



Government of **Western Australia**  
Department of **Environment and Conservation**

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Perth Hills Bushfire February 2011 Review  
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### **PERTH HILLS BUSHFIRE FEBRUARY 2011 REVIEW**

The attached submission has been prepared by the Department of Environment and Conservation (DEC).

DEC is the lead agency responsible for conserving Western Australia's native flora, fauna and natural ecosystems, and the management of more than 26 million hectares of land including national parks, conservation parks, regional parks, State forests, timber reserves and nature reserves. Fire management for both biodiversity conservation and community protection is a key responsibility of DEC on lands for which it has statutory management responsibility.

DEC's submission addresses the review's terms of reference.

DEC would be pleased to offer to the inquiry further information or assistance as required.

Yours sincerely

Keiran McNamara  
DIRECTOR GENERAL

15 April 2011

Att.

# **Submission by the Department of Environment and Conservation to the Perth Hills Bushfires February 2011 Review**

## **1. Background**

### **The Department of Environment and Conservation (WA)**

The Department of Environment and Conservation (DEC) is the lead agency responsible for conserving Western Australia's native flora, fauna and natural ecosystems, and many of its unique landscapes. Under the *Conservation and Land Management Act 1984* (CALM Act), DEC manages more than 26 million hectares of land, including national parks, conservation parks, regional parks, State forests, timber reserves and nature reserves (10.25% of WA's land area).

Fire management, whether for biodiversity conservation or community protection, is a key responsibility of DEC on lands for which it has statutory management responsibility under the CALM Act. In 2003, DEC was also given fire preparedness responsibility for a further 89 million hectares of unallocated crown land and unmanaged reserves in the State, managed in accordance with section 33(2) of the CALM Act.

### **DEC's fire management role**

DEC uses prescribed fire as a tool to achieve a range of land management objectives associated with biodiversity conservation, bushfire risk mitigation, water catchment management, silviculture, vegetation management and research. The resources and expertise utilised in prescribed fire activities are consistent with those applied to fire suppression operations when required.

DEC has the lead role in responding to and suppressing bushfires on DEC-managed lands across the State (other than in the Perth metropolitan region). In the south-west forest regions and in the Midwest and South Coast regions, DEC has significant fire management capacity and is currently supported by officers of the Forest Products Commission and the bushfire brigades of local government authorities. In other parts of Western Australia, DEC has more limited fire management resources. DEC works with the Fire and Emergency Services Authority (FESA) and local governments in fire management.

Fire management is an integral component of DEC carrying out its statutory functions.

### **Fire management in the forested region of south-west Western Australia**

Like many Australian ecosystems, the combination of flammable vegetation and climate in the south-west of WA, together with lightning and humans as ignition sources, has ensured that fire has been an environmental factor that has shaped these ecosystems over many thousands of years. Consequently, native species and ecosystems have evolved physical and behavioural traits that not only enable them to persist with fire but, in many cases, mean they depend upon certain fire regimes.

The bushfire hazard in the south-west of Western Australia is as severe as any region in the world. It is one of the few regions in the world that has the combination of tall forests, which shed tonnes of highly flammable material each year, and a Mediterranean-type climate with cool wet winters and warm to hot dry summers. Vegetation is flammable for five to nine months each year during which there are periods of high temperatures, low humidity and high winds generated by unstable frontal movements, intense low pressure systems (cyclone remnants), deep coastal troughs and strong land and sea breezes. This gives rise to days of High, Very High, Extreme and even Catastrophic fire danger.

Each year more than 300 bushfires start on the public lands managed by DEC in the south-west of Western Australia. The main sources of these bushfires are due to human activities including deliberate ignitions (50-60%); accidental (20-40%) and lightning-caused fires (10-40%). Weather conditions often occur under which many of these fires, if not quickly contained, have the potential to develop into fast spreading, intense, uncontrollable bushfires that threaten lives, damage property and the environment, and are costly to the community. Each year, DEC, FESA and volunteer firefighters are called upon to protect the community and its valued assets from the impacts of intense summer bushfires in the forests, woodlands and heaths of the south-west.

Fire management is, ecologically and socially, one of the most complex and challenging issues facing land managers. Prescribed burning, which is the deliberate use of fire set under specified conditions of fuel and weather to achieve management outcomes, is also controversial. As a land management agency, DEC recognises that in fire-prone environments, proactive fire management is integral to, not incidental to, good conservation and land management. If bushfires cannot be managed, then it is unlikely that other land management objectives will be achieved.

### **Departmental management structure**

The work of the department is carried out through five service divisions and four operational and support divisions. Inputs to the direction of fire management works are provided by three service divisions - Nature Conservation; Parks and Visitor Services; and Sustainable Forest Management. Science Division provides research and technical support to fire management programs which are implemented by the Regional Services Division. DEC's Fire Management Services Branch together with the Department's nine regions, are located within the Regional Services Division. Fire management programs are developed and carried out collaboratively between regions, Fire Management Services Branch, Science Division and the three service divisions. The Regional Services Division is headed by a Director who reports direct to DEC's Director General.

### **Departmental resources**

As a result of its State-wide responsibilities, DEC has some fire management and response capabilities in all regions of Western Australia, and particularly in the south-west of the State. Further, DEC's broadscale prescribed burning program provides excellent opportunities for the training and development of staff in fire management and response across a spectrum of forest and bushland fuels.

#### ***Ground-based resources***

DEC has built up a significant resource available for both the implementation of hazard reduction burns and for response to bushfires when they inevitably occur in such a fire-prone environment.

Resources currently accessible within DEC include:

600	staff able to fill a wide range of incident management and support roles
300	frontline firefighters (Conservation Employees under AWU Award)
98	fire trucks (medium and heavy tankers)
180	light fire units
10	low loaders (for shifting heavy machinery)
11	bulldozers
11	front end loaders.

Three specialised high-lift fire pumps have been developed to allow the extinguishment of fires burning in the canopy of tall trees that would otherwise need to be felled to avoid the risk of fire.

DEC manages a comprehensive fire training and development program which aims to ensure that incident management staff (at the required numbers) maintain competence and currency.

### *Aerial resources*

In the past 45 years, DEC and its predecessors have overseen considerable development in the use of aircraft for fire management in Western Australia. In the 1970s, the department introduced spotter aircraft to augment and partly replace the fire detection system which had until then been solely based on lookout towers, and it has more recently started using aircraft to water bomb and contain small initiating bushfires. DEC still maintains a primary network of 13 lookout towers.

Water bombing aircraft have proven to be effective where the aircraft have been able to apply the water/foam drops within 30 to 45 minutes of a fire starting. DEC's aerial fire fighting fleet includes:

### *Aerial detection*

Nine American Champion Scout fire detection aircraft which fly about 4,500 hours each season, owned and operated by DEC. In conjunction with the network of lookout towers, these spotters provide an excellent fire detection and surveillance capacity.

### *Aerial suppression*

One AS350 Squirrel Helicopter and eight fixed-wing fire bomber aircraft that fly between 600 to 800 operational hours each year, attending, on average, 125 fires and delivering 3.4 million litres of fire suppressant each fire season. These aircraft, which are contracted by DEC from private operators, travel at 340 kilometres an hour and deliver 2,500 to 3,200 litres of water/foam each drop. They are highly effective in slowing the forward spread rate of developing fires to allow ground crews time to gain access to the fire.

### *Aerial ignition*

DEC also contracts two AS350 Squirrel helicopters and two GA8 Airvan fixed-wing aircraft, which carry an incendiary machine, pilot and crew, to conduct aerial prescribed burning throughout the State. A total of 1.3 million hectares across WA was aurally ignited by DEC aircraft in the 2009/10 burning season.

### *Aircrew*

DEC staff are trained in-house for a variety of fire aviation roles including as air attack supervisor, incendiary machine bombardier, air observer, air base manager, search and rescue monitors, aircraft officer, helitorch ground crew and incendiary operations supervisor.

As many major bushfire incidents occur in remote locations, DEC has developed portable incident control centres and communications facilities that enable large numbers of incident leaders, support staff and fire crews to be managed and coordinated effectively without the need to utilise existing fixed infrastructure. DEC's large mobile communications trailer is

fitted with satellite communications systems, internet connections, terminals, servers, radios, phones, faxes, plotters and printers.

### **Coordination of effort**

Fire management has become an increasingly national and international business. DEC senior fire management staff are strong contributors on several national fire coordination bodies including the Australasian Fire and Emergency Service Authorities Council, Forest Fire Management Group, Northern Australian Fire Managers Group, National Aviation Fire Centre and the Bushfire Cooperative Research Centre.

Over the past decade DEC has also contributed teams of fire leaders and specialist staff to many international and interstate fire fighting efforts, including deployments of expert fire team leaders to assist in large-scale emergencies in the United States, Canada, Victoria, New South Wales and South Australia.

### **Fire Management Policy and Code of Practice**

DEC's fire management business is guided by a comprehensive policy document (Policy Statement No. 19). The policy contains the fire management objectives for DEC-managed lands and policy statements pertaining to safety and risk; use of fire; fire suppression; bushfire prevention; liaison; and research. Also included in the policy are a set of principles for fire management and the requirements for policy implementation. The policy was updated in October 2005 following a comprehensive round of public consultation and review by the Environmental Protection Authority (EPA). Further amendments to the policy are currently under consideration.

DEC has also prepared a code of practice for fire management which provides a framework for fire management and procedures on DEC-managed lands.

### **Early fire policies**

There is considerable evidence that, prior to European settlement of WA in 1829 Aboriginal people used fire widely and frequently for a range of reasons, although the actual frequency with which Aboriginal people burnt the different vegetation types is uncertain. Following European settlement, there was little attempt to deal with bushfires in the south-west until after the passage of the Forests Act in 1918 and the establishment of the Forests Department in 1919. Early foresters were concerned by the extent of fire damage from the severe forest fires that were allowed to run unchecked as a result of the cessation of Aboriginal burning and uncontrolled logging during the nineteenth and early twentieth centuries. From 1924 onwards there was an attempt to apply a fire exclusion policy to most of the cutover jarrah forests.

During the 1920s and 1930s fire management involved the subdivision of the forest into areas which had been cut over for timber and regenerated, and those which had not. Attempts were made to completely protect cutover and regenerating forests from all fire. Some limited prescribed burning to create "firebreaks" (narrow strips of forest between two tracks) was undertaken in the remainder of the forest. These narrow firebreaks did little to prevent bushfires burning much of the forest in these early years.

The policy of restricting the use of broadscale planned burning and improved fire suppression saw heavy fuels steadily accumulating with time in most forest areas by the 1940s. From the late 1930s onwards, bushfires had started to become very large and difficult to control as fuels accumulated across the region. There were major fires in the jarrah forest in 1949/50, and in the jarrah and karri forests in 1937 and in 1950/51. In long unburnt compartments with heavy fuel loads, fires became uncontrollable once they exceeded about one hectare in size, even under mild weather conditions.

Also at about this time there were large, intense fires in the southern forest national parks, notably the area that is now the Walpole-Nornalup National Park and adjoining areas, where whole hillsides of karri and tingle trees were killed. Few, if any, people were killed by these fires because these areas were sparsely populated at the time.

Recognising that the attempted fire exclusion policy was failing, and as foresters better understood the role of fire in the environment, the Forests Department changed its policy and, in 1954, introduced a policy of broadscale prescribed burning to manage fuel build-up. Because of the heavy fuels in most of the areas to be prescribed burnt, implementation of the policy was cautious and slow at first. Most of the initial burning in the northern jarrah forest was actually done in winter. Little effective burning was undertaken in the dense southern forests, principally because of lack of access and problems with predicting fire behaviour in complex karri and karri-tingle fuels.

### **The 1960/61 fires**

The inevitable consequence of the early policy of fire exclusion culminated in massive bushfires in the summer of 1960/61. Preceded by drought, ignited by numerous lightning strikes and fanned by strong hot winds, intense bushfires burnt through the forests of the south-west. The town of Dwellingup was burnt down, as were the smaller settlements of Holyoake, Nanga Brook and Karridale. There were serious losses of houses, buildings, infrastructure, pasture, stock and fencing. Fortunately no one died in the fires, but many were injured, and the cost to the community was enormous.

In the wake of the 1960/61 fires, a Royal Commission was held. The report of the Commission (Rodger, 1961) contains many recommendations concerning measures necessary to prevent and control bushfires. From the point of view of the Forests Department, recommendation 20 was the most significant. It read:

*"The Forests Department is to make every endeavour to improve and extend the practice of control burning to ensure that the forests receive the maximum protection practical consistent with silvicultural requirements."*

This did not represent a complete redirection of policy for south-west forests, rather it unambiguously endorsed the policy which had been adopted in 1954. The Royal Commission's recommendations were adopted in full by the Government of the day.

### **Fire research and development**

The decision to expand the use of low intensity planned fire to manage bushfire in Western Australian forests initiated a program of scientific research and technical development to underpin fire operations. This research, much of which has been summarised in a book, *"Fire in ecosystems of south-west Western Australia: impacts and management"* (Abbott and Burrows, eds.), published in 2003, focused on the following themes:

#### ***Fire behaviour and prescribed burning guides***

Over a period of about 30 years of research, fire scientists developed a firm understanding of how forest fires behave (their speed and intensity) under different conditions of fuel quantity and type, fuel moisture content, weather and topography. They also developed fuel accumulation and fuel moisture models. This knowledge was incorporated into a fire behaviour prediction model and a prescribed burning guide (Sneeuwjagt and Peet, 1976, 1998 and 2006), which is used by field staff in rating fire danger, planning and implementing low intensity prescribed burns and in the planning of suppression of bushfires.

### ***Fire ecology***

Studies into the effects of forest fires on soil physical and chemical properties, flora, fauna, water resource values and forest regeneration commenced in the early 1960s and have continued since. This work has resulted in significantly increased knowledge about forest ecosystems and their response to fire. While knowledge is incomplete, there is an adequate knowledge base to devise and implement fire regimes that are likely to be beneficial to the environment.

### ***Aerial prescribed burning***

In the 1960s it was apparent that there were insufficient personnel and other resources to undertake the amount of prescribed burning that needed to be done during the limited number of suitable burning days by the traditional method of strip burning by teams of people walking through the forest. A technique for lighting prescribed fires by dropping incendiaries from aircraft under specific conditions of fuel and weather was conceived and developed in Western Australia. Not only did this allow more area to be prescribed burnt under the desired (prescribed) fuel and weather conditions, it was much safer and less expensive than using ground crews.

Prescribed fire is used as a tool for fuel hazard reduction and bushfire mitigation and for ecosystem management. Planned fires are used to maintain and enhance nature conservation values (eg. protecting and regenerating a diversity of wildlife habitats; rehabilitating degraded areas; creating a diversity of post-fire structural stages), and maintain ecosystem processes such as nutrient cycling. Fire is also used to achieve land management objectives such as catchment management and the regeneration of native forests and understorey vegetation associations after disturbance by timber harvesting. In many cases, planned burns are undertaken at landscape scales to achieve both protection and ecological management objectives by varying the seasons, fire intensities, and the interval between fires. The Department has an obligation to ensure that the condition of the public land which it manages does not pose a threat to human life and property as a consequence of bushfires.

### **Regional parks**

Metropolitan Perth has one of the best networks of urban parks of any city in Australia. In all, there is approximately 72,900 hectares or 10.4% of the Perth metropolitan area designated as regional open space. Regional parks represent a relatively recent (1997) addition to and a significant part of this network, providing ready access to natural areas for Perth's rapidly growing urban population, especially within the rural-urban fringe.

Regional parks are identified by planning procedures as having regionally significant value for conservation, recreation and landscape amenity. The parks comprise lands with a variety of tenures such as Crown lands vested in State government agencies and local governments, as well as private lands where the agreement of the landowner is obtained. Because of this, their management necessitates integrated planning by different agencies as well as collaboration with owners of private land.

Regional parks are a land management concept that provides the opportunity for an integrated planning and management strategy by different land management agencies and private landowners. They comprise a 'package' of lands drawn together for management coordination by DEC.

Unlike nature reserves and national or conservation parks, regional parks are not a category of land under section 5 of the CALM Act, although they could be comprised of such lands. In addition to their multiple vestings and ownership, the majority of regional parks comprise an amalgam of multiple non-contiguous parcels of land.

There are eleven regional parks within the Perth metropolitan area. Seven of the parks, Yellagonga, Herdsman Lake, Canning River, Woodman Point, Beeliar, Rockingham Lakes, and Jandakot, are located on the Swan Coastal Plain. The other four parks, Wooroloo, Mundy, Banyowla and Wungong, are located in the Darling Range.

### **Planning and administration of regional parks**

The Western Australian Planning Commission (WAPC) retains responsibility for overall planning of lands for regional parks and the broader regional open space system under the provisions of the Metropolitan Region Scheme as well as retaining responsibility for the acquisition of land through the Metropolitan Region Improvement Fund. In effect, the WAPC retains the role of overall planning for, and establishment of, regional parks in consultation with DEC.

Coordinating the management of regional parks is achieved through the preparation of management plans for each of the parks. Under the regional park management model, DEC prepares management plans for the parks through a consultative process with relevant agencies and the community to address issues across land tenures and management jurisdictions.

The complexity of tenure and management responsibilities characteristic of regional parks requires management plans to be acceptable to all managing agencies (including local government) and the community. As a result, one of the key roles of a regional park management plan is to develop land tenure and management arrangements that provide for effective and efficient on-ground management.

The management plans are prepared under the CALM Act but are statutory documents only for reserves vested in the Conservation Commission of Western Australia and other lands under DEC management. While the plans guide the coordinated management of the parks, there is no statutory requirement for the other land managing agencies and private property owners to adhere to the management plans. Regional park management plans are approved by the Minister for Environment. DEC seeks endorsement of the management plans from the other managing agencies involved in the respective regional parks.

In managing land in regional parks, the policies and management actions of local governments and other relevant agencies should be consistent with regional park management plans.

In general, DEC manages conservation areas such as bushland and wetlands in the parks, while local governments often manage the more intensive recreation areas such as sporting fields and picnic areas. Figure 1 shows how regional park management plans prepared under the CALM Act correspond to State legislation and policies, and subsidiary plans that provide more detailed direction for on-ground management.

The management plans also guide day-to-day management of the parks which requires effective engagement with a range of different managing agencies, private landowners and the community.



Figure 1: Legislative and policy framework for managing regional parks

## Fire planning and management in regional parks

As is the case on DEC-managed land throughout Western Australia, fire management on regional parks is guided by the *Bush Fires Act 1954* and DEC's *Fire Management Policy* and procedures.

Bushfires are a significant threat to Perth's regional parks and nearby residents, and the risk of bushfire is managed accordingly.

In managing for bushfires in regional parks, DEC undertakes a range of on ground pre-suppression works. These works include prescribed burning, maintaining firebreaks, completing fuel reduction slashing in open grass areas and servicing locks and gates enabling rapid access for emergency vehicles. Pre-suppression and post-suppression works in regional parks are the relevant land managers' responsibility. In certain situations, where efficiencies can be gained, on-ground works are shared between agencies to help achieve practical on ground arrangements.

DEC prepares a 'Fire Preparedness and Response Plan' for each of the regional parks and a 'Prescribed Burning Plan' covers each of the regional parks. DEC's fire record system also enables details on the date and cause of fires on DEC-managed land in regional parks to be easily retrieved.

The regional park fire preparedness and response plans are prepared in conjunction with FESA and relevant local government authorities and cover all areas in the parks irrespective of land tenure. The plans include fire management objectives and strategies addressing fire prevention and preparedness, fire notification, fire suppression and post-fire recovery. The plans also outline the role of DEC staff at fires in the Perth Metropolitan Fire District (MFD).

The master burn plan for DEC's Perth Hills District identifies the areas that are to be subject to prescribed burning, the scheduling of these burns in the coming year and an indication of the schedule of burning for a further two years into the future.

Responsibility for bushfire suppression depends on whether the fire occurs within or outside the MFD. If a bushfire occurs within the MFD, then FESA is responsible for fire suppression. If a bushfire occurs outside the MFD, then either local government authorities, through bushfire brigades, or DEC is responsible depending on the tenure of the subject land.

## **Banyowla Regional Park**

As an outcome of implementing the *Forest Management Plan 2004-2013*, four regional parks and three national parks were created in the Perth Hills. In 2008, the four new regional parks, which comprised sections of the former Darling Range Regional Park, were named Woorloo, Mundy, Banyowla and Wungong to reflect the Aboriginal heritage of the area. Banyowla was a Nyoongar elder at the time of European settlement.

Banyowla Regional Park is about 2620 hectares in size and is located in the south-eastern suburbs of Perth. It includes land in the Shire of Kalamunda and the Cities of Gosnells and Armadale. The park covers land on the escarpment of the Darling Range and has regionally significant conservation, recreation and landscape amenity value. The park also includes water catchment areas which protect some of Perth's drinking water supply.

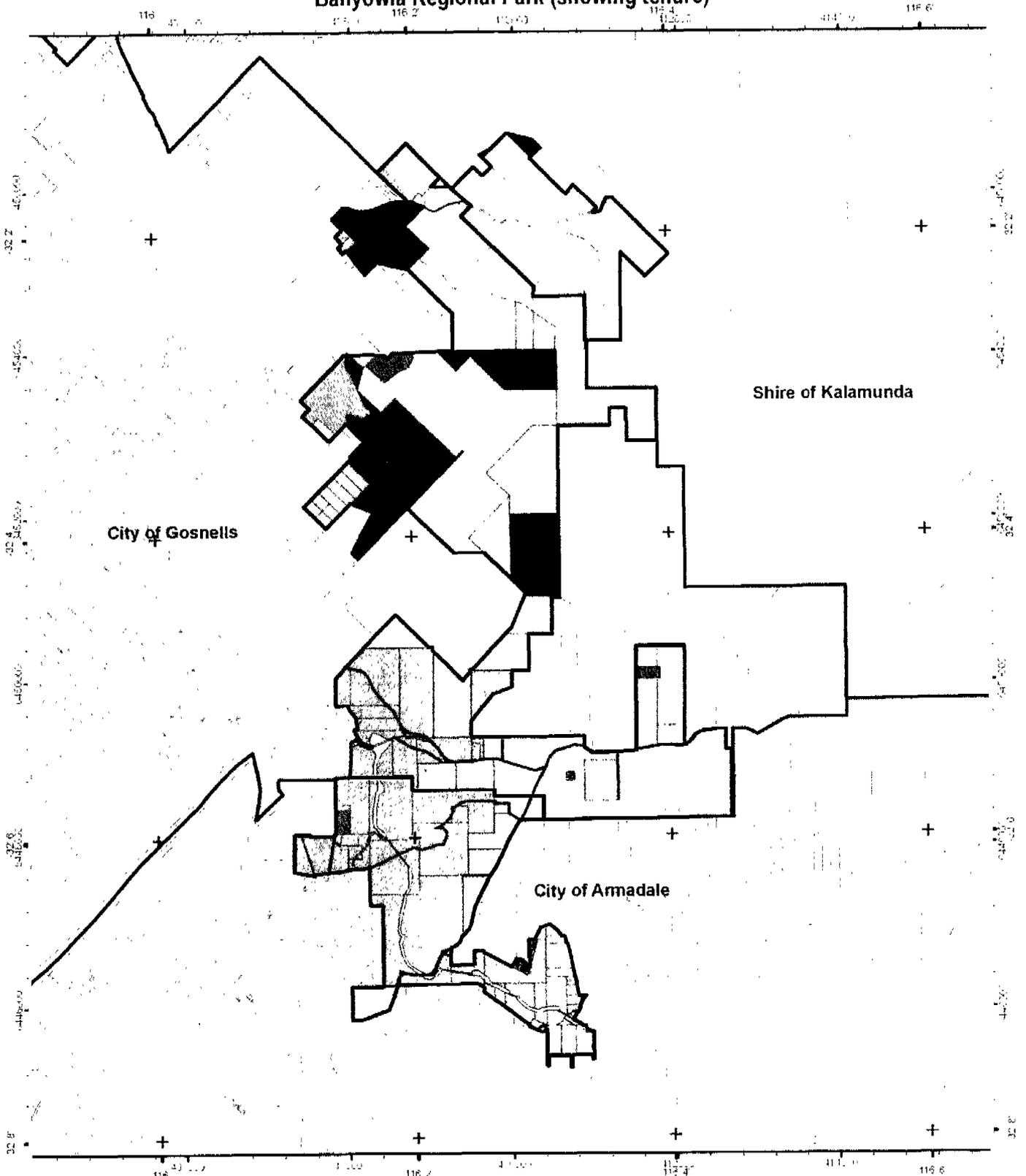
The park comprises jarrah-marri forest and marri-wandoo woodland, which provides important habitat for a range of wildlife.

Ellis Brook Valley, managed by the City of Gosnells is a popular day use recreation site in the park. The park is also a popular destination for bushwalking, mountain bike riding, nature observation and a range of other recreation activities.

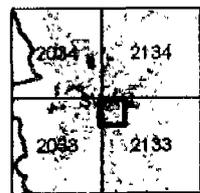
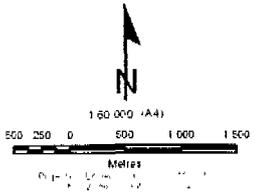
As a natural area in a rapidly developing urban setting, the park provides significant landscape and amenity value to the region. The natural landform of the park provides a scenic backdrop to urban development in the cities of Armadale and Gosnells.

Tenure arrangements for Banyowla Regional Park are complex (Figure 2). The park comprises Crown reserves vested in the City of Armadale, City of Gosnells, Conservation Commission of Western Australia and other government agencies (e.g. Department of Water). Unvested Crown reserves, unallocated Crown land and freehold land owned by the WAPC, other government agencies (e.g. Water Corporation) and private individuals/organisations are also included in the park.

# Banyowla Regional Park (showing tenure)



- Legend**
- Regional Park
  - DEC tenure
  - WA Planning Commission (CALM Act Section 16)
  - WA Planning Commission (Local Government Led)
  - Local Government (Crown Reserves and Provisions)
  - Water Corporations
  - Department of Water
  - Private Property
  - Department of Education
  - Unmanaged Crown Reserves
  - Unallocated Crown Land
  - Other Crown Reserves
  - Public Roads
  - Local Government Boundary



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Figure 2: Tenure Arrangements in Banyowla Regional Park

## **2. Terms of Reference**

### ***1. The adequacy of current preventative measures, specifically prescribed burning and other bushfire mitigation activities.***

#### **Effectiveness of prescribed burning in the control of bushfires**

The combination of weather, fuels and ignition sources that occur in the south-west of Western Australia could be expected to result in the regular occurrence of large uncontrollable bushfires that threaten lives, destroy properties and severely damage forests, plantations, water catchments and ecosystems.

On the contrary, the forest region of south-west Western Australia has experienced few fires (larger than 10,000 hectares) since the implementation of broadscale prescribed burning and the implementation of other fire control measures following the 1961 bushfires. Since that time there have been no forest fires larger than 30,000 hectares, no lives lost in forest fires, few injuries, and few instances of multiple property losses. In the past 20 years, the average annual area burned by bushfires in the south-west forest regions is about 20,000 hectares, which is less than one per cent of the forested landscape managed by DEC (Sneeuwjagt 2008).

This contrasts with the severity and extent of bushfires in the forests of south-east Australia, where many very large bushfires have occurred on a regular basis resulting in loss of life, very significant damage to property, infrastructure and the environment, and a substantial expenditure of resources in fire suppression and post-fire recovery.

The extent of prescribed burning undertaken over the past 50 years in south-west Western Australia has enabled fire managers to achieve a high level of protection for community assets and natural values on and near the lands managed by DEC. There have been numerous examples where the fuel reduction burning program has resulted in relatively rapid containment of bushfires and significant 'saves', even under extreme fire weather conditions.

Forest fire managers who are directly involved in fire control operations have no doubt about the value of fuel reduced areas in reducing the intensity of bushfires and in providing safe conditions to apply effective fire suppression tactics.

While the contribution of prescribed burning to bushfire control may be obvious to fire practitioners and many fire scientists, some commentators continue to question its value and call for the need to have statistical evidence to validate the effectiveness of prescribed burning. Some critics of prescribed burning offer accounts of severe bushfires burning through recently prescribed burned areas and have concluded that in order to be effective against major conflagrations burning under extreme weather conditions, fuel reduction burning has to be repeated every two or three years.

Contrary to the claims made by some critics of prescribed burning, there exists in Western Australia a body of scientific and experiential evidence of the effectiveness of prescribed burning in ameliorating the bushfire threat.

#### **Fire behaviour studies**

Live and dead vegetation (fuel) powers a bushfire. The fundamental relationship between fuel structure and quantity, and the speed and intensity of a forest fire, has been well established since the 1960's. Doubling the quantity of fuel doubles the speed of the fire and increases its intensity four-fold. Reducing the amount of fuel over a significant proportion of the landscape by prescribed burning will significantly reduce the speed, intensity and damage potential of bushfires and greatly improves opportunities for safe suppression. This is the rationale behind fuel reduction by prescribed burning.

The effect of fuel conditions on fire behaviour has been most recently investigated by Project Vesta (Gould *et al*, 2007). This national study involving the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and a variety of fire and land management agencies was conducted in the dry eucalypt forests of Western Australia, and examined the relationship between fuel age and fire behaviour by quantifying age-related changes in fuel attributes and fire behaviour in dry eucalypt forests typical of southern Australia. More than 100 experimental fires were lit under dry summer conditions of moderate to high fire danger at two sites with different understorey vegetation types ranging in age from two to 22 years since fire.

This research demonstrated that the forward rate of spread of a fire is directly related to characteristics of the surface fuel bed and understorey layers, with the near-surface fuel layer having the strongest effect on rate of spread. The near-surface layer provides a common fuel descriptor for a wide range of dry eucalypt forest types that are visually very different because of the characteristics of the understorey shrubs. Experimental data also confirmed the influence of understorey shrub height on flame height, and the contribution of bark characteristics and surface fire intensity to the spotting process.

The Project Vesta experiments indicate that fires in fuels older than about seven years will prove difficult to control under average summer conditions of moderate to high fire danger in open eucalypt forest. This finding is consistent with the conclusions of the Victorian study by McCarthy and Tolhurst (1998) which found that forests with an overall fuel hazard above the high category offered little prospect of assisting bushfire suppression.

Based on the Project Vesta experiments, Gould *et al* (2007) concluded that hazard reduction by prescribed burning will reduce the rate of spread, flame height and intensity of a bushfire, as well as the number of spot fires, by changing the structure of the fuel bed and reducing the total fuel load. The persistence of this effect will be determined by the rate of change in fuel characteristics over time, but is likely to be at least 15 years in forest with fibrous-barked trees and a shrubby understorey.

### **Case studies of effectiveness of prescribed burning**

There have been numerous examples where the fuel reduction program has enabled forest fire managers to control major fire events and prevent serious impacts on lives, properties and environmental values.

The most outstanding example of the contribution of fuel reduction burning in controlling intense forest fires in Western Australia occurred in 1978 following Cyclone Alby which caused 92 fires to burn out of control in and near forests in the south-west. Wind speeds of up to 130 km/hour caused fires to spread at speeds of up to 8,000 metres per hour with extensive spotting. Although the total area burnt by the multiple bushfires was more than 54,500 hectares, the rate of spread in the State forests where fuels were kept at low levels by prescribed burning was so reduced that only about 7,000 hectares of native forests were burnt. Most of the fires were allowed to burn in the low fuel areas, while fire suppression resources were directed at those fires which posed a greater threat to communities and other high values.

The effectiveness of prescribed burning in bushfire control has been documented for nine case studies in the south-west of WA by Underwood *et al* (1985). These case studies were drawn from fire records maintained by the WA Forests Departments over the period 1969 to 1984. The case studies selected included a wide range of forest fuel types in which major fire runs as well as smaller fires with high damage potential had run into areas that had been prescribed burned in the previous six years or less. The study projected each fire in the absence of fuel reduction burning based on the weather prevailing at the time. The study clearly demonstrated that in every case a much larger and more intense fire would have led to

serious social and economic costs to the community. A similar finding was made in a case study by McCaw *et al* (2008) on two bushfires that posed a severe threat to property and community assets near Perth.

There have been several published case studies in the eastern States that have clearly demonstrated the contribution to bushfire control made by prescribed burning for fuel reduction. These include Billings (1981), Rawson (1983), Rawson *et al* (1985) and CSIRO (1987).

### **Case studies of recent bushfires**

While there are published examples of case studies that demonstrate how fuel-reduction burning has modified bushfire behaviour under average summer conditions, there are also examples of where the behaviour of bushfires burning under extreme weather conditions has been significantly modified by fuel reduced areas. For example during the 2006/07 Victorian fires, the extreme weather conditions drove the fires into areas burnt previously in the 2002/03 fires in the Victorian Alps. Fire intensity and the rate of spread were clearly observed to be significantly reduced as the bushfire burned through these areas. Regrettably there were not any firefighting resources available to take advantage of the lowered fire behaviour to contain the bushfire, so the fire continued to spread.

Two recent case studies involving very high intensity forest fires burning under severe weather conditions in south-west Western Australia are presented below.

#### ***Mt Cooke Fire - January 2003***

The Mt Cooke fire in the Monadnocks Conservation Park on DEC-managed land about 70 kilometres south-east of Perth resulted from a lightning strike. For various reasons, fire had been deliberately excluded from large sections of this reserve for 17-20 years, so the bushfire burnt as an intense crown fire under the severe weather conditions (maximum temperature 36°C; low humidity; gusty north-west winds from 25 to 35 km/hr). The fire burnt fiercely up the slopes and along the spine of Mt Cooke and southwards for about 25 kilometres and eventually burnt out 18,000 hectares in 24 hours. The fire defoliated and killed a vast majority of the mature jarrah and marri trees within the long unburnt forests and has simplified the mosaic of vegetation and habitat structures over a large area. The deaths of most of the overstorey will mean that it may take more than a century for the forest to return to its former structure.

Some of the impacts such as loss of topsoil and siltation of watercourses caused during the subsequent winter rains may be irreversible.

When the head-fire reached forest blocks that had been prescribed burnt between one to seven years before, the fire intensity reduced considerably and firefighting forces equipped with bulldozers were able to attack the flanks of the fire. Even though the weather conditions remained severe, the headfire was able to be contained when it slowed after reaching several areas that had been prescribed burnt for fuel reduction three to five years before. The presence of one year old fuels on the north-eastern flank also greatly reduced the size of the fire when the winds changed to westerly.

A spatial analysis of the impact of the Mt Cooke fire on the forest canopy and understorey vegetation based on Landsat satellite data (Figure 3) clearly demonstrates the reduction in fire intensity and crown damage within fuel reduced areas. It is worth noting that the one year old fuels on the northern flank of the main fire run are likely to have been instrumental in limiting spread of this flank as the wind changed to the west.



Figure 3: Landsat image of Mt Cooke Fire of January 2003 showing the benefit of DEC's prescribed burns in controlling this very intense bushfire.

### ***Mundaring-Karragullen Bushfire - January 2005***

The Mundaring-Karragullen fire which burnt during 15-25 January 2005 is another example of a high intensity forest fire that was eventually contained with the assistance of prescribed burns. The fire was the result of seven arson-caused ignitions on land managed by DEC east of Karragullen and within 20 kilometres to the east of the Perth Hills suburbs.

A study of the fire behaviour of the Mundaring-Karragullen fire was undertaken by former CSIRO fire scientist Phil Cheney (2010) to reconstruct the fires during the initial westerly and south-westerly spread on 15-17 January 2005. Three major tongues of the escalating fire travelling at an average rate of spread of 900 m/hour burned towards the Brookton Highway and the Hills suburbs of Roleystone and Araluen. When it crossed the Brookton Highway, the fire ran into two and four year old fuels resulting from fuel reduction burns, where its spread was either stopped completely or checked to such a degree that suppression was straightforward and safe. Figure 4 shows the fire boundaries in relation to the previously burned prescribed burns and the Perth Hills suburbs.

Cheney found that the fuel reduction program carried out by DEC in the preceding years enabled suppression forces to safely contain the fire before it burnt into the Hills suburbs of Roleystone and Gosnells.

Case studies can also provide insight into how the final shape of a bushfire may be influenced by the pattern and extent of prescribed burning, and by suppression activities. For example, the spread of fire can be modelled for different fuel situations and the difference between the predicted and observed final fire shape and values impacted used as a measure of the difference attributable to fuel treatment. This approach was used by Cheney (2010) who was able to estimate the projected fire perimeter of the Mundaring-Karragullen fire in the absence of fuel reduction burning in the past 20 years. Such a scenario was commonly encountered in the ACT, NSW and Victorian fires of 2003 and the Victorian fires of 2006 and 2009. Under

the 20 year old fuel scenario, Cheney estimated that the fire would have burnt westwards over the Darling escarpment and into the suburbs of Roleystone, Armadale and Gosnells less than 24 hours after ignition, causing significant damage and possibly loss of life. This projection is shown as the solid black line in Figure 4 below.

This case study demonstrated that if fuel reduction burning is to be effective under severe summer conditions, spatial and temporal scale thresholds of fuel management must be exceeded. Burning must be regularly undertaken within large blocks throughout the forested landscape and not just immediately adjacent to high value assets such as private land and town sites, and a significant proportion of the landscape must be treated (at least seven to nine per cent per annum).

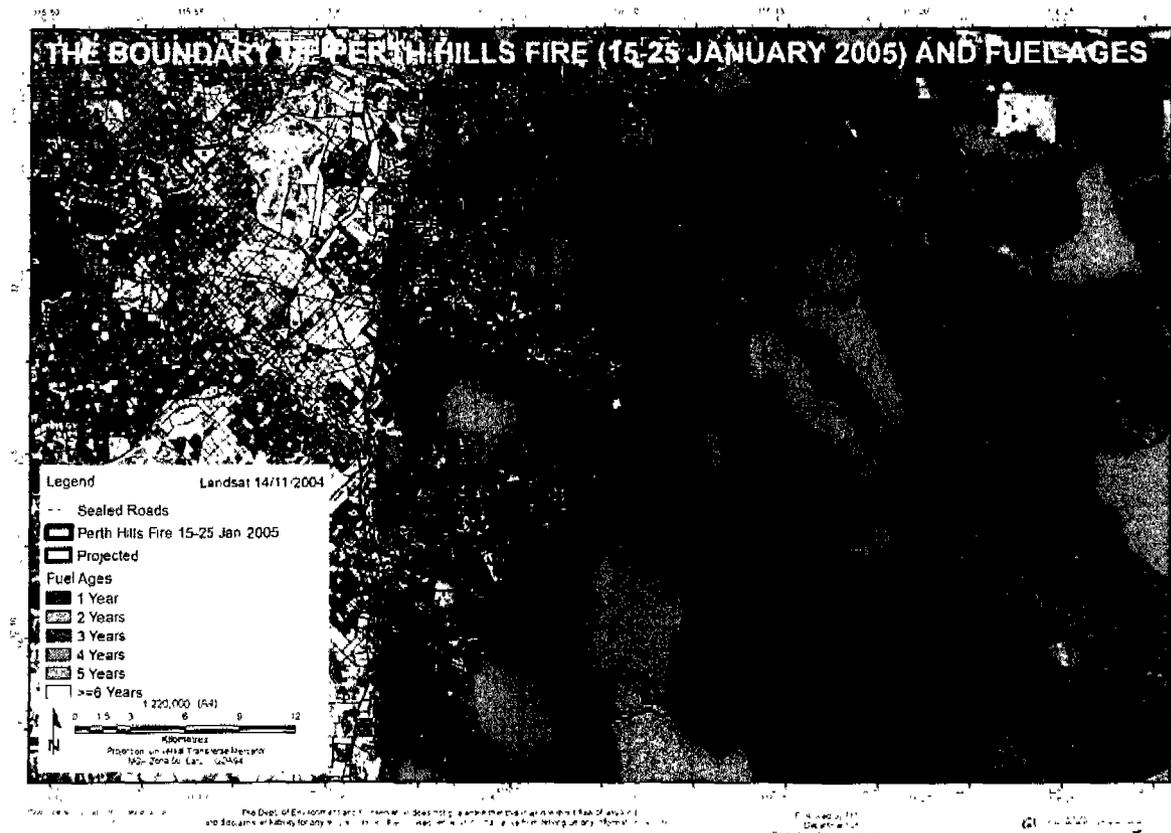


Figure 4: Plot of the perimeter of the Mundaring-Karragullen fire of January 2005 showing the fire in relation to the DEC prescribed burns and the Perth residential areas.

## Quantifying the effectiveness of prescribed burning at a landscape scale

Quantifying the effectiveness of fuel management by prescribed burning at a landscape or regional scale is clearly a matter of great importance to agencies responsible for rural fire protection and management of public lands, as well as to governments and the broader community. This is not an easy task, nor one necessarily amenable to conventional scientific approaches. Cheney (2010) noted that the problem with any landscape-scale trial is that for prescribed burning to be really effective, it has to be applied right across the landscape and on such a scale that it is impossible to have an adequate experimental control. Despite these limitations, Lang (1997) was able to demonstrate a significant relationship between the extent of prescribed burning and bushfires in the south-west jarrah forests of the Collic area, with a notable decline in the area burnt by bushfire once the extent of prescribed burning exceeded about seven per cent per annum (10, 000 ha yr<sup>-1</sup>) of the entire study area (see Figure 5).

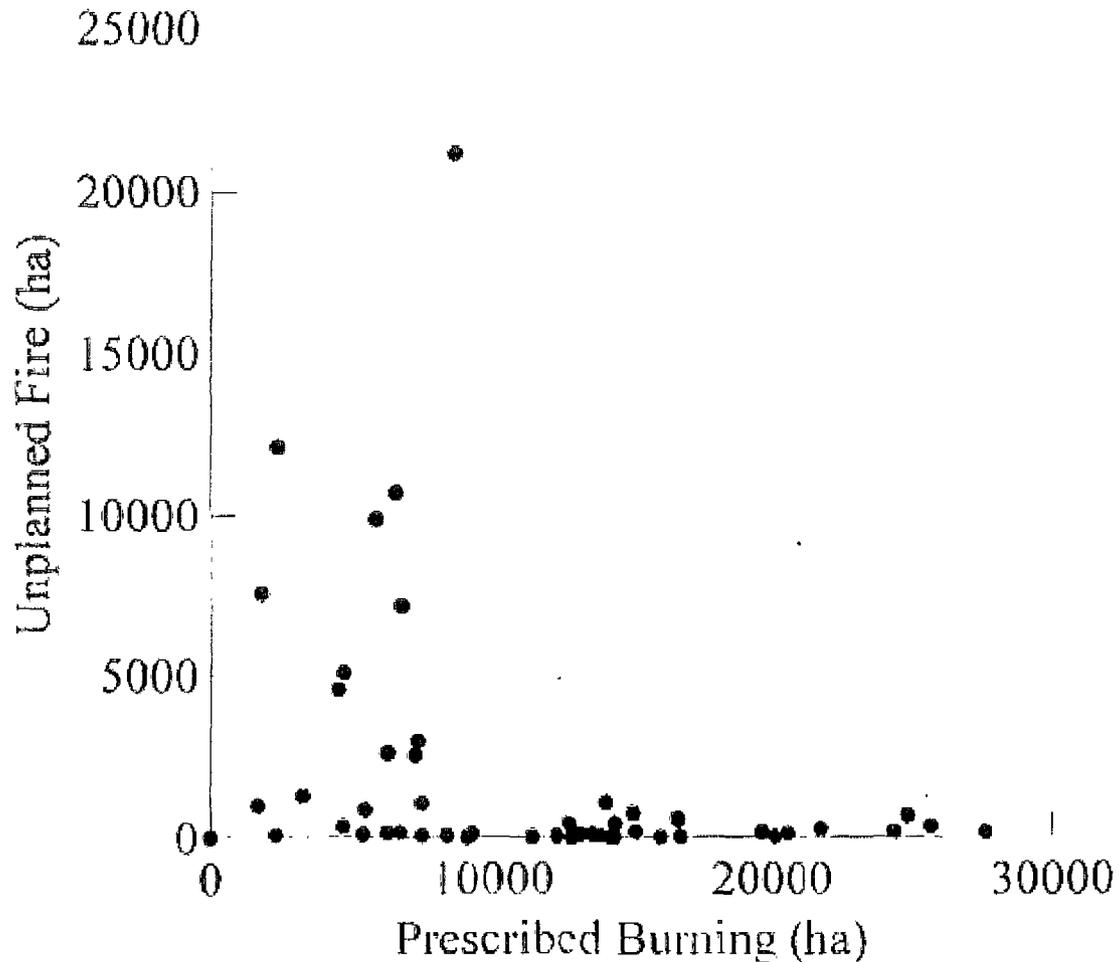


Figure 5: Taken from study by Lang (1997) on the relationship between the annual area of forest prescribed burned and area of unplanned fires (bushfire) within the Collie forest district from 1937 to 1987.

The contribution of prescribed burning to fire control is likely to persist for several years (Boer *et al* 2009) and any comparison between the extent of prescribed burning and bushfire areas should include a spread of years. An investigation into the possible relationship between the areal extent of prescribed burning in preceding years and unplanned fires over subsequent years was undertaken on the south-west forest data from 1961/62 to 2007/08.

This period covers the start of the application of prescribed burning to broad areas, with high levels in the 1960's and 1970's and gradual reductions as the burn program became more refined and targeted to achieve integrated biodiversity conservation and community protection objectives. The variations in the extent of the annual prescribed burning programs over the 47 years of this study provide sufficient data to determine whether the different levels of annual burning have an impact on the total area of bushfires that occur in subsequent years.

Figure 6 shows the prescribed burn areas achieved in the south-west forest regions from 1960/61 to 2009/10.

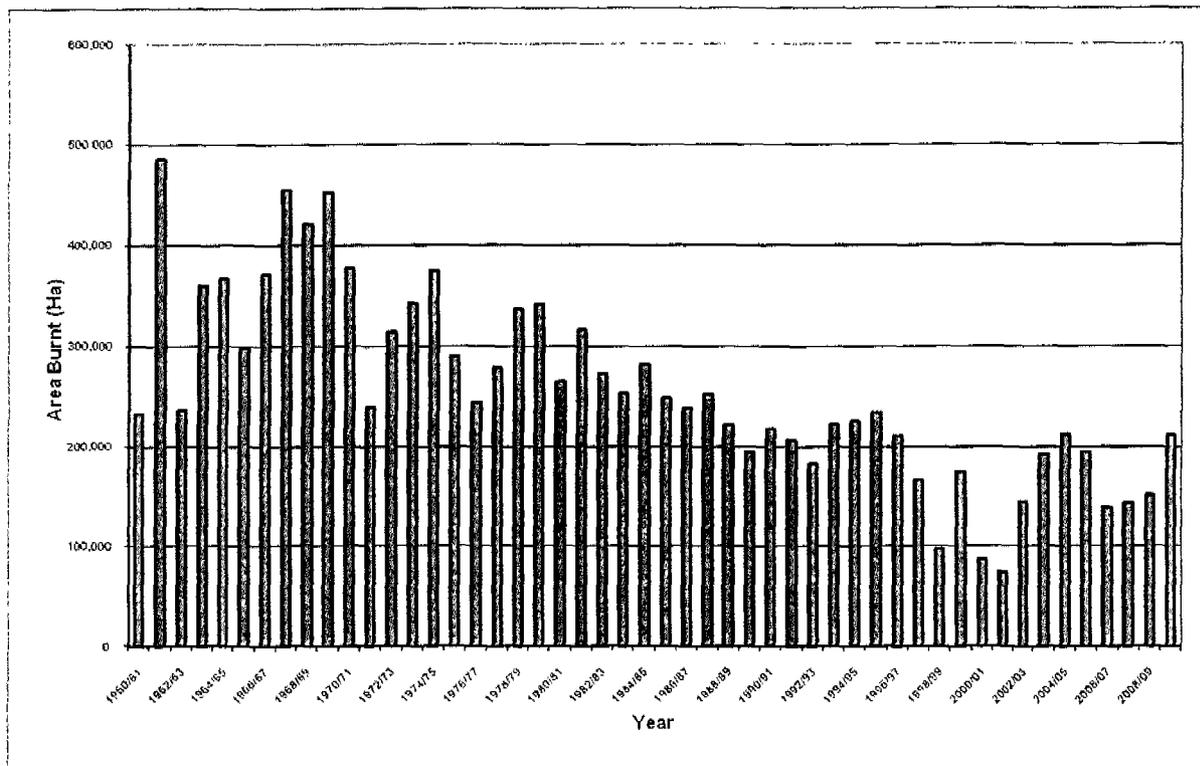


Figure 6: Area of prescribed burns undertaken each year in south-west forest regions from 1960/61 to 2009/10, showing the trend over the past 50 years.

The analysis that was undertaken examined the relationship between the area of prescribed burning achieved over multiple years, against the total areas of bushfires that occurred in a series of the following years. This approach was taken to test the hypothesis that the contribution of prescribed burning to fire control persists over multiple years.

The results of this analysis indicate that the area of bushfires is influenced by the amount of prescribed burning that has been achieved in the preceding period. A strong correlation exists between the area of prescribed burning achieved in one year and the accumulated area of bushfires averaged over the following five years ( $R^2=0.77$ ). This correlation, as expressed as a polynomial relationship, is remarkably strong despite the inherent variations from year to year in bushfire areas that may be due to confounding influences other than the amount of fuel reduced areas that is present across the landscape (see Figure 7).

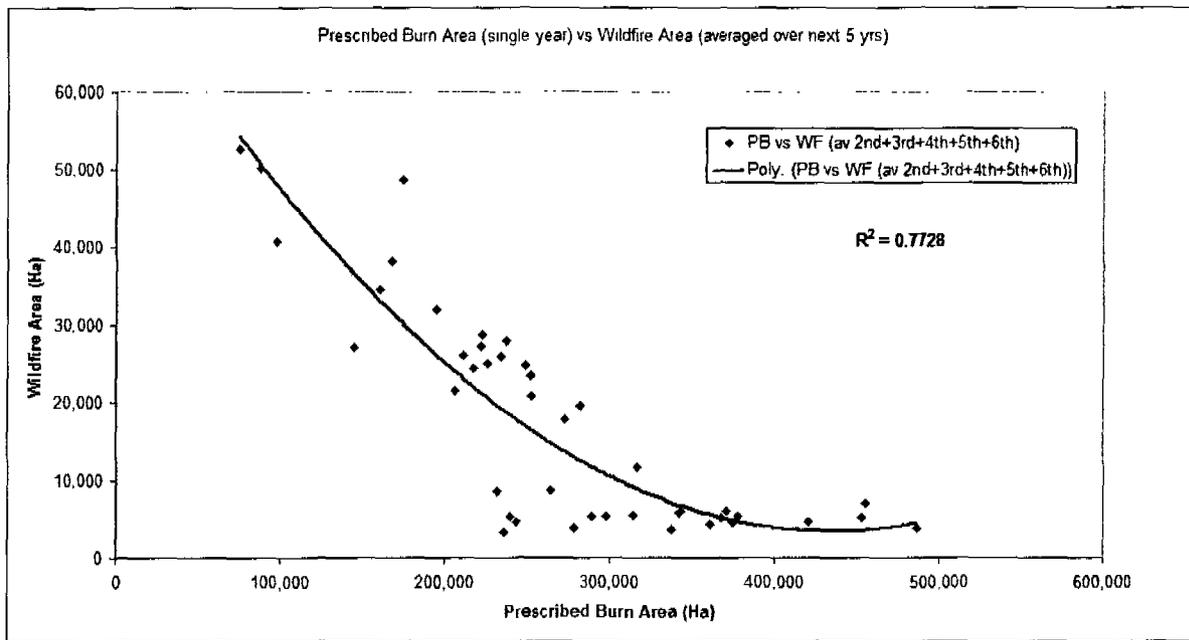


Figure 7: Correlation between the Average Annual Area of Prescribed Burns in a single year, and the Average Area of Bushfires over the following five years in south-west forest regions of WA.

In addition, a strong correlation exists between the area of prescribed burns averaged over four years and the area of bushfires averaged over the subsequent four years (see Figure 8).

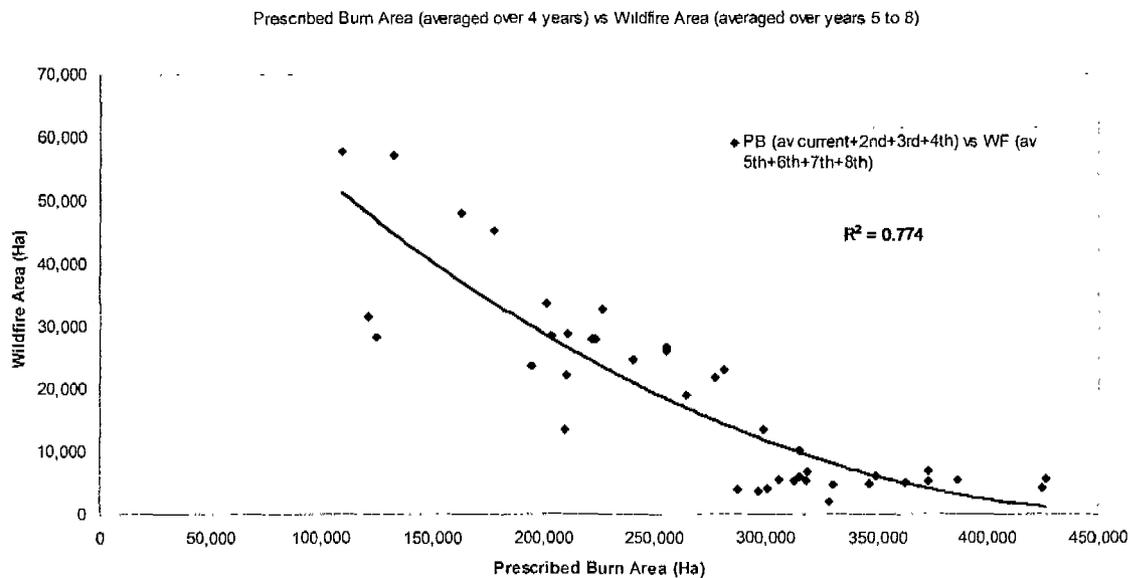


Figure 8: Correlation between the Annual Area of Prescribed Burns averaged over 4 years and the Area of Bushfires averaged over the following four years in south-west forest regions of WA.

## **The role of prescribed burning in reducing incidence of bushfires**

A study by McCaw *et al* (2008) demonstrated that prescribed burning will also reduce the incidence of fires by maintaining areas of sparse fuel that are less likely to remain alight following ignition. Lightning-caused fires should be randomly distributed at a landscape scale, making the expected incidence of ignition directly proportional to the area of each fuel age. Analysis of fire statistics for forests in the south-west of Western Australia between 2000 and 2006 shows that lightning-caused fires are less likely to be sustained in areas where the fuel is less than five years old. This result is consistent with the relatively minor impact of fires observed on the forested estate during the severe fire weather and bushfire emergency associated with Cyclone Albany in 1978.

Under the burning program undertaken by DEC in recent years, the area with fuel less than five years old makes up around 30 per cent of the forest estate. The fact that there are very few fires occurring in this area, and those that do are easily suppressed, makes a very substantial difference to the total fire workload during lightning storms when suppression forces can be easily overwhelmed by a large number of almost simultaneous fires.

Fuel management can also have important benefits to fire suppression that are subtle and difficult to quantify, such as increasing the safety, efficiency and effectiveness of suppression strategies. In this situation comprehensive fuel management decreases the probability of first attack failing under significant fire weather conditions.

### **How much to burn?**

The WA analysis indicates that in order to restrict the extent of forest fires to less than one per cent of the landscape each year, the proportion of the landscape that needs to be fuel reduced is around seven to nine per cent per year (or 35 to 45 per cent over five years). In the case of south-west WA, the annual prescribed burning target of 200,000 hectares was developed as a reflection of this target range. At about eight per cent of the DEC-managed estate, it is likely to result in average bushfire extent of less than about 30,000 hectares per year and more importantly, to significantly reduce loss of life and property and reduced environmental damage.

Statistical analysis shows that the contribution a well-designed prescribed burning program makes to the reduction in the area of unplanned fires is very significant and can persist for at least eight years (Boer *et al* 2009). The current level of annual burning that is targeted by DEC is therefore expected to restrict unplanned fires in south-west WA to the present low levels of between 0.5 and 1.5 per cent of the total estate.

The eight per cent (200,000 hectares) target level was first put forward by CALM in its submission to the Ministerial Review Panel inquiring into its prescribed burning policies and practices in 1994. The subsequent report of the Ministerial Review Panel was highly supportive of CALM's prescribed burning program, which has subsequently been endorsed by a series of reviews and inquiries. In Western Australia, in a subsequent review of CALM's fire policies and management practices in 2004, the Environmental Protection Authority (EPA) opened its summary of recommendations by saying:

*"A fuel reduction programme, as employed by CALM, is seen and endorsed by the EPA as a key strategy in reducing the extent and damage to biodiversity and other assets which might otherwise be caused by bushfires."*

The 2009 Review of Western Australia's Bushfire Preparedness, commissioned by the Premier following the Victorian 'Black Saturday' fires, noted that:

*“There is general agreement that the current 200,000 hectare prescribed burning target in the south-west administered by DEC provides an appropriate level of protection against the risk of major destructive bushfires occurring on DEC-managed land.”*

At the national level, both House of Representatives and Senate Select Committees have noted DEC’s prescribed burning program and acknowledged the role such programs can play in bush fire mitigation.

The 2003 House of Representatives Select Committee inquiry into the 2002/3 bushfires in Victoria, New South Wales and the ACT, *“A Nation Charred”*, contrasted the extent and impact of fuel reduction programs in south-western and south-eastern Australia and made several recommendations in support of broader prescribed burning programs.

The Senate Select Committee on Agriculture and Related Industries inquired into the incidence and severity of bushfires across Australia in 2010. Information about DEC’s prescribed burning program, and a variety of views about prescribed burning, were put to the Committee, leading it to note *inter alia*:

*“...the committee is of the firm view that all fire prone communities in Australia should be part of a well-considered, risk-based and co-ordinated ‘tenure-blind’ prescribed burning program...”* (p87).

The Victorian Bushfires Royal Commission, which produced its final report into the 2009 fires in July 2010, undertook a comprehensive analysis of prescribed burning. It took evidence from DEC officers and other fire experts in regard to the implementation and effectiveness of DEC’s program, and prescribed burning more generally. It acknowledged the positive impacts that prescribed burning had on bushfire mitigation. In a strong endorsement of DEC’s prescribed burning target, it stated:

*“The Commission considers that a target of 5 to 8 per cent prescribed burning of public land is necessary for community safety and would not pose unacceptable environmental risks, particularly if priority is given to the dry eucalypt forests referred to by the expert panel.”* (Final Report, Volume 2, Part 1, p295)

This view was reflected in Recommendation 56 of the Commission:

*“The State fund and commit to implementing a long-term program of prescribed burning based on an annual rolling target of 5 per cent minimum of public land.”*

## **Other components of successful fire management**

The high profile of DEC’s successful prescribed burning program has tended to obscure the fact that prescribed burning, although very important, is only one of the strategies employed in managing the bushfire threat in the south-west forests.

In parallel with the developments described above, a number of other related and very significant fire management developments took place in Western Australia in the aftermath of the destructive 1961 bushfires. Over the years these have included:

- the introduction of spotter aircraft to augment and partly replace the previous fire detection system based solely on lookout towers;
- better firefighting equipment;
- risk-based fire preparedness systems to ensure rapid deployment of fire response resources to initiating fires;
- the development of inter-agency agreements for cooperative fire management with local government authorities, Bush Fire Brigades, FESA, Police and other organisations;
- formal and structured fire training systems for DEC staff and volunteers;

- the development of a structured and pre-planned fire command systems (the Australasian Inter-agency Incident Management System – or AIIMS - which is standard for all bushfire authorities in Australia) which ensures that arrangements and procedures for responding to and coping with fire emergencies are integrated, effective, timely and appropriate;
- the development of a bushfire threat analysis framework as an objective way of identifying, ranking and mapping values to be protected so that priorities and procedures for fire prevention and fire suppression works can be agreed on and implemented with the resources available; and
- the introduction of an aerial suppression capability (water bombers) and specialised ground equipment to rapidly contain initiating bushfires.

Building on a foundation of planned fire to reduce fuels in the forest, these fire control measures provided an integrated approach to fire management on Crown land forests in the south-west. In addition, good working relations with local government authorities, bushfire brigades and FESA have been maintained to ensure the integration of the department's approach with the approach taken on neighbouring lands.

## **Prescribed burning in the Perth Hills**

### ***DEC program***

DEC's program of prescribed burning in the interface areas of the Perth Hills is integrated into the broader master burn plan for its Perth Hills district. The prescribed burning achievements for the District over the last three completed years are shown in Table 1.

2007/08		2008/09		2009/10		Total	
No of Burns	Area (ha)						
31	15,131	27	27,848	45	57,946	103	100,925

*Table 1: Prescribed burning achievements in Perth Hills district – 2007/08-2009/10*

These figures highlight two basic issues which are of relevance to this term of reference. Firstly, the range in annual area burnt reflects, to a large degree, the heavy reliance on suitable burn conditions prevailing to allow the program to be implemented safely and effectively.

In addition, the average burn size of less than 1000 hectares demonstrates the number of small burns that are undertaken in the District. This is a feature of burning in urban interface areas.

These patterns continued in spring 2010 when 15 burns (or parts thereof) totalling only 3220 hectares were completed. Both average burn size and the total area burnt were particularly low. To a large extent, the poor spring season was due to 2010 being an especially dry year, including the driest winter on record.

DEC's six-season indicative prescribed burn program for its Perth Hills district is summarised in Table 2.

Year	Season	No of Burns	Area (Ha)
2011	Autumn	66	60,895
	Spring	64	51,216
	2011 Total	130	112,111
2012	Autumn	19	17,173
	Spring	18	25,890
	2012 Total	37	43,063
2013	Autumn	8	13,890
	Spring	12	20,405
	2013 Total	20	34,295
TOTAL		187	189,469

Table 2: Perth Hills six-season indicative prescribed burning program – 2011-2013

The forward or year one weighting apparent in Table 2 is normal, as a high number of burns are planned and prescribed in order to provide flexibility to the program and allow burning on the most number of suitable days. A number of these burns will not be completed and will carry forward to the following year(s). The low average area of approximately 1000 hectares is again apparent. DEC has undertaken to present its indicative prescribed burning programs to FESA and local government prior to each season through the Interagency Bushfire Management Committee, in accordance with the 2009 *Review of Western Australia's Bushfire Preparedness*.

To date, DEC has not developed a specific prescribed burning (or alternative mitigation) plan for the near-interface areas around the Perth Hills (other than those developed under individual regional park fire preparedness and response plans). This reflects DEC's view, as supported by the work of Cheney (2010), that it is critical that DEC maintains a forest-wide approach to ensure that major fires are not allowed to develop and make significant runs towards urban interface areas in the hills as occurred in 2005. Small fuel-reduced areas adjacent to urban areas are unlikely to provide adequate protection of life and property assets in the absence of larger landscape-scale burns.

Nevertheless, during 2010, DEC commenced an internal review of fire protection and mitigation in regional parks, both in the Perth Hills and on the Swan coastal plain. The scope of this review will include ensuring that there is an appropriate balance between smaller protective burns at the urban interface and larger burns in the forest belt away from the interface to create protection at a landscape scale.

### ***Influencing factors***

DEC's capacity to implement its indicative prescribed burning program is influenced or limited by a number of factors, several of which are more prominent closer to the Perth urban area. The pivotal importance of suitable weather and fuel conditions has already been explained. Other factors which must be taken into consideration include:

- Smoke management

The need to manage the risk of significant smoke pollution events in urban areas, particularly metropolitan Perth, is a significant component of decision-making on the day of proposed burns. This issue is closely tied to weather in that the most suitable time in the regular weather cycle offering stable atmospheric conditions, particularly in spring, involves conditions that are conducive to the formation of temperature inversions that can trap and accumulate smoke in the lower atmosphere in and near Perth.

Such days commonly involve south-easterly winds, especially overnight, which carry smoke from burns east and south of the city towards the metropolitan area. In addition, it is common for there to be an overnight and early morning low-altitude temperature inversion that serves to trap accumulated smoke close to ground. This exacerbates visibility issues in particular, and raises public concern and debate over health issues, despite the fact that Australian standards for particulate levels are seldom exceeded.

In 2009, the Government acknowledged this issue and approved DEC exercising greater flexibility in managing smoke, within national guidelines, in order to achieve its prescribed burning program. However, the implications for community support of the program remain and smoke management is still the second most influential factor in day-of-burn planning (the most influential factor is fuel moisture conditions).

Due to its immediate proximity to the metropolitan area, the Perth Hills area is most affected by smoke management requirements.

- Road and traffic management

Smoke from prescribed fires also has the potential to impact on visibility and safety on adjacent roads. Where these impacts are significant, the need to manage traffic and, possibly, to close roads becomes a resource-hungry part of burn planning and implementation. Once again, the Perth Hills area is disproportionately affected by this issue due to the number of major highways and other high-use roads in the area.

- Heavy adjacent fuels

In comparison to elsewhere in the south-west, the proportion of burns in the Perth Hills area that are adjacent to areas of non-DEC-managed lands with heavy fuel loads is high. This creates an additional complication for burn implementation in order to ensure that the burn does not escape into the adjacent area and threaten life or property. Quite often, given the complicated matrix of tenures in the urban interface areas, the most favourable wind conditions to avoid such an escape may conflict with otherwise preferred burn prescription conditions, or even with smoke management guidelines.

- Unsuitable fuels

There are several fuel types around the urban interface that are not ideally suited to prescribed burning. A prominent example is where annual grasses have invaded forested areas adjacent to urban areas, meaning that prescribed burning will not have a lasting mitigation benefit. In other areas, typically on shallow soils on the face of the escarpment, where trees may be sparse or absent, the vegetation consists of low scrub which does not produce a litter fuel layer to carry low intensity burns. Such fuels will only carry fire in high-intensity fire conditions which are difficult to control and more characteristic of bushfires.

Alternative mitigation methods, such as mowing or slashing, may be suitable for small buffer areas immediately adjacent to assets but are unsuited to broadscale application.

- Topography

Steep terrain is another complicating issue in burn planning and implementation that is a common occurrence in the Perth Hills. In isolation, topography is a matter that DEC staff are well trained and able to deal with in burn planning and implementation. However, when steep slopes interplay with other issues like heavy fuels and high-value adjacent assets, the task becomes highly complex.

In summary, these influences on achievement of the prescribed burn program in the Perth Hills are, individually, of varying importance. However, the interaction between them regularly leads to a level of burn complexity that is highly challenging and carries a level of risk. These are challenges that can be addressed and overcome, but they invariably lead to a

heavy drain on departmental resources that may not be commensurate with the size of individual burns or the limited risk mitigation benefit that they represent.

Significant additional resources would be required were DEC to implement both a comprehensive program of prescribed burning throughout the urban interface areas of the Perth Hills and the ongoing landscape-scale program required to prevent major fire runs from impacting on those interface areas.

### **Alternative risk mitigation options**

A number of alternative bushfire risk mitigation options are open to land managers and owners. A significant number of these are included in the individual regional park fire preparedness and response plans, such as that for Banyowla Regional Park that has been provided to the Review.

Typically, these measures fall into one of the following categories:

- Fuel modification

Alternative methods of fuel treatment such as mowing, slashing and/or pruning, have been mentioned above. These have their place, particularly in limited areas immediately adjacent to high-value property or other assets. However, they are generally not suited to broadscale application for a variety of reasons such as cost, safety or environmental impact.

- Pre-suppression works and planning

Pre-suppression works such as construction, maintenance and sign-posting of access tracks and fire breaks, or planning measures such as inter-agency consultation, liaison and response agreements serve to maximise the effectiveness and success of incident response measures in the event of a fire.

These measures all have some value and should be included in agency and individual fire plans. Individually, or in concert, they may play a part in preventing or reducing the harmful impacts of bushfires under certain conditions. There is ample evidence, however, that such measures do not constitute sufficient protection from fire in all circumstances. In fire weather conditions at the upper end of the scale, the rate of spread and intensity of fire is likely to overwhelm such measures in most cases. The Kelmscott-Roleystone fire is the most recent example where these approaches have largely failed.

### **A tenure-blind approach**

In considering prescribed burning or other bushfire mitigation measures for the Perth Hills, a tenure-blind approach is fundamental. Whilst DEC is the most significant single land manager in the area, there are also substantial areas of land, including forested land, managed by other agencies, local government or private landowners. Furthermore, much of this land is not subject to prescribed burning or other mitigation measures and fuel loadings are typically high.

In the case of many landowners or managers, there may be a lack of awareness of fire risk, or a lack of capacity to address it, or both. Even local governments, many of which have undertaken prescribed burning and other fire mitigation measures in the past, have done less of such work in recent years. This may be due to community attitudes to fire or to lack of resources. In some cases, the reduced involvement of bush fire brigades, particularly within the Metropolitan Fire District, is a factor as they were previously an important resource in undertaking such works. Over time, in the absence of an optimal fuel management program, fuel loads in these areas have increased and the risk associated with using prescribed fire as a mitigation measure has increased significantly for the agency undertaking the work.

As a result of these factors, any fire prevention approach which relies primarily or entirely on measures undertaken on DEC-managed land will not succeed. This is apparent in the case of the Kelmscott-Roleystone fire, where DEC-managed land constituted only half of the total area burnt. More importantly, a study of the fire by Dr Lachie McCaw, a Principal Research Scientist in DEC whose fire behaviour and ecology expertise is recognised internationally, indicates that fuels on lands not managed by DEC played the major part in the spread of the fire (McCaw, 2011; copy attached as Appendix 1).

The report suggests that, as the fire made its major run to the west along the Canning River valley and up the slopes to the south around Scott Road and Bromfield Drive, it was almost entirely within private property with an array of fuel types, although it also severely burnt the Lloyd Hughes Park, managed by the City of Armadale, when it reached the Clifton Hills area of Kelmscott. It was only in the late stages of the main fire run that steep slopes below Canning Mills Road caused a significant fire run towards the north-west through the DEC-managed section of Banyowla Regional Park. Subsequently, significantly more of the regional park, mostly on the northern slopes of the Canning river valley, burnt under milder flank-fire conditions before a firebreak was established to contain it.

The importance of addressing the build-up of fuels across all tenures was raised in 1994 by the Ministerial Working Group investigating the Darling Escarpment fire hazard whose report still has significant relevance to the terms of reference of the review. The importance of a comprehensive, “tenure-blind” approach to risk mitigation has subsequently been advocated by a number of bushfire inquiries, including the *Review of Western Australia’s Bushfire Preparedness* (DPC 2009). As a result of that review DEC, FESA and local government, through the Interagency Bushfire Management Committee, are currently developing a State-level fuel management policy which will incorporate all tenures.

## ***2. The impact of land use, environmental and building laws, practices and policies in the affected areas, affecting bushfire prevention, mitigation and response and what, if any, changes may be required.***

The bushfire risk resulting from the complex matrix of bushland and urban or semi-rural development in the Perth Hills presents a significant challenge for the community and relevant authorities. Further development throughout the region is assured and appropriate planning and policy approaches are critical if loss of life and property is to be minimised. This must begin with an acknowledgement that land-use planning and development approval processes have a significant part to play in addressing the issues that we face, and a resolve on the part of relevant authorities to use the processes fully and effectively to achieve the required level of risk mitigation.

Concepts such as the declaration of bushfire prone areas and the imposition of relevant Australian Standards for buildings in these areas may have a part to play if they are appropriately implemented and policed. These are not areas in which DEC has a significant role or expertise, although it is aware that they have been considered at some length by the Victorian Bushfires Royal Commission and, to some extent, as part of other processes such as the 2004 Council of Australian Governments inquiry (Ellis *et al*, 2004) and the 2009 *Review of Western Australia's Bushfire Preparedness* (DPC 2009). Their deliberations and recommendations on these matters may be of some guidance to the Review.

### **Land-use planning**

DEC has strong views in relation to the conditions placed upon, and guidance given to, developers and home builders on property adjacent to DEC-managed land in relation to such issues as appropriate levels of development, hazard separation zones and building protection zones. The department has thousands of neighbours in the Perth Hills and is aware of the wide range of views that exist about fire risk, and the responsibility for mitigation. It maintains a consistent approach and will use best endeavours to ensure it meets its responsibilities and obligations with respect to risk mitigation, consistent with providing for its other land and biodiversity management objectives on behalf of the community.

On the other side of the fence, however, many developers are unwilling to acknowledge the risks involved in new developments at the urban interface and their own responsibility to mitigate them. It is imperative that development approval processes ensure that the level of bushfire risk associated with individual developments is properly evaluated, that effective measures for mitigation of those risks are conditions of approval, and that the satisfaction of those conditions is monitored and policed. Any approval process that does not meet these requirements will lead to the perpetuation of the high-risk circumstances that were exposed in the Kelmscott-Roleystone fire, and previously at Toodyay and Lake Clifton, and which occur throughout the Perth Hills area due to less stringent processes.

As a neighbour, and given its significant expertise in bushfire behaviour and management, DEC is strongly of the view that it is well-placed to make recommendations to planning authorities on appropriate mitigation measures for developments at the urban interface. Current planning processes, as outlined in the 'Planning for Bushfire Protection Guidelines' (WAPC, FESA 2010), do not adequately provide for DEC to have a direct role in providing such advice. Guidance statement A8 in the guidelines states:

*In addition to the matters normally required to be taken into consideration, any advice received from FESA, the DEC (regarding potential impacts of their fire regime on amenity) or other relevant authority regarding fire management practices is to be taken into consideration before a decision is made by the decision-making authority on that application. When assessing new proposals or proposed changes of zoning or design that will result in the introduction of, or intensification of, development that abuts land vested in the DEC, FESA will consider input from DEC on bush fire management prior to providing final advice on fire management practices to the decision-making authority.*

Similarly, Guidance statement B8 states:

*In addition to the matters normally required to be taken into consideration in the determination of a subdivision application, any advice received from FESA, the DEC (regarding potential impacts of their fire regime on amenity) or other relevant authority regarding fire management practices is to be taken into consideration before a decision is made by the decision-making authority on that application. When assessing new proposals or proposed changes of design that will result in the introduction of, or an intensification of, development that abuts land vested in the DEC, FESA will consider input from DEC on bush fire management prior to providing final advice on fire management practices to the decision-making authority.*

The guidelines are currently under review. This review is being conducted by the Land Use Planning Working Group which is a sub-committee of the State Mitigation Committee. As has been the case in the past, DEC will again raise this and a number of other issues through this review process.

Supporting this view, a more active role was advocated in a review of DEC's ability to manage major fires (Ferguson, 2010). Finding 4 of this review states:

*It is sensible that, in considering planning development proposals on land adjacent to the DEC estate, that development authorities invite comment from DEC on the fire management consequences of development proposals.*

The department will continue to exercise its right to comment on development plans for neighbouring land but believes strongly that that right should be reflected in the formal planning guidelines.

Proposals for new subdivisions and developments that contain features that cannot comply with the performance criteria and acceptable solutions as described in the guidelines will generally require the development and approval of a fire management plan as a condition of subdivision or development in areas of high bushfire risk. These plans include mitigation measures which developers agree to. However, the commitment of landowners to mitigation measures inevitably wanes over time, and the neighbouring landowner and broader community expectation falls on DEC to provide the necessary protection, with these increased costs borne by the public through DEC.

### **Native vegetation clearing controls**

DEC is responsible for the regulation of the clearing of native vegetation under the provisions of the *Environmental Protection Act 1986*.

Clearing of native vegetation for the purpose of fire prevention is exempt from requiring a permit under the Act in most circumstances. Landowners are able to clear native vegetation at any time of year if:

- a local government has given notice in writing under section 33 of the *Bush Fires Act 1954* to undertake fire prevention measures determined necessary by that local government to prevent the outbreak or spread of a bush fire; or
- the clearing is done in accordance with a subdivision approval given by the responsible authority under the *Planning and Development Act 2005*; or
- the clearing is to the extent previously cleared around a building for the purpose of fire risk reduction, provided that the native vegetation was lawfully cleared within the ten years prior and does not occur within an environmentally sensitive area; or
- the clearing is up to 20 metres around a building for the purpose of fire risk reduction, provided that the native vegetation was previously lawfully cleared and does not occur within an environmentally sensitive area.

Where these exemptions do not apply, clearing may be carried out where a clearing permit is applied for and granted.

A landowner may burn native vegetation to reduce the fire risk outside of the restricted and prohibited period, provided this is done in such a way as to minimise long-term damage to the environmental values of native vegetation and does not occur within an environmentally sensitive area.

FESA may clear native vegetation for fire prevention or control purposes or undertake other fire management works on Crown land. There are other provisions for FESA, bushfire control officers and local government to authorise clearing of native vegetation by burning during restricted or prohibited times.

DEC may clear native vegetation in the performance of its functions under section 33(1)(a) of the *Conservation and Land Management Act 1984*.

***3. The actions that can and should be taken by landowners, residents and tenants in relation to bushfire risk management including undertaking vegetation clearance, operation of evaporative air-conditioners and storage and/or removal of hazardous inflammable material surrounding their dwellings and buildings. This should include consideration of associated enforcement regimes and penalties.***

DEC's position in regard to this term of reference directly reflects and extends upon points that have been made earlier in this submission. Essentially, it is based on the absolute requirement for risk mitigation actions to be comprehensively undertaken on a tenure-blind basis. Consequently, there is a need for the whole community to acknowledge and 'own' the problem and, more importantly, to act accordingly. An analogy can be made with disease immunisation programs in that a significant non-participation rate within the community can render the entire system ineffective.

It follows that the community needs to be fully informed in regard to bushfire risks as well as mitigation standards. There is a strong argument that this information is, and has long been freely available, but that it has not been acted upon, other than for short periods following catastrophic events. More therefore needs to be done, and this should extend to enforcement if necessary.

The means to both inform the community in bushfire risk areas of the measures they can and should take to mitigate the risk, and to enforce the relevant standards, currently exist. The issue that must be addressed if lives and properties are to be protected in the long-term is the willingness and capacity to enforce the standards. The responsibility for this falls with local government which is likely to require additional resources to manage the issue. A possible model for enforcement is already available in the form of swimming pool fencing legislation, the main components of which are:

- statutory responsibility and power;
- appropriate and widely understood standards;
- enforcement at the installation/building stage; and
- ongoing enforcement through periodic inspection, and when ownership changes.

A similar approach for bushfire risk mitigation is quite feasible and, in fact, is simply an extension of the existing 'Firebreak Notice' system administered by local governments in accordance with Section 33 of the Bush Fires Act.

The imposition of such a regime is likely to meet a level of initial resistance and may require some political will, in addition to resourcing. However, once it is established and the benefits become obvious, then acceptance and compliance increase and enforcement requirements moderate and become routine.

#### ***4. The adequacy and effectiveness of information and communication campaigns and mechanisms, including systems for alerting residents in relation to the fire or potential fires.***

DEC notes that the processes used to disseminate information at the Kelmscott-Roleystone fire were in accordance with systems developed in Western Australia to reflect national initiatives following the 2009 Victorian fires and the report of the Victorian Bushfires Royal Commission in 2010.

Public information about the incident included regular announcements on ABC Radio and Radio 6PR and activation of the State Alert system based on SMS messages. In DEC's view, both these processes were put in place in a timely manner when consideration is given to the lead time required to verify relevant information relating to the fire. The State Alert system has been widely criticised due to delays in some members of the community receiving SMS alerts, despite this being a function of the capacity of the carrier's network infrastructure rather than the alert system itself. To this extent, the system is likely to remain problematic and not meet the expectations of the entire community.

There is a sense that, in this age of instant messaging, the community expectation for information may have risen to a level that is not aligned with practical reality. The need for a level of incident assessment and human judgment to be exercised in responsible and accurate information dissemination requires an amount of time that may never meet the apparent expectation.

This increases the importance of pre-event preparedness and there is a variety of opportunities for information and communication mechanisms to be improved.

#### **Pre-incident communications**

Community awareness of bushfire-related information remains low and increased resources for promotion of a variety of information and material in the lead-up to and during the fire seasons are required. For example:

- the community, collectively, appears not to have grasped the standard terminology related to fire danger ratings, what they mean, and how they should respond;
- many alerts and warnings refer to implementation of individual bushfire survival plans when it appears that a high proportion of the community, even in high bushfire risk areas, do not have such plans; and
- where people do have survival plans, they may be ineffective because they are based on poor understanding of bushfire behaviour and impacts, as well as mitigation options.

There may be a capacity for an assessment of individual survival plans in conjunction with any mitigation enforcement process that may be adopted.

In addition, consideration could be given to a variation in the State Alert system whereby residents are reminded by SMS early on days of very high (or above) fire danger of the fire danger and where they can access necessary information on which to base their plans and movements for the day.

## **Communication during an incident**

The AIIMS system caters quite adequately for the development and dissemination of incident information to the community. A current review of AIIMS is likely to enact the recommendations of the Victorian Bushfires Royal Commission to include a new position of Public Information Officer and to have that position report directly to the Incident Controller, rather than the Planning Officer.

Consideration should also be given to modifying the current public information templates used by agencies to ensure that shorter messages are read by radio announcers. In the midst of an emergency, listeners could potentially benefit from receiving only the most relevant information in a short burst rather than listening through a radio announcement that can take up to three minutes to read.

Whilst it applies at any time, DEC believes it is vital that a single bushfire/emergency information portal is developed to provide information to the community during incidents. Currently, FESA undertakes this role through its website but there have been difficulties associated with placing standard community information sheets, maps and other important information generated by DEC onto that site in a timely fashion. A single portal, accessible and updateable by the Incident Controller, would overcome such issues and allow incident information generated by any authority and approved by the Incident Controller to be accessible to the community in one location and in a timely manner. The regular occurrence of large fires that affect communities in north American jurisdictions has resulted in the development of web-based information dissemination tools such as Inciweb (<http://inciweb.org/>) and the associated multi-agency business practices that enable its effective use. A similar facility is required by WA.

## ***5. Improvements that can be made in relation to the coordination of activities across all levels of government, including with volunteer groups.***

Improvements in whole-of-government coordination have been constant but incremental over the last decade. The recent establishment of the Interagency Bushfire Management Committee is a positive initiative that is expected to foster more rapid improvements in coordination and inter-operability.

The Interagency Bushfire Management Committee has five sub-committees:

- Aerial Suppression;
- Fire Operations;
- Fuel Load Management;
- Research; and
- Training.

Each of the sub-committees is working on a variety of initiatives designed to assist in improved cooperation between, and joint effectiveness of, bushfire authorities. For example, the Fuel Load Management Sub-committee is working on the State-level fuel load management policy, and the Fire Operations Sub-committee is refining the incident action planning process.

There is currently no sub-committee focussed on community engagement and information provision nor a sub-committee dedicated to information communications technology. These issues are currently under consideration by the Interagency Bushfire Management Committee.

### **Statutory and administrative framework**

In DEC's view the statutory and administrative framework is, in the most part, satisfactory. Several reports have considered these issues over the last decade including the Auditor-General's performance examination (*Responding to Major Bushfires*, 2004), the Community Development and Justice Standing Committee *Inquiry into Fire and Emergency Services Legislation* (Legislative Assembly, 2006) and the *Review of Western Australia's Bushfire Preparedness* in 2009. Most of the issues that have been identified in these processes have been acted upon, most notably with amendments to the Bush Fires Act in 2009.

#### Zone 2 Arrangements

One aspect of the administrative arrangements that DEC believes requires refinement is the *Zone 2 and 2A Operational Protocols*. Zone 2 and 2A are special bushfire response zones that have been established along the Darling Scarp (Perth Hills) for the following reasons (as stated in the Protocols document):

- *High risk to life and property*
- *Bushfire prone area*
- *Steep slopes and variable winds resulting in fast moving erratic fire behaviour and an increased rate of spread due to gradient*
- *Limited access in many areas*
- *Very politically sensitive*
- *Urban/Rural Interface area similar to the Canberra Fires.*

These response arrangements for the Perth Hills are intended to provide automatic, rapid response by fire agencies to reported fires in the hills. However, the documentation is somewhat ambiguous about whether the response is actually automatic and, as a consequence, there has been a drift towards a managed response. Symptoms of this include DEC being advised of fires a considerable time after they have first been reported to FESA and/or being advised by the FESA Communications Centre that assistance is not required. This is not consistent with automatic response and leads to delays in resource deployment to fires which may have significant consequences.

### **Operational response capacity**

DEC has considerable fire response capability and its basic resource levels have been summarised earlier in this submission. As part of its response capacity DEC has five pre-formed incident management teams that are rostered throughout the fire season. Each team has about 65 trained staff who fill all the key command and support roles of a large incident management team capable of managing complex (Level 3) emergencies. Typically, DEC is able to mobilise the rostered team within four hours and has generally been able to mobilise a second, non-rostered team within 24 hours. In order to manage large incidents in remote locations, DEC has developed and utilised a system of mobile communications and portable incident control and field operations facilities. These facilities rely on satellite and radio communications systems to provide reliable means of planning, supporting and coordinating a large number of incident operations, resources and inter-agency personnel.

As a result, there have been examples, including the Lake Clifton fire in January 2011, when the DEC pre-formed teams and the mobile control and communications facilities have been mobilised to assist at a FESA or local government-managed fire. However, these instances have to date been in regional areas and it has not typically been the case in metropolitan or metropolitan fringe fires. DEC believes that its high level incident management skills and capacity could be of substantial benefit in augmenting FESA or local government resources at large fires in the metropolitan region, including in the Perth Hills. In particular, in the event of significant bushfires at the urban/bushland interface, it is essential that bushfire capacity and expertise held by DEC are called upon, as well as urban fire capacity and expertise.

Through the deliberations of the Interagency Bushfire Management Committee, the agencies are currently evaluating options for inter-agency pre-formed teams. However, there are a number of issues such as the lack of uniform accreditation, differences in industrial arrangements, and pre-season exercising which need to be resolved before this becomes a reality. In the meantime, there is a capacity for DEC to assist at non DEC-managed fires, under a simple inter-agency or a unified command structure, where DEC's capacity and expertise in bushfire management can enhance outcomes.

Noting that this fire occurred within Zone 2 of the Metropolitan Fire District, while FESA has the lead role in bushfire suppression, it is essential that DEC's capacity to assist is better utilised well beyond initial response as currently described in the *Zone 2 and 2A Operational Protocols*.

### 3. Summary

The following points summarise the main issues raised in this submission:

- Research, operational experience and case studies provide compelling evidence that prescribed burning is the most effective means of bushfire mitigation on a broad scale.
- Large scale prescribed burns in the hinterland are vital to prevent major fire runs into the urban interface and should not be sacrificed to provide small-scale buffer burns in interface areas.
- Burning in urban interface areas is highly complex and additional resources are required to utilise the limited safe and effective burn opportunities needed to significantly reduce bushfire hazards and community impacts.
- The Kelmscott-Roleystone fire which initially burned through and impacted on private lands and assets provides strong evidence that any bushfire mitigation approach for the Perth Hills that focuses primarily on DEC-managed land will not succeed – an all tenure-approach is fundamental to success.
- Leadership by local government authorities and FESA that enables a strong resolve and an effective means to enforce bushfire mitigation and preparedness standards is required.
- Appropriate land-use and development approval processes are an important means to minimise future loss of life and property.
- It is necessary for DEC to have direct input to planning authorities in relation to development proposals adjoining DEC-managed lands
- Improvements can continue to be made to communication and public information systems for major fires, in particular the development of a single emergency information portal which can provide information created by all relevant controlling or response agencies.
- Community expectations relating to the timeliness of warnings and information may be unrealistic and some management of expectations may be required.
- Interagency coordination is adequate at a statutory level but can be improved at an operational level. DEC has a proven high level incident management capacity that has been tested at fires in regional areas, including FESA-managed fires, and which should be utilised to enhance outcomes in relation to bushfire response in the Perth Hills.
- Given some current inconsistencies in the application of the current *Zone 2 and 2A Operational Protocols*, these protocols should be reviewed and clarified to the satisfaction of all parties involved.

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KELMSCOTT- ROLEYSTONE BUSHFIRE  
PERTH HILLS FIRE 107  
SUNDAY 6 FEBRUARY 2011

RECONSTRUCTION OF FIRE SPREAD FOR THE PERIOD 1200-2300 hrs

Report prepared by Dr Lachlan McCaw  
Department of Environment and Conservation

23 March 2011

## SCOPE OF REPORT

This report has been prepared at the request of the Director General of the Department of Environment and Conservation (DEC) to document the circumstances of weather, fuel and fire behaviour associated with the bushfire that burnt in the Kelmscott-Roleystone area of the Perth hills on 6 February 2011. The purpose of this report is to provide information relevant to an examination of the factors contributing to the bushfire and its impact on the community, noting that DEC-managed land was burnt in the bushfire.

## INFORMATION SOURCES

Weather data from automatic weather stations at Bickley and Champion Lakes were provided by the Perth Regional Forecasting Centre of the Bureau of Meteorology. Bickley is located 17 km north east of the fire origin at an elevation of 384 m a.s.l and represents winds on the crest of the Darling escarpment. Champion Lakes is located 7 km north west of the fire origin at an elevation of 22 m a.s.l and represents winds on the Swan coastal plain at the base of the Darling escarpment. The Bureau of Meteorology is preparing a comprehensive report on weather conditions during the Kelmscott-Roleystone bushfire which will provide additional information and analysis to that presented here.

Spatial information for terrain and land tenure was obtained from DEC Operational Graphics. Spatial information relating to fire history, the final perimeter of the Kelmscott-Roleystone bushfire and the location of properties damaged by the fire was provided in the form of maps prepared by Fire Management Services Branch of DEC. Digital aerial imagery of the area affected by the fire was acquired on 24 February 2011 by contractor AAM. Imagery had a resolution of 16 cm and was provided as individual ortho-rectified images and a mosaic.

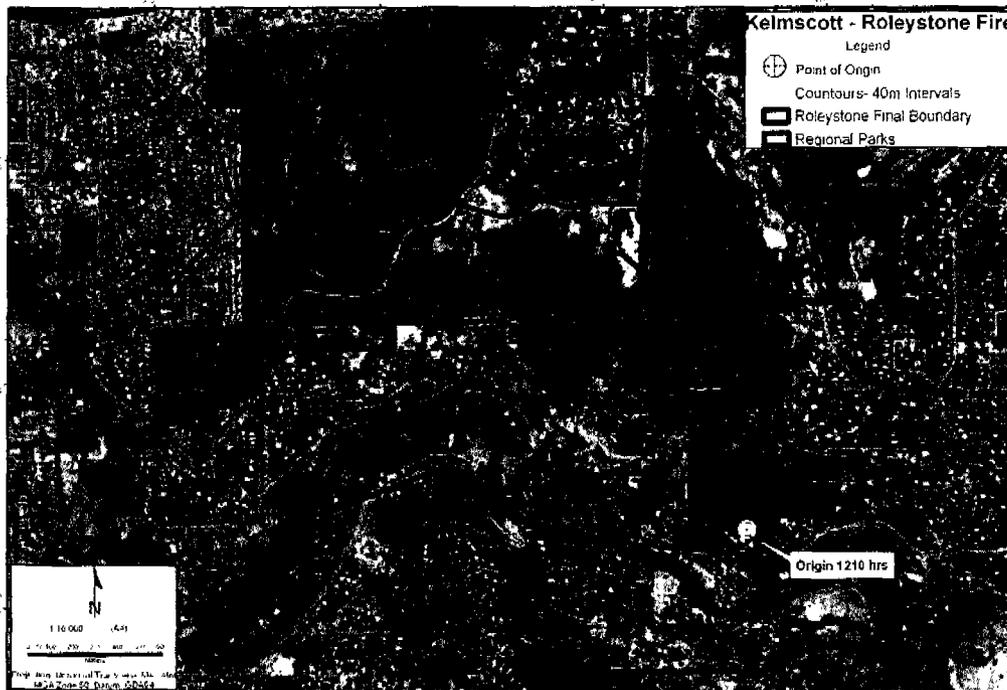
Details relating to the detection and initial response to the fire by DEC were taken from a briefing note prepared by Keith Low of Fire Management Services Branch, and from notes prepared by Stefan de Haan of Perth Hills District. Information relating to the presence of fire at particular locations and times was interpreted from a copy of the log recorded at the Fire and Emergency Services Authority Communications Centre. However, these times are indicative only due to lack of specific information about whether these reports refer to the passage of the fire front or to spot fires some distance ahead of the main fire front.

A field visit was made to the fire affected area on 21 February 2011 to inspect fuel characteristics and crown damage, and photographs were taken at a number of places.

## DESCRIPTION OF THE AREA AFFECTED BY FIRE

### Location and terrain

The fire burnt areas adjoining the Brookton Highway in the suburb of Kelmscott in the south eastern suburbs of Perth (Fig. 1). The Brookton Highway follows the valley of the Canning River which has a generally east-west orientation as it descends the Darling escarpment. Local elevation within the fire affected area ranges from 40 m a.s.l at the Buckingham bridge on Brookton Highway to 240 m a.s.l on the ridge west of Canning Mills Road. Average slopes associated with the Canning River valley and the Darling escarpment are about 15° with steeper slopes in localized areas.



**Figure 1.** Orthophoto showing the final perimeter of the Kelmscott-Roleystone bushfire. Contour interval is 40 m.

### Land tenure and use

The fire burnt an area of about 475 ha within the City of Armadale comprised of freehold land in suburban and peri-urban sub-divisions, the Lloyd Hughes Park which is vested in and managed by the City of Armadale, and part of the Banyowla Regional Park which is freehold land managed by DEC under s.16 of the CALM Act. It is difficult to specify an exact figure for the area burnt because of the complex fire perimeter in residential areas where some properties were burnt and adjacent properties were not.

Freehold lands adjoining the Brookton Highway range from fully cleared properties with pasture and orchards through to blocks where only the building envelope has been cleared and the remainder of the area is covered by remnant native vegetation. Blocks tend to be larger at the eastern end near the origin of the fire. Residential subdivisions with a significant cover of native vegetation occur south of the Brookton

Highway in the area adjoining Scott Road and Bromfield Drive, and north of the highway in the area adjoining Canning Mills Road and Buckingham Road. The fire also impacted residential subdivisions in the Clifton Hills area north of the Lloyd Hughes Park, although properties in this area had predominantly suburban gardens with lawn, low shrubs and few remaining native trees.

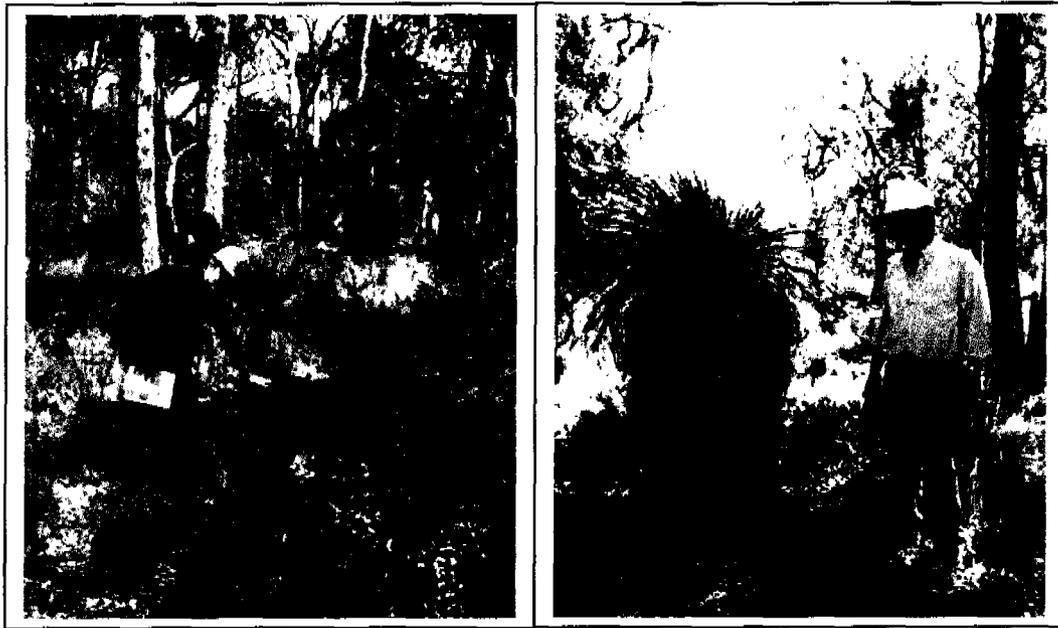
#### Vegetation and fuel types

The dominant native vegetation in the area is open forest of jarrah (*Eucalyptus marginata*) and marri (*Corymbia calophylla*) which varies in height and density according to soil type and aspect. Forest up to 25 m in height occurs on fertile deep soils associated with creeks, but heights of 15-20 m are more typical of forest growing on shallow soils and around exposed rock outcrops. Exposed rocky sites also support patches of open shrubland with scattered trees. Stands of open wandoo (*Eucalyptus wandoo*) woodland occur along the Darling escarpment, and flooded gum (*Eucalyptus rudis*) occurs along the watercourse of the Canning River.

Open forests have a surface fuel layer comprised of leaf litter and fine twigs, a well aerated near-surface fuel layer of twigs, bark and dead shrub components, and a layer of elevated fuel provided by standing live shrubs (Fig. 2). Other important components of the fuel in open forest include grass trees (*Xanthorrhoea preissii*), and fibrous bark on standing trees, particularly jarrah. The typically open nature of forest and shrubland in the area means that fuels are directly exposed to solar radiation and wind and do not retain moisture for more than a few days after rain. Wind can also readily penetrate through the forest canopy such that the effective wind speed in the forest at 2 m height will be about one third of that measured at a 10 m tall tower in a well exposed location in open country.

Vegetation and fuel types on private residential properties vary from relatively undisturbed native forest through to orchards, nut tree plantations and heavily grazed pasture. Some properties have been planted with eucalypts from eastern Australia and with northern hemisphere conifers and deciduous trees.

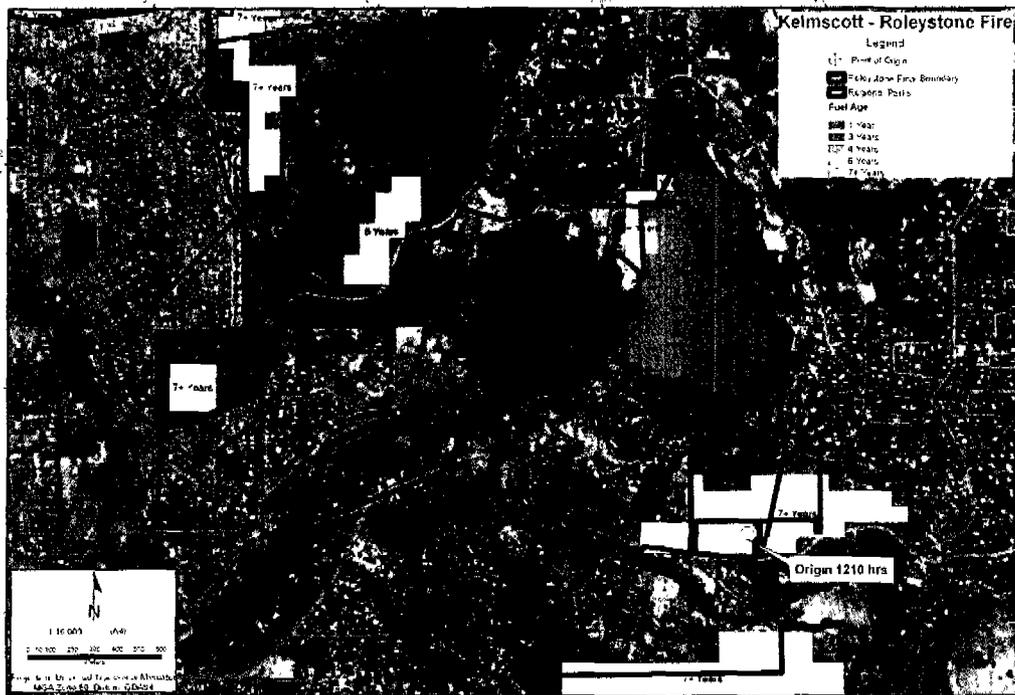
Weeds, notably introduced grasses and the bulbous plant *Watsonia* from South Africa, are common along road verges. Herbicide spraying to control *Watsonia* has resulted in a dense residue of dead elevated foliage up to 0.5 m deep along some road verges.



**Figure 2.** Fuel characteristics in open forest of jarrah and marri. Left hand picture shows 4 year old fuel resulting from prescribed fire in 2006. Right hand picture shows a grass tree with a dense thatch of dead leaf fronds contributing to the elevated fuel layer. The year of last fire is unknown but likely to be greater than 10 years.

#### Fire history

Within the section of the Banyowla Regional Park affected by the Kelmscott-Roleystone bushfire a section on the eastern flank north of the Stony Brook had been fuel reduced using prescribed fire in 2006 by DEC, and carried 4 year old fuel in February 2011 (Fig. 3). This prescribed burn was about 50 ha in size, and was partially reburnt during the February 2011 bushfire. Unplanned fires had also resulted in areas of 3 year old fuel north of Buckingham Rd, and 6 year old fuel adjoining the western side of Canning Mills Road. There were also several areas within the Regional Park that had a recorded fuel age of greater than 7 years as a result of unplanned fires. The earlier fire history of lands now included in the Banyowla Regional Park is not well documented. However inspection of vegetation and fuel at several locations indicated that some areas had been unburnt for at least a decade, perhaps considerably longer (Fig. 2).

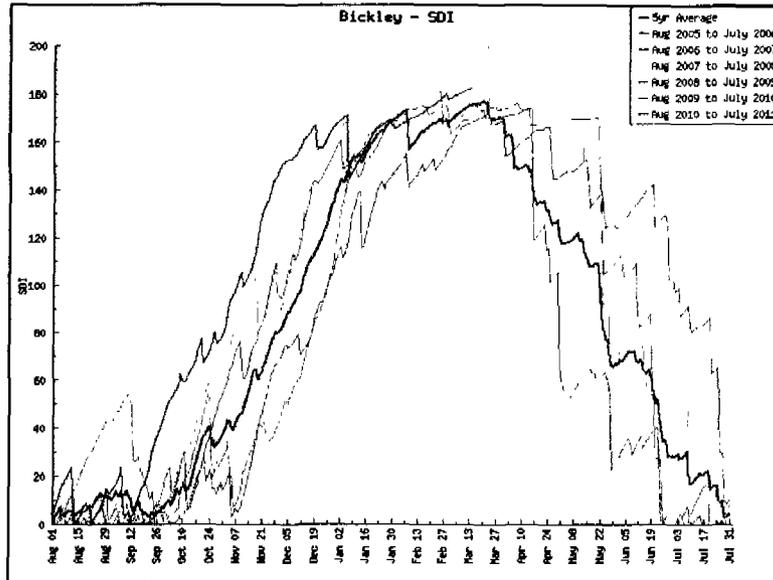


**Figure 3.** Map showing recorded history of prescribed fire and unplanned fire on DEC managed land within and adjacent to the area affected by the bushfire. Reliable fire history records are not available for areas of DEC managed land that do not have fuel age indicated.

Fire history on private land is unknown, although it is likely that many of the larger blocks carrying remnant native vegetation have not been burnt since the time that houses were constructed several decades or more ago.

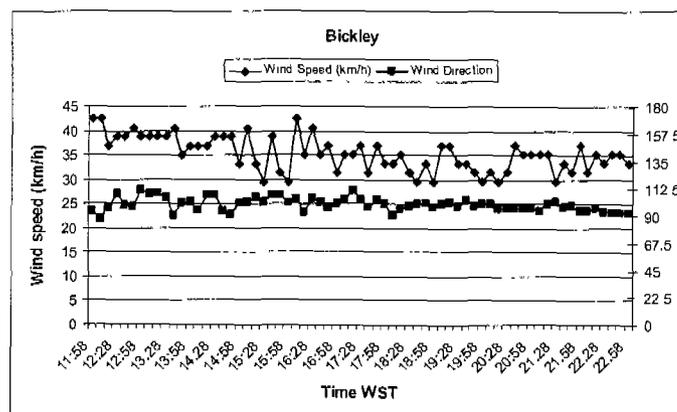
#### WEATHER CONDITIONS AND FIRE DANGER ON 6 FEBRUARY 2011

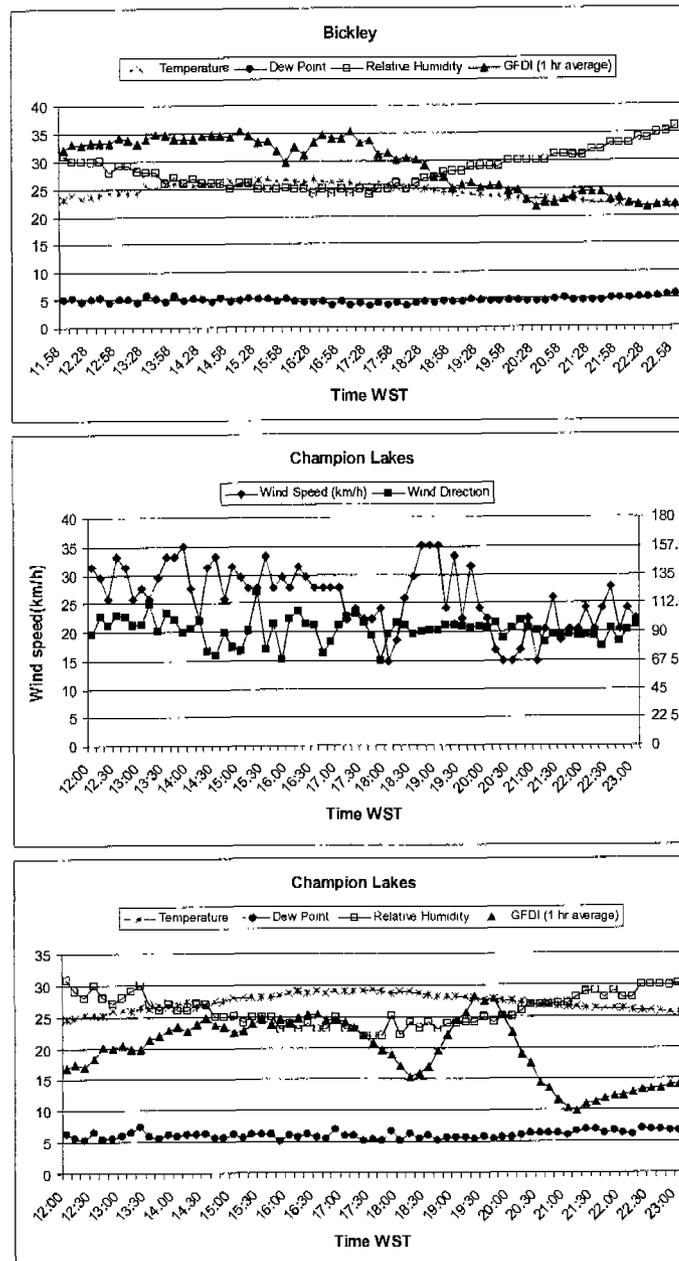
The severity of annual summer drought at Bickley in early February 2011 was close to the 5 year average value with a Soil Dryness Index of 168 mm and Keetch Byram Drought Index of 172. Persistent dying conditions had commenced in the first week of September 2010 which is a month earlier than normal (Fig. 4). January 2011 was mostly dry except for several light falls of rain late in the month associated with decaying TC Bianca with a total of 8 mm recorded over 5 days between 25 January and 1 February.



**Figure 4.** Soil Dryness Index at Bickley automatic weather station (source: Bureau of Meteorology, Perth)

On 6 February a strong high pressure system moving into the Great Australian Bight directed easterly winds across the southern half of Western Australia. The fire weather forecast issued at 0745 hrs on 6 February for the DEC Bickley site by the Bureau of Meteorology indicated a maximum temperature of 27°C, minimum relative humidity of 23%, dew point of 4°C, with strong easterly winds throughout the day. Winds were forecast to be strongest during the morning averaging 40 km h<sup>-1</sup> with gusts up to 70 km h<sup>-1</sup>, reducing to 30 km h<sup>-1</sup> between 1500 and 1700 hrs. Grassland fire danger was forecast to be Severe (50-75). The fire danger index for jarrah forest (Sneeuwjagt and Peet 1985) calculated at the DEC Perth Hills District office at Mundaring was 290, based on a minimum surface fuel moisture content of 7% and winds of 40 km h<sup>-1</sup>. The fire danger rating for jarrah forest was at the lower end of the extreme category defined by the Forest Fire Behaviour Tables.





**Figure 5.** Weather observations for Bickley and Champion Lakes for the period 1200 to 2300 hrs on 6 February 2011.

Weather observations at Bickley corresponded closely to forecast values. Strong easterly winds sustained throughout 6 February, averaging close to  $40 \text{ km h}^{-1}$  between midday and 1500 hrs and reducing slightly as the afternoon progressed. Wind direction tended about 10 degrees south of east until around 1700 hrs and then settled due east. Maximum temperature of  $27^\circ\text{C}$  and minimum relative humidity of 24% were recorded at around 1630 hrs. Grassland fire danger reached Very High (32) at midday and remained at this rating until 1730 hrs, but did not reach Severe at any time during the day. The McArthur Forest Fire Danger Meter indicated Very High with a maximum index of 30. Champion Lakes recorded a slightly higher maximum temperature and lower relative humidity than Bickley, but winds were lighter and grassland fire danger did not exceed High.

## IGNITION AND DEVELOPMENT OF THE BUSHFIRE

### Ignition

The fire started around 1130 hrs on 6 February as a result of sparks from angle-grinding on private property in Old Coach Road just north of the Brookton Highway. Initial attack on the fire appeared to have been successful and the fire was reported to the FESA Communications Centre as contained at 1203 hours. However, within 10 minutes of this call, further assistance had been requested and a large smoke plume reported by the DEC lookout tower at Bickley. For the purpose of this reconstruction the commencement of the main run of the fire is taken as 1210 hrs.

### Fire spread 1210-1430 hrs

The general pattern of fire spread has been deduced from prevailing wind direction and terrain, supplemented by information from the FESA Communications Centre log which records time and place relating to fire emergency calls.

From the point of origin the fire spread in a westerly direction remaining north of the Brookton Highway until the Stony Brook where it extended to the southern side of the highway. Notes provided by Stefan De Haan, Duty Officer for DEC Perth Hills District, record that FESA Communications Centre advised that the fire had extended to the southern side of the highway by 1230 hrs. Properties on Scott Road were also reported as being threatened by fire by this time. To reach this point the headfire had therefore travelled at least 0.5 km in 20 minutes, indicating an average rate of spread of 1500 m h<sup>-1</sup>, mostly through private property with a significant cover of remnant native forest.

South of Scott Road, spread of the fire would have been strongly influenced by the steep terrain and north easterly exposure through the well-vegetated residential area adjoining Bromfield Drive. To date, information available to reconstruct the spread of fire in this area is limited to reports of the need to deal with gas venting at a number of properties at about 1540 hrs.

The pattern of crown scorch apparent on the post-fire aerial photography suggests that spotting played an important role in propagation of the fire as it spread westwards from Scott Road, across the Canning River and into the residential area adjoining Roberts Road, Buckingham Road and Grade Road where there was extensive damage to houses. This is indicated by the absence of a clearly defined head fire path associated with severe crown scorch or defoliation, and by the presence of unburnt areas of significant size within the final fire perimeter. The fire is likely to have impacted the Roberts Road and Grade Road areas between 1300 and 1315 hrs. The FESA Communications Centre log recorded houses burning at Tranquil Place and Roberts Road on the south-western extremity of the eventual fire perimeter by 1333 hrs. These properties were almost certainly ignited by spotting.

North of Brookton Highway the fire spread through properties adjoining Buckingham Road which carried a mixture of grazed pasture and remnant forest. The photograph in Fig. 6 looking west north west along Buckingham Road towards Canning Mills Road shows the fragmented nature of the vegetation in the subdivision, with partly cleared building envelopes and gravel road verges. The general upslope terrain on the northern side of the highway would have increased the flankfire rate of spread into the Banyowla Regional Park. The FESA Communications Centre log has a report at 1322 hrs of flames west of Contour Road near the junction with a water

supply pipeline track, indicating that by this time the fire had spread about 500 m to north of the point of origin. This represents a flankfire rate of spread of  $430 \text{ m h}^{-1}$ .



**Figure 6.** View west north west along Buckingham Road towards Canning Mills Road, photograph taken 21 February 2011 by Lachie McCaw.

Spotting is also likely to have carried the fire across Canning Mills Road into Lloyd Hughes Park where it is likely to have coalesced into a relatively continuous flame front again. The pattern of crown scorch and defoliation apparent on the post-fire air photography suggests that the most intense fire behaviour was in the north west corner of the park near the junction of Marmion and Martin Streets. This is consistent with a fire spread under the prevailing eastern winds. The earliest report of fire threatening properties in the Clifton Hills area of Kelmscott is at 1416 hrs, slightly more than 2 hours from commencement of the main fire run. Observations by Mark Humble, the first arriving DEC officer in the area, also suggest that fire impacted properties in this area around 1400 hrs. The distance travelled between 1210 and 1400 hrs is 2.8 km, indicating an average rate of spread of  $1.6 \text{ km h}^{-1}$  through a mosaic of forest, pasture and residential subdivision.



**Figure 8.** Unscorched tree crowns in 4 year old fuel burnt by flankfire.

#### DISCUSSION

The area of 4 year old fuel resulting from prescribed burning west of Urch Road was burnt by flankfire spreading upslope. The intensity of the fire in the 4 year old fuel was considerably lower than in adjacent areas of older fuel and this is evident from the reduced severity of crown scorch in the younger fuel (Fig. 8). Reduced rate of spread and flame height in the 4 year old fuel would have assisted suppression of the fire in this area. In the situation where a south-westerly sea breeze was expected to reach the Darling Escarpment, as is often the case in summer, the existence of the 4 year old fuel could have been important in containing further spread of fire north east across Urch Road into northern parts of Roleystone and towards Karagullen.

The southern end of the patch of 6 year old fuel immediately west of Canning Mills Road was impacted by the intense fire run originating from the Rock View Place area, and it does appear from the aerial photography that the extent of crown damage in the 6 year old fuel is somewhat less than in surrounding areas that carried older fuel. To make a more informed judgement about whether or not the 6 year old fuel had any real effect in reducing the intensity of main fire run on 6 February it would be necessary to seek further information about the conditions under which the earlier fire occurred, and to examine the condition of areas of the 6 year old fuel that were not burnt.

#### CONCLUSION

The Kelmscott-Roleystone bushfire developed rapidly from about 1210 hrs on 6 February 2011 under conditions of Very High fire danger in forest and grassland fuels. Almost immediately the fire began impacting residential areas adjoining the Brookton Highway. The direction of fire spread was clearly dominated by the strong easterly winds which were reinforced by the orientation of the topography along the valley of the Canning River. By 1400 hrs the fire was well established in the Lloyd

Hughes Reserve and was impacting properties in the southern section of the Clifton Hills residential area. Reconstruction of fire spread indicates that the Banyowla Regional Park was burnt by flanking spread upslope from Buckingham Road, and by a fire front that spread in a northwesterly direction across Canning Mills Road under the dominant influence of localized steep slopes. Fire behaviour observed during the afternoon of 6 February was generally consistent with predictions from the Project Vesta Field Guide and the Forest Fire Behaviour Tables. Spotting appears to have contributed significantly to propagation of the fire and to the ignition of buildings

## REFERENCES

- CSIRO 1997 Grassland Fire Danger Meter. CSIRO Forestry and Forest Products, 1997 edition.
- DEC 2010 Predicting fire behaviour using the Field Guide for Dry Eucalypt Forest 2007. Fire Operations Guideline 22.
- Gould JS, MCCaw WL, Cheney NP, Ellis PF, Matthews S. 2007 Field Guide for Fuel Assessment and Fire Behaviour Prediction in Dry Eucalypt Forest. Ensis-CSIRO, Canberra ACT and Department of Environment and Conservation, Perth WA.
- McArthur AG 1967 Forest Fire Danger Meter Mk 5. CSIRO Forestry and Forest Products, 1992 edition.
- Sneeuwjagt RJ and Peet GB 1985 Forest Fire Behaviour Tables for Western Australia. Department of Conservation and Land Management, Perth.

## ACKNOWLEDGEMENTS

Neil Burrows, Rick Sneeuwjagt and Keith Low contributed their expertise during a field trip and commented on a draft of this report.

**Submission to the  
Perth Hills Bushfire February 2011 Review**



Submissions should be submitted electronically (preferred) to:

or posted to:

Perth Hills Bushfire February 2011 Review  
 Locked Bag 10, Cloisters Square  
 PERTH WA 6850

**Note:** All submissions received will be made available on the Inquiry's website. People wishing to make a confidential submission should make this clear at the time of lodgement and the Inquiry will not publish those submissions. However, people should be aware that whilst every endeavour will be made to ensure confidentiality, there is a possibility that such submissions might be released in accordance with the *Freedom of Information Act 1992*.

**Contact Details**

<b>Name:</b>	ELIZABETH J. WEARING - SMITH
<b>Address:</b>	
<b>Email address:</b>	
<b>Telephone number:</b>	

**Organisation Details (Where Applicable)**

<b>Is this submission presented on behalf of an organisation:</b>	Yes / No
<b>If yes, name of organisation:</b>	
<b>Position in organisation:</b>	

**Response to Terms of Reference**

*2 pages attached*

**You must address at least one of the Terms of Reference.**

- 1. The adequacy of current preventative measures, specifically prescribed burning and other bushfire mitigation activities.**

# SUBMISSION TO PERTH HILLS BUSHFIRE FEBRUARY 2011 REVIEW

## INFORMATION & COMMUNICATION

- 1) THESE FIRES HAPPENED AT THE WEEKEND WHEN EVERY STATION WAS EITHER BROADCASTING PRE SEASON FOOTBALL ON THE FRIDAY. TRYING TO FIND OUT WHETHER THE FIRES WHICH WERE MENTIONED ON THE LOCAL 6PR ON FRIDAY AM HAD BEEN PUT OUT THAT EVENING OR ON SATURDAY VIA RADIO OR COMPUTER ALL THAT WAS AVAILABLE WAS REPEATED WARNINGS FROM THE EASTERN STATES ON HOW TO PREPARE FOR FLOODS. THE ABC HAD 3 RADIO STATIONS ALL NETWORKED & ONLY CONNECTED BY THE SAME OLD ADVERTS. THE LOCAL RADIO WAS NO BETTER. PERTH WAS ~~TEN~~ 3 HOURS BEHIND THE ES <sup>THEN</sup>
- 2) NOT UNTIL QUITE LATE IN THE DAY DID 6PR HAVE STAFF RUSHING IN TO HELP BUT WITH SO MANY STREET NAMES REPEATED IN THE AREA IT WAS DIFFICULT TO BE SURE WHERE THE FIRE WAS. THE MAPS ISSUED BY THE SHIRE ARE POOR & THE UBD GUIDE IS BEHIND THE DEVELOPMENT. GPS MAPS ARE NOT ACCURATE: I AM TOLD THAT IN TREES THEY CANNOT GET ENOUGH FIXES TO BE ACCURATE AS THEY NEED 5POINTS. IN MY STREET WHICH IS OPPOSITE THE FIRES , WAS SETTLED POST WAR & LOTS MADE SMALLER IN 1968 WE ALL DID SHARED RECONNOITERING . WE ARE LUCKY THAT WE HAVE QUICK ACCESS TO THE ALBANY HIGHWAY & WHERE POSSIBLE OUR CARS WERE ON OUR DUSTY VERGES READY TO GO, THE WATER PRESSURE IS FAR TOO LOW TO DO ADVISED PROTECTION SO WE JUST MADE SURE THE HYDRANTS WERE KEPT WELL CLEAR.
- 3) IN THE VALLEYS AROUND THE AREA MOBILE PHONE RECEPTION IS POOR. WHEN FIXED LINES GO WI-FI IS NOT THE ANSWER FOR THE SAME REASON.

# SUBMISSION TO PERTH HILLS BUSHFIRE FEBRUARY 2011 REVIEW

FROM EJ WEARING-SMITH  
PREVENTION

- 1) DURING WINTER TREES SHED TWIGS & SMALL BRANCHES ,USUALLY DEAD . EUCALYPTS 17% BUT SO DO NON NATIVE TREES. THE ARMADALE COUNCIL FOR A FEW YEARS HAS PREVENTED US BURNING THESE OFF IN SMALL SAFE FIRES .REGULATIONS SHOULD BE CHANGED SO THAT WE CAN & THAT WE CAN DO IT WITH A HOSE UNCOILED & READY WITH SOMEONE AT THE TAP RATHER THAN WASTE WATER RUNNING IT.
- 2) FIRE MANAGEMENT IN THE DARLING RA PARKS SHOULD BE RETURNED TO FORESTRY & FIRE PEOPLE SO THAT BURNING OFF CAN BE DONE SAFELY . LAYING OUT POSITION OF BREAKS SHOULD ALSO BE LEFT TO THAT GROUP WITH CONSULTATION WITH OLDER PEOPLE WHO CAN RECALL THE FIRES OF THE EARLY 70"S. THE PATTERN OF THESE FIRES IN THE FEBRUARY FIRES WAS EXACTLY THE SAME WITH THE FIRES SWEEPING IN THE SAME WAY BY THE "GULLY" WINDS WHICH RACE THROUGH THE CUT OF THE CANNING R IN THE RANGE: CALLED BY THE LOCALS THE EASTERLY.
- 3) IN THE SMALL PLOTS OF BUSH IN THE ARMADALE COUNCIL'S CARE THE VELTD GRASS HAS BEEN 3FEET TALL FOR OVER A YEAR . IT IS BEYOND WEEDING BUT SHOULD BE HAND SPRAYED WITH WAND SPRAYS WITH ROUND UP BY PEOPLE WHO KNOW LOCAL PLANTS FROM OTHERS. THIS COULD BE TAUGHT VIA THE INTERNET WITH VERY GOOD PHOTOGRAPHS.
- 4) HOUSEHOLD FIREBREAKS. IT IS NOT POSSIBLE TO CLEAR ALL TREES AROUND A HOUSE AS THESE BREAK THE FORCE OF THE WINDS & PREVENT THE ROOF BLOWING AWAY IN WINTER STORMS. THE SOIL OF A LOT OF THE HILLS IS LATERITE GRAVEL WITH THE TREE ROOTS PUSHING BEWEN THE ROCKS TO BIND IT ALL TOGETHER. WANDOO TREES (THE WHITE GUMS WHICH LEAN AWAY FROM THE WIND ALL OVER THE HILLS) HAVE A ROOTING SYTEM 8 TIMES THE SIZE OF THE CANOPY. WHERE A LOT HAVE BEEN CUT DOWN CRACKS OPEN IN CONCRETE PADS & IN SOME CASES PADS HAVE SLIPPED AS THE DRAINAGE FROM 1 HOUSE RUNS DOWN THE HILL ONTO THE HOUSE BELOW.
- 5) NEAR THE EDGES OF THE FOREST 500 GALLON TANKS SHOULD BE STATIONED WITH HOSES WHICH CAN REACH FIRE HYDRANTS IF SOME SECURE WAY CAN BE FOUND TO PREVENT MISUSE & ALL LARGE LOTS SHOULD HAVE THEM .
- 6) WOOD CHIPS SPREAD ON VERGES WHEN DRY CATCH FIRE .

## PLANNING & DEVELOPMENT

- 1) NO MORE ISOLATED POCKETS OF DEVELOPMENT SHOULD EXTEND INTO THE FORESTS , NOR THE SWAMPY AREAS OF THE SHIRE WHERE THE GRASS IS HIGH IN SUMMER & WHERE THERE ARE CONTINUAL FIRES
- 2) RECENT DEVELOPMENT BETWEEN THE RIVER & WHERE THE SMALL CREEKS RUN TO THE CITY SIDE OF THE KELMSCOTT STARGATE SHOPPING CENTRE & IN THE AREA ON THE HILLS SIDE OF THE RIVER HAVE LEFT TOTALLY INADEQUATE PUBLIC OPEN SPACE WHERE THERE IS NO ACCESS ALONG THE CREEK SIDES & THEY ARE CRISS CROSSED WITH PIPES. . THE FIRE FUNNELED ALONG THE RIVER NEAR THE KELMSCOTT PRIMARY SCHOOL & AGAIN NEAR THE BROOKTON BRIDGE. THE AREA BETWEEN THE HOUSE FENCES & THE RIVER IS CLOGGED WITH WEEDS, BLACKBERRIES WHIGH CAUGHT FIRE WITH THE INTENSITY OF THE BLAZE. WHO IS RESPONSIBLE FOR THIS AREA.

Chair of Enquiry  
Perth Hills Bushfire February 2011 Review  
197 St Georges Terrace  
Perth WA 6000



Chairperson,

As a Kelmscott "Hills" resident for 26 years, and having endured three destructive bush fires in this period, the attached submission has been presented to the Armadale City Council following this most recent devastation.

Although suggestions have been formulated for Council consideration and possible action/adoption, perhaps some may be encapsulated into a more broad scope so that similar tragic situations will be avoided or at least, minimised in the future.

As the fire of 6 February 2011 was caused by a deliberate disregard of a Total Fire Ban instruction, comments contained in the submission go somewhat in addressing the problem of inappropriate actions by offenders of such a compliance and, at the same time, provide the foundation for an ongoing educational program.

Thank you for receiving submissions.

Sincerely,

A handwritten signature in cursive script that reads 'Barrie Hall'.

Barrie J Hall

12 April 2011

ROLEYSTONE - KELMSCOTT  
POST FIRE REVIEW  
ITEMS FOR CONSIDERATION

1. Reactivate local (Kelmescott) Volunteer Bushfire Services and through them, reintroduce Annual burn off to private properties, (FESA & Fire Brigade too busy). After approximately 15 years without this essential service, some private property undergrowth and weed infestation, has reached serious fire threat proportions.
2. Armadale Council to eradicate high grass/weeds (commonly referred to as Velt Grass by locals), to verges and un-occupied properties. This weed species burns prolifically whether green, dry or dead and probably was responsible for much devastation on the day.
3. Continuity of water supply. Residences in Bromfield Drive and surrounds were seriously affected by total absence of any mains water supply on day of fire.
4. Control of sightseers. Fire fighters and evacuees obstruction. Ridged law enforcement on such occasions need to be implemented as Fire fighter and evacuee strategies can be seriously impeded.
5. Use of local fm Radio station (107.3 Heritage) as prime source of information dissemination for any local, catastrophic event. Although the ABC 720 radio station as well as commercial operators provided up-to date accounts of the event, having a dedicated information source such as 107.3 for this particular region, would be most beneficial. A publicity program advising "locals" of such an agreement would need to be implemented and maintained.
6. Armadale Council to devise a compulsory 'Induction Program' for all new Hills residents/dwellers as a means of guaranteeing that all people moving into the "Hills" region, are totally familiar with fire risk associated with the area and the environment. Programs could be presented on a regular, or as required basis, to suit Council and / or the influx of new arrivals to the scene.  
Program could include:
  - 6.1 Footage of recent fire ravaged devastation
  - 6.2 Verbal and written information covering understanding of "Total Fire Ban"
  - 6.3 Steps to ensure safety fire barriers around homes and infrastructure
  - 6.4 Organisation of sprinkler systems, use of pools and rain water tanks to reduce fire risk/damage
  - 6.5 Burn off assistance ie, Fire Brigade; FESA; Volunteer Services; permits, requirements and obligations of property owners/occupiers.
7. Residents/dwellers (over a certain age) who fail to attend compulsory Induction Program, to be substantially fined.
  - 7.1 Insurance Coys advised of non attendees. This could / would / should, jeopardise a Fire claim by irresponsible persons.

8. Similarly, the same or a condensed version of the Induction Program, could be used as a reinforcement strategy involving all existing "Hills" residents who, likewise, must attend on a compulsory basis. Failure to comply should invoke the same penalties for 'New' inductees.

This would provide an ongoing educational program and negate excuses of ignorance.

9. After hours Ranger contact: Where residents are concerned over a neighbour's flippant disregard for TFB, a ranger needs to be notified so that immediate interception and action can be instigated. This would alleviate neighbour confrontation and disputes. Council would need to provide mobile phone details of an after hours duty Ranger. This could be achieved as a "Weekly Notice" through local press and 107.3 fm radio, as well as various Council publications and notices, and in copies of the 'LocalLink' publication, similar to that of the "Busselton Shire Directory" which features a segment on Fire Control. (Copy of page, attached as Appendix 1).

10. Stronger visual and communications impact on "Total Fire Ban" warnings need to be undertaken. This could be achieved by:

10.1 More prominent TFB signage should be placed over strategically located, roadside "Fire Barometer" indicators. Currently, a piece of board painted white with red lettering is positioned below the indicator. This is not always readily observed.

10.2 Prominent advertising of TFB in local news papers throughout duration of Ban.

10.3 Broadcasting of TFB over local radio station (107.3 fm). Opportunity exists for Council to expound requirements and obligations of residents through "Interview / Talk Back" sessions.

10.4 Notices of TFB through letter box drop plus various Council publications and notices.

11. Bi-annual green pick-up service: While this service provides an important measure in reducing fuel sources, Council to consider extending the usual 9 day notice (covering 2 week ends) of planned pick-up, to at least 16 days notice incorporating 3 week ends, to all "Hills" property owners.

The short notice of only 9 days does not allow sufficient time for "Hills people" in particular, to adequately clear and place on roadside verge, potentially hazardous fire material from premises. Difficulties encountered by only a 9 day notification, include: large lot sizes, steep and awkward sites, amount of material to be cleared and disposed, organisation of assistance (if required), Hire of equipment (if necessary), fitting into busy schedules and adverse weather conditions.

Submitted by:  
Barrie J Hall

28 March 2011

Assembly in respect of a residence within the Shire of Busselton; or

- You are enrolled as an elector for the Legislative Assembly in respect of a residence outside the Shire of Busselton; and
  - o You own or occupy rateable property within the Shire;
  - o You have made an enrolment eligibility claim which has been accepted by the Local Authority.

To enrol as an elector for the Legislative Assembly (register on the State Electoral Roll), you can obtain an enrolment form from the Post Office.

### ENGINEERING

The Community Infrastructure Directorate can assist you with engineering enquiries related to:

- Busselton Jetty
- Busselton Regional Airport
- Drainage and flooding
- Exploration drilling
- Extra Mass Permits
- Footpath and cycleway maintenance
- Foreshore protection and coastal erosion
- Street furniture and bus shelters
- Street names
- Tenders for plant and road materials
- Boat ramps

### FIRE CONTROL (FOR ALL FIRES RING 000)

**Prohibited Burning Time:** The Shire Prohibited Burn Time is December 15 to February 28 each year inclusive. Subject to climatic conditions, these dates may vary in which case a notice will be placed in the local press advising of the revised dates.

**Restricted Burning Time:** Burning Permits to burn bush are required for two periods of the year. November 2 to December 14 inclusive and March 1 to May 12 inclusive each year. (Due to climatic conditions, these dates may vary in which case a notice will be placed in the local press advising of the revised dates). Permits can be obtained from the Fire Control Officer for your area before burning commences. (The permit holder must be in possession of the permit during the burn).



#### Coordinator Ranger and Fire Services:

Tim Wall ..... 0418 933 332

#### Fire Management Officer:

Andy Thompson ..... 0427 202 717

#### Chief Bush Fire Control Officer:

Alan Guthrie ..... 0417 176 656

#### Deputy Chief Bush Fire Control Officer:

Geoff Jones ..... 0428 863 028

#### Bush Fire Brigade Fire Control Officers:

##### ZONE 1 - CAPE

Eagle Bay ..... 9756 7365

C Sanderson ..... 0417 921 426

Yallingup Coastal ..... 9755 2107

P Blight ..... 0427 522 233

Dunsborough ..... 9756 6054

B Hatherly ..... 0419 955 066

(Rural Residential Area)

##### ZONE 2 - WEST

Metricup ..... 9755 7551

R Poole ..... 0427 557 551

Wilyabrup ..... 9755 5354

A Guthrie ..... 0417 176 656

Yallingup Rural ..... 9756 7904

G Jones ..... 0428 863 028

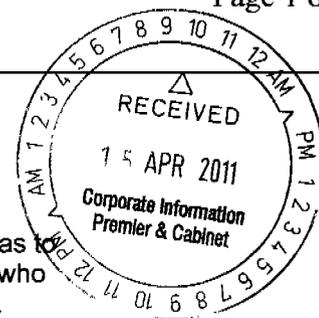
Yallingup Siding ..... 9755 2235

M Standish ..... 0417 977 192

**patkd**

**From:**  
**To:**  
**Sent:** Tuesday, 12 April 2011 12:18 PM  
**Subject:** submission

As a widowed pensioner living in Kelmscott I would like to express some concerns as to the results of the recent fires. My home was protected by neighbours who stayed and fought (and who had an excellent fire plan!) I will be for ever grateful to them as the fire was very close to my home.



Last year our second green waste pickup happened in December which is a totally unsuitable time for pruning.

Perhaps **3 pickups** a year in the hills would make more sense as people would have the opportunity to prune, weed and get rid of leaf litter more efficiently.

**Controlled burns** should be re-instated. If notification is given for approximate dates of the same there would be opportunity for anyone with health problems to make alternate arrangements for several days, surely better than losing a home.

The **care of verges** by the appropriate authority needs more attention especially those with rampant watsonia and dry grasses.

The **Canning River** in the Mount Street, Buckingham Road, Roberts Road, Marmion Street loop is also an area of concern. Overgrown with weeds, blackberries and leaves, dead branches etc it is a fire hazard waiting to happen. A local group - Friends of Goolamrup Reserve - has tried hard to clean the area up but in my humble opinion need much more help than has been offered by relevant authorities.

Thank you for your consideration  
 June Long

*My email was returned 'undeliverable submission'  
 so please accept by snail mail'  
 J. R. Long*

Perth Hills Bushfire February 2011 Review  
By email to

The Araluen Progress Association represent the residents of the Araluen Golf Resort Estate situated across the valley from Roleystone. The following comments represent the views and concerns of the residents of this estate prior and post the recent Bush Fire and have previously been raised with the relevant regulatory bodies.

1. The Canning River Reserve, the Canning River bed itself and lot 62 Araluen Golf Resort.

These areas have been seriously neglected and are in a dangerous state providing high fuel levels.

This year the City of Armadale did not discharge it's duties in making this reserve safe, chest high grass still stands to this day from the Canning River Reserve to the private properties adjoining that reserve. In fact in early in December (well past the legal time frame) they set fire to the reserve itself when they belatedly and without fire appliance cover, attempted to slash the reserve (photos attached).

The State Government, to our knowledge, has never attempted to reduce the fuel load in the river itself in the last 20 years that we know of. It was the ember attack cannoning out of the filthy (fire load) Canning River reserve and bed west of Stocker Road, that caused the fire of the 6<sup>th</sup> of February to be so devastating to Kelmscott. (Observed from Knuckey Court on the day.)

2. Lack of stewardship of all the Government and Local Government lands in general. Houses that were unfortunate enough to be situated near these lands were by far the worst affected on the day. For years the planning authorities have required developers to set aside lands for public open space. This in itself would appear to be a community beneficial policy – the problem lies in the fact that the authorities charged with the stewardship of these lands are not caring for them and many of them are serious fire risks. This was self evident on the day.

3. Single exit road from the Araluen Golf Resort Estate – previous road traffic incidents have clearly demonstrated the risks to residents of and visitors to this estate, in the event of a major incident. There is no adequate alternative exit and for those residents towards the back of the estate the risk is greater. The risk is increased in the event of a fire during a Corporate Golf day when as many as 150 golfers could be on the course. Has an evacuation in that instance even been considered with a single entry/exit road?

### **Realistic Scenario that should be considered.**

When the automated and media warnings were communicated on the catastrophic day of 6<sup>th</sup> February 2011, many house holders in Roleystone (and the Araluen Golf Course Estate), who were in no danger at all from that particular fire, evacuated. This is an understandable reaction in the circumstances.

In the event that several deliberate fires should be lit along McNess Drive (which has happened before) on a similar day and the same alert was issued, over 200 households and say 50 (conservative) patrons and employees, may all well attempt to evacuate within the space of 20-30 minutes – down the single exit of Heritage Drive to Croyden Road and away.

Imagine if a vehicle crashed or had broken down blocking the road in the section on Heritage Drive, anywhere before the Heritage Drive Canning River bridge, to 1 km south of the Croyden Road Junction – again a very realistic scenario - it has happened before. In this instance there would be a serious potential for a back up of scores of vehicles and hundreds of panicked people. In these circumstances, and together with the steepness of the terrain and design of the road, it would be impossible to turn any vehicles around and a huge jam would evolve. It would only take our fire bug to strike again – say 1 km east of that bridge, to cause an incident not unlike the one east of Southern Cross a few years ago, where lives were lost. In fact it would not be too much of a stretch to see that the final scene could be reminiscent of the devastation of Iraqi troops retreating to Bagdad in the Gulf War. The intensity of this fire could well be catastrophic because of the huge fire loads that exist in the Canning River bed and reserve, and similarly fire loads on Lot 62 Croyden Road which are also massive.

4. Fire Risk on the Golf Course – the smoking ban on the Golf course is not being enforced and there are regular instances of thrown cigarette butts causing fires. The Resort management need to take the situation seriously and take some action.

During the high fire risk summer months the grass on the golf course fairways is brown, dry and dead affording little protection from fire.

5. There are a large number of undeveloped bush blocks on the estate that have not been maintained and have an excess of flammable material. The owners should be enforced to clear their blocks and maintain them appropriately.
6. The owners of the Golf Resort should have an obligation to create fire breaks and clear flammable material where bush-land owned by them adjoins residential properties.
7. Bush blocks, by their nature, produce a significant amount of fuel in terms of leaves, twigs, branches etc. Owners should be encouraged to collect and dispose of this fuel by having garden refuse bags provided by the local Council.

Submitted by: The Araluen Estate Progress Association

Contact details: Phil Aked, Chairman, AEPA























