



CUMBERLAND STATE FOREST (CSF)

FUEL MANAGEMENT PLAN

2020 - 2025

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1. Introduction

Under the *Forestry Act 2012* and *Rural Fires Act 1997*, Forestry Corporation (FCNSW) has a statutory responsibility to protect life and property from wildfire and to minimise the spread of wildfire from areas it manages. FCNSW also has obligations to manage fire regimes on State forests to maintain ecosystem health and vitality and protect the full range of economic, social and environmental values of State forests.

Apart from statutory responsibilities, Forestry Corporation has a number of business and risk management imperatives to maintain an effective and efficient fire management capacity. In relation to Cumberland State Forest (CSF) appropriate fuel management strategies will aid in the protection of internal built assets such as recreational infrastructure, the West Pennant Hills Corporate Facility, Plants Plus Nursery, TreeTops Ropes Course, FCNSW Visitor Centre and Café Saligna, internal environmental assets such as the historical Arboretum and threatened species and external assets such as Mirvac and neighbouring residential properties. In total these assets are valued at more than \$100M with the corporate facility within CSF alone valued at approx \$6M. The location of the above infrastructure within the forest is illustrated in [Maps 1 & 2](#).

The risk posed to forest, community and environmental assets by wildfires is addressed by the *Rural Fires Act 1997*. This act requires bushfire risk to be identified and managed cooperatively by a broad cross-section of the community, including fire fighting agencies as well as significant owners of land. The *Rural Fires Act* also requires the formation of District Bushfire Management Committees (based on local Government boundaries) and these committees are required to prepare and submit a Bushfire Risk Management Plan (BFRMP) to the Bushfire Coordinating Committee (BFCC). This plan is a strategic document that identifies various assets at risk across all land tenures and sets out a 5-year program of co-ordinated multi-agency treatments to mitigate the risk.

Forestry Corporation sits as a representative on The Hills District Bushfire Management Committee as a result of CSF residing within the Hills Shire.. This fuel management plan forms an addendum to the Bush Fire Risk Management Plan (BFRMP) specifically stating CSF fuel management strategies and operational procedures over the next 5 years.

CSF is located within the NSW Fire Brigades precinct and works cooperatively with both the NSW Fire Brigade and the NSW Rural Fire Service North Rocks Brigade when undertaking fuel management activities, community consultation events and operational response.

2. The Fire Environment

2.1 Description of the Region

2.1.1 Location & Topography

CSF is a 40ha forest located within West Pennant Hills, an urban suburb of Sydney. Originally privately owned land the area was cleared for agriculture in 1908. Purchased by the Forestry Commission in 1938, one third was planted as an arboretum and the remainder was allowed to regenerate and has been developed with a recreational and forest management focus.

CSF is bounded to the south, north and east by residential development and to the west by the MIRVAC development . The grounds of MIRVAC are currently under construction and not only contain buildings, carparks and open areas but also 25ha of natural bushland. Together CSF and Mirvac form a significant area of vegetation and bushfire fuel located within an otherwise urban landscape.

CSF is situated immediately south of the ridge forming the watershed between Berowra Creek (to

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the north) and Parramatta River. CSF is on the south west escarpment of the Hornsby Plateau near the Hornsby Warp that separates the plateau for the Cumberland Basin. A major geological interface between the Hawkesbury sandstone group and the overlying Wianamatta Shale group occurs within CSF. The shale rests comfortably on the sandstone, both dipping slightly south-east. The interface occurs at approximately the 120m contour.

The shale series represented is Ashfield shale. This is evident in the northern section of CSF in a gently undulating topography without cliffs or rock outcrops. Sandstone occurs to a limited extent in the lower south-western section of the forest. This is evident by minor outcrops of sandstone rocks and small cliffs.

The highest point of CSF is Castle Hill Road at 174m above sea level. From this altitude the height drops to 88m above sea level.

The Forest falls within the Parramatta River catchment and Darling Mills sub catchment. First order streams are located within the upper slopes of CSF and form tributaries of the second order stream known as Darling Mills Creek.

2.1.2 Climate and Fire Weather

The general climate for the area is temperate with rainfall peaks during late summer/early autumn and lows during winter/early spring. High temperatures generally occur during the summer months and low temperatures during the winter months, where mean temperatures of 28°C and 7°C have been recorded over the last 40 years in January and July respectively by the Bureau of Meteorology North Parramatta (Masons Drive) weather station.

The start of the bush fire season coincides with northwest winds, which often prevail during late spring (Sep/Oct). The majority of serious bushfires occur from this period until the onset of autumn. Longer fire seasons are experienced when summer rainfall is lower than normal, with the bush fire season extending through summer to early autumn. Serious bush fires have occurred late in the season under dry summer conditions.

Dangerous bush fire seasons are most commonly associated with two or more of the following factors in combination:

- Occurrence of an extended drought period
- Lower than average rainfall through winter
- Persistent north to north-west winds in late spring and through summer
- Prolific fuel occurrence from strong growing seasons the previous summer
- Higher ignition potential during school holiday period

Extreme fire danger days in the Hills BFMC area are most often associated with high temperatures, low humidity and strong north, north-westerly and westerly winds.

Bushfire fuel management burning, in accordance with the Bush Fire Management Committees Annual Fuel Reduction Program is usually carried out in the autumn, winter months of April, May, June and August. Burning during these months will usually encourage low intensity burns. It is possible however, to burn during late February-March for the purpose of high intensity, strategic burns sometimes necessary for environmental reasons.

It has been found that in July, due to varying climatic conditions (wet, very low temperatures, high humidity, frosts etc) Bushfire fuel reduction burning is very limited at best.

Where proposed bushfire fuel reduction works are impaired by unfavourable weather conditions they are reviewed by the BFMC and where deemed necessary are carried over to the following year.

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2.1.3 Population Demographics and Recreational Use

There are approximately 100 employees working at CSF on a weekly basis. In addition to this there are an average of 100,000 visitors to the forest each year (or 500 a day), which not only include picnickers and bushwalkers but also include environmental groups (such as the Cumberland Bird Observers Club) school and community groups and special permit groups.

In addition to internal occupants there are approximately 50 residential dwellings located directly along the boundary of CSF with a further 124 residential dwellings located within 100 metres of the forest. Further to this there are also shopping centres, childcare facilities, schools and aged care facilities located within the local area.

Using the philosophy behind legislation such as *Planning for Bushfire Protection 2006*, these assets could all potentially be impacted upon by some form of bushfire attack whether it is direct flame contact, radiant heat or embers.

The number of potential occupants within and adjacent to CSF needs to be considered when planning fuel management burns and undertaking active fire fighting operations in terms of accountability and smoke management.

2.1.4 Assets and Infrastructure

Within CSF, there are a number of built assets including two forest cottages, West Pennant Hills Corporate Facility, Plants Plus Nursery, Forestry Corporation Visitor Centre, TreeTops Ropes Course and an onsite Café, Cafe Saligna. The forest is bounded on the northern, eastern and southern sides by residential houses and on the western side by the Mirvac development. .

CSF also contains infrastructure including:

- two telecommunication towers - one is located at the very northern point of CSF on Castle Hill Road, and the other is located at the rear of the nursery production area in the middle of CSF;
- underground power, water and sewage services;
- a public entry and exit road; and
- an extensive walking track and fire trail network.

2.1.4.1 Fire Management Access

Access trails, roads and walking tracks enable access to different parts of the forest. Access infrastructure is essential for undertaking fire management operations and activities, including direct attack of low-intensity fires, back-burning to contain high intensity fires, and conducting hazard reduction burning.

The proposed management standard for access trails within the forest is based on the Bush Fire Coordinating Committee (BFCC) Policy 2/2007 standards for fire trails. This policy provides the basis for the development of maintenance regimes for existing trails and the standards for proposed upgrades to trails. The classification of trails has been undertaken in consultation with the Hills District BFMC and is consistent across member agencies. Any proposed upgrades to trails will be subject to an environmental impact assessment.

The location of fire trails within the forest is illustrated in [Map 2](#) with a register identifying operational accessibility classifications as per BFCC standards listed below in [Table 1](#).

Table 1: Operational accessibility classifications for vehicular access trails/roads within CSF

Fire trail/road name/walking track	Vehicle carrying capacity	BFCC classification
Cumberland Forest Way	Cat 1	Essential
The Scenic Way	Cat 1	Essential
Gentle Way	Cat 1	Essential
Dare Edwards Road	Cat 1	Essential
Nursery Link Road	Cat 1	Essential
Bryant Road	Cat 1	Essential
Shepherds Bush FT	Cat 9	Essential
Short Cut FT	Cat 9	Essential
Tower Road FT	Cat 7	Important
Swaines FT	Cat 7	Essential
De Beauzeville FT	Cat 9	Essential
McPherson FT	Cat 9	Essential
Horseshoe FT	Cat 7	Essential
Backdoor FT	Cat 7	Essential
The Boot FT	Cat 7	Essential
Eastern FT	Cat 9	Essential
Ply Mill FT	Cat 9	Important
Link FT	Cat 9	Important

Descriptions of vehicle carrying capacities are provided below:

- **Cat 1:** This is a fire trail that can be safely traversed by a Category 1 fire fighting appliance. Length 8500 mm, Width 2800 mm (including 400 mm for mirrors), Height 4000 mm (including 600 mm for aerials), Ground clearance 310 mm, Approach angle 35°, Departure angle 30°, Distance between axles for clearance of drains 4700 mm, Turning circle – wall to wall 22 m diameter, Weight 15000 kg.
- **Cat 7:** This is a fire trail that can be safely traversed by a Category 7 fire fighting appliance. Length 6500 mm, Width 2600 mm (including 400 mm for mirrors), Height 3200 mm (including 500mm for aerials), Ground clearance 215 mm, Approach angle 35°, Departure angle 30°, Distance between axles for clearance of drains 3400 mm, Turning circle – wall to wall 17 m diameter, Weight 7000 kg.
- **Cat 9:** This is a fire trail that can be safely traversed by a Category 9 fire fighting appliance. Length 5500 mm, Width 2200 mm (including 400 mm for mirrors), Height 2600 mm (including 400 mm for aerials), Ground clearance 220 mm, Approach angle 35°, Departure angle 30°, Distance between axles for clearance of drains 3200 mm, Turning circle – wall to wall 16 m diameter, Weight 3700 kg.

Descriptions of BFCC Classifications are provided below:

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- **Essential:** This is a fire trail without which fire response and suppression in an area would be severely compromised. All reasonable efforts must be made to ensure that this trail is trafficable to the agreed vehicle carrying capacity at all times. Sudden problems such as tree falls and land slips should be rectified as soon as identified. This trail should be checked on occasions throughout each year, and particularly before the commencement of the local bush fire season. Physical barriers to vehicle access must not be deliberately installed, unless they are readily broached by fire fighters. That is, a locked gate with key access for fire fighters would be acceptable; fixed bollards, felled trees, piles of rock and the like would not be acceptable, as the obstruction cannot be removed by a fire fighting crew without additional machinery.
- **Important:** This is a fire trail that is required for fire management. If this trail was unusable due to temporary circumstances, other trails could be used to contain a fire, albeit with some loss of fire management efficiency. This trail should be trafficable to the agreed vehicle carrying capacity at all times. This trail should be checked before the commencement of the local bush fire season.
- **Dormant:** This is a track or trail that has been used at some time in the past, but where there is no requirement for it to be constantly maintained in a trafficable state.

2.1.5 Natural Heritage

CSF is of major conservation significance as it not only provides one of the largest extant examples of wet sclerophyll forest on Wianamatta shale in the Sydney metropolitan area (that were all but cleared for timber, orchard and agricultural purposes) but also provides an island of habitat for numerous species of flora and fauna within the highly developed urban areas that surround it.

Fire management planning within CSF is therefore essential to not only assess the likely impact of fire frequency and intensity on the local flora and fauna but to also manage natural regeneration of the forests native and planted vegetation species.

Three main vegetation communities have been identified as occurring within CSF that is:

- Dry Sclerophyll Forest (shrubby sub formation);
- Wet Sclerophyll Forest; and
- Rainforest Communities (planted arboretum).

Within these communities there are several canopy species associations that gradually change with the local topography and geology. These have been identified below in **Table 2** and are also shown on **Map 3**.

Table 2: Vegetation Communities within Cumberland State Forest

Vegetation Communities	Vegetation Associations
Rainforest Communities (Planted Arboretum)	Planted Arboretum includes species such as: • Water gum <i>Tristaniaopsis laurina</i>; • Bangalow Palm <i>Archontophoenix cunninghamiana</i>; • Cabbage Tree Palm <i>Livistonia australis</i>; • Sandpaper Fig <i>Ficus coronata</i>; • Hoop Pine <i>Araucaria cunninghamii</i>; • Bunya Pine <i>Araucaria bidwillii</i>;

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	Norfolk Island Pine <i>Araucaria heterophylla</i>.
Wet Sclerophyll Forest	Forest Associations include: - Sydney Blue Gum; - Blackbutt/Sydney Blue Gum; - Grey Ironbark/Sydney Blue Gum; - Blackbutt/Turpentine.
Dry Sclerophyll Forest	Forest Associations include: - Forest Red Gum/Grey Gum/Grey Ironbark; - Turpentine.

Endangered Ecological Communities, as identified under the *Threatened Species Conservation Act 1995* (TSC Act), thought to occur within CSF (although not currently confirmed by survey) include Sydney Blue Gum High Forest and Sydney Turpentine Ironbark Forest.

Threatened Species, as identified under the TSC Act, known to occur within and adjacent to CSF include:

- Powerful Owl *Ninox strenua* (Vulnerable - NSW)
- Eastern Freetail Bat *Mormopterus norfolkensis* (Vulnerable – NSW)
- Greater Broad nosed Bat *Scoteanax rueppellii* (Vulnerable – NSW)
- Little Bentwing bat *Miniopterus australis* (Vulnerable – NSW)
- Yellow-bellied Sheath-tailed Bat *Saccolaimus flaviventris* (Vulnerable – NSW)
- Eastern Bentwing bat *Miniopterus schreibersii oceanensis* (Vulnerable – NSW)
- Grey Headed Flying Fox *Pteropus poliocephalus* (Vulnerable – NSW) and
- Swift Parrot *Lathamus discolor* (Endangered – NSW).

Regionally/Locally significant fauna also recorded as occurring within CSF include the Sugar Glider *Petaurus breviceps*.

Fire regimes and guidelines for maintaining a healthy and diverse ecosystem with effective regeneration for those vegetation communities, threatened species and endangered ecological communities identified above have been addressed in Section 6 of this plan.

2.1.6 Cultural Heritage

During 1937 the Commissioner for Forests, Mr E.H.F Swain, directed that a search be made in the Sydney metropolitan area for an area suitable for the purpose of ornamental tree production, an arboretum, forest experimentation and conferencing. In 1938 land was purchased and dedicated as Cumberland State Forest. At the time of dedication the land was bounded by farming properties owned by the Bellamys and Mobbs.

None of the built assets within CSF have been formally declared as cultural heritage however there are some structures and land forms that have been identified as providing evidence to its past land use and cultural history. Special features within CSF include the historical fence line located along the southern boundary (compartments 19a and 19b) that would have formed the boundary fence between CSF and the Bellamys and the western boundary (compartments 20 and 4a) that would have formed the boundary fence between CSF and the Mobbs, later IBM. Another potential site of historical significant is the Bellamy Saw Pit depression and Bellamy Quarry located in compartment 19a.

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The arboretum possesses a significant historical value for Forestry Corporation. Planted in the mid 1940s it contains an extensive collection of tree species of great scientific, botanical and educational value including nine species considered rare or threatened in their natural occurrence (ie *Austrobuxus swainii*, *Choricarpia subargentea*, *Eucalyptus curtisii*, *Eucalyptus guilfoylei*, *Eucalyptus kartzoffiana*, *Eucalyptus macarthuri*, *Eucalyptus rummeryi*, *Eucalyptus scoparia*, *Eucalyptus squamosa*). The majority of the trees species planted within the arboretum are sensitive to fire. Special significance of this asset warrants protection from fuel management burning and wildfire.

Although CSF lands was traditionally visited seasonally by Dharug, Guringah and Gammeriagal Aboriginal Peoples to obtain resources for daily life, to date there have been no specific records of aboriginal sites, relics or artefacts of significance occurring within the area.

The following factors contribute to the risk of damage to historic heritage features:

- Bushfires may directly remove or destroy combustible material such as timber structures;
- High intensity fires may permit soil erosion, which may lead to displacement of foundations, artefacts movement and damage to archaeological deposits;
- Vehicles or bulldozers may physically damage features; and
- Fire may damage or destroy vegetation with historical significance, such as the arboretum.

2.2 Fire History

No major fire event has been recorded across the landscape of CSF since the time of land purchase in 1938 and commencement of forest regrowth some 70 years ago. There have however been small areas which have been treated with fuel management burns and only two areas impacted upon by arson. [Map 4](#) along with [Table 3](#) summarises the known fire incidents recorded for CSF.

Table 3: Cumberland State Forest Fuel Management and Wildfire History

Location in CSF (Compartment)	Date	Description	Area Burnt (ha)	Area affected/burnt other tenure (ha)
Unknown	Early 1950s	Unknown	Unknown	Unknown
15a, 15b, 18d	1991	Fuel management burn	2	Nil
1b, 1d, 10a, 10b, 10c	1993	Fuel management burn	2	Nil
1a, 4d, 4c, 13b, 14c,	1994	Mechanical fuel management	2 (approx)	Nil
6a, 6b, 14a, 17a, 17e, 18a, 18b, 19a, 19b	1994	Fuel management burn	5 (approx)	Nil
15a	1996 (Mar)	Wildfire - Arson	1/3	Nil
19	1998 (Jan)	Unknown	Unknown	Unknown
19b	1999	Wildfire - Arson	3m x 3m	Nil
1b	2002 (4 Sep)	Fuel management burn	1	Nil

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9a, 9b	2002 (4 Sep)	Unknown	Unknown	Unknown
10b, 10c & part of 16c	2007 (17 Oct)	Fuel management burn	1.8	Nil
15a & 15b	2007 (17 Oct)	Fuel management burn	1.6	Nil
18a, 18b, 19a & 19b	2012 (25 Sept)	Fuel Management burn	3.344	Nil
11b	2012 (25 Sept)	Fuel Management burn	0.92	Nil
17a, 17e	2017 (24 Aug)	Fuel Management burn	0.5	Nil
3a	2017 (24 Aug)	Fuel Management burn	1.3	Nil

NOTE: Estimates on historical burns due to lack of information on specific dates.

Preventing the ignition of bushfires by human activities, particularly on days when severe weather conditions prevail is an important strategy for managing bush fires. To put effective ignition management programs in place it is important to understand the patterns and major sources of ignition in the area.

The major ignition causes in CSF are:

- Careless use of fire where insufficient supervision of fire allows its escape; and
- Arson (deliberate and accidental)

Within CSF it is predicted that future ignitions are likely to occur in close proximity to roads, walking tracks and trails and neighbouring properties with the unlikely exception of lightning strikes. Ignitions are also more likely to occur during school holidays and on days of high and extreme fire danger.

2.3 Summary of Key Fire Issues

- Bushfires can occur within the forest owing to the combination of vegetation, climate, unplanned human-caused ignitions and occasional lightning strikes.
- There are a large number of community assets within and adjacent to the forest that requires protection from damage by bush fire.
- A large proportion of existing assets and property do not conform to Australian Standards for both building construction (as per Planning for Bushfire Protection and AS3959 Building in Bushfire Prone Areas) and the establishment and maintenance of Asset Protection Zones on private property.
- The ability of residents to prepare for and take appropriate action during a bushfire is highly variable.
- During the bushfire danger period many visitors to the forest may be located in areas surrounded by highly flammable vegetation and where escape from a bushfire would be slow or difficult.
- The forest conserves natural and cultural heritage values that are vulnerable to inappropriate fire regimes and fire management activities.

3. The Legal and Policy Environment

Fuel management activities are planned and implemented within a complex legal and policy framework that includes:

- International conventions - such as the United Nations Conference on Environment and Development (UNCED) and the Montreal Process);
- National policies and agreements - such as the National Strategy for Ecologically Sustainable Development (ESD), Ecologically Sustainable Forest Management (ESFM), National Forest Policy Statement and Regional Forest Agreements; and
- Corporate policies such as the Environmental Policy which commits FCNSW to ecologically sustainable forest management, details of which are included in FCNSW's Corporate Fuel Management Plan.

3.1 Legislation Relevant to Fuel Management

There are many Acts, Regulations and Codes that provide the State-wide legal framework for FCNSW's fuel management policy, guidelines and operational conditions (s3.3 of the Corporate Fuel Management Plan).

FNSW's legal obligations to undertake fuel management are set out in the statutes contained in [Table 4](#).

Table 4: Legislation with Fuel Management Responsibilities

Statute	Responsibility
<i>Forestry Act 2012</i>	s8A – shall take all practicable steps that it considers necessary or desirable to ensure the preservation and enhancement of the quality of the environment. s11 – may carry out on Crown-timber lands measures for the protection from fire of timber and products on Crown-timber lands.
<i>Rural Fires Act 1997</i>	s63(2) – it is the duty of the owner or occupier of land to take the notified steps (if any) and any other practicable steps to prevent the occurrence of bush fires on, and to minimise the danger of the spread of bush fires on or from, that land. s52 – each bushfire management committee must prepare and submit to the Bushfire Co-ordinating Committee (BFCC) a draft Bushfire Risk Management Plan (BFRMP) for the rural fire district for which it is constituted. In terms of the Hills District a draft BFRMP is currently being prepared and should be completed by the end of 2009. The fuel management plan for CSF will form an addendum to the Risk Plan.

Consequently, fuel management is carried out to achieve the following legislated objectives:

- Protecting life and property (including timber resources), through a program of reducing forest fuels, and
- Maintaining or restoring forest health, and in some cases manipulating habitat for threatened species management, through ecological burning.

3.2 Environmental Impact Assessment (EIA) of Fuel Management Burning

FCNSW legal obligations for assessing the environmental impact of fuel management activities arise from a number of statutes, which are detailed in [Table 5](#).

Table 5: Legislation Relating to Environmental Impact of Fuel Management Burning

Statute	Responsibility
<i>Plantation and Reafforestation Act 1999 (P&R A)</i> <i>Plantation and Reafforestation (Code) Regulation 2001 (P&R Code)</i>	s47 of the Act exempts authorised plantations from application of the EP&A Act. Part 3 of the Code addresses the requirements to be considered in the process of authorising a plantation.
<i>Environmental Planning and Assessment Act 1979 (EP&A Act)</i>	For lands not covered by an Integrated Forestry Operations Approval (IFOA) or for plantations not authorised under the P&R Code, s5A requires proposed activities to be assessed to determine whether they are likely to have a significant effect on threatened species, populations, ecological communities or their habitats. Section 5A of the EP&A Act is applicable to works conducted in CSF.
<i>Forestry and National Parks Estate Act 1998 (F&NPE Act)</i>	For lands covered by an IFOA, s30(5) of the IFOA requires that a comparative assessment be carried out of the potential impacts on the environment of conducting fuel management burning with the potential impacts on the environment of not conducting fuel management burning

4. The Risk Management Context and Principles for Fuel Management

4.1 The Risk Management Context for FCNSW Fuel Management Program

FCNSW maintains a strategic, risk management approach to fire management consistent with AS/NZ 4360:2004 and the recommendations of the Council of Australian Governments (COAG) National Inquiry on Bushfire Mitigation and Management. The main principles are:

- Research, information and analysis – analysis of relevant data is incorporated into planning and management practices,
- Prevention and mitigation (risk modification) – modify risk by prevention and mitigation strategies,
- Preparedness – manage residual risk through pre-incident planning,
- Response – implement an organised and scaled suppression approach to incidents, and

- Recovery – rehabilitation process are incorporated into incident action plans.

4.2 FCNSW Fuel Management Principles

FCNSW uses fuel management as a land management tool for the protection of forest resources and local communities and for the maintenance of forest health and ecological integrity. Principles underpinning fuel management in FCNSW are detailed in [Table 6](#).

Table 6: Fuel Management Principles

Principle	Description
Principle 1	Fire is an integral part of the Australian landscape and has influenced its makeup
Principle 2	Fire is overwhelmingly important in the evolution and maintenance of Australian biota
Principle 3	In fire maintained ecosystems, such as grasslands and dry eucalypt formations, low-intensity fire does not change the structure or function of the ecosystems. Infrequent high-intensity fire and long-term fire exclusion are both disturbances that initiate adverse environmental outcomes.
Principle 4	Natural structural diversity in ecosystems that depend on low intensity fire is mostly a function of fine scale climatic and edaphic variation.
Principle 5	Fire diversity promotes biodiversity at both the landscape scale and the local scale.
Principle 6	The principal components of fire regimes are frequency, intensity and seasonality
Principle 7	FNSW fire management will apply the precautionary principle and adapt to new knowledge gained through experience, monitoring and research,
Principle 8	Fuel management burning priorities will be based primarily on the risks posed by wildfires to the community and secondarily on maintaining and enhancing ecosystem health and biodiversity.
Principle 9	Fuel management burning will be excluded from fire sensitive native and exotic conifer plantations
Principle 10	Fuel management is the most effective fire mitigation option

5. FCNSW Fuel Management Program

5.1 The Need for Fuel Management

Fuel management by either burning or mechanical modification is an effective resource and economic means of mitigating against the adverse effects of wildfire and potential damage to environmental, residential and community assets. For this reason, the Cumberland State Forest Fuel Management Plan is mainly directed at managing this process.

5.2 Objectives of FCNSW Fuel Management

The fuel management objectives for CSF are:

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- to protect human life and property from wildfires;
- to protect highly-valued public assets, including the Cumberland Forest nursery, arboretum, walking tracks, picnic grounds and information centre;
- to prevent the spread of wildfires from CSF estate onto neighbouring properties; and
- to conserve and maintain ecological health and vitality within an area bounded by urban development.

5.3 Strategies Used to Achieve Fuel Management Objectives

Good planning results in timely and targeted fuel management activities that meet pre-determined objectives and ensures that they are carried in a cost-effective manner and consistent with the principles of ecologically sustainable forest management.

The following strategies will be used by CSF to achieve fuel management objectives:

- Conduct and/or participate in programs, including fuel management burning and mechanical fuel modification, to minimise the occurrence and impact of wildfires, including improving community awareness and understanding of wildfires;
- Maintain membership on the Hills District Bushfire Management Committee;
- Prepare a Fuel Management Plan for CSF;
- Integrate this plan into the Hills District Bushfire Risk Management Plan;
- Undertake strategic and appropriate burning programs as a means of establishing substantial barriers to limit the progression of high intensity fires within and from CSF;
- Maintain a system of fire roads and trails to provide access and a safe working environment for personnel engaged on fuel management activities;
- Undertake burning operations under appropriate conditions to reduce the fire hazard;
- Provide staff with appropriate training in fuel management and safety according to current standards and legislation;
- Use fuel management burning in a manner consistent with the principles of ecologically sustainable forest management;
- Use fuel management burning in a manner that provides a diverse range of forest structures to conserve and maintain biodiversity;
- Use fire under appropriate burning prescriptions to produce seedbed and site conditions appropriate for forest regeneration;
- Use fire under appropriate burning prescriptions to maintain specific ecological values;
- Periodically analyse records of weather, fuel types and fuel loads, fuel moisture contents, fire behaviour and fire effects, recorded in Operational Fuel Management Plans, to review burning prescriptions and operational procedures;
- Foster research and development by other agencies and institutions, into effects of fire on forests and incorporate appropriate research findings into operational practice;
- Evaluate the effectiveness of fuel management burning and other land management practices in achieving fuel management objectives;
- Produce operational burning plans as a means of identifying site-specific issues that must be addressed when carrying out fuel management activities; and
- Establish and maintain cooperative operational arrangements with other land management agencies and fire authorities.

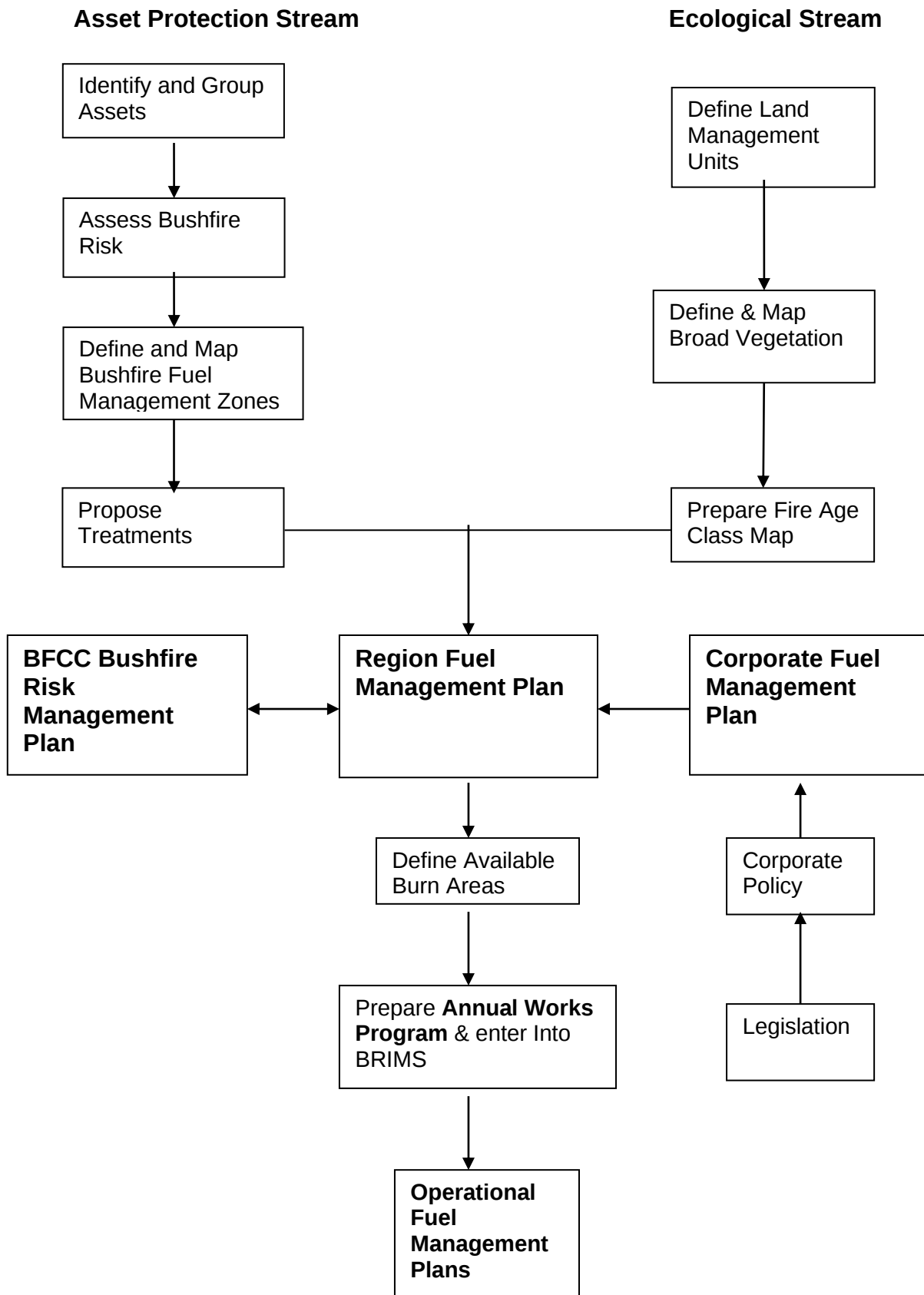
5.4 Fuel Management Planning Process

The hierarchy of fuel management planning within FCNSW is as follows:

- Corporate Fuel Management Plan – sets a State-wide framework
- Regional Fuel Management Plan – sets out strategies for a particular FCNSW Region
- Operational Fuel Management Plan – addresses site-specific considerations for fuel management

This plan for CSF represents the Regional Fuel Management Plan for which the planning process is illustrated in **Figure 1**.

Figure 1. - Regional Fuel Management Planning Process



5.4.1 Asset protection stream – bushfire fuel management zones

Fuel management zoning allows determination of priorities for reducing forest fuels, based on values at risk, risk potential and the range of wildfire suppression options desired under most weather conditions. Changes in forest structure (such as additional regrowth forest and plantations requiring protection); human settlement expansion; or variations to the conservation resource may result in an amendment to the fuel management zones.

The zoning system provides a strategic fuel management framework across forests at a landscape scale.

The determination of fire risk and the subsequent delineation of fuel management zones are required for the Regional Fuel Management Plan as well as the Bushfire Risk Management Plan (BFRMP), a plan prepared jointly with other fire and land management agencies pursuant to s 52 of the Rural Fires Act 1997.

The four categories of Fuel Management Zones are:

- Asset Protection Zone (APZ),
- Strategic Fire Advantage Zone (SFAZ),
- Land Management Zone (LMZ), and
- Fire Exclusion Zone (FEZ)

Some of these zones (usually Land Management Zones) may be further classified within this category by the land manager, e.g. HMZ -Heritage Management Zone etc. The purpose, characteristics and objectives of each burning zone are listed below in [Table 7](#).

Table 7: Characteristics of Fuel Management Zones

Zone	Purpose	Suppression Objective(s)	Zone Characteristics
Asset Protection Zone	To protect human life, property and highly valued public assets and values.	To enable the safe use of direct attack suppression strategies within the zone. To minimise bush fire impacts on undefended assets.	As per FCNSW Corporate Fuel Management Plan standards for Asset Protection Zones. Max. fuel load 5 t/ha for forested areas.
Strategic Fire Advantage Zone	To provide strategic areas of sufficient width and continuity to provide a substantial barrier to the spread of wildfire by reducing its rate of spread, intensity and the potential for spot fire development from the area; reduce damage caused by the wildfire; and provide areas that assist in making fire suppression safer and more effective.	To enable the safe use of parallel attack suppression strategies. To enable the safe use of indirect attack suppression strategies (back burning) in high fire danger conditions within the zone. To minimise the potential for crown fire development within the zone. To minimise spot fire ignition potential from the zone.	Zone width related to suppression objectives and dependant upon: Topography Aspect Spotting propensity Location of adjacent firebreaks Mosaic pattern of treatment Suggest fuel load managed between 8-12 t/ha for forested areas. Burning cycle 3-6 yrs.

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Land Management Zone	To meet relevant land management objectives in areas where APZs or SFAZs are not appropriate.	To enable the safe use of indirect attack suppression strategies (back burning and burning out) in drought conditions up to high fire danger within the zone. To avoid large contiguous areas of long-unburnt vegetation that may result in very large high intensity fires when subjected to wildfire.	As appropriate to achieve land management e.g. heritage and/or fire protection e.g. broad scale mosaic burning objectives. 35-60% coverage. Larger areas up to 5000ha. Burn cycle 5-10yrs.
Fire Exclusion Zone	To exclude fires.	N/A	Identified assets Areas presenting fire suppression problems Fire sensitive and/or endangered communities Riparian areas Fire sensitive plantations.

Fuel Management Zones within CSF have been identified and mapped ([see Map 5](#)). These zones identify the fire management intent for a specific area.

- The Asset Protection Zones identified within CSF will be treated annually by mechanical means such as mowing/hand clearing/brushcutting to maintain fuel loads at or below 5 tonnes/ha.
- The Strategic Fire Advantage Zones within CSF will be treated by a mosaic pattern of prescribed burning in accordance with their fire intervals. The fuel loads will be managed to achieve 8-12 tonnes/ha.
- The Fire Exclusion Zone which indicates the boundary of the arboretum, where there are fire sensitive species, will be managed to minimise the run of fire within it.
- Fire will be excluded from Riparian Habitat within CSF as far as is practicably possible through the use of appropriate moisture differentials and application of standard fuel management burning guidelines.

Total Burnable Area within CSF have been identified and mapped ([see Map 6](#)). This identifies that there is 13.22ha of non burnable area and 26.35ha of burnable area. As per current guidelines and regulations, it is aimed to conduct Fuel Reduction Burns to 5% of burnable area each year. This equates to 1.3ha per year. Some years will have no burns conducted if previous years burn totals exceed the 5% (i.e. 2012 when 4.264ha were Fuel Reduced – approximately 16% of total burnable area).

5.4.1.1 Priorities for fuel management operations

Priorities for fuel management across fuel management zones are detailed in [Table 8](#).

Table 8: Fuel Management Priorities

Priority	Fuel Management Zone
Priority 1	APZ - Asset protection fuel management.
Priority 2	LMZ - Post-harvesting burning; and SFAZ - Strategic fire advantage zone burning; and LMZ- Burning under younger regrowth forests or plantations. - Burning native forest areas adjacent to fire sensitive plantations.
Priority 3	LMZ - Forest health and protection burning.
Priority 4	LMZ - Ecological restoration burning to arrest or reverse forest health decline in severely affected forest areas, or to manipulate habitat requirements for specific threatened species in accordance with species recovery plans or other requirements.

Where a number of conflicting fuel management aims occur within a specific area, fuel management for the protection of human life, property and high value plantation assets will take precedence.

5.4.1.2 Bushfire risk management plans

Under the *Rural Fires Act 1997*, Bushfire Management Committees (BFMC) are required to prepare and submit to the Bushfire Coordinating Committee a Bushfire Risk Management Plan (BFRMP).

The BFRMP is a strategic document that encompasses all land tenures, including private lands and State forests, on a Local Government area basis and identifies community, environmental, cultural and economic assets at risk and sets out a five-year program to mitigate these risks.

As part of this process, CSF has identified assets at risk within this Regional Fuel Management Plan. Details of planned mitigation works proposed to protect these assets at risk for the nominated five-year period will be provided to the Hills District BFMC as part of the preparation of the BFRMP.

This plan will be endorsed by the Hills District BFMC and annual works, as identified within the plan, will be undertaken by CSF in conjunction with other fire authorities and will have regard to the principles of ecologically sustainable development.

The Baulkham Hills Rural Fire Service (RFS) will undertake periodic audits, as part of its monitoring process, to gauge compliance with the BFRMP plan.

5.4.2 Ecological Stream - theoretical fire regime guidelines

To guide FCNSW in developing ecologically sound fire regimes, in the longer term, a process documented in the "Guidelines and Procedures for Ecological Burning on Public Land in Victoria 2004" (Fire Ecology Working Group), will be used. Through combination of fire history and vegetation type data, this process calculates theoretical fire regimes.

6. Environmental Impacts and Management Considerations

6.1 FNSW Environmental Management Philosophy

FCNSW environmental management philosophy is to maintain populations, species, communities and ecological processes at a landscape scale, within a framework of multiple-use forests. This philosophy recognises that:

- it is not possible to maintain all values at a particular site all the time, and

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- management actions will be positive for some organisms and negative for others over different time-frames.

Consequently, FCNSW aims to maintain these forest values at a landscape scale by applying management actions in a considered manner in a mosaic across the landscape within appropriate ecological thresholds. With regard to fuel management, this philosophy is applied by prescribing appropriate fire regimes to a range of forest communities to reduce the potential for large, high intensity wildfires and to maintain ecological processes and biodiversity across those communities. This is done within a framework of legislative and regulatory requirements that also influence fuel management policy and practice.

This is consistent with conditions in Threatened Species Licenses in IFOAs that specify that fuel management burning must take into account the wildfire history, fire regimes and the ecological requirements of threatened species in the area being treated.

6.2 Fire Regime Guidelines Implemented by FNSW

Fire regimes are defined by the combination of several parameters, including fire intensity, fire frequency, seasonality and patchiness. Certain combinations of these parameters can produce adverse fire regimes and pose a high risk to natural and planted cultural heritage features. Fire parameters that affect fire regimes and FCNSW's guidelines are listed below in [Table 9](#).

Table 9: Factors Affecting Fire Regimes

Factors	Management Objectives
Fire Intensity	FCNSW aims to carry out fuel management burning under mild conditions, producing a low intensity fire that will not consume all the fuel on a site, will leave some areas unburnt altogether and will not desiccate soil layers.
Fire Frequency	FCNSW aims to undertake fuel management burning, for asset protection, at frequencies that will maintain fuel loads at manageable levels, according to the characteristics of the Region's Fuel Management Zones. In the longer term, FCNSW's approach to managing fire frequency, for ecological purposes, will be to identify fire age classes that are grossly over-represented for any particular vegetation type. These age classes will then be considered for application of prescribed ecological burns that, over time, will enable absent or under-represented age classes to exist and a more heterogeneous landscape to develop.
Seasonality	As far as practicably possible, FCNSW will undertake fuel management activities across a broad seasonal range, but this will be dependent on the prevailing weather conditions and other operational factors.
Patchiness	FCNSW will, as far as practicably possible undertake fuel management activities to achieve and maintain a complex mosaic of burnt and unburnt forest areas.

Fire frequency has been identified as a key threatening process, as it disrupts key life cycle processes in plants and animals. The primary risk from high fire frequency is a reduction in the abundance of a species to the point where it may become locally extinct. Alternatively, the exclusion of fire for an extended period of time may lead to the senescence of plants and their seed banks and the succession of other communities.

6.2.1 Fire Regime Guidelines for Cumberland State Forest

6.2.1.1 Vegetation Types

Evaluating the fire interval status for vegetation communities, flora and fauna assists with the identification of adverse fire regimes caused by high fire frequency.

As wildfire has largely been excluded from CSF over the last 50 years protection of assets and regeneration of vegetation/habitat has relied upon planned fuel management burns. These burns have usually been small in size, moderate in intensity and have occurred in a mosaic pattern usually during the cooler months of the year (ie autumn/spring) (see Table 2).

As discussed earlier in section 2.1.5 of this report vegetation types existing within CSF include Dry Sclerophyll Forest (shrubby sub formation), Wet Sclerophyll Forest and Rainforest Communities (planted arboretum).

In order to reduce the threat of fire impacting on internal and external assets and to maintain a healthy and diverse ecosystem with effective regeneration certain fire intervals have been prescribed (see Table 9). These intervals have been compiled from best available information and research on the fire ecology of the communities (Bradstock et al 1995; Keith 2002). The fire interval thresholds are based on a consideration of the broad vegetation type and the species composition of communities. The minimum interval (for SFAZ) is based on the primary juvenile periods of species sensitive to extinction under frequent fire regimes and does not include the time to replenish seed bank reserves. The minimum interval (for LMZ) takes into consideration replenishment of seed bank reserves. The maximum interval indicates the time since fire at which species may be lost from the community due to senescence. The figures for maximum intervals are largely based on assumptions and generalisations rather than on quantitative life history studies.

It is important to note that the fire intervals identified in **Table 10** provide a guide to identifying inappropriate fire regimes within the reserves. They do not specify the preferred or desired fire intervals for vegetation communities on a long term basis. Desired fire regimes are those that provide a diversity of fire intervals (within the intervals range identified) along with patterns of fire intensity, season of occurrence and spatial extent. Extinctions are most likely to occur when fire regimes of relatively fixed intensity, frequency and extent prevail without variation.

Table 10: Major Vegetation Communities Occurring in CSF & Associated Fire Intervals

Vegetation Communities	Minimum interval for SFAZ (years)	Minimum interval for LMZ (years)	Maximum interval (years)	Impact of Fire
Rainforest Communities (Planted Arboretum)	No Fire	No Fire	No Fire	Rainforests and plantations are not fire tolerant. Fire should be excluded from these areas.

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Wet Sclerophyll Forest	15	30	60	Wet sclerophyll forests should only be subject to moderate intensity fire. Moderate fire provides the natural regeneration mechanism for these forests. Exclusion of fire will encourage the infiltration of rainforest elements within this forest type.
Dry Sclerophyll Forest (Shrubby Sub-formation)	7	10	30	Dry sclerophyll forests have evolved with frequent burning events. In the absence of regular burning dry sclerophyll forests constitute the main fuel source for wildfires across the landscape.

6.2.1.2 Threatened flora species

No Threatened flora species are known to exist in CSF at the time of writing this plan.

6.2.1.2 Threatened fauna species

Threatened fauna species known to occur within CSF and associated fire regime guidelines are described below in [Table 11](#).

Table 11: Threatened fauna species occurring in CSF and associated fire regime guidelines

Scientific Name	Common Name	Conservation Status	Management Guidelines
Mammals			
<i>Mormopterus norfolkensis</i>	Eastern Freetail Bat	V	Protection of habitat/roost trees. Inspections to be conducted prior to Fuel Reduction Burns.
<i>Scoteanax rueppellii</i>	Greater Broad nosed Bat	V	Protection of habitat/roost trees. Inspections to be conducted prior to Fuel Reduction Burns.
<i>Miniopterus australis</i>	Little Bentwing Bat	V	Protection of habitat/roost trees. Inspections to be conducted prior to Fuel Reduction Burns.
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tailed Bat	V	Protection of habitat/roost trees. Inspections to be conducted prior to Fuel Reduction Burns.
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing Bat	V	Protection of habitat/roost trees. Inspections to be conducted prior to Fuel Reduction Burns.

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<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	Not known to inhabit the forest. Only observed flying over. Fire and mechanical forms of hazard reduction should avoid known roost sites. Maintain appropriate fire regimes within community thresholds for forests and woodlands with well developed understorey.
<i>Petaurus breviceps</i>	Sugar Glider	Local & Regional Significance	Protection of habitat trees (trees with hollows). Inspections to be conducted prior to Fuel Reduction Burns.
Birds			
<i>Ninox strenua</i>	Powerful Owl	V	Protection of habitat/breeding/roosting trees. Burns to be conducted outside breeding season if possible. 50m exclusion zone from nest/roost sites.
<i>Lathamus discolor</i>	Swift Parrot	E	Itinerant species, generally not affected by fire. Avoid burning during September to December breeding season Maintain appropriate fire regimes within community thresholds for eucalypt forest and woodland, especially where eucalypts are flowering profusely and an abundance of psyllids are available.

Response has been determined using the Threatened Species Hazard Reduction List in the NSW Rural Fire Service 2006 'Bush Fire Environmental Assessment Code'.

6.2.1.3 Endangered Ecological Communities

Sydney Blue Gum High Forest and Sydney Turpentine Ironbark Forest, both listed as endangered ecological communities under the TSC Act are believed to exist in CSF, although no formal identification has been conducted. **Table 12** provides the fire regime guidelines for these communities.

Table 12: Endangered Ecological Communities thought to occur within CSF and associated fire regime guidelines

Name		Occurrence	Response to fire and mechanical forms of hazard reduction
Sydney Blue Gum High Forest		Northern section of CSF	- No fire more than once every 15 years, and of low intensity - No slashing or trittering except for fire trail maintenance. No tree removal unless deemed hazardous or potentially hazardous.
Sydney Turpentine/ Ironbark Forest		Southern section of CSF	- No fire more than once every 10 years - No slashing or trittering except for fire trail maintenance. No tree removal unless deemed hazardous or potentially hazardous.

Response has been determined using the Threatened Species Hazard Reduction List in the NSW Rural Fire Service 2006 Bush Fire Environmental Assessment Code.

6.2.1.4 Cultural Heritage

As discussed earlier there are no specific records of aboriginal sites, relics or artefacts of significance occurring within CSF.

European cultural heritage sites (ie the arboretum, historical boundary fences and the quarry) will be managed and protected by applying the following guidelines described in [Table 13](#).

Table 13: Fire management guidelines to protect historic heritage

Site Group	Management Guidelines
Planted Arboretum	Exclude fire from the area.
Historical Wooden Fences	- As far as possible, protect site from fire. - Avoid all ground disturbances, including the use of earthmoving machinery, handline construction and driving over sites.
Quarry	Site unlikely to be affected by fire or any fire management activities.
Bellamy Saw Pit	Site unlikely to be affected by fire or any fire management activities.

6.3 Environmental Values Considered in Planning

In managing environmental and community values, FCNSW operational fuel management plans will consider the attributes listed in [Table 14](#) in the planning process.

Table 14: Environmental Values Considered in Planning Process

Attribute	Management Objective
Large Fallen Logs and Hollow Trees	Fuel management burning guidelines will contain strategies to reduce the impact on the amount of large fallen logs and standing hollow trees, such as ensuring burns are low intensity and constraining the drought index under which burning may be undertaken
Soil and Water Values	Fuel management burning guidelines will ensure low intensity patchy burns that do not remove all ground cover and organic matter, do not overly heat the soil nor burn into moister riparian buffer strips. The fuel management burning regime will protect soil and water values by reducing fuel levels and thus reducing wildfire intensities.
Air Quality	Fuel management burning guidelines will contain strategies to reduce the impact on air quality, such as consideration of prevailing wind direction, presence of temperature inversions and timing of burn.
Social and Economic Values	FNSW will identify hazards, and will analyse and manage bushfire risk through a program of reducing fuel levels at strategic locations in appropriate vegetation types across the landscape.

6.4 Environmental Impact Assessment

On lands where FCNSW operates without the coverage of an IFOA, an environmental impact

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assessment (EIA) for fuel management burning is required under Part 5 of the *Environmental Planning and Assessment Act 1979 (EP&A Act)*.

Preparation of an EIA is also required for burning that is carried out in a plantation that is not authorised under the *Plantations and Reafforestation Act 1999*, or for burning that is not part of normal plantation operations in an authorised plantation.

EIAs produced by FCNSW to meet the requirements of Part 5 of the EP&A Act may be prepared on a whole-of-Region, or part-of-Region basis, or may be site-specific and prepared in the course of preparing site-specific Operational Fuel Management Plans.

On lands covered by an IFOA, environmental impact assessment is addressed by way of a comparative assessment of the potential impacts caused by implementing the proposed burning regimes with the potential impacts caused by not implementing the proposed burning regimes. This is addressed in s6.3 of the Corporate Fuel Management Plan.

Burning carried out as part of normal plantation operations in a plantation authorised under the *Plantations and Reafforestation Act 1999*, is exempt from Part 5 of the EP&A Act.

6.5 Corporate Prescriptions in IFOA areas

Where fuel management burning operations are carried out within IFOA areas, a number of features and their exclusion/protection zones require special treatment. Prescriptions for these features/zones are listed in [Table 15](#).

Table 15: Treatment of Features and their Exclusion/Protection Zones under the IFOA

Feature Exclusion/Protection Zone	FNSW Prescription
Rare Non-Commercial Forest Types	Rare and Non-commercial Forest Types will not be deliberately ignited, unless assessment of post-fire age class distributions for the vegetation type identifies that fire is required to restore under-represented post-fire age-classes for the maintenance of ecological integrity.
High Conservation Value Old Growth (HCVOG)	HCVOG will not be deliberately ignited, unless assessment of post-fire age class distributions for the vegetation type identifies that fire is required to restore under-represented post fire age-classes for the maintenance ecological integrity.
Rainforest	Burning of Rainforest is to be avoided as far as practicably possible through the use of appropriate moisture differentials and application of standard fuel management burning guidelines
Ridge and Headwater Habitat	Ridge and Headwater Habitat will not be deliberately ignited.
Riparian Habitat	Fire will be excluded from Riparian Habitat as far as is practicably possible through the use of appropriate moisture differentials and application of standard fuel management burning guidelines.
Rocky Outcrops and Cliffs.	Rocky Outcrops and Cliffs will not be deliberately ignited.
Wetlands	Wetlands will not be deliberately ignited.

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Heath and Scrub	Heath and Scrub will not be deliberately ignited, unless assessment of post-fire age class distributions for the vegetation type identifies that fire is required to restore under-represented post fire age-classes for the maintenance ecological integrity.
Flora and fauna Records	Species-specific fire protection prescriptions identified in this plan will be applied.
Modelled Habitat	Modelled Habitat will not be deliberately ignited.

6.6 Regional Burning Prescriptions and Guidelines

FCNSW achieves its fuel management burning objectives by burning under controlled conditions to pre-determined prescriptions or guidelines that are specified in site-specific operational burning plans. **Table 16** details burning guidelines for the Region.

Table 16: Hazard Reduction Burning Guidelines for the Region

	Forest Health & Protection	Post-Logging/Windrow	Young Regrowth & Plantation
BKDI	<100	<100	<100
Dry Bulb Temp. (°C)	<25	<20	<20
Relative Humidity (%)	>40	>40	>50
Windspeed (km/h)	<15 if dry bulb >15	<15	<15
Windspeed (km/h)	<20 if dry bulb <15	<20 if dry bulb <15	<15
Fuel Moisture Content (%)	>12	>12	>12
Head Fire Rate of Spread (m/min.)	<2.0	<2.0	<2.0
Forest Fire Danger Index	<10	<7	<6

Burning in Asset Protection Zones and Strategic Fire Advantage Zones will be undertaken consistent with *Guidelines for Low Intensity Bushfire Hazard Reduction Burning* issued by the NSW Rural Fire Service.

7. Monitoring Procedures and Training

7.1 Training

Personnel involved in supervising fuel management activities will receive the appropriate level of training to attain the necessary skills and competencies to be able to interpret fire, fuel, weather and fire danger indices. In addition, key personnel will receive training in visual estimation of forest fuels as well as field estimation of fuel moisture content. Training in health and safety will be provided to all personnel. Training undertaken by FCNSW personnel will be recorded in FCNSW training database.

7.2 Monitoring of Weather and Fuels

- Build-up of forest fuels across the Region will be monitored on a regular basis using visual estimation techniques. This information, together with ecological considerations, will

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provide the basis for determining priorities for fuel mitigation works within the various fuel management zones,

- Developing weather and fire weather indices will be monitored in the lead up to and during fuel management activities to ensure that both personnel safety and pre-determined burn prescriptions are achieved,
- Key personnel involved in the implementation of Operational Fuel Management Plans will use field weather kits to monitor on-site weather and fire behaviour during the course of operations. This information will also be used in refining burn prescriptions for future fuel management burning, and
- Recording of fuel quantity and moisture content and site-specific weather information will provide records for fire behaviour calculations.

7.3 Monitoring of Burning Operations and Results

- The RFS BRIMS program (or its equivalent) will be used to register all fuel management activities and to record their completion date,
- Monitoring of fuel management burns will be carried out using the Post-burning Checklist and Checklist for Day of Burn, contained in the Operational Fuel Management Plan. Supervisors will record and analyse reasons for changes to the plan, or for unpredicted fire behaviour, as part of the feedback and training program,
- Maps will be maintained as a basis for recoding fire history data,
- Operational audits of fuel management activities will be undertaken by FNSW as part of normal monitoring procedures under its Environmental Management System, and
- The RFS will conduct periodic audits of compliance with the Bushfire Risk Management Plan across all agencies. FCNSW will be responsible for justifying its position in relation to the actions assigned to it within the BFRMP.

8. Operational Procedures

Fuel management burning will be planned to ensure that:

- The operation can be carried out with negligible risk to personnel or property,
- Fire can be contained within defined physical limits and burn parameters, and
- Fire intensity will be at levels adequate to achieve fuel modification, while minimising adverse effects on the forest environment.

8.1 Annual Programming

- A three-year rolling fuel management program for the Region will be prepared prior to commencement of the fuel management burning season each year,
- Details of the fuel management program will be entered into BRIMS (or its equivalent) and will be aligned with rural fire district boundaries to allow integration of FCNSW's fuel management program into the community-based Bush Fire Risk Management Plans. Spatial BRIMS (or its equivalent) will include maps of the areas proposed for fuel management activities prepared on rural fire district boundaries,
- The planning of any one year's program will take into account not only general fuel levels and areas of regular strategic or protective burning, but will also consider the effects of

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previous years' fuel management burns, grazing and wildfires. Planning will also take into account the progress of timber harvesting operations throughout the Region, and

- Limitations on the amount of fuel management burning that can be achieved, imposed by the vagaries of weather and a shortage of resources, make it necessary to have operational plans prepared for more areas than are likely to be burnt in any one season. This will allow flexibility to bring identified areas forward or to defer planned areas to future years of the rolling program as conditions and changes in works programs dictate.

8.2 Site-specific Planning Guidelines

In the preparation of operational fuel management plans, the following documentation should be consulted and kept, as appropriate, as planning documentation to support the operational plan:

- If conducting broad area burning, consult the "The NSW Fuel Management Burning Course Manual" (FNSW 1997) and FNSW Metricated Version of "Leaflet 80" (FNSW, 1991),
- If conducting post-logging burning in native forests, consult the "Guidelines for the Conduct of Post-harvesting Burning in Native Forests" (FNSW 1995),
- If conducting burning under regrowth, consult guidelines such as "A fuel management burning guide for young regrowth forests of Silvertop Ash" (Cheney *et al* 1992),
- If conducting softwood plantation establishment burning, consult the "Guidelines for softwood plantation establishment burning" (FNSW undated),
- Environment Protection Licence (EPL) conditions, specifically as applicable to post-harvest burning,
- Forest Management Zone (FMZ) maps – for any special prescriptions,
- Bushfire Risk Management Plan (CSF Fuel Management Plan) – identification of zones, assets and prescriptions,
- Records of threatened flora, Endangered Ecological Communities, threatened fauna habitat (using FCNSW flora and fauna database or NPWS Wildlife Atlas) – for prescriptions,
- Cultural Heritage Register – location of significant sites and prescriptions, and
- Fire history records – from a combination of available records, such as compartment histories, wildfire records or fuel management burning maps and from field-based evidence of fire history on the ground – for fire regime considerations.

The following planning principles should be incorporated into operational fuel management plans:

- The Region should be divided into a number of bushfire management zones in accordance with provisions contained in the RFS Bushfire Risk Management Plans (Regional Fuel Management Plan) and operational units or logical burning blocks, the nature, size and constitution of which will vary according to the type of fuel management to be undertaken,
- Detailed site-specific plans will be prepared for each logical burn unit or homogeneous group of units,
- Fire will be contained within predetermined control lines. Should fire escape these control lines, it will be quickly extinguished to minimise any adverse impacts,
- All fuel management burning will be supervised by a competent supervisor,
- Expected weather conditions will be monitored during the lead-up to the burn. Burning will be avoided when a significant level of uncertainty exists in weather forecasting or there is

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imminent impact of frontal weather or other unstable weather conditions,

- Security of fire edges, particularly during late spring burns as the conditions become progressively warmer, will be given high priority,
- As far as practicably possible, fuel management burning will be planned for completion in a single day. The lowest level of fire intensity and the least intensive ignition pattern, consistent with a burnout on the same day and within fuel management objectives, will be planned. Where fuel management burning is planned for completion over more than one day, fire edge security will be planned and managed to progressively contain the burn at the end of each day and the burning will be completed in as short a time frame as possible,
- The safety of burning crews, as well as of other persons likely to be in the area, will be of paramount importance,
- The burn supervisor will brief the burn crews prior to each operational period of active burning and will ensure that the following items are clearly explained:
 - reason/objectives for the burn,
 - boundaries of the area to be burnt,
 - areas/ features that must be looked for and from which fire must be excluded or that must not be deliberately ignited or burned,
 - planned control lines,
 - ignition points, patterns and direction of work,
 - expected weather conditions,
 - resource deployment,
 - communications on the fire line,
 - specific hazards, escape routes and safety zones, and
 - first-aid and emergency evacuation provisions.
- For larger, multi-day burns, results of the previous day's burn (including fire behaviour) should be analysed and discussed with the burn crew in the context of proposed activities for the coming day prior to the burn re-commencing,
- Specific approval must be obtained from the supervising forester to conduct the burn outside plan prescriptions. This must be recorded in the plan,
- Notification must be given to the supervising forester of the commencement and completion times of the burn on a daily basis, and
- Details of fuel management burns are to be entered into the RFS BRIMS database.

8.3 Operational Fuel Management Plans

Each fuel management burn will be carried out according to a site-specific Operational Fuel Management Plan. The Operational Fuel Management Plan template and Guidelines for Planning and Preparing Operational Fuel Management Plans are available from the EMS intranet site.

Each Operational Fuel Management Plan will have an effective life of three years, at which time it must be reviewed for currency.

Each Operational Fuel Management Plan will include the following:

- Map of the proposed operational area, using a scale of 1:25,000 for broad area burns, with preferably a larger scale for post-logging or small area burning,
- Pre-planning checklist,
- Checklist for the day of the burn and a record of burning that provides scope for monitoring and evaluating the burn.
- Site Safety Plan, including risk assessment, first-aid and emergency evacuation

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procedures,

- Location and area, including descriptions of forest types and fuels,
- Objectives of the burn, both general and specific,
- Environmental aspects and controls, including threatened species of fauna and flora, Endangered Ecological Communities and cultural heritage items and all necessary proposed protection measures. Fire exclusion areas and areas that must not be deliberately ignited or burned must be mapped,
- Burning prescriptions, including weather, fuel conditions, burning cycle, FDI, desired fire behaviour and effects;
- Perimeter control lines,
- Bushfire Risk Zones and location of any assets that require special protection,
- Tactical details, including crew and equipment details, methods of ignition, patrol and mop-up,
- Identification of and contact details of neighbours, permittees, licensees, affected land management agencies and fire fighting authorities and any other affected party,
- Co-operative arrangements with other land managers, neighbours or fire authorities,
- During the burn, the 'Record of Burn Form' should be used to record the following:
 - weather conditions - conditions at time of ignition must be recorded, with details at other times during the burn desirable, especially if there is a change in weather,
 - fire behaviour and results,
 - area treated, fuels burnt and general evaluation of the burn,
 - any specific approvals obtained during the conduct of the burn,
 - details of any incidents where fire escaped from control lines, and
 - details of any OH&S incident or near miss that occurred during the conduct of the burn.

8.4 Burn follow-up and monitoring

The location, success and effects of each burn should be recorded, and the operation should not be regarded as complete until this phase, at least in the short-term, is carried out. In some instances, follow-up work in the successive season may be required to achieve the burn objectives. BRIMS should be updated with completed burn details.

At the end of each season, a brief report should be prepared, summarising the results achieved and commenting on any variations to the proposed program, or results that did not conform to predictions or expectations.

Records of fuel management burning and wildfires will assist in monitoring the effectiveness of the Regional Fuel Management Plan. Periodic review will be undertaken as new knowledge comes to light and the Plan will be amended, as necessary.

9. Review Procedures

This Plan will be reviewed within five years. Regular updates may be required if, for example, further research information becomes available, fuel management zoning requirements are amended, settlement areas expand significantly, changes occur in conservation areas or additional forest regrowth areas or plantations are established.

The Fuel Management Program will be prepared for three years but will be revised annually. This will facilitate setting of priorities within zones and will allow the program to be updated based on the

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burning achieved each year.

Review will also be undertaken, if significant changes are required, as part of the Bush Fire Management Committee's s52 fire management planning process.

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