Biodiversity outcomes of prescribed burning in the southern forests

Conservation Commission of Western Australia

Function of Conservation Commission performance assessments

Conservation Commission performance assessments are undertaken primarily to fulfil the functions described in section 19 (g) of the *Conservation and Land Management Act 1984*. That is; to assess and audit the performance of the Department of Environment and Conservation (DEC) and the Forest Products Commission (FPC) in carrying out and complying with the management plans. The assessments also help inform the Conservation Commission's policy development function and its responsibility to advise the Minister on conservation and management of biodiversity components throughout the state.

The performance assessment was undertaken in accordance with the *Conservation Commission policy and guidelines for the performance assessment of conservation reserve and forest management plans and biodiversity management in WA*. This document is available on the Conservation Commission's website www.conservation.wa.gov.au.

This report has been prepared by the Conservation Commission of Western Australia.

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The Conservation Commission acknowledges the use of DEC data for the production of this report.

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Executive summary

The Conservation Commission recognises that prescribed burning is done to achieve a number of purposes, such as community protection and biodiversity management. This document is not intended to assess the management of wildfire (unplanned fire), however the Conservation Commission acknowledges the significant wildfire events that have transpired since the initiation of this assessment and the date of its publication. The Conservation Commission is of the view that the need to protect human life is of the highest priority and will continue to support the work conducted by the Department of Environment and Conservation (DEC) in this regard.

This assessment aims to evaluate the effectiveness of DEC's fire management system in meeting specified objectives. It focuses specifically on:

- assessing the process and criteria used when determining biodiversity management as the primary objective of prescribed burning
- assessing the outcome of prescribed burning where the primary objective is biodiversity management.

This assessment identified that it is unclear what criteria are used to list a prescribed burn as primarily for biodiversity objectives. Additionally, for burns where biodiversity has been determined as the primary objective, it is unclear how success criteria are established.

The assessment also identified inconsistencies between the primary burn purposes as recorded on the DEC indicative burn program and the primary purposes recorded on individual prescribed fire plans.

Because the outcome of a burn is intrinsically linked to the burn's objective, reporting on the outcome is an important part of the process. There is an ongoing requirement for better outcome reporting at an operational scale. Additionally, this assessment highlights areas where outcome reporting at the landscape scale could be improved.

Findings

- There are inconsistencies between the primary burn purpose as recorded on the DEC indicative burn program and the primary purpose recorded on individual prescribed fire plans. It is also unclear what criteria are used to list a prescribed burn as primarily for biodiversity objectives.
- There is variation between the DEC regions on biodiversity success criteria and it is not clear how these success criteria are determined.
- There is an ongoing requirement for better outcome reporting for prescribed burns at the operational scale.
- The data used to evaluate *Forest management plan* Key Performance Indicator 16 is not quantitatively analysed for conformance with the negative exponential curve.

- There is no outcome reporting of the planning objective to achieve a mosaic of burnt and unburnt at the landscape scale.
- There is no performance measure of variability in the season of burns.
- The document 'Goals for Understorey Structural Diversity' is still a work in progress and there is a lack of reporting available to assess the achievement of the *Forest management plan* objectives in relation to the diversity of understorey vegetation structure.
- There were recordkeeping inconsistencies in the burn prescriptions in DEC's South West Region.
- There is a lack of planning detail on habitat goals for declared rare fauna species known to be within the burn boundaries.

Preface

An extract from the Conservation Commission's position statement on fire management:

> The Conservation Commission would like to see fire management established on the basis of ecological sustainability, with full recognition of biodiversity and environmental requirements. It recognises that DEC will need a range of approaches to prescribed burning regimes and practices based on location and that the objectives of carrying out introduced fire practices will differ in relation to management issues. In situations where the protection of life and property or major public infrastructure is the primary objective, it is likely that a more strategic approach to fire management will be undertaken. Equally, where habitat rehabilitation or species protection is the primary objective, fire prescriptions will reflect ecological, species or habitat requirements.

1 Background

In the *Review of the Fire Policies and Management Practices of the Department of Conservation and Land Management* (2004), the Environmental Protection Authority (EPA) recommended the audit of prescribed burning as part of the Conservation Commission's responsibility in auditing for the *Forest management plan 2004–2013* (FMP):

> The EPA recommends that the Conservation Commission be responsible for auditing the prescribed burning programme, and that this audit forms part of the auditing for the 2004–2013 Forest Management Plan.

Performance assessment findings are therefore based on the relevant objectives and actions of the *Forest management plan 2004–2013*. Relevant DEC-approved fire management documents (policies, plans and fire management guidelines) are also referenced in the course of the assessment. This assessment report follows the Conservation Commission's 2006 prescribed burning performance assessments and demonstrates the Commission's commitment to maintaining its performance assessment of fire management within its work program.

DEC has provided a response to the findings which is included in this report in Appendix 5. The Conservation Commission acknowledges the significant wildfire events that have transpired since the initiation of this assessment and the date of its publication. It is also recognises that DEC are responding to Special Inquiries into recent fires and that a comprehensive policy and practice documentation review is currently underway and due for completion at the end of 2013. The Conservation Commission is of the view that the need to protect human life is of the highest priority and will continue to support the work conducted by DEC in this regard. As for previous Conservation Commission assessments, a review of this report will be undertaken approximately 12 months after its publication.

2 Assessment objectives, scope and criteria

2.1 Assessment objectives

This assessment aimed to evaluate the effectiveness of DEC's fire management system in meeting specified objectives. It focuses specifically on:

- assessing the process and criteria used when determining biodiversity management as the primary objective of prescribed burning
- assessing the outcome of prescribed burning where the primary objective is biodiversity management.

Please note: the objectives of this assessment relate to biodiversity management where this aspect has been identified by DEC as a priority over the other identified objectives of prescribed burning. There is no intent to assess the management of wildfire (unplanned fire). The Conservation Commission acknowledges the significant wildfire events that have transpired since the initiation of this assessment and the date of its publication.

2.2 Scope and description of work

The *Forest management plan 2004–2013* (FMP) applies within the geographic area of the Swan, South West and Warren regions of DEC, excluding marine waters. DEC is responsible for fire management within the conservation estate, and describes prescribed burning as "the controlled application of fire under specified environmental conditions to a predetermined area and at the time, intensity, and rate of spread required to attain planned resource management objectives".

This assessment examines the outcomes of prescribed burning for biodiversity management purposes undertaken in the southern forests (DEC Warren and South West regions) over the 2010–2011 prescribed burning seasons.

2.3 Assessment criteria

The assessment criteria include applicable policies, procedures, standards and previous assessments. In this assessment the criteria are generally drawn from a range of fire-related objectives and settings in the following documents:

- *Forest management plan 2004–2013* (2004)
- *Review of the Fire Policies and Management Practices of the Department of Conservation and Land Management,* Environmental Protection Authority (2004)
- *DEC Fire Management Policy* – Policy Statement 19 (2005)
- Conservation Commission prescribed burning performance assessments:
    - *Prescribed Burning* (2006)

    - *Master Burn Plan Assessment* (2006)
- *DEC Master Burn Planning Manual* (version 2009)
- *DEC Fire Operational Guideline 79* (version 2009)
- Specific objectives from individual prescribed fire plans (2010–2011).

A number of individual burns were selected from DEC's indicative prescribed burn program. Burns were selected if the primary objective was for biodiversity management and if the burn had been completed during Spring 2010 or Autumn 2011.

It should also be noted that for the period chosen for reporting (2010–2011), there were no completed burns with biodiversity listed as the primary objective on the indicative prescribed burn program for the Frankland District (within DEC's Warren Region). To fully evaluate the objectives of this assessment, it was decided to select some additional burns from the Frankland District that were completed and had biodiversity objectives but which were listed as primarily for protection on the indicative prescribed burn program. All selected burns are listed in Table 1 (see next page). The burns in the table that are shaded were field-inspected. The remainder were subject to records checking only.

Table 1 – Burns assessed in this report

DEC region	DEC district	Burn reference number	Name of burn	Was biodiversity listed as primary objective on burn plan?	Season on indicative plan (season of previous fire event)	Year	Location (approximate)
South West	Blackwood	BB_202	Ryall	Yes	Autumn	2011	3.5km east of Donnybrook
South West	Blackwood	BS_049	Whicher	Yes	Autumn	2011	18km south-east of Busselton
South West	Wellington	W_015	Surface	Yes	Spring	2010	22km north north-east of Collie
South West	Wellington	W_038	Davis	Yes	Spring	2010	10km east of Dardanup
South West	Wellington	W_058	Bowelling	Yes	Spring	2010	30km south-east of Collie
South West	Wellington	W_071	Muja	Yes	Autumn	2011	30km south-east of Collie
South West	Wellington	W_073	Muja	Yes	Autumn	2011	25km south-east of Collie
South West	Blackwood	BS_120	Layman Ballan	Yes	Spring	2010	25km south-west of Nannup
South West	Blackwood	BB_019	Greenbushes	Yes	Autumn	2010	15km north of Bridgetown
South West	Wellington	W_057	Nundedine	Yes	Autumn	2010	30km east of Collie
South West	Blackwood	BB_282	Camballan	Yes	Autumn	2010	20km north of Boyup Brook
Warren	Frankland	F130	Styx	No	Autumn	2010	29km north-west of Denmark
Warren	Frankland	F525	Williambayn/P	No	Autumn	2010	18.5km south-west of Denmark
Warren	Donnelly	DMJ405	Balban	Yes	Autumn	2010	42km north-east of Manjimup
Warren	Donnelly	DMJ401	Keninup	No	Autumn	2010	49km north-east of Manjimup
Warren	Donnelly	DMJ448	Quindinup Nature Reserve	Yes	Autumn	2010	10km north-west of Rocky Gully
Warren	Donnelly	DP008	Charley	Yes	Spring	2010	15km west of Pemberton
Warren	Frankland	F101A	Denbarker	No	Spring	2010	18 km north-east of Denmark
Warren	Frankland	F008	Sharpe–Deep	No	Spring	2010	21km north-west of Walpole
Warren	Donnelly	DMJ430	Lake Unicup Reserve	Yes	Autumn	2011	53km east south-east of Manjimup
Warren	Donnelly	DMJ013	Beavis	No	Autumn	2010	25kms south-west of Manjimup

3 Findings

Finding 1

There are inconsistencies between the primary burn purpose as recorded on the DEC indicative burn program and the primary purpose recorded on individual prescribed fire plans. It is also unclear what criteria are used to list a prescribed burn as primarily for biodiversity objectives.

The primary objective of prescribed fire is important, as the planning documentation indicates a potentially different outcome for the burn area if the objective was primarily for biodiversity management as opposed to protection. However, it is not clear from the available planning documentation how the final decision is made in setting the primary and secondary objectives of burns.

The DEC document *Master Burn Planning Manual* (April 2009) provides the following guidance in relation to the purpose of prescribed fire:

> Fire management on Department-managed lands is undertaken to achieve a number of purposes. These purposes are reflected in the prescribed fire plan for each burn. Burns also have a primary and secondary purpose [...]
>
> Biodiversity Management
> To protect, maintain and enhance biodiversity and ecological processes by applying fire under prescribed conditions to achieve a spatial and temporal mosaic of fire intensities and burnt and unburnt areas at both a landscape and a local scale.
>
> Strategic Protection
> To minimise the potential size and intensity of wildfires and/or the risk of damage from wildfire to private and community assets by the application of fire under prescribed conditions to reduce the quantity of combustible material.

It is acknowledged that prescribed burning is done to achieve a number of purposes, and that the outcome of a burn is intrinsically linked to its objective. It is clear from the descriptions of the general burn objectives above that a key difference when burning for biodiversity objectives is the concept of achieving a 'mosaic' (or patchy) burn outcome at the local level while varying the interval, season, intensity and placement of fire throughout the landscape. However, it is not clear from the available planning documentation how the final decision is made in setting the primary and secondary objectives of burns.

The process of selecting burns for the assessment did reveal discrepancies in the way that the objectives for biodiversity burns were represented on the relevant publications of DEC's indicative burn program for the Warren Region. There were instances where the primary objective for prescribed burning published in the burn program was not consistent with the primary objective from the DEC regional records. For example, prescribed burns DMJ430 and DMJ405 were listed on the DEC indicative burn program as primarily for biodiversity management but the individual prescribed fire plans for these burns showed the primary purpose as strategic protection. The burn DMJ013 was listed as for strategic protection on the Autumn 2010 indicative burn plan but the individual prescribed fire plan listed the primary purpose as biodiversity management. The burn F008 was also listed as primarily for protection on the Spring 2010 indicative burn plan but it was not clear from the regional records or interviews whether the primary purpose of the burn was biodiversity or protection.

Finding 2

There is variation between the DEC regions on biodiversity success criteria and it is not clear how these success criteria are determined.

It is apparent from the individual burn prescriptions that success criteria for biodiversity burns can often be linked to protecting and maintaining specific components of local biodiversity. A degree of local variability could then be expected between the DEC regions' respective success criteria. However, there is a lack of planning standard to achieve consistency of application across the regions assessed.

An example of a biodiversity objective and its related success criteria is provided below. This relates to burn DP008 (Charley) in the Donnelly District, Warren Region.

Objective:

- To protect and maintain local biodiversity by providing a range of fire intensities to maintain the habitat for quokka and quenda populations.

Success criteria:

- No more than 10 per cent of mature forest canopy can be defoliated.
- Crown scorch in dominant and co-dominant trees is not to exceed 25 per cent of the forest areas within the burn boundary.
- Retain a mosaic of unburnt vegetation in mature forest and riparian systems within the burn for the protection of quenda and quokka populations.

Limitations on crown scorch percentages (as in the example above) were commonly used in the biodiversity success criteria for individual burns selected for this assessment. The notable exception to this was the burn prescriptions from DEC's Frankland District, which (from the sample of burns selected) did not use defoliation or crown scorch in their biodiversity success

criteria. Scorch appears to be a common evaluation technique for determining burn intensity and it is not clear why there is some variation between DEC districts in this approach.

The DEC document *Fire Operational Guideline 79 – Prescribed Fire Plan* provides a 'standard format for a prescribed fire plan', as well as guidance to fire planners in the development of individual prescribed burn objectives and success criteria. *Fire Operational Guideline 79* states:

> For the categories listed below that are applicable to this burn:
> - State the objectives of this burn.
> - For each objective stated, list pertinent success criteria.
>
> Objectives should be, as far as is practicable, **S**pecific; **M**easurable; **A**chievable; **R**ealistic and; **T**ime bound.
>
> Success Criteria should focus on 'effectiveness' (how well did the burn meet the objectives) as well as 'efficiency' (the effort expended on achieving the objectives e.g. $/ha).
>
> See Prescribed Fire Manual for worked examples.

Although the template above references a document titled 'Prescribed Fire Manual', this document has reportedly never been finalised and is not available. Worked examples of the success criteria for biodiversity objectives were therefore unavailable for comparison with the individual prescribed burns that were examined in this assessment. Nevertheless, the template does provide a structured outline of what would be expected in biodiversity objectives (using the acronym 'SMART' – Specific, Measurable, Achievable, Realistic and Time bound). It also gives an indication of what success criteria should focus on—effectiveness and efficiency.

An example of biodiversity success criteria from one of the individual burn prescriptions examined in this assessment is "a mosaic of burnt and unburnt vegetation throughout the burn area for fauna refuge and movement and relictual invertebrate refuge". There were also criteria set for individual species and general habitat, such as "persistence of *Dryandra sessilis*".

Further reference to objectives at the operational scale[1] is provided in Appendix 3 of the FMP (pp. 91), which refers to burn prescriptions in informal reserves as follows:

> A burn prescription for an area that includes an informal reserve must identify the informal reserve and any special requirements with respect to prescribed burning.

[1] Operational scale: A discrete area of forest to which one or more operations have been or are planned to be applied. Sometimes also referred to as the 'local' scale.

However, the inclusion of informal reserves in areas burnt by low intensity prescribed fire to meet general fuel reduction or biodiversity objectives is generally acceptable with no special precautions to be applied.

It follows, then, that in the process of setting biodiversity objectives and the related success criteria, it is important to define within certain parameters the success criteria that might be applied to 'low-intensity prescribed fire', or other fire intensities that might be applied. This is explored further in the following section on outcome reporting.

Finding 3

There is an ongoing requirement for better outcome reporting for prescribed burns at the operational scale.

There was limited outcome reporting at the operational scale for the prescribed burns that were assessed, particularly in the DEC South West Region, where the evaluation section of numerous burn prescriptions had not been completed (see Finding 7).

In the Conservation Commission's 2006 prescribed burning performance assessment, it was recommended that DEC develop and utilise post-burn satellite images. In this assessment, only two of the burns assessed had satellite imagery available and these were provided upon request and were not part of the burn prescription records. At interview it was apparent that the use of satellite imagery for outcome reporting has not become routine practice and that the use of handwritten maps from spotter planes was a more common evaluation record.

Because the handwritten map records on burn prescriptions were not always available and were of variable quality, the Conservation Commission independently sourced Landsat satellite imagery to assist in gaining information about the operational outcome of biodiversity burns. This was done by examining the spatial mosaic of fire intensities, including burnt and unburnt areas.

The Normalised Burn Ratio[2] (NBR) was applied to Landsat imagery to depict the individual burns at the operational scale. The imagery shows the change detected between the pre-fire image and the post-fire image as quantified by the NBR. The effects of prescribed burning were not captured for all of the burns, as the date that the Summer 2011 Landsat image was taken slightly pre-dates some of the Autumn 2011 prescribed burning. However, a number of

[2] Normalised Burn Ratio: a vegetation index used to detect change by identifying differences in the state of land features by observing them at different times.

prescribed burns are visible in the imagery. A sample of these areas has been mapped and presented with on-ground photos in the appendices to this report. The imagery shows the spatial location of the fire and hence provides a visual guide to the achievement of a mosaic of burnt and unburnt vegetation. Site inspections were made to the areas shown in Appendices 1–4. The time since fire and the time between the burn and the satellite image date should be considered when viewing the results.

Some points noted in relation to the individual burns are as follows:

- The Nundedine burn (Appendix 1a) was reported by DEC to have sustained around 30 per cent crown scorch (success criterion was less than 30 per cent scorch in the non-riparian zones) and estimated to have burnt 60–90 per cent of the area (success criterion was 60–90 per cent of area burnt). The imagery and inspection suggest closer to 90 per cent of area was burnt with few unburnt areas within the burn boundary.

- A key success criterion of the Bowelling burn (Appendix 1b) was protection of the riparian area from fire. This was reported on the burn prescription as achieved and is consistent with the imagery available and the visual inspection.

- The Sharpe–Deep burn (Appendix 2a) reportedly sustained high scorch in some areas. There were indications of a less patchy outcome in the riparian systems in the eastern portion of the burn. However, it was not clear whether biodiversity or protection was the primary purpose of the burn and, as mentioned above, burn prescriptions from the DEC Frankland District do not appear to use defoliation or crown scorch in their success criteria.

- While appearing to have retained some unburnt areas, the Layman–Ballan burn (Appendix 3a) also reportedly sustained higher levels of canopy scorch than was set in the success criteria. The image shows where fire escaped from the burn boundary.

- The other burn that was visually inspected was the Charley burn (Appendix 4a). The imagery and visual inspection suggests a mosaic of burnt and unburnt areas. However, the image also shows where fire escaped from the burn boundary. DEC reported the aim to leave target areas unburnt within the burn boundary as being achieved by burning at a time when there was a moisture differential and such areas were less likely to ignite. At interview for this assessment, DEC outlined the perception of risk sometimes associated with this approach (for late spring burns in particular). It was outlined that as the forest dries out over spring and summer, if any ignition sources remain, even the creek systems will burn under certain conditions and provide potential for fire to escape from the burn boundary (as had reportedly occurred in this burn). The resulting general outcome for biodiversity (apart from the original prescribed burn purpose) then becomes the situation which was purportedly being avoided through prescribed burning—large

and intense (hot) fires. The Conservation Commission acknowledges that DEC has to manage risks to the surrounding values and assets associated with retaining ignition sources within burn areas.

In seeking to verify the process and criteria for determining the primary purposes of burns, a number of burns designated as primarily for protection were also analysed and the imagery and limited on-ground analysis tends to indicate burning outcomes consistent with the planning documentation. However, as indicated, there is a lack of planning clarity in the process of determining the primary purpose of burns, as well as shortfalls in the reporting of the outcomes.

As shown in this report, each individual burn has a burn prescription file with sections for setting the objectives and reporting outcomes for that burn. These prescriptions were used in this assessment primarily to gauge the objectives and outcomes at the operational scale. The following section of this report discusses planning and reporting at the landscape scale[3].

Finding 4

The data used to evaluate *Forest management plan* Key Performance Indicator 16 is not quantitatively analysed for conformance with the negative exponential curve.

The *Forest management plan 2004–2013* Key Performance Indicator 16 (KPI 16) is "the risk to conservation, life, property and other forest values posed by wildfire".

The DEC document *Protocols for Measuring and Reporting on the Key Performance Indicators of the Forest Management Plan 2004–2013* outlines the reporting protocol for KPI 16 as "general conformance with the theoretical distribution of time since fire for the whole-of-forest and for each Landscape Conservation Unit".

At the landscape scale, the key measure for evaluating outcomes defined in the FMP is the graphical depiction of the fuel age against land area distribution (presented as fuel ages against the negative exponential curve[4]) for each Landscape Conservation Unit [5](LCU).

[3] Landscape scale: Landscape scale is usually tens of thousands to a few thousand hectares. A landscape is a mosaic where the mix of local ecosystems and landforms is repeated in a similar form over a kilometres-wide area. Several attributes including geology, soil types, vegetation types, local flora and fauna, climate and natural disturbance regimes tend to be similar and repeated across the whole area. It could be a (sub) catchment or, for convenience, an administrative management unit such as a forest block or an aggregation of blocks.

[4] Negative exponential curve: theoretical time-since-fire distribution for Landscape Conservation Units.

[5] Landscape Conservation Unit (LCU): a mosaic of local ecosystems and landforms repeated in a similar form across a wide area (measured in kilometres). Each unit is defined and named for management purposes, e.g. Northern Upper Collie.

In the Conservation Commission's mid-term and end-of-term audits of the FMP, KPI 16 was reported on at both the whole-of-forest and landscape scale. The table below shows information received from DEC about conformity with the negative exponential curve for the end-of-term audit of the *Forest management plan 2004–2013*. (Please note it shows only information relating to the LCUs relevant to this assessment.)

Table 2 – Information provided on conformity with fuel age classes (as provided by DEC)

Landscape Conservation Unit	Comments on conformance with negative exponential curve
Blackwood Plateau	Generally conforms with the curve
North Karri	Higher fuels in the 15–24 year old categories due to karri regrowth
Northern Upper Collie	Some younger fuels due to recent burns in large forest blocks
Southern Dunes	Generally conforms with the curve
Southern Hilly Terrain	Large area of nine-year old fuel due to a 2003 bushfire

The analysis above provides only subjective commentary on the general conformance of the data but does not attempt to provide a quantitative analysis of conformance.

Finding 5

There is no outcome reporting of the planning objective to achieve a mosaic of burnt and unburnt at the landscape scale.

As discussed in Finding 1 of this report, the DEC *Master Burn Planning Manual* states that one of the key aims of biodiversity burns is to "achieve a spatial and temporal mosaic of fire intensities and burnt and unburnt areas at both a landscape and a local scale". The Conservation Commission found that there is no measurable indicator of whether this mosaic has been achieved at the landscape scale.

For the burns that were inspected, photographed and mapped in the appendices of this assessment, the Conservation Commission also completed a landscape-scale analysis of the burn.

The appendices detail the fuel ages against the negative exponential curve and provide a map depicting the spatial distribution of burning (prescribed fire and wildfire) since 2006, as provided by DEC. A brief summary of the findings from that landscape-scale analysis is presented below and should be read in conjunction with the maps in the appendices.

Northern Upper Collie Landscape Conservation Unit – Appendix 1c (relevant to Nundedine and Bowelling prescribed burns)

Appendix 1c of this report details the fuel ages against the negative exponential curve. It also provides a map depicting the spatial distribution of burning (prescribed fire and wildfire) since 2006. At both the mid and end-of-term audit stages, although no quantitative analysis was provided, this LCU was assessed by DEC as not in conformance with the negative exponential curve, primarily due to prescribed burning:

- Mid-term audit observation: 'The frequency distribution for time since fire for the Northern Upper Collie Landscape Conservation Unit was impacted by five large prescribed burns in this Landscape Conservation Unit over the last six years.'
- End-of-term audit observation: 'Some younger fuels due to recent burns in large forest blocks.'

For this LCU, the non-conformance from the mid-term audit does not appear to have been incorporated into the burn program.

Southern Hilly Terrain Landscape Conservation Unit (relevant to Sharpe–Deep prescribed burn)

Although no quantitative analysis was provided, this LCU was assessed by DEC at both the mid and end-of-term audit stages as not in conformance with the negative exponential curve, primarily due to a wildfire in 2003. A significant wildfire in the Mount Roe wilderness in 2009 added to the recently burnt proportion, as shown in Appendix 2b of this report. Prescribed burning was also undertaken in 2010 (the Sharpe–Deep burn); however, as mentioned, it was not clear whether biodiversity or protection was the primary purpose of that burn.

- Mid-term audit observation: 'The Southern Hilly Terrain Landscape Conservation Unit was impacted by large wildfires in the Denbarker area in 2003 resulting in a large area of five-year old fuels.'
- End-of-term audit observation: 'Large area of nine-year old fuel due to a 2003 bushfire.'

Blackwood Plateau Landscape Conservation Unit (relevant to Layman–Ballan prescribed burn)

Appendix 3b of this report details the fuel ages against the negative exponential curve. The related map depicts the spatial distribution of burning (prescribed fire and wildfire) since 2006. At both the mid and end-of-term audit stages, although no quantitative analysis was provided, this LCU was assessed by DEC as in conformance with the negative exponential curve.

- Mid-term audit observation: 'The frequency distribution for time since fire for the Blackwood Plateau Landscape Conservation Unit generally conforms with the desired shape of the curve.'

- End-of-term audit observation: ‘Generally conforms with the curve.’

Southern Dunes and Northern Karri Landscape Conservation Units (relevant to Charley prescribed burn)

Appendix 4b of this report details the fuel ages against the negative exponential curve. The related map depicts the spatial distribution of burning (prescribed fire and wildfire) since 2006.

- Mid-term audit observations: ‘The Southern Dunes Landscape Conservation Unit is located along the south-west coast within D’Entrecasteaux National Park and constituted of large areas of coastal heath vegetation. The frequency distribution for time since fire for the Northern Karri Landscape Conservation Unit has a discrepancy with the desired shape of the curve (Figure A13) because this Landscape Conservation Unit contains large tracts of young karri regrowth that require fire exclusion for up to 25 years before they become tolerant to fire and can be burnt without unacceptable bole damage. Unfavourable weather conditions in the last three years have limited the opportunity for low intensity burning in karri stands.’
- End-of-term audit observations: ‘Generally conforms with the curve’ and ‘higher fuels in the 15–24 year old categories due to karri regrowth.’

Many of the prescribed burns that were assessed intersected two or three different LCUs. In the Conservation Commission’s 2006 prescribed burning performance assessment it was noted that full operational application of LCUs for planning had not been achieved. At the interviews for this assessment, it was still apparent that the LCU planning tool was not routinely employed for burn development. While planning at the LCU level is widely referenced in the planning documentation, there was little evidence of LCUs or the LCU planning tools being referenced at the operational level.

Finding 6

There is no performance measure of variability in the season of burns.

Individual prescribed burns should be considered as part of a wider-scale fire regime, and as such, the seasonal variation of burns is very important.

Further detail was requested from DEC about the timing and season of the burn preceding the prescribed burns that were assessed in this report. The data that was received is in Table 3 (see next page).

The records include information relevant to both the burn interval and the variability in season of burning. While it is clear that this information is readily available, it has not been used to date to measure variability in timing and season of burning.

Table 3 – Detailed fuel age table (data provided by DEC)

South West Region			Warren Region		
Burn ID	**Date of most recent burn**	**Date of preceding burn**	**Burn ID**	**Date of most recent burn**	**Date of preceding burn**
BB_282	(North polygon BB_282) AU 7/04/2006 (South polygon BB_282) AU 25/04/2010	(North polygon BB_282) AU 1/04/1985 (PB) (South polygon BB_282) SP 16/09/1983 (PB)	**F008**	(Left polygon F008) AU 15/04/2011 (Right polygon F008) SP 17/01/2011	(Left polygon F008) SP 16/09/2001 (PB) (Right polygon F008) SP 16/09/2002 (PB)
W_038	SP 4/10/2010	SP 16/09/2000 (PB)	**F130**	SP 29/09/2010	AU 1/04/2000 (PB)
W_058	SP 17/09/2010	SU 1/01/1989 (WF)	**F101A**	SP 18/11/2010	SU 1/01/2002 (WF)
W_057	AU 3/05/2010	SP 16/09/1984 (PB)	**F525**	AU 28/04/2010 & AU 29/05/2009	SU 1/01/1999 (WF)
BB_019	(North polygon BB_019) SU 03/12/2008 (South polygon BB_019) SP 16/10/2009 (Middle polygon BB_019) AU 9/04/2010	(North polygon BB_019) SP 16/09/1991 (PB) (South polygon BB_019) SP 16/09/1992 (PB) (Middle polygon BB_019) SP 16/09/1992 (PB)	**DMJ013**	AU 7/05/2009	Unknown season 16/09/1995 (unknown fire type) SP 16/09/1974 (PB)
BS_120	SP 19/10/2010	SP 16/09/1997 (PB) SP 16/09/1995 (PB)	**DMJ401**	(Left polygon DMJ401) SP 24/09/2010 (Right polygon DMJ401) AU 20/04/2010	(Left and right polygon DMJ401) AU 1/04/1997 (PB)
BB_049	? No burn ID	? No burn ID	**DMJ405**	(North polygon DMJ405) AU 29/04/2010 (South polygon DMJ405) AU 26/03/2009	(North polygon DMJ405) SP 16/09/1999 (PB) (South polygon DMJ405) SP 16/09/1968 (PB)
W_015	(Left polygon W_015) AU 12/05/2011 (Right polygon W_015) SP 13/11/2008	(Left polygon W_015) SP 16/09/1998 (PB) (Right polygon W_015) SP 16/09/1997 (PB)	**DMJ448**	AU 4/05/2010	AU 1/04/1991 (PB)
W_071	AU 15/06/2011	SP 16/09/1986 (PB)	**DMJ430**	(Left polygon DMJ430) AU 13/05/2011 (Right polygon DMJ430) AU 12/04/2006	(Left polygon DMJ430) SU 1/01/1991 (WF) & AU 1/04/1991 (PB) (Right polygon DMJ430) SP 16/09/1975 (PB)
W_073	(North polygon W_073) AU 1/05/2011 (South polygon W_073) AU 8/05/2006	(North polygon W_073) No record available (South polygon W_073) SP 16/09/1961 (PB)	**DP008**	SP 16/11/2010	SP 16/09/1997 (PB)

This table shows the length of time between the most recent burn and the burn prior to that, therefore providing an indication of the age of fuels in those areas. In some cases, the burn boundary of the most recent burn was not the same as that of the preceding burn, so the data shows which section(s) (or polygon) was burnt and when.

The naming convention used in the table is as follows: season of burn followed by date burnt, and, for the preceding burn column only, the fire type in brackets. Please note: SP = spring, AU = autumn, SU = summer, WF = wildfire and PB = prescribed burn.

Finding 7

There were recordkeeping inconsistencies in burn prescriptions in DEC's South West Region.

There were a number of instances where recordkeeping inconsistencies were observed in the process of this assessment. For instance:

- In some instances where one part of the file indicates that a hygiene plan is required, no record of hygiene plan could be located on the file.
- The post-burn record and assessment section of the individual burn prescriptions was generally not filled out.
- Post-burn assessment records did not always include an aerial plot of burnt and unburnt areas and the quality of the mapping on burn prescription files was variable. Two of the burns had satellite imagery available but these were provided upon request and were not part of the burn prescription records.

Finding 8

The document 'Goals for Understorey Structural Diversity' is still a work in progress and there is a lack of reporting available to assess the achievement of the *Forest management plan* objectives in relation to the diversity of understorey vegetation structure.

A key document for evaluating the setting of objectives and monitoring of prescribed burning under the FMP is the DEC document 'Goals for Understorey Structural Diversity'. However, this document is not finalised, therefore no monitoring and outcome reporting under this guideline can be reported.

Finding 9

There is a lack of planning detail on habitat goals for declared rare fauna species known to be within the burn boundaries.

For the burn prescriptions assessed, there was often detailed information on locations and requirements for declared rare flora, however for declared rare fauna known to be within the burn boundary, there was less planning detail evident. For example, some of the individual prescribed burns assessed were listed as having habitat for forest red-tailed black cockatoos. The *DEC Fire Management Guideline No. S10 – Black Cockatoos* makes the following recommendations to protect and conserve black cockatoo populations:

Frequent low-intensity burns

Frequent (6–8 years for dry eucalypt forests, 6–10 years for wet eucalypt forests, 5–10 years for heaths) patchy fires of low intensity in the landscape are necessary for fuel reduction and biodiversity outcomes in most south-west forested areas. This results in a

fine-grained mosaic of fuel ages, including recently burnt and long unburnt. Such a regime will also provide habitat diversity and reduce the risk and impact of large-scale, high intensity fires that result in complete or near-complete landscape burnout.

Occasional moderate-intensity burns

Less frequent (15–25 years) introduction of moderate intensity fire into the landscape in late summer/early autumn can have some beneficial outcomes. These occasional late summer–autumn fires are important for regenerating vegetation in fire maintained, fire regime specific communities, including heaths, shrublands, woodlands and riparian zones.

The Conservation Commission acknowledge that DEC's fire management guidelines are not intended to be prescriptive instruments setting out rules; however, they do provide guidance for land managers. In aiming to protect and conserve black cockatoo populations, this particular guideline appears to favour a fire regime where frequent, low-intensity patchy (mosaic) spring or autumn burns are most desirable, with an occasional dry autumn fire. Based on the operational documentation for some of the burns assessed, it is not clear whether this management guideline is being followed, given the limited planning details in relation to whether:

- the burn assessed could be considered as one within a cycle of frequent low-intensity burns and less-frequent moderate-intensity burns, or
- the relative intensity of the preceding burn has been accounted for.

This information is pertinent to the objective of the biodiversity burn, but is not clearly documented in the burn prescription.

In the instances where there are numerous and sometimes potentially conflicting objectives it is understood that there may be a need to strike a balance between habitat requirements. However, it is not clearly specified in the planning documentation what the habitat goals for all the declared rare fauna in the burn area might be, and what compromises might be necessary to achieve a balanced outcome.

4 Assessment conclusions

This assessment aimed to evaluate the effectiveness of DEC's fire management system in meeting specified objectives. It focused specifically on:

- assessing the process and criteria used when determining biodiversity management as the primary objective of prescribed burning
- assessing the outcome of prescribed burning where the primary objective is biodiversity management.

The Conservation Commission acknowledges that prescribed burning is done to achieve a number of purposes, including biodiversity management and community protection. However, this assessment found that it is unclear what criteria are used to list a prescribed burn as primarily for biodiversity objectives. Additionally, for burns where biodiversity has been determined as the primary objective, it is unclear how success criteria are established.

The assessment also identified inconsistencies between the primary burn purposes as recorded on the DEC indicative burn program and the primary purpose recorded on individual prescribed fire plans.

Because the outcome of a burn is intrinsically linked to its objective, outcome reporting is an important part of the process. There is an ongoing requirement for better outcome reporting at an operational scale and this assessment highlights areas where outcome reporting at the landscape scale could be improved.

5 Appendices 1–5

Appendix 1a – Nundedine – operational-scale analysis
Appendix 1b – Bowelling – operational-scale analysis
Appendix 1c – Landscape Conservation Unit analysis – Northern Upper Collie
Appendix 2a – Sharpe–Deep – operational-scale analysis
Appendix 2b – Landscape Conservation Unit analysis – Southern Hilly Terrain
Appendix 3a – Layman–Ballan – operational-scale analysis
Appendix 3b – Landscape Conservation Unit analysis – Blackwood Plateau
Appendix 4a – Charley – operational-scale analysis
Appendix 4b – Landscape Conservation Unit analysis – Northern Karri and Southern Dunes
Appendix 5 - Department of Environment and Conservation response to findings

Appendix 1a - NUNDEDINE - OPERATIONAL SCALE ANALYSIS

Red areas are a visual indicator of the spatial location of the fire

Legend

- Photopoints
- Major watercourse
- Minor watercourse
- Change detected between pre-fire image (2007) and post-fire images (2010, 2011)
- Prescribed burning boundary

Forest ecosystems

- Jarrah forest - North East
- Jarrah open woodland
- Rocky outcrops
- Shrub, herb, and sedgelands
- Wandoo forest
- Wandoo open woodland

NAME	NUNDEDINE
YEAR	2010
SEASON	AUTUMN
IGNITION DATE	3-May-10
SATELLITE IMAGE DATE	Jan, Feb or March for 2011 image
PHOTO DATE	8-Nov-11
AREA (Hectares)	6172
PRIMARY OBJECTIVE on indicative plan	BIODIVERSITY
Approx location	30km east of collie

This map was produced by the Conservation Commission
using themes sourced from DEC
Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994
False Easting: 500,000.0000
False Northing: 10,000,000.0000
Central Meridian: 117.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

N

525 262.5 0 525 Meters

444000 447000 450000 453000 456000 459000 462000

6312000 6310000 6308000 6306000 6304000 6302000

Appendix 1b BOWELLING - OPERATIONAL SCALE ANALYSIS

Wandoo

Jarrah

Jarrah

444000 447000 450000 453000

6304000 6302000 6300000 6298000

NAME	BOWELLING
YEAR	2010
SEASON	SPRING
IGNITION DATE	17-Sep-10
SATELLITE IMAGE DATE	Jan, Feb or March for 2011 image
PHOTO DATE	8-Nov-11
AREA (Hectares)	2604
PRIMARY OBJECTIVE on indicative plan	BIODIVERSITY
Approx location	30km south east Collie

This map was produced by the Conservation Commission using themes sourced from DEC
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Projection: Transverse Mercator
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False Northing: 10,000,000.0000
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Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

N

330 165 0 330 Meters

Red areas are a visual indicator of the spatial location of the fire

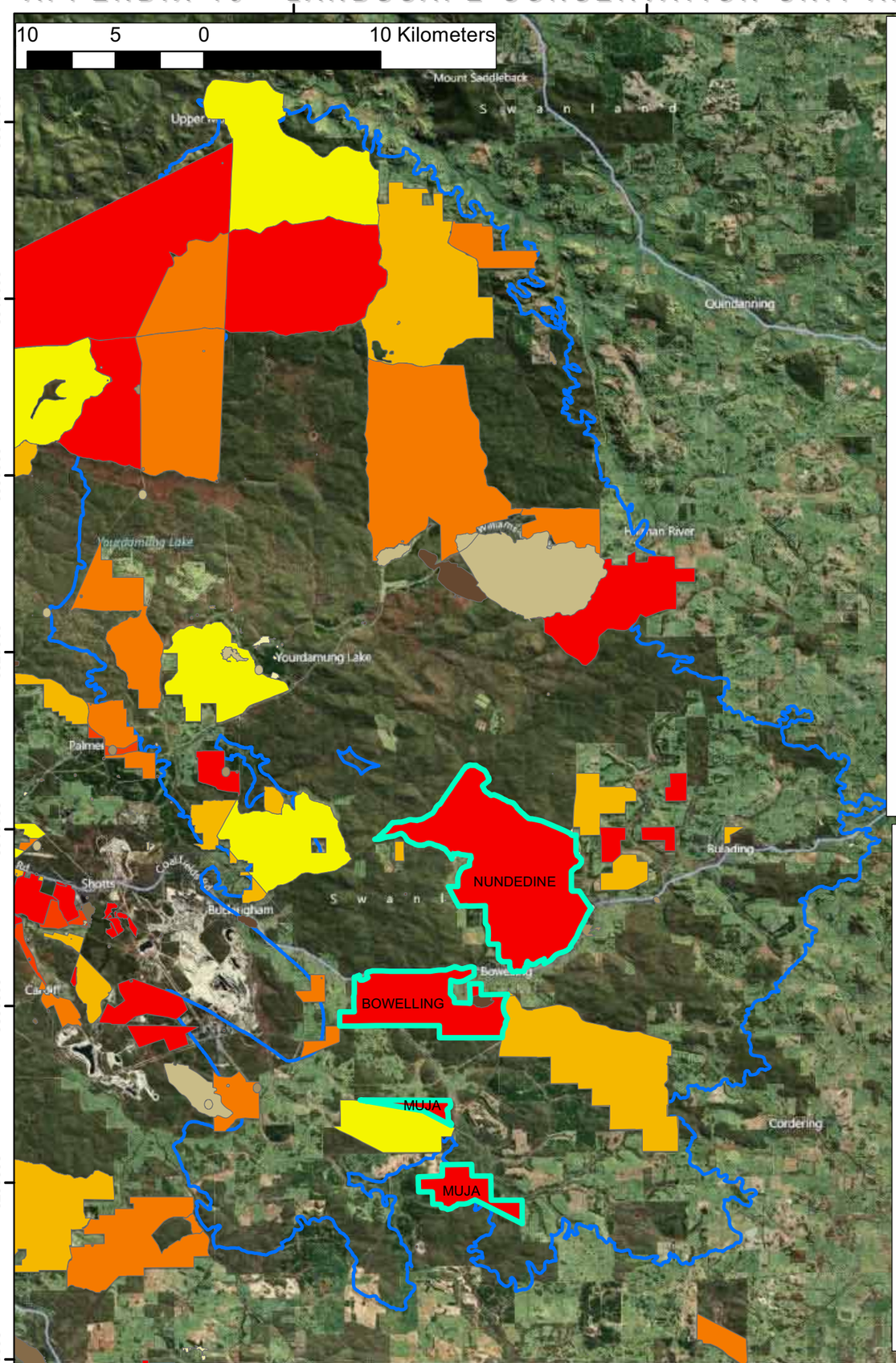
Legend

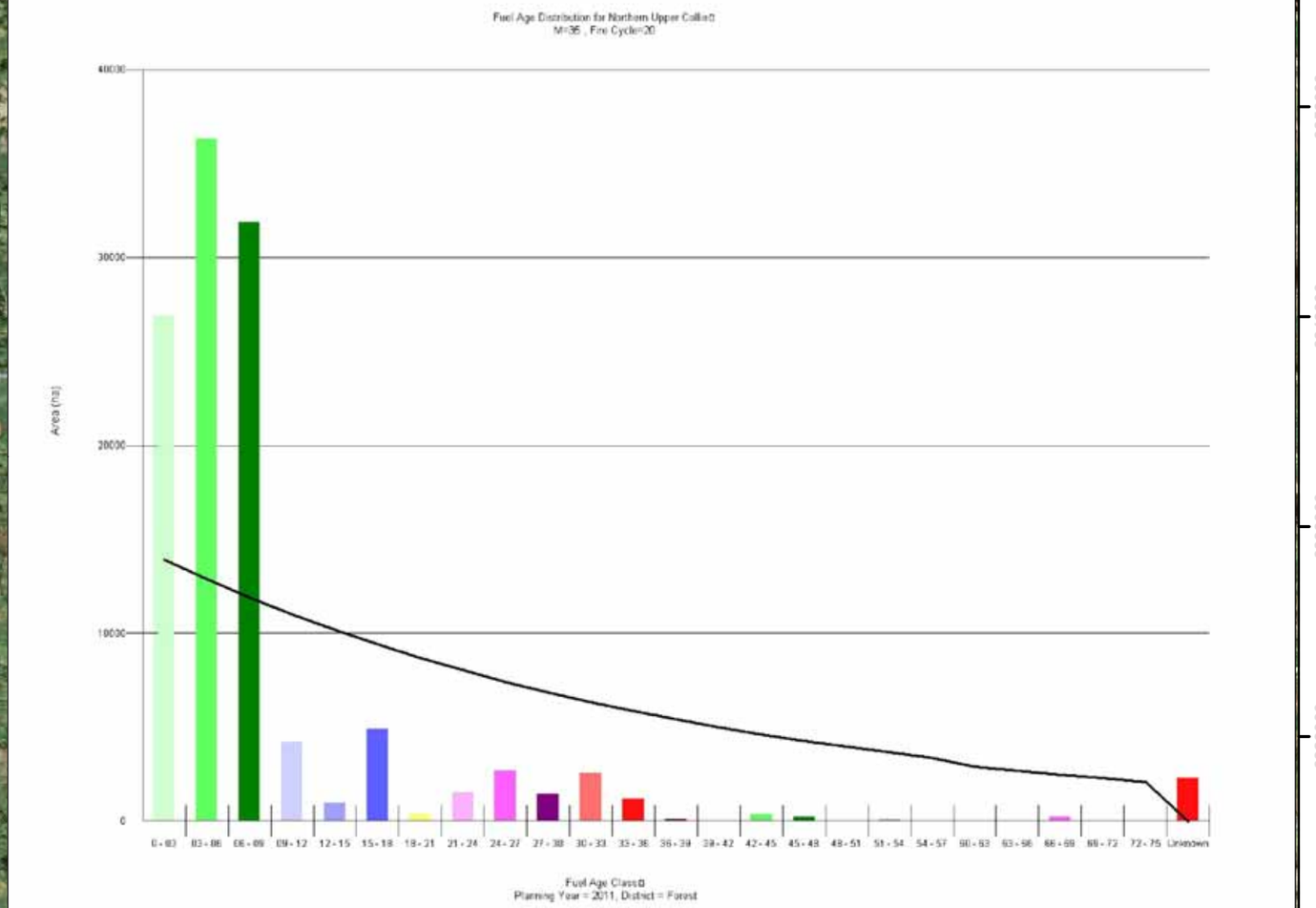
- Photopoints
- Major watercourse
- Minor watercourse
- Change - pre-fire (2007) and post-fire (2010, 2011)
- Prescribed burning boundary

Forest ecosystems

- Jarrah forest - North East
- Jarrah open woodland
- Rocky outcrops
- Shrub, herb, and sedgelands
- Wandoo forest
- Wandoo open woodland

APPENDIX 1c - LANDSCAPE CONSERVATION UNIT ANALYSIS - NORTHERN UPPER COLLE





Legend

Prescribed burn subject to this assessment

LCU - Northern Upper Collie

Wildfire years 2006-2011

- 2006
- 2007
- 2008
- 2009
- 2010 - 2011

Prescribed burns years 2006-2011

- 2006
- 2007
- 2008
- 2009
- 2010 - 2011

This map was produced by the Conservation Commission using themes sourced from DEC
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Latitude Of Origin: 0.0000
Units: Meter

N

Appendix 2a - SHARPE_DEEP - OPERATIONAL SCALE ANALYSIS

Red areas are a visual indicator of the spatial location of the fire

Legend

- Photopoints
- Change detected between pre-fire image (2007) and post-fire images (2010, 2011)
- Prescribed burning boundary

Forest ecosystems

- Shrub, herb, and sedgelands
- Jarrah forest - South
- Jarrah forest/Yellow Tingle
- Karri - Main Belt
- Karri/Yellow Tingle
- Major watercourse
- Minor watercourse

Karri/Yellow Tingle

Jarrah forest/Yellow tingle

Shrub, herb and sedgeland

BEARDMORE

NAME	SHARPE
YEAR	2010
SEASON	SPRING
IGNITION DATE	17-Sep-10
SATELLITE IMAGE DATE	Jan, Feb or March for 2011 image
PHOTO DATE	21/11/2011
AREA (Hectares)	9153
PRIMARY OBJECTIVE on indicative plan	PROTECTION
Approx location	21km north-west of Wapole

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Projection: Transverse Mercator
Datum: GDA 1994
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False Northing: 10,000,000
Central Meridian: 117
Scale Factor: 0.9996
Latitude Of Origin: 0.00
Units: Meter

500 250 0 500 Meters

N

462000 465000 468000 471000 474000 477000 480000

6158000 6156000 6154000 6152000 6150000 6148000 6146000 6144000

Legend

LCU - Southern Hilly Terrain

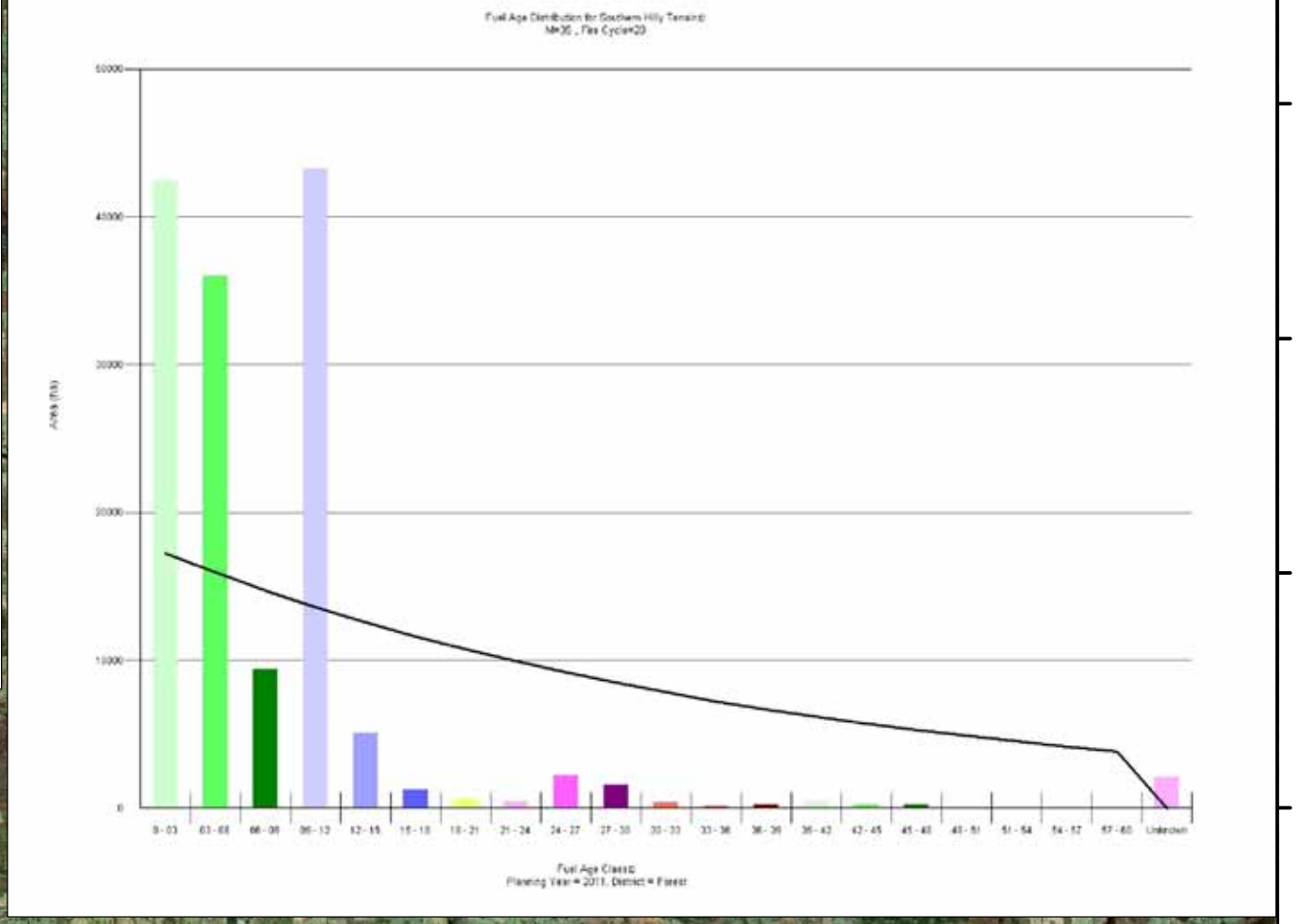
Prescribed burn inspected and/or records checked

Wildfire years 2006-2011

- 2006
- 2007
- 2008
- 2009
- 2010 - 2011

Prescribed burns years 2006-2011

- 2006
- 2007
- 2008
- 2009
- 2010 - 2011



10 5 0 10 Kilometers

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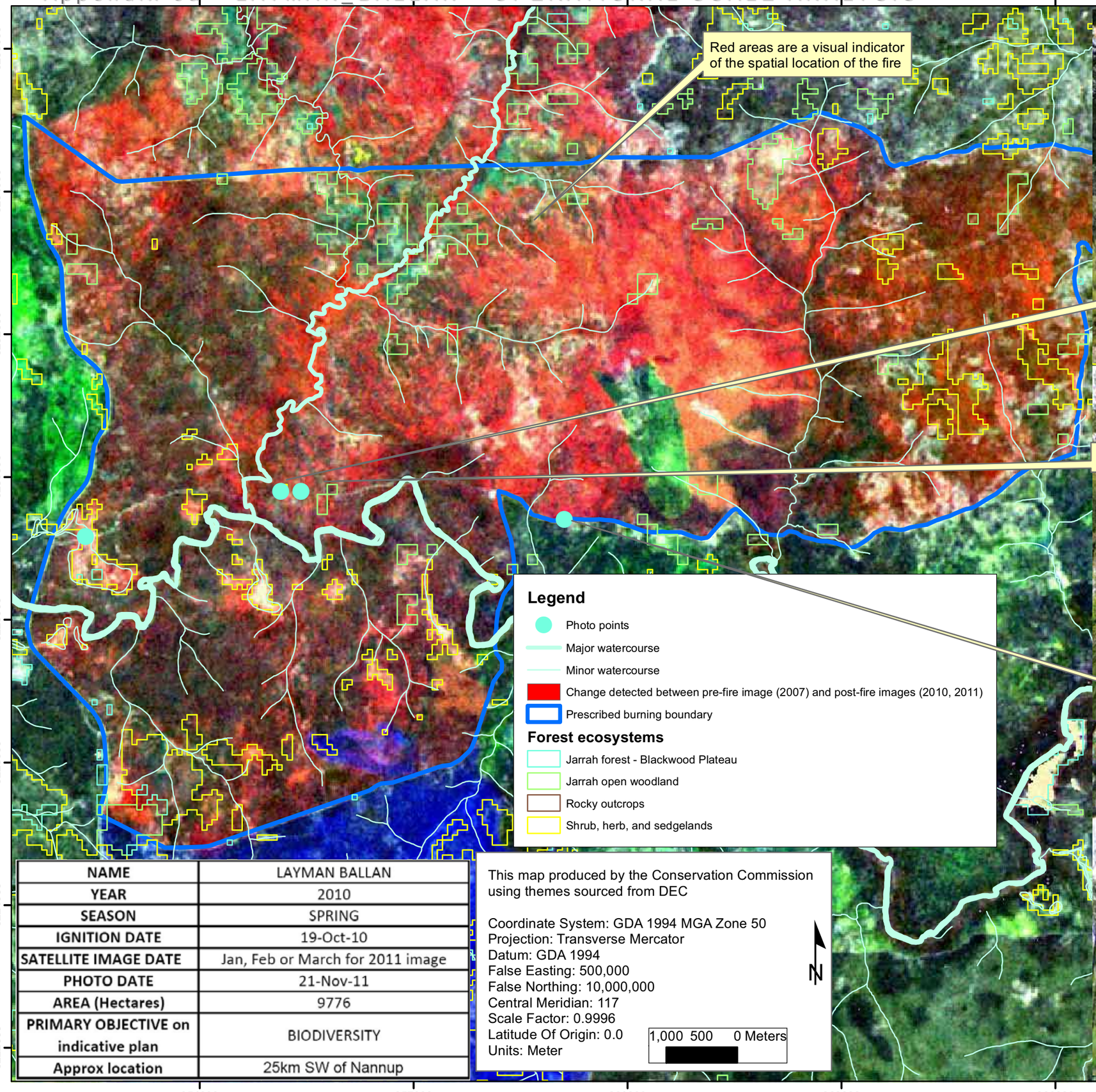
False Easting: 500,000.0000
False Northing: 10,000,000.0000
Central Meridian: 117.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

N

Quindinup Nature Reserve
Frankland
Tordit Gurrup Lagoon
Rocky Gully
Muirs Hwy
102
Unicup Lake
Sharpe / Deep
Styx
Denbarker
Korbosup
Walpole
Normalup Inlet
Irwin Inlet
Peaceful Bay
Parryville
WilliamBayN/P
Wilson Inlet

460000 480000 500000 520000

Appendix 3a - LAYMAN_BALLAN - OPERATIONAL SCALE ANALYSIS



NAME	LAYMAN BALLAN
YEAR	2010
SEASON	SPRING
IGNITION DATE	19-Oct-10
SATELLITE IMAGE DATE	Jan, Feb or March for 2011 image
PHOTO DATE	21-Nov-11
AREA (Hectares)	9776
PRIMARY OBJECTIVE on indicative plan	BIODIVERSITY
Approx location	25km SW of Nannup

This map produced by the Conservation Commission using themes sourced from DEC

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994
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False Northing: 10,000,000
Central Meridian: 117
Scale Factor: 0.9996
Latitude Of Origin: 0.0
Units: Meter

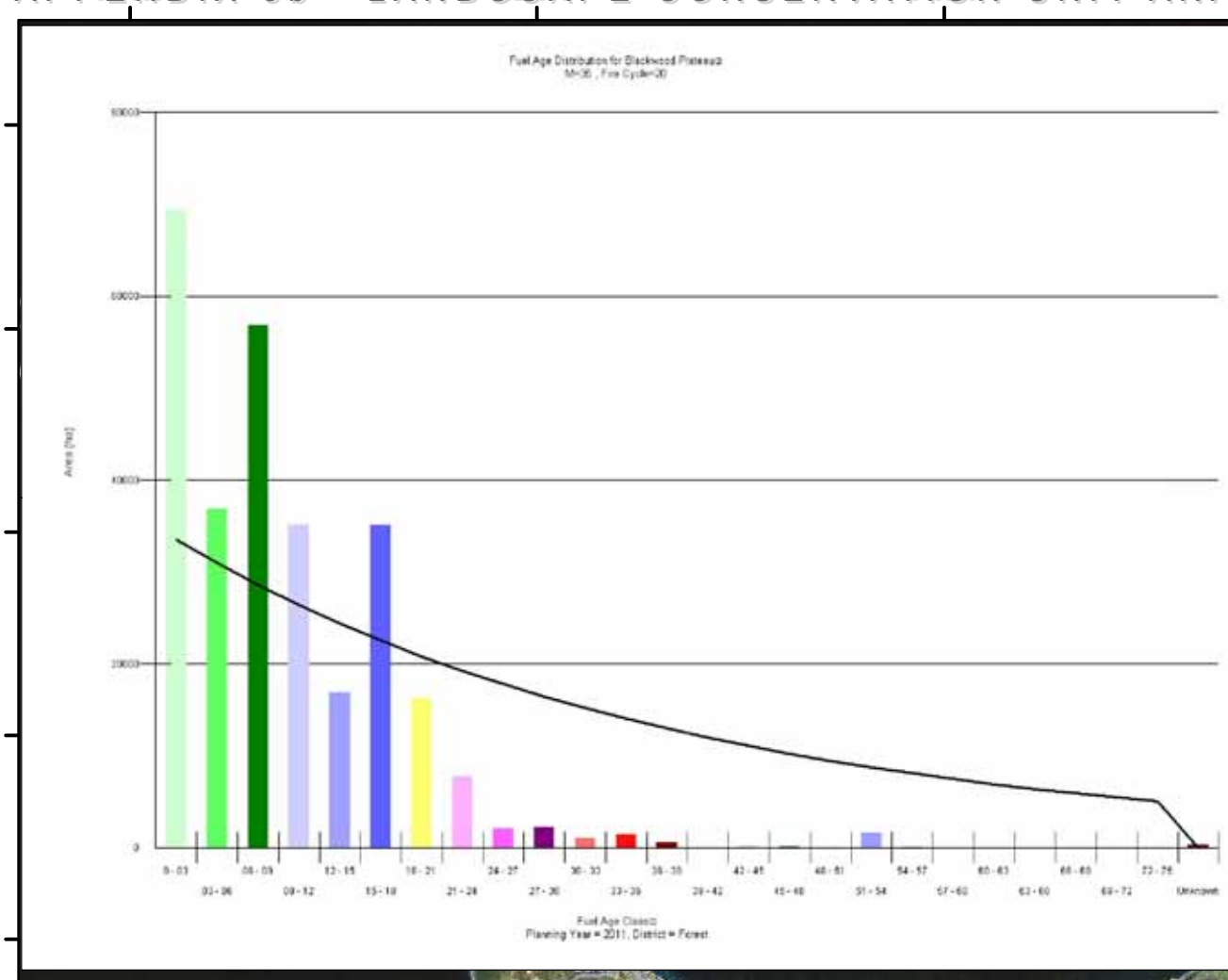
1,000 500 0 Meters

N

354000 357000 360000 363000 366000 369000 372000

6236000 6234000 6232000 6230000 6228000 6226000 6224000 6222000

APPENDIX 3b - LANDSCAPE CONSERVATION UNIT ANALYSIS - BLACKWOOD PLATEAU



10 5 0 10 Kilometers

WHICHER

LAYMAN BALLAN

Legend

Prescribed burn inspected and/or records checked

Wildfire years 2006-2011
- 2006
- 2007
- 2008
- 2009
- 2010 - 2011

Prescribed burns years 2006-2011
- 2006
- 2007
- 2008
- 2009
- 2010 - 2011

This map was produced by the Conservation Commission using themes sourced from DEC
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Projection: Transverse Mercator
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False Northing: 10,000,000.0000
Central Meridian: 117.0000
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Latitude Of Origin: 0.0000
Units: Meter

Appendix 4a - CHARLEY - OPERATIONAL SCALE ANALYSIS

Legend

- Photopoints
- Change detected between pre-fire image (2007) and post-fire images (2010, 2011)
- Prescribed burning boundary

Forest ecosystems

- Shrub, herb, and sedgelands
- Jarrah open woodland
- Jarrah forest - South
- Karri - Main Belt
- Major watercourse
- Minor watercourse

Red areas are a visual indicator of the spatial location of the fire

This map produced by the Conservation Commission using themes sourced from DEC

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994
False Easting: 500,000
False Northing: 10,000,000
Central Meridian: 117
Scale Factor: 0.9996
Latitude Of Origin: 0.0
Units: Meter

500 250 0 500 Meters

N

NAME	CHARLEY
YEAR	2010
SEASON	SPRING
IGNITION DATE	16-Nov-10
SATELLITE IMAGE DATE	Jan, Feb or March for 2011 image
PHOTO DATE	21-Nov-11
AREA (Hectares)	3692
PRIMARY OBJECTIVE on indicative plan	BIODIVERSITY
Approx location	15km west of Pemberton

ARUP DUNES

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390000 393000 396000 399000 402000

6184000 6182000 6180000 6178000

Legend

Southern Dunes & Northen Karri LCUs

Prescribed burn subject to this assessment

Wildfire years 2006-2011

- 2006
- 2007
- 2008
- 2009
- 2010 - 2011

Prescribed burns years 2006-2011

- 2006
- 2007
- 2008
- 2009
- 2010 - 2011

20 10 0 20 Kilometers

This map was produced by the Conservation Commission using themes sourced from DEC
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Units: Meter

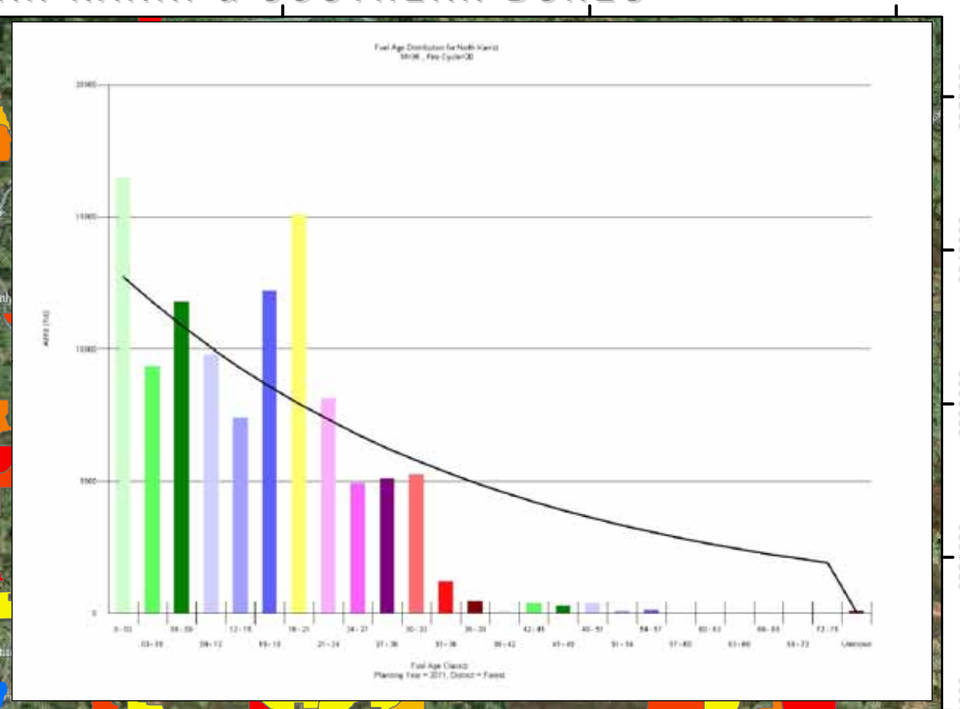
N

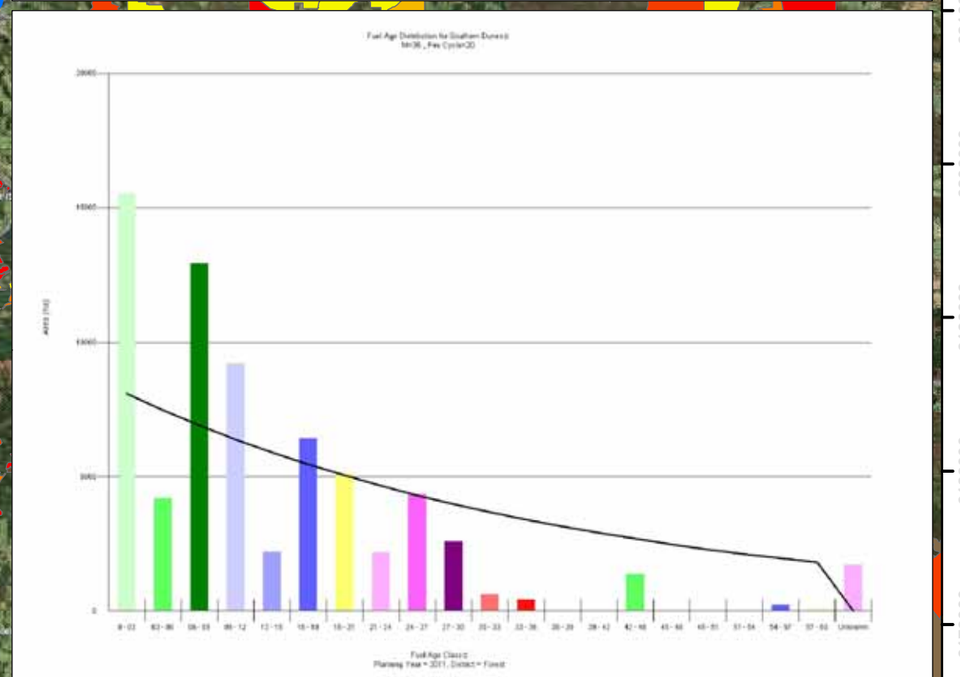
DMJ013

Charley

Sharpe / Deep

Sharpe / Deep





340000 360000 380000 400000 420000 440000 460000 480000

6250000 6240000 6230000 6220000 6210000 6200000 6190000 6180000 6170000 6160000 6150000

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

Ms Carol Shannon
Acting Director
Conservation Commission
Cnr Australia II Drive and Hackett Drive
CRAWLEY WA 6009

PERFORMANCE ASSESSMENT: BIODIVERSITY OUTCOMES OF PRESCRIBED BURNING IN THE SOUTHERN FORESTS

Thank you for your letter dated 23 November 2012 providing the Conservation Commission's draft performance assessment report on the above subject. In addition to responding to the specific findings in the draft report, this letter also provides some context on prescribed burning following the bushfire events and related inquiries that you acknowledged in your letter.

In concert with other major and destructive fires of recent years, the Perth Hills (Kelmscott) bushfire of February 2011 and the Margaret River bushfire of November 2011 have raised the media, community and political profile of the Department of Environment and Conservation's (DEC) prescribed burning and broader fire management program to an unprecedented level. The separate Special Inquiries into these two fires have served to reshape Government policy and thinking with respect to risk management and fuel load management and have had major ramifications for DEC's approach to these tasks.

In particular, the Government and community now expect greater emphasis to be placed on protection of communities and critical infrastructure, and for DEC's approach to prescribed burning to be demonstrably risk-based. This has seen *inter alia* the commencement of a major revision of DEC policies and subsidiary documentation related to fire management (see below) to reflect these expectations. It is also highly relevant that these bushfire events, and their respective aftermaths, have in themselves had a direct bearing over the past two years on DEC's fire management priorities and resource availability for other matters such as those that are the subject of this report.

DEC policy and practice relating to prescribed fire have developed incrementally over half a century as various needs and issues have arisen and responses have been developed to address them. These range from prescribed burning guides developed after significant fire research programs, through to relatively minor guidelines related to road sign standards or daily teleconferencing to determine the prescribed burn program. The need for a systemic review and rationalisation of this material has been recognised for some time, but delayed due to other priorities.

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More recently, the Special Inquiry into the November 2011 Margaret River bushfire conducted by Mr Mick Keelty has provided significant impetus to the review of DEC's prescribed burning policy and practice. The first recommendation suggested "DEC review its current policies and operational guidelines ..." and Recommendation 2 was for "DEC to urgently undertake a review of its risk management practices as they relate to prescribed burns ...". Due to the importance of sound and consistent doctrine in risk management, these recommendations both necessitate the prioritised completion of a review of doctrine.

DEC commenced work on Recommendation 2 of the Special Inquiry soon after the report was released and is well advanced in aligning its prescribed burning policy and procedures with the international risk management standard, AS/NZS/ISO 31000:2009. To date, this work has seen significant changes to processes, and corresponding documentation, related to prescribed fire planning, approval and implementation, all of which have been endorsed by the new Office of Bushfire Risk Management (OBRM). Under an agreed Assurance Program, OBRM now conducts audits of DEC's prescribed burns and planning and approval processes each season and this provides further opportunities for review and ongoing improvement. Of direct relevance to the Conservation Commission's performance assessment is that several documents listed in *Section 2.3 Assessment criteria* of the report – the *Fire Management Policy*, the *Master Burn Planning Manual* and *Fire Operational Guideline 79* – have been, or have commenced being, reviewed since the assessment was conducted.

Under the program to achieve full alignment with the international risk management standard, it is planned that the review of all documentation will be complete by the end of 2013. The completed policy and practice documents will support a strong risk management approach and significantly more transparent decision-making in relation to prescribed fire.

This information provides some necessary context to the following responses to specific findings of the performance assessment report.

Finding 1

There are inconsistencies between the primary burn purpose as recorded on the DEC indicative burn program and the primary purpose recorded on individual prescribed fire plans. It is also unclear what criteria are used to list a prescribed burn as primarily for biodiversity objectives.

Response

In accordance with the current Master Burn Planning Manual, it is standard practice in planning burn programs to first of all consider biodiversity outcomes and to then modify that optimal plan to take account of other imperatives, such as strategic protection or silviculture. In the absence of more specific biodiversity objectives, the general aim of achieving biodiversity objectives through a negative exponential distribution of fuel ages is adjusted for strategic protection.

Currently a burn can have more than one burn purpose. There is no requirement for a burn to have only a primary burn purpose that is superior to other burn purposes (page 9 and appendix 1 of the Manual). In the past there has been a practice to define a primary and secondary burn purpose. This historical practice may have resulted in variations in contemporary practice in applying the current Manual. Usually the burn purpose that is obviously most important or, alternatively, applicable to the majority of the burn area is stated first and is indicated in the annual burn program summary. This concept is illustrated further when prioritising burns (page 26 of the Manual) where the criteria associated with each burn purpose are considered to determine the importance or priority for each burn.

The explanation in the Manual associated with each of the agreed burn purpose statements is to assist the fire manager in determining which burn purpose or purposes may be applicable to the burn in question. The fire manager then proceeds to determine burn objectives for each of the burn purposes selected to apply to that burn. Each objective is usually supported by a set of success criteria against which effectiveness and efficiency can be assessed. DEC will provide clearer guidance on the selection of burn purpose(s) in the current process of redrafting of the Prescribed Fire Manual.

In addition, there are very straightforward reasons why the stated primary purpose for a particular burn may vary from the master burn plan (indicative) stage to when it is prescribed in detail. At the initial planning stage, initial objectives may be set based on underlying information such as tenure or location in the landscape. As staff work through the detailed planning associated with the prescribing process, including ground truthing boundaries, assessing fuel loads, and assessing risk to nearby assets such as communities or critical infrastructure, the primary burn purpose can change to reflect new information and/or the way fire will be applied within the burn area.

Finding 2

There is variation between the DEC regions on biodiversity success criteria and it is not clear how these success criteria are determined.

Response

Success criteria are required to enable an assessment of the degree to which a burn objective has been achieved. Depending on the burn objectives, the success criteria chosen will be quite variable and there is no desire on DEC's behalf to limit success criteria to a set of standard criteria.

The success of many burn objectives depends on the fire intensity and the patchiness of the burn/unburnt mosaic that results from the burn and where that patchiness is located in the landscape. Practitioners are still coming to grips with meaningful ways to describe these requirements. Scorch height and coverage are accepted means of describing fire intensity and are therefore commonly used. Describing patchiness is more difficult. Practitioners try to describe where they want patches left unburnt. This is commonly the case for areas such as riparian zones or the surrounds of rock outcrops.

However, it is difficult to describe a mosaic in terms of coverage, grain size and connectivity and therefore appropriate and meaningful success criteria of this sort are difficult to determine. The use of remote sensing and spatial statistical analysis are being explored as possible means of determining meaningful success criteria for spatial diversity. However, current experience with this approach has demonstrated limitations in the remote sensing technology, the accessibility of appropriate data, and DEC's ability in the current circumstances to routinely operationalise this approach to all the prescribed burns undertaken each season.

Finding 3

There is an ongoing requirement for better outcome reporting for prescribed burns at the operational scale.

Response

The deficiency reported in completing burn evaluations is acknowledged and some remedy to this shortcoming is expected to emerge from work DEC commenced prior to, and has accelerated as a result of, the Special Inquiry recommendations mentioned above. In short,

a new, revised process for prescribed burn planning and implementation will ensure burns cannot be certified as complete until the evaluation has been done. When complete, the web-based computer application will provide a means of reporting on this progress.

The use of remote sensing information to assess prescribed burns has not been fully operationalised due to limitations of available satellite remote sensing information (particularly due to cloud cover over target areas), difficulties in using the department's new airborne remote sensing capability to collect data and the department's capacity to routinely process these data for the entire annual burn program. Work in this area is continuing and it is intended to improve this capability.

As noted by the auditors, where the remote sensing information has been used, it has confirmed burning outcomes are generally consistent with the burn objectives.

Finding 4

The data used to evaluate* Forest Management Plan *Key Performance Indicator 16 is not quantitatively analysed for conformance with the negative exponential curve.

Response

DEC is of the view that the reporting against Key Performance Indicator 16 is appropriate given the limitations of the datasets on which the analysis was undertaken. The data used to represent the fuel age class frequency distribution are based on the 'Year of Last Burn' data which are applied to the entire area of the polygon treated with prescribed fire. The data do not capture the finer grained mosaic within each burn polygon and therefore overestimate the quantum of younger fuels and underestimate the older fuels.

To apply a more rigorous statistical analysis to these data would be to misrepresent the actual situation and the use of statistical measures such as standard deviations would be to infer a far greater reliability and precision than is possible. Nevertheless, further statistical analysis will be applied as appropriate.

Finding 5

There is no outcome reporting of the planning objective to achieve a mosaic of burnt and unburnt at the landscape scale.

Response

The intention of using the negative exponential distribution of fuel age classes in each landscape conservation unit is to ensure an appropriate spatial mosaic is maintained at a landscape scale for biodiversity conservation. The underlying principle is that fire management provides a sufficient variety of fire-induced habitat opportunities across the landscape. Unfortunately, the fire planning tool that incorporated the ability to use the negative exponential curve in planning processes was both difficult to use and unstable, leading to the use of alternate GIS applications to prepare burn programs.

This limitation has been recognised and work is underway to develop a comprehensive application to manage prescribed burning that will overcome this limitation and ensure that landscape-scale diversity is not only a central consideration in preparing burn programs, but can be reported on.

Finding 6

There is no performance measure of variability in the season of burns.

Response

Information is available to fire planners on fire history across the forest areas. Contrary to the auditors' statement, it is DEC's view that this information is routinely used by fire planners to ensure, as far as possible, that seasonal variation occurs as a consequence of planned fire. A consideration in determining the season in which a proposed burn will be ignited is the season in which the area was exposed to its last fire (be that bushfire or a prescribed burn). The tabulation provided by the auditors demonstrates that this variety is present in both the season and inter-fire period of the burns listed.

DEC is concerned at the implication that additional performance measures should be introduced for questionable gain. The evidence collected by the auditors clearly shows that seasonal variability is being achieved under current circumstances, so it is unclear why the finding is made.

Finding 7

There were recordkeeping inconsistencies in burn prescriptions in DEC's South West Region.

Response

This finding is noted. Some discussion of these issues is made above at Findings 3 and 4.

Finding 8

The document 'Goals for Understorey Structural Diversity' is still a work in progress and there is a lack of reporting available to assess the achievement of the **Forest management plan** ***objectives in relation to the diversity of understorey vegetation structure.***

Response

The absence of the *Goals for Understorey Structural Diversity* is acknowledged, and it is noted that the draft Forest Management Plan 2014-23 again commits to the development of this document. DEC aims to develop the document during the early stages of the next Forest Management Plan.

Finding 9

There is a lack of planning detail on habitat goals for declared rare fauna species known to be within the burn boundaries.

Response

In the preparation of a burn program and subsequently a prescribed fire plan, a wide variety of assets must be identified, including fauna and flora assets, that may occur within the burn boundary (note - revised processes being introduced will extend this investigation to areas outside the burn boundary). These assets, if present, are recorded and discussion is undertaken with the appropriate subject matter experts within the department to determine appropriate and feasible actions to be addressed in the prescribed fire plan. Documents such as Fire Management Guidelines have been developed to assist in this decision making process.

Fire ecology knowledge about species, communities and ecosystems is imperfect. It is therefore not possible to state with confidence what each of these elements of the biota might require. Prescribed fire is therefore applied within a framework of fire management principles established to guide fire management policy and practice within DEC.

To ensure that nature conservation and other responsibilities are adequately catered for in every prescribed fire plan, endorsement by the district functional leaders responsible for Nature Conservation, Parks and Visitor Services and Sustainable Forest Management is required prior to the burn being approved by the Regional Manager. DEC believes this provides an effective means for the requirements of individual species and/or the synthesis of different requirements of a range of species to be accounted for in a prescribed fire plan.

In summary, DEC acknowledges the desire for improved processes in some areas of prescribed burning, most particularly with respect to post-burn monitoring and reporting. These are matters which have been constrained by resources and the limitations of available technology. The department will continue to seek ways to overcome these issues in the context of continuous improvement. As prescribed burning is an inexact science, there will always be opportunities for improvement in many areas as knowledge increases. However, DEC is confident that the revised and transparent processes arising from its enhanced risk management regime for prescribed fire will lead to substantive improvements.

Yours sincerely

Keiran McNamara

Keiran McNamara
DIRECTOR GENERAL

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