GOLDFIELDS

Regional Fire Management Plan 2008 - 2013

Document History

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Goldfields Regional Fire Management Plan
2008-2013

Preface:

This Regional Fire Management Plan presents guidance to fire managers on achieving the Departments' policy objectives within the Goldfields Region over the 5-year period 2008 to 2013.

Fire has been a natural element of the Australian landscape for millions of years. Along with other natural disturbances, such as drought, storms and geological changes, fire has shaped the Australian environment, its native plants and animals and the ecosystems that sustain them. Many species have developed specific mechanisms to survive and tolerate periodic fire. Some even depend on fire for regeneration and other critical life stages.

Aboriginal people have used fire for more than 40,000 years for cultural reasons, heating, cooking and for clearing the country to enable easier access for hunting and to stimulate regrowth of native grasses to attract native grazing animals.

The contemporary fire environment in Western Australia is significantly different to the period prior to European settlement. There are now numerous fire vulnerable community assets embedded in a very fire-prone environment. While natural fires in the past once would run their course until it rained, the creation of towns and settlements, community infrastructure, farmlands, specific land uses and other developments has meant that today's community requires protection against the ravages of wildfires.

The role that fire plays in maintaining the biodiversity of the myriad of ecosystems across the State has also been affected by development. Historical fire regimes have changed in many parts of the State from the frequent, low intensity burning applied by Aboriginal people resulting in a fine grained mosaic of burnt patches, to a regime of less frequent and often higher intensity fire extending over larger areas and resulting in a coarse grain mosaic of fire footprints across the landscape.

The Department consists of a number of administrative Regions. Some Regions are constituted by a number of Districts. Fire Management outcomes are provided through this Regional and District structure.

The Department's fire management is guided by Policy Statement 19 'Fire Management', which states:

> *The Department will manage prescribed fire and wildfires on lands managed by the Department to protect and promote the conservation of biodiversity and natural values whilst also providing for protection of human life and community assets. The Department will also promote fire management that protects biodiversity on lands not managed by the Department.*

Fire management will be planned and implemented in partnership with other landowners and land managers, fire authorities and the community. The Department will implement an informed and balanced approach to risk management. A variety of fire regimes incorporating different frequency, intensity, season and scale will be applied at the landscape scale on lands for which the Department has a fire management responsibility.

This Regional Fire Management Plan is the interpretation of the guidance contained in Policy Statement 19 for the Goldfields Region. It sets out the objectives for managing fire across the Region and within the Fire Management Areas that have been identified within the Region. It has been developed with reference to existing plans such as the Regional Management Plan, Regional Operations Plan and the Nature Conservation Output Plan.

This plan is developed for use by regional fire managers and managers of other regional portfolios and will provide guidance in the determination of fire management works and priorities. It will also provide fire management guidance in the preparation of Area Management Plans for specific parts of the estate managed by the Region.

The plan is a dynamic document; it will be revised from time to time as new knowledge is developed from experience, research and adaptive management. The document will be formally reviewed within 5 years of publication.

The Region

The Goldfields Region includes all lands managed by the Department of Environment and Conservation (DEC) in the Shires of Coolgardie, Menzies, Yilgarn, Sandstone, Wiluna, Ngaanyatjarraku, Leonora, Laverton and the City of Kalgoorlie-Boulder.

The Goldfields Region has an area of approximately 842,000km² and includes 8,589,047 hectares of conservation reserves and areas managed by DEC. This area includes 3 national parks (153,161 ha), 19 nature reserves (6,294,486 ha), 6 conservation parks (183,041 ha), 11 timber reserves and State Forest No. 8 (110,856 ha), an Arboretum located at Kalgoorlie (26 ha), 1 Section 33(2) managed area within the Goldfields Woodlands National Park (28,514 ha) and 11 whole or parts of former Pastoral Leases now UCL managed under S33(2) by the Department (1,847,475 ha) proposed for conversion to Conservation Park. There are also proposed additions for new conservation reserves including 3,378,957 ha and further 2015 pastoral lease excisions for additional reserves of around 4,500 ha (Table 1.).

DEC is also responsible for the management of fire mitigation on all Unallocated Crown Land (but not wildfire suppression) that falls within the regional boundaries totalling approximately 40 million hectares.

Fire Management Area	Area of DEC land (ha)	Area of UCL (ha)	Total area (ha)
Woodland	1,028,246	3,547,147	**4,575,393**
Desert	3,689,911	26,779,896	**30,469,807**
Pastoral	1,681,355	3,639,352	**5,320,707**
Nullarbor	2,187,781	5,809,811	**7,997,592**
Total	**8,589,047**	**39,776,206**	**48,365,253**

Table 1. IBRA Area statement for the Goldfields Region (not inc. Proposed and 2015)

As with much of the rangelands, fire is of immense importance, however, current regimes are likely to be having significant detrimental impacts on biodiversity. Estimates show that in the last decade around 50% of the Region has been burnt. The average size of these fires is around 14,500 ha but can exceed 100,000ha in size. Areas most prone to fire are the Desert management unit and the sandplains of the Coolgardie Bioregion.

Climate and Weather

There is a climatic gradient from a predictable winter rainfall regime of approximately 300mm per annum in the south west of the region to unpredictable episodic rainfall events approximately 150mm in the northern Nullarbor area.

The contribution to rainfall of cyclonic influences, particularly rain-bearing depressions increases to the north of the region.

A report on implications of the Greenhouse effect for Western Australia suggests that rainfall intensities may increase significantly and return periods (the average time between rainfall events) may decrease (Allan et al., 1992).

Geology and Geomorphology

Geographically the western half of the region comprises Pre-Cambrian granites, gneisses and greenstones or erosional remnants, e.g. breakaways and sandplains of these components. Minor topographic relief is offered by low hills and ranges of banded ironstone and greenstone in the Yilgarn.

The Nullarbor is the largest arid land karst area in the world. It comprises Tertiary limestone and other marine sediments.

The deserts in the Goldfields Region include red sandplains and dunes from the weathering of lateritic duricrust and low hills and ranges of either Proterozoic laterites or sandstones. Deserts of W.A. have been described and delineated by Beard (1969). Major ancient drainage lines and lakebeds of Tertiary age are interspersed with other landforms throughout the Goldfields.

Soils reflect geology with red-brown earthy loams in the south west, shallow calcareous loams on the Nullarbor, red siliceous sands in the desert and brown sandy clay loams over much of the Mulga woodlands.

Hydrology

Much of the hydrology of the Goldfields is ancient paleo-drainage systems and lakebeds. There are no significant river systems found in the Region. Most water bodies are in the form of salt lakes.

Fire Management Areas in the Region

The region can be divided into four main Fire Management Areas (FMA) based on designated conservation management zones. The boundaries of FMA's have significant congruence with the Interim Biodiversity Regions of Australia (IBRA) found in the Goldfields and the Conservation Management Zones determined in the Nature Conservation Output Plan for the Goldfields Region. In determining the boundaries of an FMA several criteria were considered:

- The vegetation and landform in relation to fire behaviour. For example the hummock grasslands of the arid interior are significantly different to the woodlands and the extensive chenopod shrublands of the Nullarbor.
- The existing land use. Areas that are used for pastoralism require different fire management than areas used primarily for nature conservation and areas of Aboriginal land may be managed for cultural or commercial outcomes.
- The influence of climate. Flammability of the arid interior is affected by irregular and scattered pulses of rainfall. Flammability of the northern half of the arid zone is affected by periodic cyclone events whilst the southern half of

the arid zone is affected by winter cold fronts and the north east central ranges and desert is less prone to rainfall events.

These are derived from the 8 major IBRA regions found in the Goldfields. These units are;

- Pastoral (Murchison and Gascoyne),
- Deserts (Little Sandy Desert, Gibson Desert, Great Victoria Desert and Central Ranges),
- Nullarbor (Nullarbor Plain) and
- Woodlands (Coolgardie).

The Pastoral FMA is primarily identified by mulga (*Acacia anuera*) in the form of low woodland on plains, and shrubland on shallow soils and hills. Some areas often have a grass and/or spinifex understorey.

The Desert FMA is primarily identified by spinifex vegetation interspersed with areas of mulga and/or mallee in the breakaway and swales. The plains and ridges usually feature open marble gum woodland over spinifex. This FMA changes in the Central Ranges area to include large quartzite and basalt ranges interspersed with desert oak groves.

The Nullarbor FMA is primarily identified by chenopod shrubland dominated by either Pearl Bluebush *(Maireana sedifolia)* or Saltbush *(Atriplex* species). Claypans found within this FMA support grasslands, with Acacia and mallee woodlands occurring on the northern and western edges of the FMA.

The Woodlands FMA is primarily identified by eucalypt woodland becoming open and with a saltbush-bluebush understorey on the more calcareous soils**.** This is interspersed with sandplain vegetation, salt lakes, ironstone/greenstone ranges and granite outcrops.

Regional Fire Management Approaches

There are a number of approaches to fire management that apply to all land managed by the Department in the Goldfields Region. A description of these differing approaches to fire management is outlined below.

Biodiversity Conservation

Fire management for biodiversity conservation in the Region is based on the application of appropriate fire regimes within each of the four FMA's. The determination of an FMA is based on similarity between IBRA regions using climate, landform, geomorphology and vegetation. Each FMA represents an area of land where fire interacts with the environment in a relatively consistent manner. The biota within each FMA should share similar adaptations to allow them to persist in a fire prone environment. The life strategies or 'vital attributes' of these biota (particularly the vegetation) provide indicators to the natural bounds of an appropriate fire regime in terms of fire return intervals, seasonality of fire, intensity of fire and patchiness of fire history (spatial and temporal) across the landscape. In particular, the age to first flowering and the time to senescence and decline for plant species provide clues to the appropriate frequency distribution of area and time since fire.

Fire Management Approach for Biodiversity Conservation:

- The Department will facilitate the maintenance of the biodiversity of the Region by applying appropriate fire regimes to the landscape in partnership with other land managers.
- The Department will, as far as is practicable, apply prescribed fire to DEC managed lands and UCL within each FMA resulting in spatial and temporal mosaic of fire history that is conducive to enhance biodiversity.
- Determine the trend in the frequency and extent of fire to at least the last 20 years using satellite imagery as the basis of an assessment of the impact of fire regimes on landscape condition and biodiversity values.

Success Criteria:

- The average size of unplanned fire events on DEC managed land and UCL is reduced where fire mitigation has been undertaken.

Protection

The estate managed by the Region abuts pastoral and mining developments with private assets that may be fire vulnerable. There are also a number of high value infrastructure 'life line' assets such as transport routes and utility distribution easements that traverse the DEC estate in the SW area of the region. Both Aboriginal and non-aboriginal cultural heritage assets occur across the Region. However, the location and extent of most aboriginal heritage assets is poorly known. Human use of DEC lands is moderate within the Region with visitation rates to developed recreational infrastructure and other areas of the estate being high for particular periods of the year. Fire Protection in the Goldfields Region has been greatly assisted by the Federal Bushfire Mitigation Program.

Fire Management Approach for Protection:

- To protect visitors and DEC personnel to DEC managed estate from unplanned fire events.
- The Department will mitigate the risk of unplanned fire to fire vulnerable assets on and adjacent to DEC managed lands and UCL.
- Implement operational recommendations of the Southern Cross – Coolgardie Wildfire Threat Analysis report.

Success Criteria:

- No lives lost.
- No damage from fires emanating from DEC managed estate to adjacent community assets.
- The size and frequency of unplanned fire affecting DEC managed lands is reduced where fire mitigation has been undertaken.

Fire Suppression

Under the *Emergency Services Act (2005)* and the Bush *Fires Act (1954)* the Department has obligations as a Hazard Management Agency for wildfire on DEC managed estate and has powers to undertake fire suppression operations. The suppression obligation for UCL lies with local government, however, DEC will provide assistance to local government wherever possible to assist with suppression operations. Unplanned fire is managed primarily through mitigation works on UCL and DEC managed estate. The mitigation work includes prescribed burning at a mosaic scale and extensive firebreak construction. Fire suppression operations are only undertaken in situations where resources and response times allow an effective suppression response.

Fire Management Approach for Fire Suppression:

- The Department will maintain a fire detection (utilising web-based remote sensing products eg. Sentinel and Landgate) and fire reporting system that will give timely and accurate warning of fires threatening community or environmental values.
- The Department will undertake active suppression on fires immediately threatening life lines in the Woodlands FMA.
- Determine priorities for fire management based on a risk analysis of fire and its implications for biodiversity and other assets in each FMA.

Success Criteria:

- The average size of unplanned fire events on DEC managed land is reduced where fire mitigation has been undertaken.

Community Engagement

Community engagement is required to ensure that the needs of all stakeholders are considered and the Department's obligations under its 'Good Neighbour Policy' are achieved.

Fire Management Approach for Community Engagement:

- Develop an informed and supportive partnership with stakeholders that are affected by, or whose management of adjacent lands may affect, DEC fire management outcomes.
- Effectively engage with Indigenous communities for cooperative fire management operations.

Success Criteria:

- The number of joint management fire operations that are agreed to and executed with other land managers on and off DEC managed estate.

Fire Knowledge

Undertake the collection of relevant data on fire behaviour and fire ecology to better inform future decision making. Utilise this knowledge to inform decision making on fire management to enhance and protect biodiversity values.

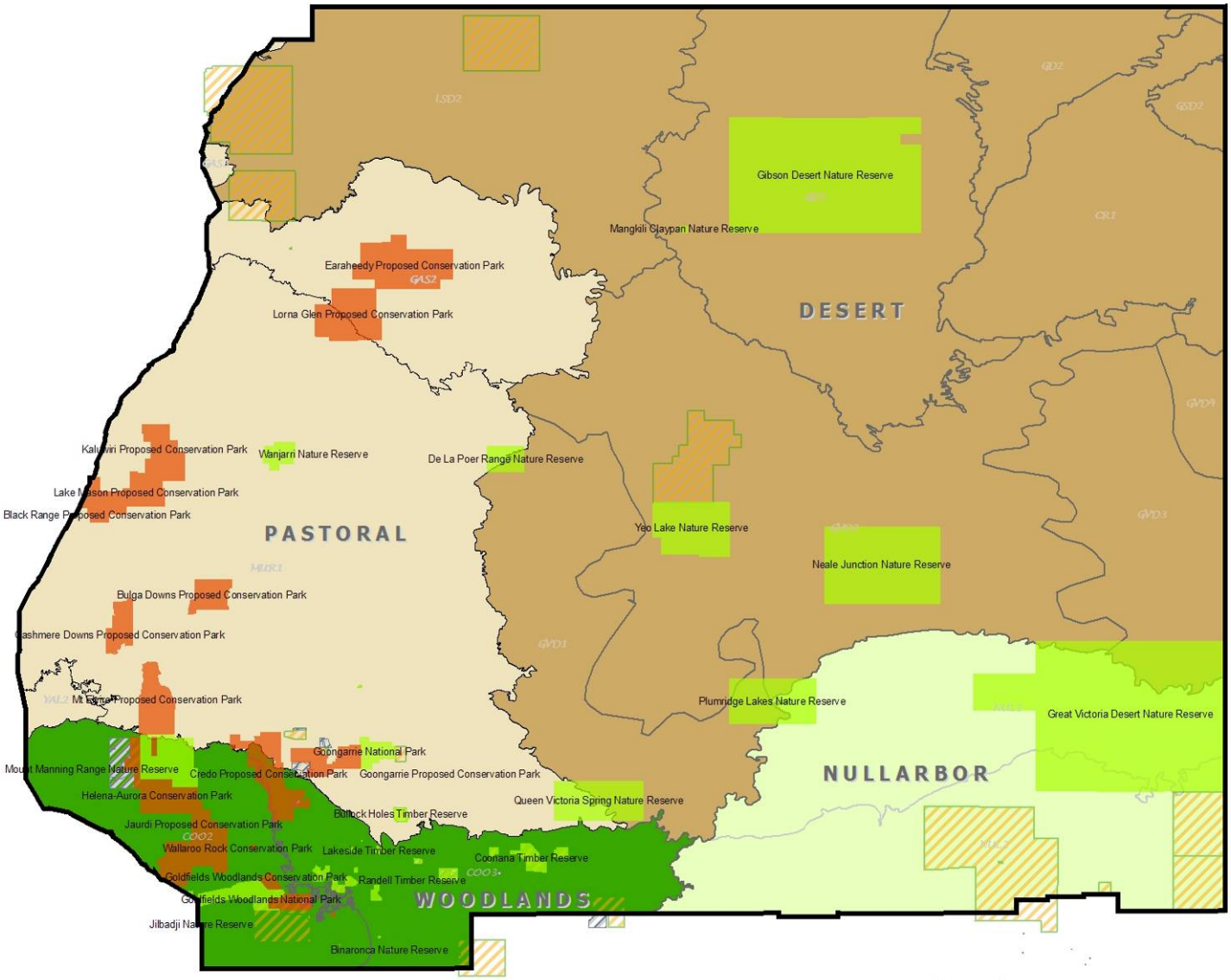
Knowledge Management Approach:

- To develop new knowledge concerning fire and its effects by applying an adaptive management approach to fire management operations.
- Collect, collate and incorporate Indigenous and non-indigenous knowledge of fire application and effects into fire management planning.
- Gather a level of data from each burn that will improve current knowledge and assist in all future planning of burns in the same FMA.

Success Criteria:

- Data gathered will increase knowledge and assist planning the next burn in each vegetation type.

Figure 1. FMA's for the Goldfields Region. Based on IBRA Regions with Conservation Estate overlay



Fire Management Area 1. – Pastoral:

Description

This fire management area includes the area of land which is covered by the Gascoyne and Murchison IBRA regions. The primary land use is pastoral leases grazing cattle and sheep, and numerous mining activities. Rainfall is generally winter rainfall in the south (<200mm) and bimodal (summer/winter) in the north. The area of this FMA is 21,253,398.1ha of which 26.1% is managed by DEC for fire mitigation. The key vegetation types for fire management are described below.

Land use considerations for fire management

Biodiversity conservation

The ecosystems in this FMA vary throughout the region in relation to fire carrying capacity. Much of the biota has adapted to fire, but species like *Acacia aneura* (mulga) are still vulnerable to local extinction under an uncontrolled fire regime. Fire regimes that include long periods (>50 years) between intense fires, large scale areas burnt (thousands of ha) and frequent fire (estimated <5 years) are damaging to sustaining biodiversity.

Community asset protection

This FMA has a number of neighbouring pastoral leases surrounding DEC managed lands. Feed for stock and station infrastructure (fencing, windmills etc.) is at risk from wildfire emanating from DEC managed land and UCL. DEC managed land is at risk from wildfire entering from adjacent pastoral or mining leases.

Community Engagement and Liaison

Community engagement for this FMA encompasses both indigenous and non-indigenous issues. For example, Lorna Glen and Earaheedy are both subject to joint management with the Wiluna community and a good neighbour policy with adjoining pastoral managers. DEC is promoting the reintroduction of managed fire into this area, which requires careful negotiation with all schools of thought and concerns. Another area that is becoming more involved with joint management is the Lake Mason complex (Lake Mason, Black Range and Kaluwiri). This area requires liaison with the Goldfields Land and Sea Council. Other community opportunities include mining companies with adjacent or overlaying tenements on the DEC reserve system. Such liaison has already begun with several companies including around Wanjarri NR (BHP Billiton) and the Plumridge Lakes area (AngloGold Ashanti).

Key vegetation types

Mulga thicket:

This vegetation type has a variety of fire sensitive species, mulga being the primary species. However there is usually very little ground fuel (*Figure 3*) and fire spread is only likely when a large fire front from adjoining spinifex fuels under extreme conditions reaches the canopy. Fire spread may also occur after a good wet season and grasses, usually absent, are growing beneath the mulga (*Figure 2*). Estimated wind ratio is approximately 3:1.

The desirable fire regime is to burn the spinifex around the thickets under mild conditions to provide a patchy result. These burns need to be implemented at regular intervals to provide some protection to the thickets. This protection is of particular importance after rainfall events when annual grasses are likely to be present within the thicket. In the absence of grazing these soft grasses may persist for one or two years. They provide sufficient fuel to allow the propagation of unplanned fires through the thicket.

Occasionally more intense fires will penetrate the mulga thicket resulting in mortality of patches within the mulga thicket. These areas need to be excluded from fire using the surrounding mosaic in the grasslands in order to allow the establishment of fire sensitive mulga regeneration.

Figure 2. Open Mulga woodland and soft grasses after good summer rain

Figure 3. Same vegetation type after a period of drought (Muller, 2006)

Open Mulga woodland and spinifex

This vegetation type appears well adapted to fire yet like the mulga thickets individual mulga plants are still sensitive to fire. Due to the spinifex understorey this vegetation type is prone to large, landscape size wildfire. These fire events usually create a high intensity fire which will kill all the mulga in the area and recovery of the mulga from seed (to reproductive capability) is usually greater than 30 years. Fire may also occur after a good wet season when usually absent grasses are growing beneath the mulga amongst the spinifex. Repeat fires prior to the regeneration cycle can eliminate mulga from the vegetation system permanently. Wind ratio is probably 1:1 to 2:1, depending on the quantity of mulga in the area. Spotting is minimal (<100m) in a cool burn, but unknown in a large wildfire. Rates of spread of up to 10km/h would not be unusual under extreme conditions.

The desirable fire regime is one of regular, low intensity burning in the spinifex to provide a fine grained mosaic of fuels that will reduce the risk of large scale, high intensity wildfires impacting on large areas of individual mulga stems. This fire regime will facilitate the persistence, establishment and regeneration of individual mulga stems in the spinifex grassland.

Visual observations of burning in different areas indicate the species of spinifex may also affect the fire behaviour. For example, *Triodia melvillei* will burn down wind and across the wind as the burning grass moves ‘down’ the plant igniting adjacent

hummocks. Fire in *T. basedowii* will propagate primarily down wind due to its growth habit or growing in rings. The age of the spinifex (time since fire) also affects the flammability of spinifex grasslands due to the fuel load and spatial arrangement of clumps affecting contagion of fire.

Figure 4. Scattered Mulga woodland and dense spinifex

Unique features

The FMA has several unique features of interest to conservation that may be affected by fire management decisions in the Goldfields Region:

- Wetlands of both regional and national significance – Windich Spring, Lake Carnegie, Lake Barlee, Lake Ballard and Lake Marmion.
- Calcrete aquifers with endemic aquatic invertebrate species.
- Only 1.92% of the Gascoyne IBRA is under strict conservation reserve (IUCN I-IV) and only 1.39% of the Murchison IBRA is reserved (*Biodiversity Audit, 2002*).
- Leeuwin paleo-drainage system on Earaheedy PCPk.

Proposed prescribed burning conditions

In general the application of prescribed fire in this FMA is best achieved by burning between late April and early September (with a falling hazard). A period in June/July may restrict or prevent burning in the southern part of the FMA due to cold, wet conditions. Depending on the requirements for strategic buffers or a general mosaic, the time required for burning will determine time of day best suited for ignition. For example, late in the day (after 1400hrs) is preferable if the intention is to create

buffers as the time the fire has to run will be reduced to a period (1 or 2 hours) before the RH is too high and temperature too low for effective fire spread.

A general guideline for mild to moderate burn conditions in the spinifex would be:
Max Temp Range: 22 – 31^{o}C (Overnight <5^{o}C)
RH%: 20 – 50%
Wind speed: 12 – 20km/h

A general guideline for the protection of mulga thickets with grass would be:
Max Temp Range: 16 – 25^{o}C
RH%: 20 – 45%
Wind speed: 7 – 15km/h

Preferred rates of spread (ROS) are in the order of 200 to 1,000m/h and extinguishment will usually occur after sunset when temperatures drop and RH rises. ROS of >2,000m/h represent conditions that may be too intense to produce a useful result for biodiversity values.

Fire Management Objectives

- Create and maintain a spatial mosaic (<1,000ha grain size) of fuel ages (time since fire) with inter fire periods sufficient to maintain biodiversity on DEC managed estate and UCL.
- Create and maintain a strategic arrangement of low fuel fire management areas sufficient to provide protection to fire sensitive assets.

Strategies

- Describe the current fire management practices and fire regimes of the Pastoral FMA and quantify the impacts of the current fire regimes on ecosystem condition.
- Implement the Lorna Glen Fire Management Plan in conjunction with research, NC and PVS initiatives to help protect and manage structural, cultural and biodiversity assets on the estate.
- Implement IMG strategies relating to fire on other Proposed Conservation Parks (former leasehold).
- Prepare basic Fire Management Plan for Lake Mason complex based on a simplified version of the Lorna Glen FMP.
- Identify areas that facilitate the establishment and maintenance of strategic low fuel buffers.
- Identify areas that are conducive to the establishment and maintenance of fire maintained mosaics.

Success Criteria

- Fifty percent of spinifex vegetation type is maintained greater than 10 year old within the mosaic.
- Wildfire is managed through mitigation works to minimise the area burnt.
- Wildfires will not travel further than 20km before intercepting a strategic low fuel buffer.

- Not net reduction in pure Mulga thickets on DEC estate.

Relevant Conservation Estate

The following Conservation Reserves and proposed conservation reserves fall within this FMA:

- Lorna Glen PCPk
- Earaheedy PCPk
- Lake Mason PCPk
- Black Range PCPk
- Credo PCPk (partial)
- Kaluwiri PCPk
- Wanjarri NR
- Mt Forrest/Ida Valley PCPk
- Cashmere/Bulga Downs PCPk
- Mt Elvire PCPk
- Goongarrie NP
- Goongarrie PCPk.
- De La Poer NR (partial)
- Queen Victoria Springs NR (partial)
- Bullock Holes TR

Table 2. – FMA 1 Pastoral

Vegetation type	*Fire management outcome*	*Prescribed Fire Regime*	*Wildfire response*	*Partnering considerations*	*Monitoring for fire management effectiveness*
Mulga Thickets	Minimise impact of wildfire on Mulga thickets.	Establish and maintain strategically located, low fuel buffers using low intensity fire in grasses.	When and where feasible, suppress fire threatening mulga thicket. Utilise established buffers and firebreaks to minimise the spread of wildfire.	Liaise with Wiluna Council and GLSC for assistance with prescribed burning.	Implement recommendations from Lorna Glen FMP for the Lorna Glen/Earaheedy complex.
Open Mulga over spinifex grassland	Minimise impact of wildfire on Mulga thickets surrounded by spinifex fuels. Establish structural and floristic diversity by breaking up the type into a mosaic of different post fire ages. Utilise knowledge gained to better plan future prescribed burning.	Ensure sufficient mosaic (up to 50% over 10 years) of burnt spinifex to prevent spread of wildfire into isolated mulga thickets. Implement annual burning program (April to September) for existing FMP's and extend to other reserves.	When and where feasible, suppress fire threatening mulga thicket. Utilise established buffers and firebreaks to minimise the spread of wildfire.	Liaise with Wiluna Council and GLSC for assistance with prescribed burning.	Implement recommendations from Lorna Glen FMP for the Lorna Glen/Earaheedy complex. Utilise remote sensing to determine extent of wildfires.

Table 3. – FMA 1 Pastoral Prescribed Burns (commenced, completed & proposed)

Burn Number	Location	Burn Type	Purpose of Burn	Comments on burn (conditions, etc)	Results (area, % mosaic, etc)
GFR1-05	Lorna Glen PCP	Handburn (In kind support for research)	Research – PhD. For Peter Langlands (UWA)	First commenced October 2005, completed August 2006. Hot, dry conditions for Oct 05 burns, but cool, mild for 2006 ignitions.	Completed. 6 plots (300m x 300m) and 4 plots (~150m x 150m). Good burn for all plots.
GFR3-06	Queen Victoria Springs NR	Aerial	<u>Biodiversity Burn:</u> To protect, maintain and enhance biodiversity and ecological processes within the Queen Victoria Springs NR by applying fire under prescribed conditions to achieve a mosaic of fire intensities.	2,365 incendiaries used.	10% burn treatment (~1,800ha actually burnt). Average grain size – 148.4ha. Largest grain size – 1,200ha.
GFR10	Lorna Glen PCP	Handburn	<u>Biodiversity Burn:</u> To protect, maintain and enhance biodiversity and ecological processes within Lorna Glen PCP by applying fire under prescribed conditions to achieve a mosaic of fire intensities and burnt and unburnt areas at both a landscape and a local scale.	Based on Lorna Glen FMP.	Autumn 2007
GFR11	Earaheedy PCP	Handburn	As Above	Based on Lorna Glen FMP.	Autumn 2007

				Not Commenced	
GFR13	Lorna Glen PCP Boundaries	Handburn	<u>Protection Burn</u> To minimise the potential size and intensity of wildfires and/or the risk of damage from wildfire to neighbouring pastoral leases.	Commenced August 2006. Total area to be estimated between 150 – 200km.	To continue in Autumn 2007
GFR14	Earaheedy PCP Boundaries	Handburn	<u>Protection Burn</u> To minimise the potential size and intensity of wildfires and/or the risk of damage from wildfire to neighbouring pastoral leases.	Commenced August 2006 Only small areas along northern boundary completed. Total area to be estimated between 150 – 250km.	To continue in Autumn 2007 About 5km burnt – stopped due to dry, hot conditions.
GFR15	Lake Mason Complex	Handburn	<u>Protection Burn</u> To minimise the potential size and intensity of wildfires and/or the risk of damage from wildfire to neighbouring pastoral leases.	Not Commenced	Autumn 2007
			<u>Biodiversity Burn:</u> To protect, maintain and enhance biodiversity and ecological processes within Lake Mason/Black Range complex by applying fire under prescribed conditions to achieve a mosaic of fire intensities		

Fire Management Area 2. – Deserts:

Description

This FMA includes the area of land which is covered by the Little Sandy Desert (LSD), Gibson Desert (GD), Great Victoria Desert (GVD) and Central Ranges (CR) IBRA regions. The primary land use is Aboriginal reserves and managed areas, UCL and mining activities. Rainfall in this area varies from bimodal rain (<200mm) in the GVD to primarily summer rainfall in the LSD, GD and CR. The area of this FMA is 45,929,685.6ha. The key vegetation types for fire management are described below.

Land use considerations for fire management

Biodiversity conservation

Burning for biodiversity conservation is a major consideration for this FMA. The ecosystems in this FMA are basically similar throughout where most of the biota is well adapted to mild to moderate fire events. Fire regimes that include long periods (>20 years) between intense fires, large scale areas burnt (thousands of ha) and frequent fire (<5 years) are damaging to sustaining biodiversity.

Community Engagement and Liaison

Much of the community engagement in this FMA comes from local Aboriginal communities associated with a particular area or reserve. Most of these communities and their respective representatives are very pro-burning as it is a tool still used for traditional purposes. The majority of community involvement in fire is in the Gibson Desert NR and the Central Ranges. Liaison and undertaking of burning is conducted with the individual communities (eg Patjarr) and the Land Management councils (eg Ngaanyatjarra Land Management Unit). There are issues with aerial burning as local elders feel they have no control over the application of fire (especially an issue as we are calling the work 'joint management'). It may require extensive liaison and invitations to fly while burning before a significant aerial program can be implemented in the Gibson Desert.

Key vegetation types

Spinifex plain:

This vegetation type is very flammable, yet inherently adapted to fire. It can be interspersed with marble gums (*Eucalyptus gongylocarpa*) in the Great Victoria Desert and mulga thickets in the Gibson Desert. It is not unusual to see very large (>100,000ha) fire scars in this vegetation throughout the UCL. Most of these massive fires are attributed to change in fire management practices since the settlement of Europeans. The fine grain mosaic developed by traditional indigenous burning has all but disappeared in the last 50 years, thus providing extensive tracts of unburnt country for wildfire runs. Periods between burning in this vegetation range between 5 years after a few good seasons to 10-15 years in dry periods. Wind ratio is usually 1:1. Some fuel loads, based solely on spinifex fuels, have been recorded around the 15-18t/ha on Lorna Glen.

Like the open mulga over spinifex fuels, the desirable fire regime is one of regular, low intensity burning in the spinifex to provide a fine grained mosaic of fuels that will reduce the risk of large scale, high intensity wildfire.

Figure 5. Spinifex plain in the Gibson Desert NR

Mallee woodland and spinifex

Due to the spinifex understorey this vegetation type can be prone to large, landscape size wildfire. These fire events can create hot, intense and frequent fires that have the potential to kill mallee woodland. Whereas low intensity, less frequent fires are required because visual observations indicate that many of these mallee species are re-sprouters and recover well after a mild fire event. Wind ratio is usually 2:1 to 3:1 and fire behaviour calculations can be based on the mallee tables. Spotting is minimal (<100m). Rates of spread of up to 5km/h would not be unusual under extreme conditions. Fuel loads, based on the spinifex understorey have been recorded as high as 13t/ha at Queen Victoria Springs NR.

A desirable fire regime is the regular application of fire under mild conditions to establish and maintain a coarse grained mosaic of 10's to 1,000 ha in size. Need areas in the mosaic that are greater than 10 years of age since fire. The majority of the mosaic (50-60%) should be less than 10 years of age.

Calculations in regards to fire spread, intensity etc, will need to be calculated using either the mallee heath table or the spinifex calculations developed by Burrows *et al*. Which one is used is dependant upon which part of the vegetation structure is the dominant fuel type.

Figure 6. Mallee woodland and spinifex

Central Ranges

The Central Ranges is an area that could possibly be separated from all the other FMA's, yet some characteristics certainly fall into the Desert FMA. While it contains spinifex/mulga/mallee communities similar to the other surrounding desert areas it also contains more extensive and significant ranges and gorge communities. It is also an area still primarily managed by Aboriginal people and of major significance to the local indigenous communities who live in the area. Traditional burning is still carried out in some parts but not on the scale it once was. Due to water catchment abilities of the ranges, the fuel loads can be higher here than surrounding plains. This may lead to large, high intensity fires. Wind ratio is likely to vary, probably 1.5:1 to 4:1, depending on the influence of the hills in the area. Like much of the spinifex and grassland dominated vegetation types, rates of spread of up to 10km/h would not be unusual under extreme conditions.

Figure 7. Central Ranges

Unique features

The FMA has several unique features of interest to conservation that may be affected by fire management decisions in the Goldfields Region:

- Wetlands of both regional and national significance – Lake Gruszka, Gibson Desert gnamma holes, Yeo Lake and Lake Throssell complex, Durba Hill's pools, Lake Disappointment and the Carnarvon Range pools.
- 9.4% of the Great Victoria Desert IBRA, 4.6% of the Little Sandy Desert IBRA, 12% of the Gibson Desert IBRA (but no Dune Field area) and 0% of the Central Ranges IBRA is under strict conservation reserve (IUCN I-IV) (*Biodiversity Audit, 2002*). The whole of the Central Ranges falls within an Indigenous Protected Area (IPA).
- There are several threatened fauna species at risk of local extinction including the bilby, rock wallaby, marsupial mole and princess parrot. Around 40% of the original mammal fauna are locally extinct.
- Most of the area is still in pristine or near pristine condition (impacts from weeds/pests etc).

Proposed prescribed burning conditions

In general the application of prescribed fire in this FMA is best achieved by burning between late April and early September (with a falling hazard). Depending on the requirements for strategic buffers or a general mosaic, the time required for burning will determine time of day best suited for ignition. Late in the day (after 1400hrs) is

preferable if the intention is to create buffers. A general summary for mild to moderate handburn conditions would be:
Max Temp Range: 22 – 31^{o}C
RH%: 15 – 30%
Wind speed: 12 – 25km/h

Aerial burning conditions will vary depending on time of year but the optimum condition range would be:
Max Temp Range: 24 – 32^{o}C (cooling to <8^{o}C overnight preferably)
RH%: 15 – 40%
Wind speed: 15 – 30km/h

Spacing of incendiaries for aircraft burning will vary and most often best determined during the application to the area. Autumn 2006 burning required the incendiaries to be dropped at the maximum rate from the minimum flying height (under very mild conditions - <24^{o}C, 20%RH and <15km/h winds).

Preferred rates of spread (ROS) are in the order of 400 to 1,500m/h and extinguishment will usually occur after sunset when temperatures drop and RH rises. ROS of >2000m/h represents conditions that may be too intense to produce a useful result for biodiversity values.

The species of spinifex can also affects the fire behaviour and conditions for ignition. For example, *Triodia melvillei* will burn down wind and across the wind as the burning grass moves 'down' the plant igniting adjacent hummocks. Fire in *T. basedowii* will propagate primarily down wind due to its growth habit or growing in rings. The age of the spinifex (time since fire) also affects the flammability of spinifex grasslands due to the fuel load within clumps and the spatial arrangement of clumps affecting contagion of fire.

For burns in predominantly mallee vegetation (low levels of spinifex fuels) than factors determining the success and planning of the burn should be gathered using the mallee-heath fuel tables. It may not be completely accurate, but will provide better guidance than just basing calculations on the spinifex understorey.

Fire Management Objectives

- Create and maintain a spatial mosaic (<1,000ha grain size) of fuel ages (time since fire) with inter fire periods sufficient to maintain biodiversity on DEC managed estate and UCL.
- Create and maintain a strategic arrangement of low fuel fire management areas sufficient to provide protection to fire sensitive assets.

Strategies

- Undertake aerial burning trials to determine best conditions for extensive aerial burning program in the western and central Great Victoria Desert area.

- Liaise with communities near the Great Victoria Desert NR to assist with implementing ground and aerial burning in and around the GVDNR.
- Initiate ground and aerial burning in the Gibson Desert in conjunction with local indigenous communities in and around the Gibson Desert NR.
- Undertake assessment of area in and around the Carnarvon Range Proposed Conservation Park with the purpose of developing a basic FMP and implementing ground and aerial burning in conjunction with Native Title holders.
- Identify areas to establish large scale fire induced mosaic capable of mitigating wildfire runs greater than 80km.

Success Criteria

- No area is burnt by prescribed fire within 8-10 years of a prior fire event.
- Wildfire is managed through mitigation works to minimise the area burnt.
- Wildfires will not travel more than 80km before reaching a strategic low fuel buffer or mosaic.

Relevant Conservation Estate

The following Conservation Reserves fall within this FMA:

- Yeo Lake NR
- Neale Junction NR
- Queen Victoria Springs NR (partial)
- Plumridge Lakes NR (partial)
- Gibson Desert NR
- De La Poer NR (partial)
- Great Victoria Desert NR (partial)
- Mungilli Claypan NR

Table 4. – FMA 2 Desert

Vegetation type	Fire management outcome	Prescribed Fire Regime	Wildfire response	Partnering considerations	Monitoring for fire management effectiveness
Mallee over spinifex	Establish structural and floristic diversity by breaking up the type into a mosaic of different post fire ages. Utilise knowledge gained to better plan future prescribed burning.	Implement annual burning program (April to September) for existing FMP's and extend to other reserves and UCL. Establish and maintain strategically located, low fuel buffers using low intensity fire. Utilise aerial burning techniques and equipment to efficiently treat the large areas of UCL.	Utilise established buffers and firebreaks to minimise the spread of wildfire.		Utilise remote sensing to determine extent of wildfires and prescribed burning results.
Spinifex plain	Establish structural and floristic diversity by breaking up the type into a mosaic of different post fire ages Utilise knowledge gained to better plan future prescribed burning	Implement annual burning program (April to September) for existing FMP's and extend to other reserves and UCL. Utilise aerial burning techniques and equipment to efficiently treat the large areas of UCL.	Utilise established buffers and firebreaks to minimise the spread of wildfire		Utilise remote sensing to determine extent of wildfires and prescribed burning results.

		Current rotation between fire events is suggested at between 10-20 years depending on floristic structure and rate of recovery from previous fire event.			
Central Ranges	Establish structural and floristic diversity by breaking up the type into a mosaic of different post fire ages. Gather knowledge and data on current Aboriginal burning practices.		Utilise established buffers and firebreaks to minimise the spread of wildfire.	Liaise with Ngaanyatjarra Council for assistance with prescribed burning.	Utilise remote sensing to determine extent of wildfires and prescribed burning results.

Table 5. – FMA 2 Desert Prescribed Burns (commenced, completed & proposed)

Burn Number	Location	Burn Type	Primary Objective(s)	Comments on burn (conditions, etc)	Results
GFR3-06	Plumridge Lakes NR	Aerial	Biodiversity Burn: To protect, maintain and enhance biodiversity and ecological processes within the Plumridge Lakes NR by applying fire under prescribed conditions to achieve a mosaic of fire intensities	Cool, very mild conditions 5,999 incendiaries used Autumn (May) 2006	6% of target area burnt (~2,300ha) Average grain size – 57.2ha Largest grain size – 561.3ha
GFR12	Gibson Desert NR	Handburn (Aerial eventually)	Biodiversity Burn: To protect, maintain and enhance biodiversity and ecological processes within the Gibson Desert NR by applying fire under prescribed conditions to achieve a mosaic of fire intensities	Need to develop specific Plan to allow for intermittent burning and 'joint management' burning. Not to specific cells until aerial burning can commence.	
GFR17	UCL SW of Neale Junction NR	Aerial	Biodiversity Burn: To protect, maintain and enhance biodiversity and ecological processes within the 4 cells of UCL SW of Neale Junction Nature Reserve by applying fire under prescribed conditions to achieve a mosaic of fire	The initial attempt to burn this area in Autumn 2007 resulted in a poor mosaic. Less than 1% of the entire cell actually took and produced any results. The weather was the biggest influence with temperatures around 16- 20^{o}C maximum. The cell was revisited in September 2007 with markedly	

			intensities	different results. The fire activity was near wildfire conditions and burnt for three days. Most of the ignition spots joined up and the mosaic is more of the green patches amongst the burnt. The estimated final burnt area was ~90,000ha (cell is 370,000ha) with a portion of that outside the proposed cell boundaries. See detailed report in T:\414-Operations (Region)\Shared Data\FIRE\Prescribed Burning\Results of PB Spring 2007	
GFR19	Plumridge Lakes NR	Aerial	Biodiversity Burn: To protect, maintain and enhance biodiversity and ecological processes within the Plumridge Lakes NR by applying fire under prescribed conditions to achieve a mosaic of fire intensities	One of the best of the desert burns in regard to results. Conditions were almost perfect and 90% of the fire went out overnight. One small area burnt for longer than expected yet the patch was still only 472ha.	7.91% of target area burnt (~1,581ha) Average grain size – 21.6ha Largest grain size – 472.9ha
GFR20	UCL E of Queen Victoria Spring NR	Aerial	Biodiversity Burn: To protect, maintain and enhance biodiversity and ecological processes within the 2 cells of UCL E of Queen Victoria		5.09% of target area burnt (~4,203ha) Average grain size – 95.5ha Largest grain size – 1501.4ha

	Spring Nature Reserve by applying fire under prescribed conditions to achieve a mosaic of fire intensities	

Fire Management Area 3. – Nullarbor:

Description

This FMA includes the area of land which is covered by the Nullarbor IBRA region. The primary land use is UCL, Conservation reserve and pastoral activities. Rainfall is generally arid, non-seasonal between 150-200mm. The area of this FMA is 10,244,153ha of which 78.1% is managed by DEC for fire mitigation. The IBRA boundary actually extends south into the South Coast Region with little change in vegetation types and management characteristics. The key vegetation types for fire management are grass plains and chenopod shrublands which are described in more detail below.

Land use considerations for fire management:

Biodiversity conservation

The ecosystems in this fire management area are variable between the two main veg types. The ephemeral grasses have adapted to fire. The result is the grasslands are starting to dominate some of the previous extent of chenopod shrubland. Fire regimes that include long periods (>20 years) between intense fires, large scale areas burnt (thousands of ha) and frequent fire (<3 years) are damaging to sustaining biodiversity.

Community asset protection

This fire management area has a number of neighbouring pastoral leases surrounding UCL. Feed for stock and infrastructure may be at risk from wildfire emanating from UCL. UCL is at risk from wildfire entering from adjacent pastoral leases.

Community Engagement and Liaison

DEC is actively discussing cooperative fire management with communities in the Great Victoria Desert NR, however these are still in the early stages. The pastoral groups and individual station managers tend to communicate with FESA predominantly. As wildfire risk mitigation is introduced to the UCL surrounding the pastoral stations, DEC will become more involved with these discussions.

Key vegetation types

Grass plains

This vegetation type is very flammable. It is not unusual to see very large (>100,000ha) fire scars in this vegetation. It is thought that these large intense wildfires, along with pastoral management practices, are converting the chenopod shrublands (Figure 9) to ephemeral grasslands (Figure 8). Most of these massive fires would be attributed to a change in fire management practices since the settlement of Europeans. The fine grain mosaic developed by traditional indigenous burning has all but disappeared in the last 50 years, thus providing extensive tracts of unburnt country for wildfire runs. Fuel levels are extremely variable as there may be several seasons of low rainfall (no fuel) and then good rainfall producing plenty of grass. Wind ratio is 1.5:1.

Figure 8. Grassland surrounded by Myall vegetation type

Chenopod shrublands

This vegetation type is representative of the 'true' Nullarbor Plain. Changes in fire management (European and Indigenous) in this area appear to be converting the chenopod shrublands (primarily bluebush *Maireana sedifolia*) (Figure 9) to ephemeral grasslands (Figure 8). It is generally believed that this vegetation type does not naturally burn very well because of the large areas of bare ground amongst the vegetation. However, like the grasslands and mulga thickets in the Pastoral FMA, fuel levels are extremely variable as there may be several seasons of low rainfall (no grass amongst the vegetation) and then good rainfall producing plenty of grass scattered amongst the bluebush providing a continuous fuel. Wind ratio is 1.5:1.

Figure 9. Chenopod shrublands

Myall/Mulga woodlands

Fringing vegetation around the chenopod shrublands, mainly found in the north and western edges of the FMA.

Documentation on this vegetation type is nominal. More research is required into the historical and existing impacts of fire in this vegetation type. Due to the lower storey cover of bluebush, it may be impacted in a similar way to the chenopod shrublands.

Figure 10. Fringing Myall woodlands

Unique features

The FMA has several unique features of interest to conservation that may be affected by fire management decisions in the Goldfields Region:

- The Nullarbor Karst system (cave networks).
- Regionally significant wetlands such as Lake Boonderoo and the paleodrainage channel on Gunnadorah Station.
- No declared rare flora but several priority species.
- 16% of the FMA is under strict conservation reserve (IUCN I-IV) (*Biodiversity Audit, 2002*). Most of it in the Great Victoria Desert NR.
- Much of the Nullarbor pastoral area has been seriously impacted by weeds, pests and erosion over the last 100 years.

Proposed prescribed burning conditions

To date there has been no planned burning conducted in this FMA. In general the application of prescribed fire in this FMA may be best managed by applying the same conditions as the Desert FMA.

It will be initially assumed that the preferred climatic conditions and targeted rates of spread (ROS) will be similar to those applied to the Desert FMA which is in the order of 400 to 1,500m/h. ROS of >2000m/h represents conditions that may be too intense to produce a useful result for biodiversity values.

Fire Management Objectives

- Create and maintain a spatial mosaic (<1,000ha grain size) of fuel ages (time since fire) with inter fire periods sufficient to maintain biodiversity on DEC managed estate and UCL.
- Create and maintain a strategic arrangement of low fuel fire management areas sufficient to provide protection to fire sensitive assets.
- Establish a better understanding of fire behaviour and ecology in chenopod shrublands, grass plains and Myall Woodlands.

Strategies

- Liaise with communities near the Great Victoria Desert NR to assist with implementing ground and aerial burning in and around the GVDNR.
- Liaison with other land managers to improve fire mitigation and protection of structural, cultural and biodiversity assets.
- Liaise with DECScience division to identify research opportunities in fire behaviour and ecology.
- Research the opportunities to establish and maintain strategic low fuel buffers.
- Research the opportunities to establish and maintain fire maintained mosaics.

Success Criteria

- No area is burnt by prescribed fire within 8-10 years of a prior fire event.
- Wildfire is managed through mitigation works to minimise the area burnt.
- Within 5 years obtain sufficient knowledge to develop and implement an ecologically sustainable fire management program.

Relevant Conservation Estate

The following Conservation Estates fall within this FMA:

- Plumridge Lakes NR (partial)
- Great Victoria Desert NR (partial)
- Proposed reserves

Table 6. – FMA 3 Nullarbor

Vegetation type	***Fire management outcome***	***Prescribed Fire Regime***	***Wildfire response***	***Partnering considerations***	***Monitoring for fire management effectiveness***
Grassland			Utilise established buffers and firebreaks to minimise the spread of wildfire.	Pastoral Landholders and communities in Great Victoria desert NR	Utilise remote sensing to determine extent of wildfires and prescribed burning results.
Chenopod Shrubland		Unknown – research required. Current preferred prescribed fire regime is to try and exclude any	Utilise established buffers and firebreaks to minimise the spread of wildfire.	Pastoral Landholders and communities in Great Victoria desert NR	Utilise remote sensing to determine extent of wildfires and prescribed burning results.
Myall/Mulga Woodland fringe		Unknown – research required	Utilise established buffers and firebreaks to minimise the spread of wildfire.	Pastoral Landholders and communities in Great Victoria desert NR	Utilise remote sensing to determine extent of wildfires and prescribed burning results.

Table 7. – FMA 3 Nullarbor Prescribed Burns (commenced, completed & proposed)

Burn Number	Location	Burn Type	Purpose of Burn	Comments on burn (conditions, etc)	Results (area, % mosaic, etc)
NO	PLANNED	BURNS	TO DATE		

Fire Management Area 4. – Woodland:

Description

Includes the area of land which is covered by the Coolgardie IBRA region. The primary land use is conservation reserves, UCL, some pastoral, mining and conservation activities. The area of this FMA is 6,829,112.1ha of which 69.5% is managed by DEC for fire mitigation. The IBRA boundary actually extends south into the South Coast and Wheatbelt Regions with little change in vegetation types and management characteristics. The key vegetation types for fire management are described below.

Land use considerations for fire management:

Biodiversity conservation

There are a variety of ecosystems in this fire management area. The vegetation of the sandplains is flammable and adapted to regular fire events. The woodland is less flammable and requires fire regimes characterised by low intensity fire and/or fire at less frequent intervals. Fire regimes that include long periods (>20 years) between intense fires (for sandplain), large scale areas burnt (thousands of ha) and frequent fire (<3 years) are damaging to sustaining biodiversity. Many plant species are re-sprouters and recover rapidly after fire. Some species are seeders and hold seed in the canopy.

Beekeeping

The vegetation in this fire management area is extensively utilised by beekeepers. The seasonal flowering of many of the eucalypts in this FMA provides significant honey flow to the apiary industry at times of year when honey flow in other areas is minimal. Large-scale wildfires can significantly affect the potential honey flow from an area for one or more seasons and result in short term hardship for beekeepers. Fire regimes that do not cater for the persistence of 'nectar providing' species at the required physiological stage of maturity necessary for nectar production can also affect the long-term viability of the apiary industry in the FMA.

Community asset protection

This FMA has a number of neighbouring mining leases and some pastoral leases surrounding DEC managed lands. Infrastructure on leases and along the 'lifelines' (highway, water pipeline, 220kV powerline, railway) may be at risk from wildfire emanating from DEC managed land and UCL. DEC managed land is at risk from wildfire entering from adjacent pastoral or mining lease.

Community Engagement and Liaison

This FMA contains many of the 'lifelines' that service Kalgoorlie. Liaison is primarily with the local FESA office and local shires (Yilgarn Shire, Coolgardie Shire and City of Kalgoorlie-Boulder). There is a requirement to improve relations with local mining companies, especially in the Koolyanobbing area. Most liaison regards planning and

mitigation. There has been mutual assistance provided by all parties for wildfire suppression.

A Wildfire Threat Analysis for the area between Southern Cross and Coolgardie was completed in 2003 with several recommendations for operational work. It now requires updating with input from DEC, FESA, local shires and other asset managers.

Key vegetation types

Eucalypt Woodland:

This vegetation type is very fire sensitive and does not often burn except under extreme conditions. Periods between fires in this vegetation type range between 20-100+ years. When it does burn the result can be a complete kill of all the mature eucalypts. Some species are seeders and hold seed in the canopy resulting in regeneration events. Research is being undertaken in the Lake Johnston area to look at several aspects of fire ecology and its impact on the woodlands.

In the summer of 2004/05 a large wildfire swept through sandplain and woodland vegetation in the SW corner of the Region. This impacted severely on woodland vegetation that all current knowledge suggested would not burn. This occurred due to very extreme fire conditions, but it showed that woodland communities are not invulnerable to wildfire. Wind ratio is usually 3:1 to 3.5:1.

Figure 11. Woodland in Mt Manning NR (fire access upgrade in autumn 2006)

Sandplain:

This vegetation type is very prone to large, landscape size wildfire events. Dominated by *Acacia* and *Melaleuca* species, this vegetation is dense yet very aerated – ideal for carrying a wildfire. These fire events usually create a high intensity fire which will kill most of the species in the area. Species are a mix of seeders and re-sprouters and recover strongly after milder fire events. Wind ratio is usually 1.5:1 to 3:1 and fire behaviour calculations can possibly be based on similar vegetation and conditions in coastal heath. Spotting is minimal (<100m). Rates of spread of up to 10km per hour would not be unusual under extreme conditions.

Figure 12. Sandplain vegetation near Helena Aurora Range (fire access upgrade in autumn 2006)

Unique features

The FMA has several unique features of interest to conservation that may be affected by fire management decisions in the Goldfields Region:

- A nationally significant wetland – Rowles Lagoon, and several regionally significant wetlands.
- 12 declared rare flora species, 3 rare bird species and 1 rare mammal.
- 11.3% of the FMA is under strict conservation reserve (IUCN I-IV) (*Biodiversity Audit, 2002*).
- The Nature Conservation Output plan identified 28 ecosystems at risk from a variety of threatening processes including unplanned fire.

Proposed prescribed burning conditions

In general the application of prescribed fire in the sandplain is best achieved by burning in autumn between early April and June, and spring between August and late September. Depending on the requirements for strategic buffers or a general mosaic, the time required for burning will determine time of day best suited for ignition. Late in the day (after 1400hrs) is preferable if the intention is to create buffers. Currently there is no information on optimum conditions for handburns in this FMA. The results from aerial burning in autumn 2006 suggest conditions for burning in the sandplain need to be in the range of a moderate GFDI in order to produce a useful burn.

Aerial burning conditions in autumn 2006 were as follows:
Max Temp Range: 23 – 24^{o}C
RH%: 20 – 25%
Wind speed: 10 – 18km/h

Spacing of incendiaries for aircraft burning will vary and most often best determined during the application to the area. Autumn 2006 burning required the incendiaries to be dropped at the maximum rate from the minimum flying height (under very mild conditions - <24^{o}C, 20%RH and <15km/h winds).

Preferred rates of spread (ROS) are not clearly known however ROS of >500m/h represents conditions that may be too intense to produce a useful result for biodiversity values. It is recommended that previous burning conducted in similar landscapes in the Wheatbelt and coastal heath in the Esperance District be assessed.

Fire Management Objectives

- Create and maintain a spatial mosaic (<1,000ha grain size) of fuel ages (time since fire) with inter fire periods in the sandplain veg type sufficient to maintain biodiversity on DEC managed estate and UCL.
- Create and maintain a strategic arrangement of low fuel fire management areas sufficient to provide protection to fire sensitive assets and eucalypt woodlands.
- Establish a better understanding of fire behaviour and ecology of the sandplain heath and Woodlands.

Strategies

- Develop and implement a fire management plan that mitigates the risk of wildfire to lifeline corridors between Southern Cross to Norseman via Kalgoorlie.
- Reduce the extent and frequency of wildfires in the Coolgardie Woodlands to maintain biodiversity.
- Liaise with DEC Science to identify research opportunities in fire behaviour and ecology.
- Research the opportunities to establish and maintain strategic low fuel buffers.

- Research the opportunities to establish and maintain fire maintained mosaics.

Success Criteria

- No area of sandplain is burnt by prescribed fire within 8-10 years of a prior fire event.
- Prescribed fire should be excluded from the woodland.
- No sandplain wildfire to penetrate more than 100m into eucalypt woodland vegetation.
- Wildfire is managed through mitigation works to minimise the area burnt.
- Utilise adaptive management approach as knowledge becomes available and incorporate this knowledge in fire management program.
- Wildfires will not travel more than 20km and impact upon woodlands before reaching a strategic low fuel buffer or mosaic.

Relevant Conservation Estate

The following Conservation reserves and proposed reserves fall within this FMA:

- Mt Manning NR
- Helena-Aurora Range CPk
- Jaurdi PCPk
- Credo PCPk (partial)
- Goldfields Woodlands NP
- Goldfields Woodlands CPk
- Boorabbin NP
- Cave Hill NR
- Burra Rock CPk
- Victoria Rock NR
- Rowles Lagoon CPk
- Clear, Muddy and Carnage Lakes NR
- Kangaroo Hills TR
- Coonana TR
- Lakeside TR
- Wallaby Rocks TR
- Emu Rocks TR
- Randell TR
- Majestic TR
- Kambalda TR and NR
- Kurrawang NR
- Binaronca NR
- Dordie Rocks NR
- Wallaroo Rock CPk
- Karramindi SF
- Proposed reserves

Table 8. – FMA 4 Woodland

Vegetation type	Fire management outcome	Prescribed Fire Regime	Wildfire response	Partnering considerations	Monitoring for fire management effectiveness
Woodland	Reduce the size and impact of summer wildfires.	No prescribed burning. Establish and maintain strategically located, low fuel buffers using machinery.	Utilise established buffers and direct suppression to minimise the extent of wildfire.	Joint suppression activities with FESA and local shires.	Utilise remote sensing to determine extent of wildfires.
Sandplain	Establish structural and floristic diversity by breaking up the type into a mosaic of different post fire ages. Utilise knowledge gained to better plan future prescribed burning.	Establish and maintain strategically located, low fuel buffers using low intensity fire. Utilise aerial burning techniques and equipment to efficiently treat the large areas of UCL.	Utilise established buffers and direct suppression to minimise the extent of wildfire.	Joint suppression and prescribed burning activities with FESA and local shires.	Utilise remote sensing to determine extent of wildfires.

Table 9. – FMA 4 Woodland Prescribed Burns (commenced, completed & proposed)

Burn Number	Location (Tenure)	Burn Type	Purpose of Burn	Comments on burn (conditions, etc)	Results (area, % mosaic, etc)
GFR1-06	Yilgarn Shire (UCL)	Aerial	<u>Biodiversity Burn:</u> To protect, maintain and enhance biodiversity and ecological processes within the cell of UCL NE of Koolyanobbing and Jaurdi Station by applying fire under prescribed conditions to achieve a mosaic of fire intensities and burnt and unburnt areas at both a landscape and a local scale <u>Research Burn:</u> Identify requirements of future aerial burning of sandplain cells. Improve current knowledge and techniques to assist with future burn programs	6,753 incendiaries used applied at the maximum rate. 2 days of flying Cool, mild conditions. Temp: 23 – 24^{o}C RH%: 20 – 25% Wind speed: 10 – 18km/h	2% of burn treatment ~700ha actually burnt Average grain size – 17.8ha Largest grain size – 155.7ha
GFR2-06	Dedari - Bulla Bulling (UCL)	Handburn	<u>Protection Burn:</u> To minimise the potential size and intensity of wildfires and/or the risk of damage from wildfire to the Perth-Kalgoorlie	Issues over land tenure and responsibility (UCL, Water Corp, Pastoral lease, Western Power). Proposed fuel modification and burn on the UCL strip N	Original area was 1,800ha Proposed to reduce to 72ha after fuel modification of a 40m buffer

			water pipeline and the powerline that supplies the pump stations by the application of fire under prescribed conditions to reduce the quantity of combustible material.	of the pipeline.	
GFR??	Boorabbin NP and UCL	Handburn	Protection of free hold lease inside of park boundary	Proposed burn after breaks installed.	
GFR16	Jaurdi PCPk	Handburn	Clean up edges of firebreaks installed autumn 2006	Autumn 2007. Burning of heaps and extension of firebreaks on track edges. Conditions were very moderate resulting in less than adequate break along cleared edges. May consider fuel modification before attempting further burning along these edges.	Max Temp 22.6^{o}C Min RH 48.9% Wind SE @ 10-14kph
GFR18	Yilgarn Shire (UCL)	Aerial Next stage of ***GFR1-06***	See GFR1-06 above	Next stage of ***GFR1-06***. Partial change to boundary due to January 2007 wildfire.	3% of burn treatment ~722ha actually burnt Average grain size – 45.2ha Largest grain size – 160.3ha Conditions were relatively mild Max Temp 23.2^{o}C Min RH 31% Wind NW @ 8kph