurred in October–November 2003, being even lower than that observed during the same period in 2002–03.

In week 45 the TFS attended 103 fires. The majority of these were small (71 percent were less than two hectares). The three largest were of unknown cause, and burned 450, 180 and 108 ha respectively. Approximately one-third of all fires during that week were deliberately lit, with two of the largest burning more than 50 ha each. Bushfire weather worsened in the following week, with the TFS recording 183 fires during week 46. There was clearly an increase in the number of deliberate fires during this week but the absolute percentage of deliberately lit fires did not increase. Although the majority of fires in week 46 were small (74 percent were less than two hectares), worsening bushfire weather led not only to increased numbers of fires for all causes, but also to increased fire size. Four fires burned more than 1,500 ha; of these, one was accidental, one was natural, and for two the cause was unknown. Deliberately lit fires also burned much greater areas, with the four largest burning 93, 400, 985 and 1,000 ha respectively.

There were interesting disparities between the 2003–04 and 2002–03 bushfire danger seasons. Deliberate fires during week 46 of 2003–04 occurred across 48 suburbs (compared to 26 during week 50 of 2002–03). All deliberate fires burning 10 ha or more occurred in regional Tasmania (four, Northern; one, West Coast; two, Southern). All four in the Northern region, including one that burned 1,000 ha, occurred near Scottsdale. Only about 30 percent of deliberate lightings during week 46 occurred in Greater Hobart region (as compared to the average of 59 percent during the previous year), and reduced numbers of fires occurred in the two postcodes that featured in 2002–03 deliberate lightings. In one of those postcodes, the lower number of fires may reflect prior burning off by local brigades to reduce fuel loads, and hence the ground available for subsequent burning. This strategy appears to have been successful given the reduced number of fires that occurred in that postcode during weeks 45 and 46 of the 2003–04 summer. Had this burning off not occurred, total vegetation fire frequencies during this adverse period might have been higher.

It also clear that there were more deliberate fires of larger size in regional Tasmania during 2003–04 than in 2002–03. Whether this represents worse bushfire weather or an increase in malicious/negligent ignitions in specific regional areas is unclear. However, this trend is somewhat problematic, not only because of the size and hence potential danger posed by the fires, but because of the greater affect that such events have on regional communities. Such large events place a heavy burden on the limited resources and personnel (many of whom may be volunteer) in these regions, resources that may already be stretched by concomitant firefighting duties in their or a neighbouring region. Hence, in taking into account the problematic nature of fire frequencies (deliberate and other causes) it is necessary to not only consider the total number of vegetation fires, but also the impacts they have on the resources available in that community.

Factors impacting on TFS fire frequencies

A number of factors may have had an impact on total vegetation fire frequencies both during and subsequent to this analysis. They include:

- The Broadmarsh fires may have affected total vegetation fire frequencies observed in one or more neighbouring postcodes during January 2003 (as discussed).

- Burn offs by brigades in specific areas traditionally associated with high fire frequencies, during 2003–04 reduced ground available for firesetting. This is reflected in the lower overall fire frequencies in those postcodes during 2003–04 (as discussed).
- In 2004–05 the TFS and the Tasmanian Police conducted a joint arson reduction campaign – Operation Hydra – in selected suburbs that had recorded a high incidence of deliberate fires. This campaign markedly reduced the incidence of fires in the targeted areas.

Summary

The most important points regarding the TFS analysis are summarised below:

- The TFS attended 13,083 vegetation fires from 1999–2000 until 23 November 2004; total fire numbers were broadly consistent across all fire years.
- Thirty-six percent of vegetation fires were deliberate (36.3% incendiary; 0.02% suspicious), with the cause of 32 percent of fires being unknown. Hence, deliberate actions accounted for 53 percent of known causes.
- Natural fires accounted for 1.7 percent of all TFS fires. Of these roughly only one-quarter were attributed directly to lightning.
- Non-deliberate fires lit by children accounted for 1.3 percent of vegetation fires the TFS attended. The number of non-deliberate fires increased with the age of the child. Three-quarters of these occurred in the Greater Hobart region. Peaks in non-deliberate child fires occurred at the beginning and end of the Christmas school holidays.
- Smoking-related materials comprised 3.1 percent (minimum value) of TFS-attended vegetation fires. A disproportionate amount of these occurred in regional areas.
- Almost two-thirds of all TFS-attended vegetation fires occurred in the two regions that incorporate the largest urban centres, namely, Hobart (44%) and Launceston (17%). These regions also had the highest proportion of deliberate fires (47 to 48 percent deliberate), and collectively accounted for 82 percent of deliberate fires in Tasmania.
- Deliberate fire occurrences were disproportionately concentrated in a small number of locations; the 11 postcodes in Tasmania that recorded 100 or more deliberate fires in five years accounted for three-quarters of all deliberate fires the TFS attended.
- Overall, a uniform maximum upper limit for deliberate fires in Tasmanian sits at 25 to 50 fires per 10,000 people, irrespective of postcode population. The only locations to exceed this level – two postcodes each in the Greater Hobart and Greater Launceston regions – recorded between 50 and 320 deliberate fires per 10,000 people per year.
- Broadly, there is a tendency for the proportion of deliberate fires to increase with increasing total numbers of vegetation fires, within individual suburbs.
- Vegetation fires principally occurred between November and mid April. However, the timing was highly subject to rainfall distribution, which varied markedly between seasons.
- Fluctuations in the number of deliberate fires strongly paralleled that observed for non-deliberate fires during the same season, although there is a greater propensity for deliberate fires to outweigh non-deliberate fires in those years where the bushfire season coincides with the Christmas school holidays.
- On average, deliberate fires were 25 to 31 percent more likely on Saturday or Sunday than on a weekday; however, the propensity for weekend fires was highly variable between locations. Areas that experienced extremely high levels of deliberate firesetting were not characterised by increased numbers of fires on weekends relative to weekdays.

- Overall, the majority of fires were small with the number of fires decreasing with increasing fire size.
- Natural fires and fires of unknown cause accounted for a disproportionate number of large fires. Deliberate fires accounted for a decreasing proportion of fires as fire size increased.
- Approximately 190,000 ha burned in TFS-attended fires from July 1999 to November 2004. The majority burned in 2002–03 (56,480 ha) and 2003–04 (104,583 ha).
- Less than 10 percent of the total area was burned in the Greater Hobart and Greater Launceston regions.
- Only 6.6 percent of the total burned resulted from deliberate fires. The greatest area burned in deliberate fires occurred in 2002–03 (3,790 ha) and 2003–04 (5,332 ha), but this comprised only five to seven percent of the total area burned in those seasons. Deliberate fires burned the highest proportion of land in those years where the total area burned was small.
- The majority of vegetation fires and the majority of the total area burned in TFS-attended fires occurred in native grassland. A high proportion of fires in hummocky grassland occurred in the Hobart region.
- There is some indication for increased incidence of deliberate fires during two periods of adverse bushfire weather in 2002–03 and 2003–04, but very different trends were evident for these two seasons. This may, at least in part, reflect arson prevention measures adopted in known hot spots during the latter season.

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