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A Review of 'Overcleared' Landscapes in the PVP-Developer

Stage 1
Border Rivers/Gwydir, Central West, Lachlan and Namoi Catchment Management Authority Areas

Part 1. Overview of a new method for estimating vegetation cover in Mitchell Landscapes.

Part 2. Review of revised %-cleared estimates for Mitchell Landscapes in the context of potential extent of unmapped native grasslands

(Project No. 21-12-i)

Final Report prepared for:
Department of Environment and Conservation

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Executive Summary

Percentage-cleared estimates to be upgraded into the PVP-Developer "*Overcleared* Landscapes Database" for Border Rivers/Gwydir, Central West, Lachlan, and Namoi Catchment Management Authority areas were reviewed using a combination of expert consultancy analysis and expert workshop review. The review included two components:

1. validation of the process devised by the NSW Department of Environment and Conservation (DEC) to review the statewide vegetation mask and upgrade %-cleared estimates in Mitchell Landscapes;

2. individual validation of %-cleared estimates assigned to a screened sub-set of 'overcleared' Mitchell Landscapes in the context of potential extent of unmapped natural native grasslands.

The original approach employed by DEC in 2004 to estimate %-cleared values for each Mitchell Landscape in the "*Overcleared* Landscapes Database" was based on a statewide spatial dataset, derived in 2000 by Pressey et al. (2000). At the time this represented the best available estimate of state-wide native vegetation extent. The mask was updated in 2006 to include various new and improved API-based vegetation maps (Keith and Simpson 2006). The new vegetation mask was considered by all workshop participants to be a considerable improvement on the original, and that consequently all revised %-cleared estimates were recommended to be upgraded into *BioMetric*, as intended by DEC, in preference to the original estimates.

The %-cleared estimates of a total of 48 landscapes were reviewed. Of these, it was recommended that %-cleared estimates associated with two 'overcleared' landscapes, namely Burroway Plains and Coolah Tops in Central West CMA, be revised downward under the 'overcleared' threshold (the 'overcleared' threshold is >70% cleared). For Burroway Plains, this decision was taken in light of the likeliness of a significant area of unmapped natural native grassland. For Coolah Tops, the decision was based on visual observation of vegetation extent as evident from satellite imagery. It was recommended that the %-cleared estimates for all other 'overcleared' landscapes were reasonable, and that they be retained.

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BBS	Brigalow Belt South (bioregion)
BRG	Border Rivers/Gwydir (CMA)
CMA	Catchment Management Authority
CW	Central West (CMA)
DEC	Department of Environment and Conservation (formerly NPWS)
ELA	Eco Logical Australia
L	Lachlan (CMA)
N	Namoi (CMA)
NPWS	National Parks and Wildlife Service (now DEC)
NR	Northern Rivers (CMA)
NSWVCA	New South Wales Vegetation Classification and Assessment
PVP	Property Vegetation Plan
Landscape	Mitchell Landscape unit

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1. Introduction

The NSW Department of Environment and Conservation (DEC) is currently undertaking a major review of underlying datasets supporting operation of the *BioMetric* module of the Property Vegetation Plan (PVP) Developer, an instrument applied under the *Native Vegetation Act 2003* to support vegetation conservation and planning in NSW. This review includes revision of names, % cleared estimates and benchmarks for vegetation types, and % cleared estimates for Mitchell Landscapes. The vegetation types upgrade has been completed for 6 of the 13 CMAs in NSW and is underway for the remaining 7 CMAs. The benchmarks review is ongoing, and the landscapes review for four priority CMAs is the topic of this report.

2. Scope

Percent-cleared estimates for all Mitchell Landscapes listed in *BioMetric* were originally generated using a broad vegetation presence/absence grid developed by Pressey *et. al.* (2000). Over the past two years, DEC has been drawing together a substantial quantity of new vegetation mapping data to revise the 'mask' and thus update %-cleared estimates assigned to each landscape. While new %-cleared estimates generated represent a substantial improvement over those currently listed in *BioMetric*, it is recognised that the paucity of native grassland mapping in the Central Division of NSW casts doubt on the reliability of %-cleared estimates generated for landscapes in which the former distribution of native grasslands was likely to have been significant. In particular, there is potential that remaining patches of native grassland may have been mapped as 'cleared' in areas where grasslands mapping is absent, thus contributing incorrectly to the %-cleared estimate of certain landscapes. Of most concern is the potential for certain landscapes to be classed as 'overcleared' (%-cleared > 70%) because the current unmapped distribution of treeless or near-treeless native grasslands was mapped as 'cleared'.

To address this problem, Eco Logical Australia was commissioned by DEC to convene an expert workshop in which %-cleared estimates assigned to individual Mitchell Landscape units, calculated using GIS from the intersection of the vegetation mask and Mitchell Landscape boundaries, could be reviewed in the context of unmapped native grassland, and possibly revised with expert consensus.

3. Structure of this document

This document first provides an overview of literature associated with grassland definitions and knowledge of the former extent of true native grasslands. This sets the context for presentation of the methods employed, including the vegetation mask review undertaken by DEC, the landscape screening process, and data and map project preparation for the expert workshop. The results section outlines major findings of the initial screen, and documents all outcomes of the workshop.

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4. Native Grasslands

4.1 Definition

Mott and Groves (1994) described grasslands as treeless communities dominated by indigenous perennial and annual grasses, but which nearly always comprise some exotic species. This definition is synonymous with that of Benson (1996), who describes native grasslands as 'grasslands where >50% of the vegetative ground cover is composed of indigenous species of grasses and forbs (species native to the area before European settlement), >50% of the number of species are native, and where the minimum standing [non-woody] vegetation ground cover, alive or dead, exceeds 10%'. This definition is further divided by Benson (1996) into natural native grassland, native grasslands of forest and woodlands, and derived (secondary) native grassland.

Natural native grasslands are considered to have contained isolated or no trees or shrubs at the time of European settlement (Benson 1996). This coincides with a structural formation of 'isolated trees/shrubs' or 'isolated clumps of trees/shrubs', and is equivalent to trees or shrubs being naturally separated by more than 20 crown widths (Walker and Hopkins 1990). In contrast, derived (secondary) native grasslands are those remaining after the physical removal or dieback of previous woody vegetation (trees or shrubs), to a point where the canopy cover is less than that of open woodland (ie. crown separation ratio >20). Any native grassland occurring as ground cover in a natural woodland or forest community is referred to by Benson (1996) as 'native grassland as a ground layer in woodlands and forests'. Both derived grasslands and grasslands of native forest and woodlands are 'native grasslands', but differ from *natural* native grasslands in that they occupy, or formerly occupied, a forest or woodland community dominated by woody vegetation.

Beadle (1981) describes the main formations of native grasslands in Australia. They include: tall savannah grasslands of northern Australia dominated by genera such as *Heteropogon* and *Sorghum*; the widespread hummock grasslands from semi-arid and arid zones dominated by *Triodia* and *Plectrachne* (spinifex grasslands); littoral grasslands; freshwater or periodically flooded grasslands; tussock grasslands in semi-arid regions on fine-texture soils (dominated by *Aristida* spp., *Astrebla* spp., *Eragrostis* spp. and *Stipa* spp.); and grasslands dominated by snow grasses (*Poa* spp.) occurring in cooler, temperate zones. The last two categories make up the tussock grasslands of south-eastern Australia that are most relevant to grassland management in NSW (Mott and Groves 1994; Benson 1996).

As part of a recent review of vegetation types in the *BioMetric* Tool within the PVP-Developer, Eco Logical Australia reviewed all vegetation types within Border Rivers/Gwydir, Central West, Lachlan and Namoi CMAs (ELA 2006a,b). The upgraded list of native grassland types following the review (some may include areas of derived native grasslands) is presented in Table 4.1. There are a total of 17 native grassland types, mostly associated with heavy fertile soils of the inland plains and floodplains.

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Table 4.1. Native grassland types with the four priority CMAs

VegTypeName	CMAs	Source
Couch Grass grassland on river banks and floodplains of inland river systems (Benson 50)	BRG,CW,L,N	Benson *et al.* (2006)
Curly Windmill Grass - speargrass - wallaby grass on alluvial clay and loam on the Hay Plain, Riverina Bioregion (Benson 46)	L	Benson *et al.* (2006)
Grassland - *Austrostipa verticillata - Rhagodia spinescens* (BBS 171)	BRG,N	PlanningNSW (2002)
Mitchell Grass grassland of the semi-arid (hot) and arid zone alluvial floodplains (Benson 43)	BRG,CW,N	Benson *et al.* (2006)
Native Millet - Cup Grass grassland of the Darling Riverine Plain Bioregion (Benson 214)	BRG,CW,N	Benson *et al.* (2006)
North western wet grassland - *Paspalidium jubiflorum - Marsilea drummondii* (BBS 179)	BRG,N	PlanningNSW (2002)
Northern clay plain grassland - *Bothrichloa decipiens - Asperula conferta* (BBS 190)	BRG,CW,N	PlanningNSW (2002)
Plains Grass - Bluegrass grassland; western (Nd 85)	BRG,N	Wall (2004)
Plains Grass grassland on alluvial dark grey clays of central New South Wales (Benson 45)	CW,L	Benson *et al.* (2006)
Plains Grass grassland on basaltic black earth soils mainly on the Liverpool Plains in the Brigalow Belt South Bioregion (Benson 102)	BRG,N	Benson *et al.* (2006)
Queensland Bluegrass - Cup Grass - Mitchell Grass - Native Millet alluvial plains grassland on the eastern Darling Riverine Plains Bioregion (Benson 52)	BRG,N	Benson *et al.* (2006)
Rat's Tail Couch sod grassland of inland floodplains (Benson 242)	BRG,CW,L,N	Benson *et al.* (2006)
Spinifex - Bulloak hummock grassland/low open woodland of alkaline sandy outwash plains (Benson 235)	BRG	Benson *et al.* (2006)
Swamp grassland of the Riverine Plain (Benson 47)	L	Benson *et al.* (2006)
Tablelands dry grasslands	L	ELA (2006a)
Wet tussock grasslands of cold air drainage areas of the tablelands	BRG,CW,L,N	ELA (2006a)
Windmill Grass - Curly Windmill Grass - Button Grass alluvial plains grasslands in the dry subtropical climate zone (Benson 49)	BRG,CW,N	Benson *et al.* (2006)

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4.2 Former distribution

There is some debate as to the extent of treeless native grassland in NSW prior to European settlement (eg. Benson and Redpath 1997), mainly because the lack of accurate historical data prevents a truly reliable report of the historical distribution of grasslands. The first systematic vegetation surveys in NSW did not take place until after the landscape had been subject to years of heavy grazing by domestic stock and rabbits, altered fire regimes, extremes in rainfall, and land clearance (Mullins 2004). In the absence of systematic data, descriptive evidence from early surveys by General Surveyor John Oxley and Botanist Allan Cunningham (Curry *et al.* 2002) has been interpreted in various ways.

Despite the debate, it is generally agreed by authorities in grassland ecology that the original distribution of treeless grasslands was restricted to particular regions and was elsewhere patchy in NSW (Benson 1996, 1997; Benson and Redpath 1997), that much of the original grassy vegetation contained an open woodland or shrubland overstorey (Benson 1991; Benson and Redpath 1997; Lewer *et al.* 2003), that the former distribution of native grasslands has been reduced substantially through contemporary agricultural activities, particularly cropping (Benson 1991,1997; Eddy 2002; Kirkpatrick *et al.* 1995; Mullins 2004), and that the majority of native grasslands currently occupying the NSW landscape has been derived from the removal of forest and woodlands for grazing (Benson 1991). An estimated 57 percent of the central west slopes and plains had been modified (cleared or semi-cleared) for agriculture by the early 1900s, increasing to 80% by 1920 (Bowie and Goldney 1987). Today, much of the area is subject to cropping, particularly in the west, with smaller areas devoted to grazing pastures and forestry (Bowie and Goldney 1987). The intensive nature of cropping usually results in total destruction of native vegetation, and it is difficult for it to re-establish. Impacts of intensive cropping include soil structure decline, soil chemistry changes (through ploughing and the application of fertilisers and pesticides), and introduction of weeds (Benson 1991).

Like the great prairie grasslands of the United States and Russia, which occur mostly on heavy soils in areas that received an annual precipitation 350-800 mm and are subjected to periodic drought (Ripley 1992), similar environments in south-eastern Australia support native tussock grasslands. While native grasslands are associated with floodplains, depressions, plains and low rises which comprise relatively heavy soils (eg. lithosols and colluvial soils, clay loams to heavy clays; Mullins 2004), most literature suggests that treeless native grasslands were formerly restricted to only a few regions in NSW, Victoria, Tasmania and South Australia, and only small remnants of native grassland in "good" condition are present today (McDougall and Kirkpatrick 1993). According to Benson (1996), the main regions of native grassland in NSW are:

1. Mitchell grasses (*Astrebla* spp.) grasslands of the semi-arid inland plains of far north western NSW and south western Queensland;

2. Sections of the North Western Plains around Moree and Walgett where Mitchell grasses (*Astrebla* spp.) and wire grasses (*Aristida* spp.) commonly dominated;

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3. Liverpool Plains near Breeza, southern section of the Northern Tablelands, dominated by Plains Grass, *Austrostipa aristiglumis*.

4. Small areas on poorly drained flats and in valleys subject to cold air drainage on the Northern Tablelands where snow grasses (*Poa* spp.) was dominant;

5. The Monaro region of the Southern Tablelands where originally approximately 250000 ha of native grasslands was present dominated by Kangaroo Grass (*Themeda australis*), corkscrew grasses (*Austrostipa* spp.), wallaby grasses (*Austrodanthonia* spp.), snow grasses (*Poa* spp.) and forbs (see Benson 1994 for a description of the Monaro native grasslands);

6. Alpine and sub-alpine regions of Kosciusko and Namadgi National Parks on the Southern Tablelands dominated by snow grasses (*Poa* spp.) and forbs; and

7. Coastal clayey headlands dominated by Kangaroo Grass (*Themeda australis*).

According to Benson (1996, 1997), the extensive native grasslands of the Riverine Plain dominated by *Austrodanthonia - Austrostipa - Chloris* has most likely been derived since European settlement, from a saltbush and *Acacia pendula* (Myall) shrubland.

The natural native grassland communities of all regions of the Central Division (including 2, 3 and 4 above) have been severely depleted due to 150 years of intense European land use, and some are now highly threatened (Benson 1996). In response to the threats to lowland grasslands, the World Wide Fund for Nature (WWF) funded surveys of the main lowland grassland regions (excluding the Riverina Plains) in four States, extending previous studies in Victoria and Tasmania and initiating studies in NSW and South Australia (McDougall and Kirkpatrick 1993). Some salient findings of the WWF project, as reported by Benson (1997) were:

- 711 native plant species were recorded in grasslands with 78 being nationally or regionally significant;
- Only three of the 26 grassland communities were assessed as being adequately reserved;
- Over 90% of original grasslands had been destroyed or significantly altered;
- Most remnants were small or linear-shaped and therefore difficult to manage;
- Remnants occurred on both private and public land (roadsides, travelling stock reserves, cemeteries, railway easements);
- Half of the rare or threatened plants were recorded from private land;
- Major threats to the remnants were over-grazing, ploughing, weed invasion, urbanisation or the lack of appropriate periodic disturbance (Benson 1997).

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5. Methods

5.1 Background

ELA employed a 2-stage process similar to that carried out for a recent vegetation types review for six priority CMAs (ELA 2006a). The first stage involved an internal review to select a sub-set of landscapes based on literature searches and in-house expert opinion. Compilation of relevant supportive information, and preparation of a Microsoft Powerpoint presentation, were also undertaken by ELA in preparation for a workshop. The second stage involved convening and facilitating an independent expert workshop attended by various grassland experts in NSW, and relevant DEC and CMA staff. The objective of the workshop was to review the %-cleared estimate for each 'overcleared' landscape, in the context of its biogeography and landuse history, and to reach consensus on whether any estimates should be revised downwards through the 70% threshold based on the likely presence of unmapped areas of *natural* native grassland, or revised upwards through the threshold based on other expert advice.

5.2 Vegetation Mask Review - DEC

Planning and assessment functions under the *Native Vegetation Act 2003* require the identification of 'overcleared' landscapes in NSW as an input into the PVP Developer. The current extent of native vegetation in NSW was estimated using a presence-absence map of extant native vegetation prepared by Pressey *et al.* (2000) which was based on data captured prior to 1998, had a spatial resolution based on a 1 km grid scale, and largely excluded non-woody forms of native vegetation (Keith and Simpson 2006). Over the past 2 years, DEC has been undertaking a project to improve the mapped extent of native vegetation, and to provide a more reliable basis for the identification of 'overcleared' landscapes at a statewide level (DEC 2006). Any recent API-based dataset exhibiting fine resolution linework was utilised, including a subset which delineated remnant non-woody native vegetation (Keith and Simpson 2006).

Spatial data sets for native vegetation were compiled for assessment from available published and unpublished sources (Keith and Simpson 2006). These included 10 of the regional scale vegetation maps compiled by Keith (2004) and a further 21 data sets which have become available since the earlier compilation. Mapping specifications were recorded for each data set by extracting relevant information from reports and metadata statements. A number of parameters were recorded where information was available, including whether native grasslands were mapped or not. In addition, two land use data sets showing the locations of recent clearing and cropping were included to supplement the currency of the available regional maps of extant native vegetation. A full list of vegetation mapping sources is provided in Keith and Simpson (2006).

Each dataset was reclassified into three classes: native woody vegetation; native non-woody vegetation; and non-native vegetation (or not vegetated). A composite grid data layer of extant native woody vegetation (250m resolution) was assembled for NSW then updated using recent land use maps of western NSW to exclude any areas recorded as cleared or cropped during 1986-2005. A composite gridcell layer of native grassland (not including derived or secondary grasslands) was also derived from datasets containing grassland mapping. Figure 5.1 shows the final native vegetation

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cover map of NSW (woody and non-woody) from which re-analysis of %-cleared estimates of Mitchell Landscapes was undertaken (from Keith and Simpson 2006). The vegetation mask continues to undergo periodic refinement as new vegetation layers are added. The version of the mask products used in these workshops and subsequent *BioMetric* update is referred to as "NSW Extant Native Vegetation (Keith and Simpson 2006) - Version 002", ANZLIC metatdata ANZNS0208000230.

Given that only 12 data sets contained comprehensive information on the distribution of native non-woody vegetation, it was not possible to produce separate native non-woody and non-native vegetation (or no vegetation) grids across much of the NSW landscape, including most of the four priority CMA regions. Figure 5.2 shows areas in NSW yet to be adequately mapped and surveyed for native grasslands (Keith and Simpson 2006).

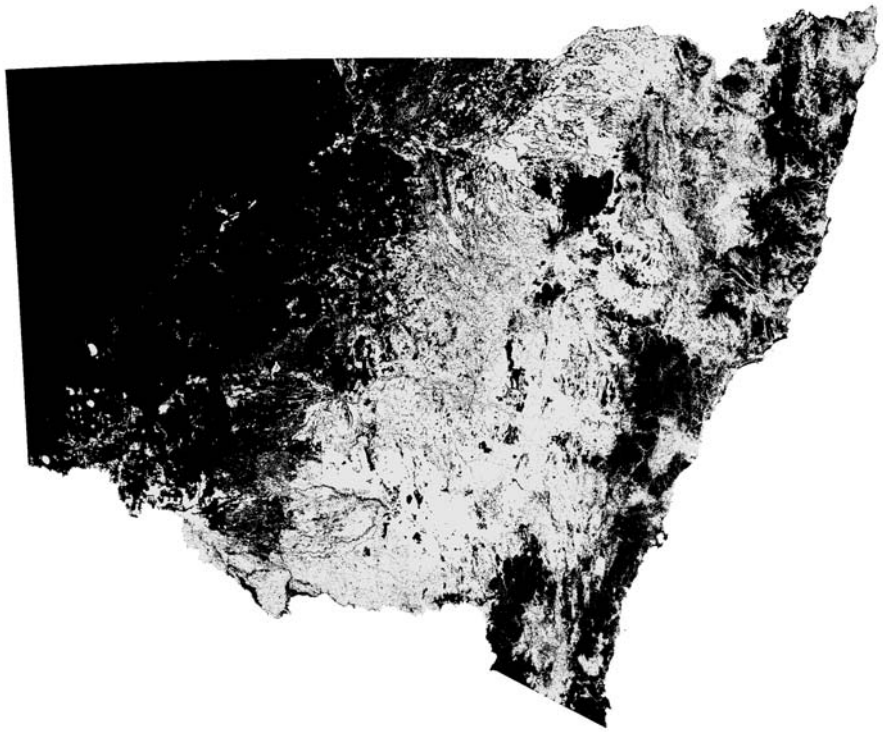

Figure 5.1. Map of extant remnant native vegetation suitable for identification of 'overcleared' landscapes (from Keith and Simpson 2006).

5.3 Screening of "Overcleared Landscapes" for Review

Following DEC's review of %-cleared estimates of all Mitchell Landscapes in NSW, a screening process was undertaken to select a subset of landscapes for the current expert review process. Landscapes were screened as follows:

1. located within the extent of the four priority CMAs (Border Rivers/Gwydir, Central West, Lachlan, Namoi);
2. %-cleared estimate >70% (ie. exhibited an 'overcleared' status);

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3. %-cleared estimate <90% (with the exception of two landscapes whose original %-cleared estimate was ≤70%); and
4. located within areas containing no grasslands mapping (Figure 5.2).

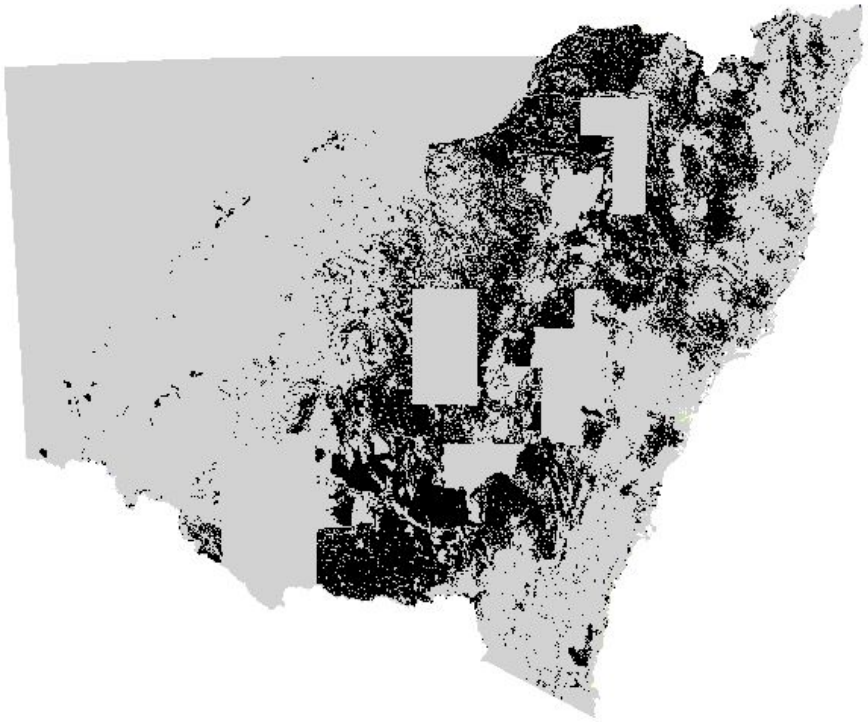

Figure 5.2. Parts of NSW that are yet to be surveyed for native grasslands that may contain areas of non-woody native vegetation (from Keith and Simpson 2006).

The rationale for eliminating from review those 'overcleared' landscapes comprising 90-100% cleared land (point 4 above) was based on evidence from relevant literature that the former extent of native grasslands in the Central Division was itself restricted, and that much has been derived from grassy woodlands or cleared for cropping since European settlement (section 4.2). Thus the likeliness that any landscape comprises in excess of 20% unmapped *natural* native grassland is considered by ELA to be very remote.

5.4 Data Preparation for Expert Review

The following information was assembled into a GIS project for each of the Mitchell Landscapes to facilitate expert review:

1. name and area (ha);
2. current and revised %-cleared estimate;
3. outline map against 1:100K topographic background;
4. outline map against Spot5 image;
5. extent map against outline of 4 CMAs; and
6. mapped extent of landuse types associated with loss of native grassland.

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Each project comprised an 'overview' view, which showed the location of the landscape within the CMA extent, including the location of major rivers, and a 'detail' view, showing an outline of the landscape against Spot5 imagery and topographic mapsheets, and a map of landuse types in which true grasslands were not likely to persist.

Location of landuse footprints were achieved through provision of three key spatial layers prior to the assessment, namely DNR land use mapping (metadata provided at **http://www.affa.gov.au/content/output.cfm?ObjectID=4B9C8D05-2887-49BD-9AAB623B75796B1C**) and 2 cropping history layers, including the northern slopes cropping layer, and the RAMs cropping records from 1986-2000 (Figure 5.3 and 5.4).

Each category within the DNR land use map was classified for this project as either 'potential' or 'no potential', according to likely persistence of natural native grassland within that land-use category. Appendices I and II list the land use categories assigned to 'potential' and 'no potential', respectively. On completion of this task, all polygons exhibiting 'no potential' were separated into a new spatial layer.

To facilitate expert overview, a spatial impression of non-grassland was undertaken by imposing the 'no potential' layer derived from DNR land use mapping, and the other cropping layers provided by DEC, across the mapped extent of each landscape.

5.5 Expert Workshop

An expert workshop was convened at DEC Head Office in Hurstville on the 25th – 26th October, 2006. Attendees included a number of independent ecologists from various NSW government agencies, staff from the Spatial Information and Assessment Section of DEC responsible for deriving revised %-cleared estimates, a representative of each of the four priority CMAs, and 2 staff members of ELA.

An agenda was distributed to all attendees a few days prior to the workshop (Appendix III). The structure of the workshop agenda included an overview of the approach adopted by ELA to review 'overcleared' landscapes, a description of the methodology employed by DEC to review %-cleared estimates, an initial overview by ELA of grassland ecology in NSW, then a stepwise consideration of each of screened landscape in turn. The aim of the workshop was to engage all relevant experts to achieve an agreed recommendation for each landscape in terms of its final %-cleared estimate, in the context of potential areas of unmapped native grassland. Figure 5.5 shows an example of the 2 GIS views for a landscape in Namoi CMA, presented to the workshop on the data projector.

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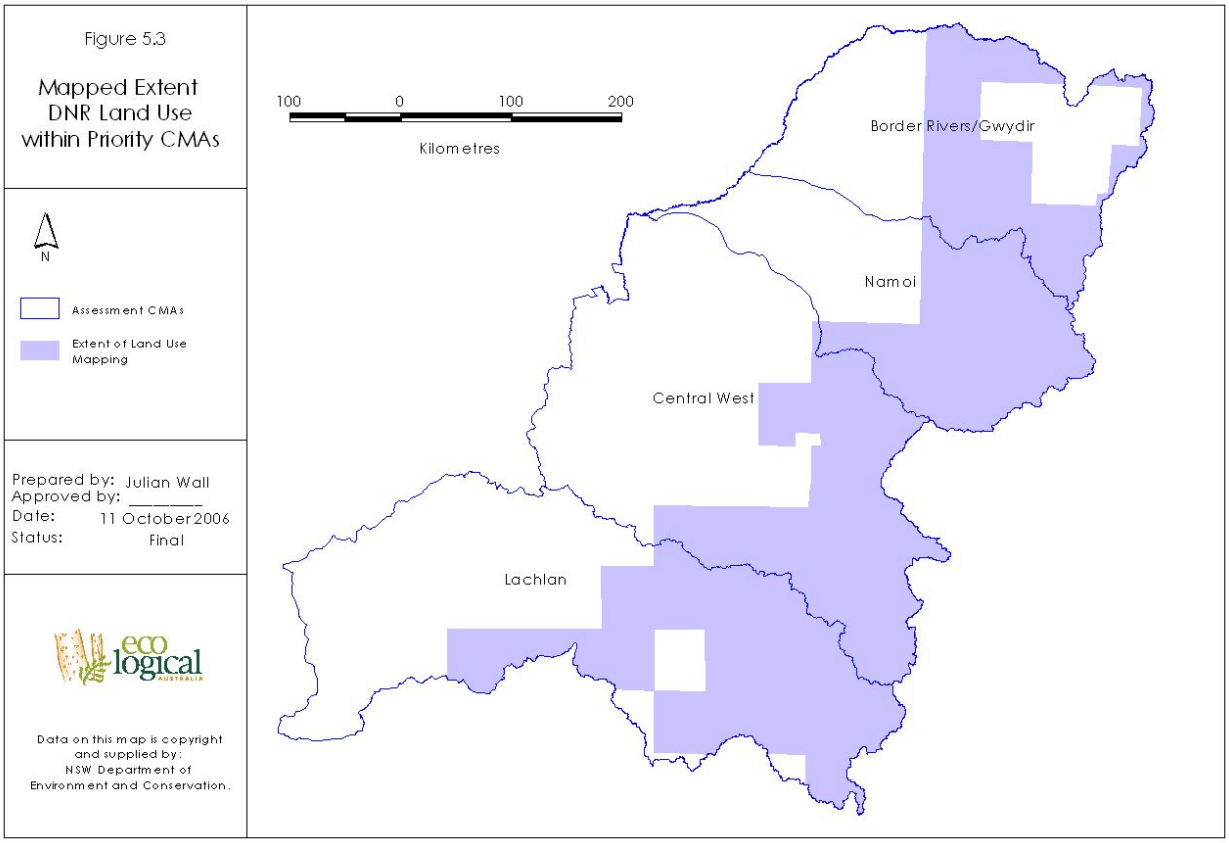
Figure 5.3

Mapped Extent DNR Land Use within Priority CMAs



Prepared by: Julian Wall
Approved by: _____
Date: 11 October 2006
Status: Final

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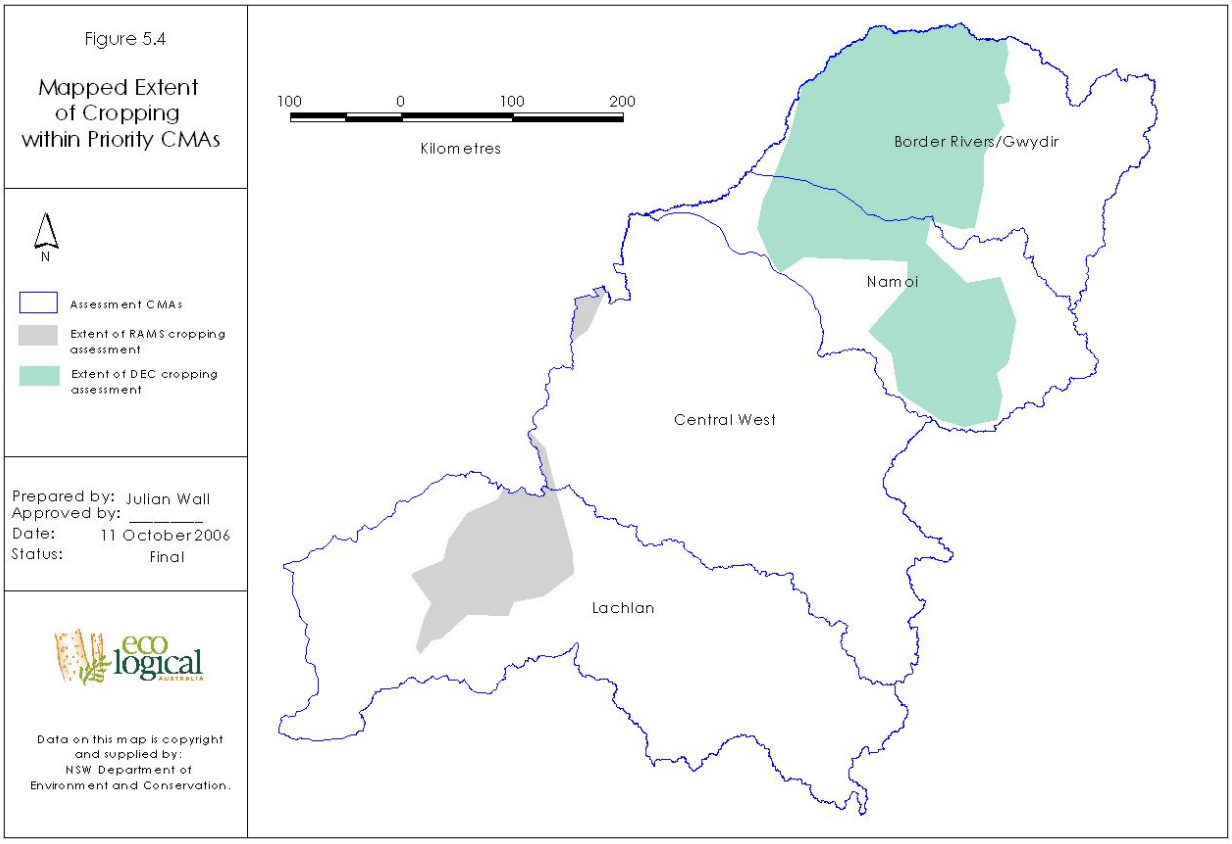
Figure 5.4

Mapped Extent of Cropping within Priority CMAs



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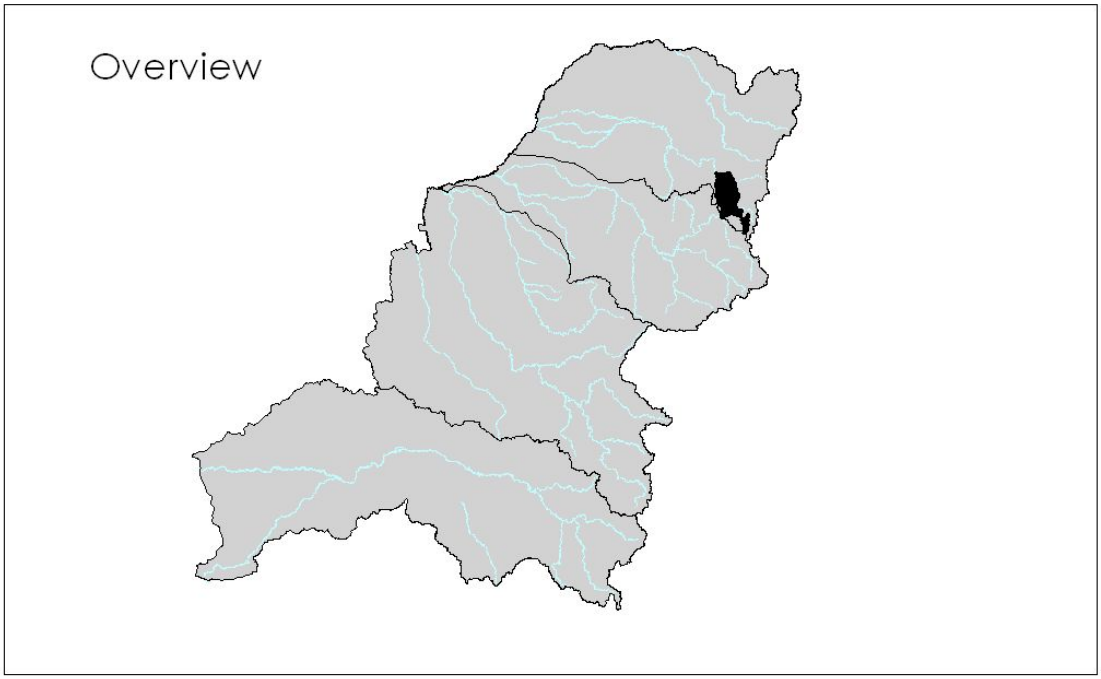

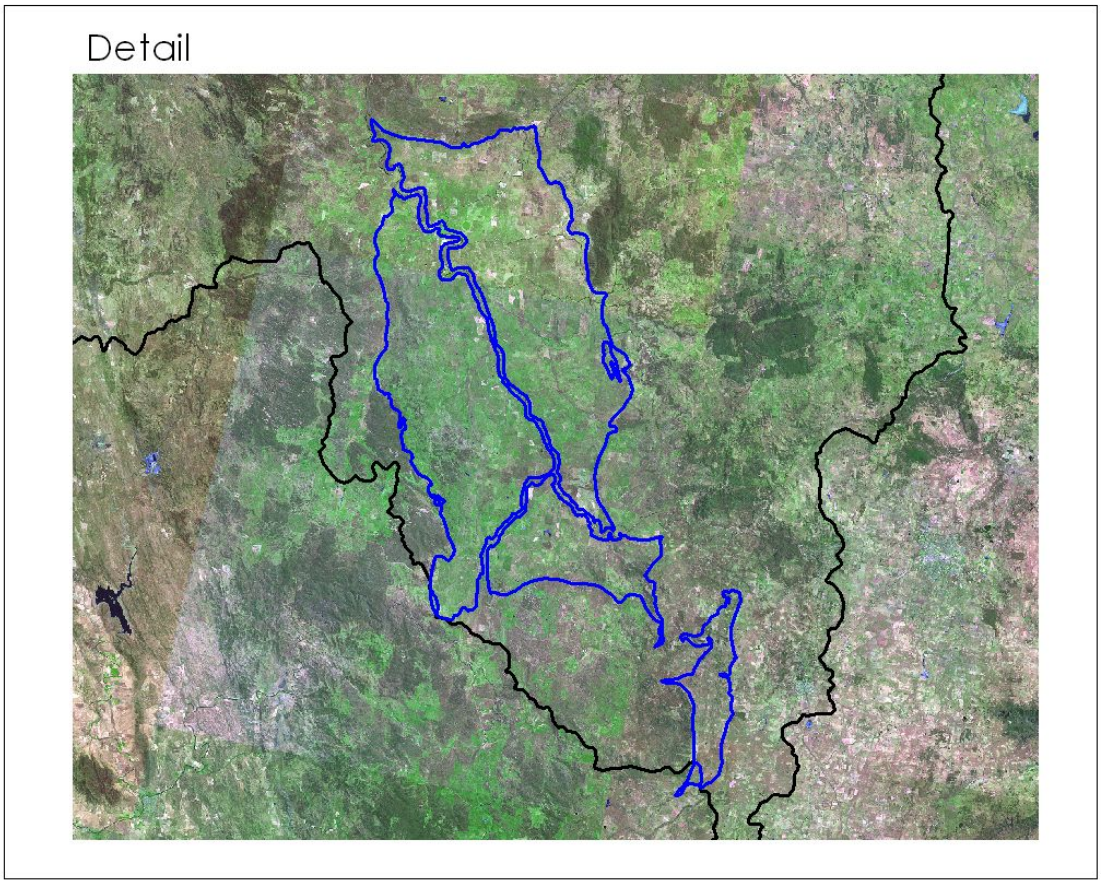

Figure 5.5.

'Overview' and 'Detail' Maps
for the Bundarra Valley Landscape

Prepared by:
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6. Results

6.1 Vegetation Mask Review - DEC

The vegetation mask and %-cleared review was undertaken by DEC for all Mitchell Landscapes in NSW (DEC 2006). However, the results provided here relate specifically to the four priority CMAs, namely Border Rivers/Gwydir, Central West, Lachlan and Namoi.

A total of 232 landscapes occur either wholly or partially within one or more of the four CMAs. Of these, 116 remained equal to or under the 70% threshold while 81 retained their 'overcleared' status (> 70% cleared) following the DEC vegetation mask review. The remaining 35 landscapes moved across the threshold, including 19 which gained an 'overcleared' status (previously ≤70% cleared) and 16 which relinquished their 'overcleared' status (previously >70% cleared).

Table 6.1 shows the effect of the DEC revision on the status of Mitchell Landscapes in each of the four priority CMAs (DEC 2006). The total number of 'overcleared' landscapes increased from 97 to 100 over the four catchments, representing an increased area of about 15000 km^2, or just over 5% of the combined area of the four CMAs. The number and area of 'overcleared' landscapes increased in Border Rivers/Gwydir, Central West and Namoi CMAs, while in Lachlan CMA the review resulted in reduction in the number and area of 'overcleared' landscapes. Figure 6.1 shows the spatial distribution of landscapes across the four CMAs according to status.

Table 6.1. Effect of the vegetation mask review on the 'overcleared' status of Mitchell Landscape units with four priority CMAs (DEC 2006).

	Catchment Management Authority									
	BRG		CW		Lachlan		Namoi		ALL	
Effect of Veg Mask review on Status	No	Area (km^2)	No	Area (km^2)	No	Area (km^2)	No	Area (km^2)	No	Area (km^2)
no change – not overcleared	23	22053	50	38773	44	44992	35	19712	116	125530
loss – revised to not overcleared	2	3534	8	2135	9	2321	3	5443	16	13433
no change - overcleared	10	15334	38	32616	42	37342	12	11209	81	96501
gain – revised to overcleared	4	9870	12	11275	4	1534	5	5695	19	28374
ALL	39	50791	108	84799	99	86189	55	42059	232	263838

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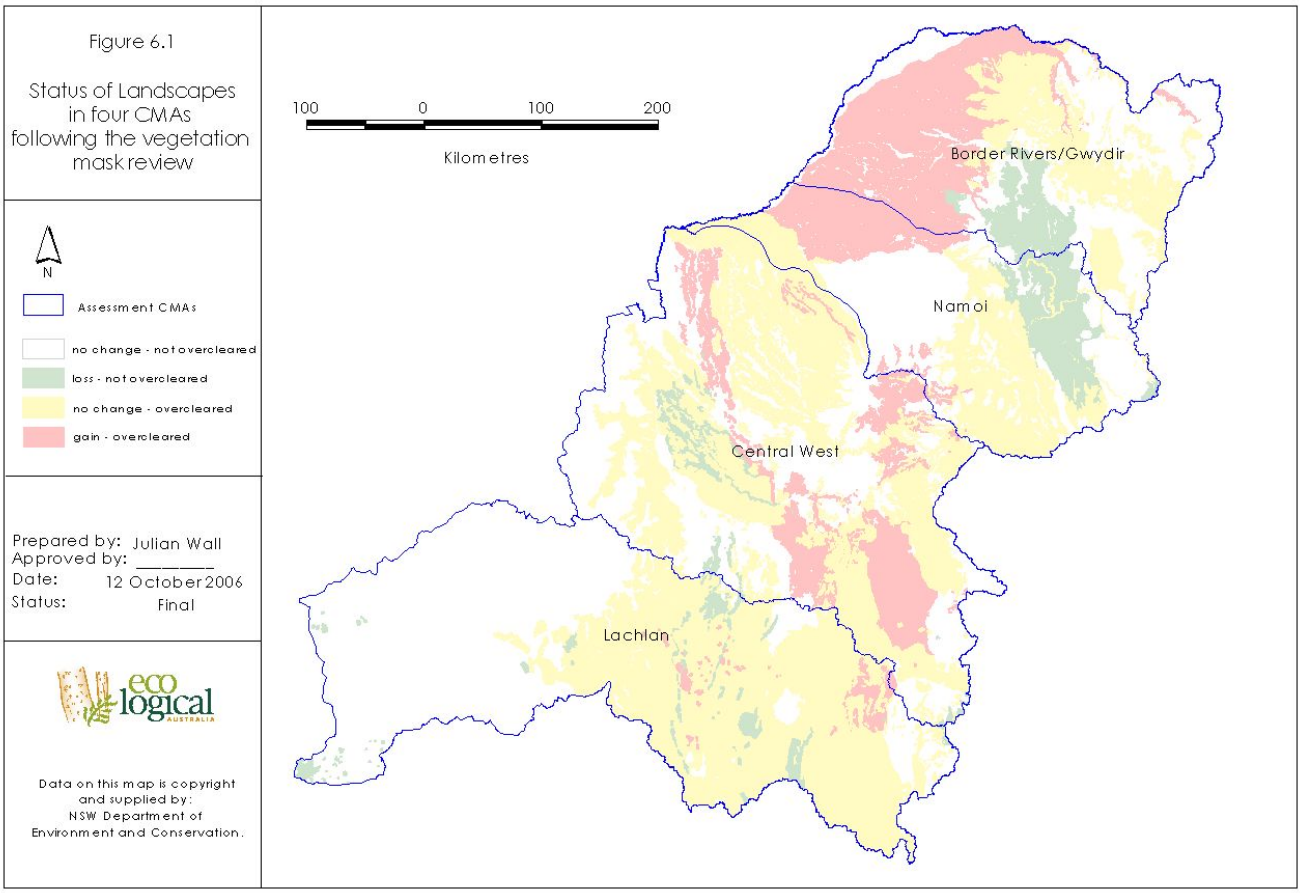

6.2 Landscape Screening

A total of 100 of the 232 landscapes located within the four CMAs were classified as 'overcleared' following the vegetation mask review conducted by DEC (Table 6.1). Of these, 40 landscapes exhibited a revised %-cleared estimate of at least 90%, all but two of which were classified as 'overcleared' prior to the vegetation mask review. Those two, namely *Macquarie Valley Basalts* and *Lachlan Terrace Gravels*, were retained for expert review, while the remaining 38 were eliminated from further consideration on the basis that no landscape in NSW was assumed to contain more than 20%, by area, of *natural* native grassland.

Of the remaining 62 landscapes exhibiting a revised %-cleared estimate of 70% to 89%, 14 were located within areas incorporating grasslands mapping (Figure 5.2). These were also eliminated from the expert review on the assertion that existing grasslands mapping had contributed directly to revision of each of their %-cleared estimates.

On completion of the screening process, a total of 48 Mitchell Landscapes had been retained for consideration by grasslands experts at the workshop. Appendix IV lists all 232 landscapes within the four CMAs, their location, original and revised %-cleared estimates, and reason or not for consideration in the workshop review. Table 6.2 lists the 48 landscapes considered at the workshop, and Figure 6.2 shows the distribution of 'overcleared' landscapes, including those retained for workshop review.

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Table 6.2. Mitchell landscapes for review.

Mitchell Landscape	CMA(s)	Total Area (km²)	%-cleared (original)	%-cleared (revised)	Overcleared Status
Ashford Karst	BRG	12	83	78	retain
Bugwah Alluvial Plains	CW	666	76	82	retain
Bundarra Valley	BRG,N	1193	78	79	retain
Burroway Plains	CW	1350	82	81	retain
Castlereagh Alluvial Plains	CW,N	10911	80	78	retain
Cherry Tree Plateau	CW	28	64	74	gain
Coolah Tops	CW,N	38	61	78	gain
Cope Hills Granite	CW	510	83	85	retain
Cowal Lakes, Swamps and Lunettes	L	369	25	71	gain
Dalton Hills	L	1301	72	85	retain
Dubbo Basalts	CW	175	97	82	retain
Dumaresq Channels	BRG	138	90	88	retain
Fifield Intrusives	CW,L	98	77	82	retain
Geurie Granites	CW	1445	63	74	gain
Glen Innes - Guyra Basalts	BRG	2479	84	82	retain
Gundary Plains	L	761	78	72	retain
Gwydir Alluvial Plains	BRG,N	14369	46	80	gain
Inverell Basalts	BRG	933	82	83	retain
Inverell Plateau Slopes	BRG	810	83	86	retain
Lachlan Terrace Gravels	L	12	66	98	gain
Liverpool Alluvial Plains	N	5954	72	84	retain
Liverpool Range Valleys and Footslopes	CW,N	1936	80	81	retain
Macintyre Alluvial Plains	BRG	3013	55	87	gain
Macintyre Swamps and Lagoons	BRG	16	57	74	gain
Macquarie Alluvial Plains	CW,L	3408	60	78	gain
Macquarie Valley Basalts	CW	43	70	95	gain
Merrygoen Hills and Slopes	CW	550	66	87	gain
Mole Valley	BRG	129	70	74	gain
Mollyan Hills	CW,N	1030	65	76	gain
Molong Ridges	CW,L	601	82	79	retain
Mooki - Namoi Channels and Floodplains	N	226	86	75	retain
Mount David Basalts	CW,L	292	77	74	retain
Myall Glen Basalts	CW	3	100	75	retain
Namoi Alluvial Plains	N	3152	37	79	gain
Nangar Slopes and Ranges	CW,L	1630	80	84	retain
Narromine Hills	CW	160	87	89	retain
Nundle Hills	N	573	76	72	retain
Oberon - Kialla Granites	CW,L	383	96	89	retain
Pangee Alluvial Plains	CW,L	3549	73	71	retain
Peel Channels and Floodplain	N	402	89	84	retain
Purlewaugh Plains	CW,N	737	66	75	gain
Scone - Gloucester Foothills	N	0	76	75	retain
Talabung Mountain	L	133	84	80	retain
Teriderie Alluvial Plains	CW,N	2074	71	73	retain
Trangie Terrace	CW	1088	93	86	retain
Warraderry Range	L	885	72	81	retain
Werris Creek Basalt Hills and Valleys	N	553	85	80	retain
Yallaroi Basalts	BRG	1054	85	87	retain

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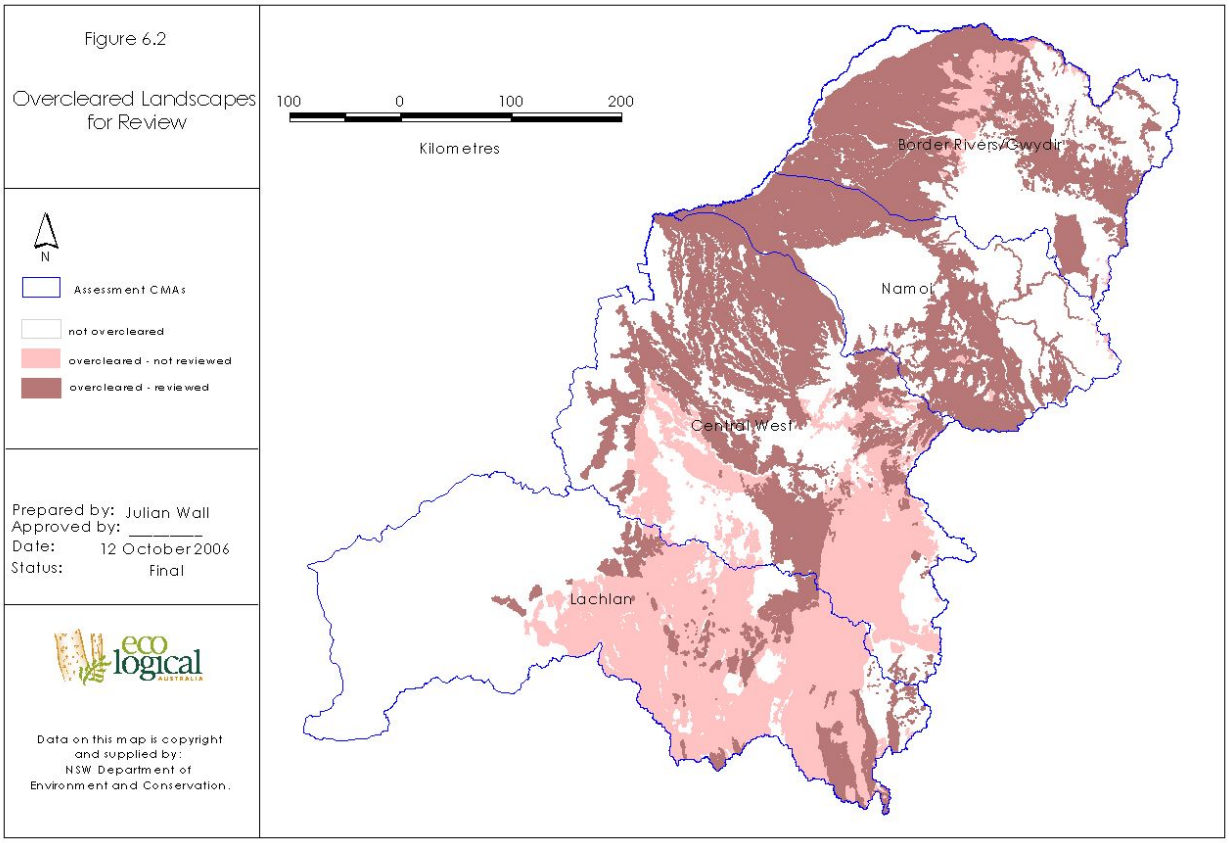

6.3 Landscape revision

Overview

The expert landscapes review convened in late October was a success for a number of reasons:

1. the process adopted by DEC for updating the vegetation mask and revising %-cleared estimates for individual landscapes was recognised as an improvement on the current values listed in *BioMetric*, and thus all revised %-cleared estimates were fully supported;

2. the process used by ELA to eliminate landscapes during the initial screening process was endorsed;

3. the broad differences between natural and derived native grasslands in terms of both definition and current and former distribution was well understood;

4. agreement was reached that the structural definition of natural native grassland, for the purpose of this expert review, should reflect that established within the broad PVP benchmark for Keith (2004) grassland types for the Central Division.

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5. it was recognised that the former distribution of natural native grasslands was likely to have been restricted to particular regions (eg. Moree Plains), and to very restricted pockets in other landscapes;

6. as claimed by the majority of literature, the significant decline in true grassland distribution was well recognised, and supported by visual demonstration of Spot5 imagery;

7. the process for reviewing individual landscapes, via ArcView files projected onto a wall by a data-projector, greatly facilitated and streamlined the decision making progress, to the extent that the review was completed on the first day (25th October). In particular, the Spot5 imagery presented an invaluable visual perspective of the extent of cropping within each landscape, which greatly assisted the decision process;

8. there was unanimous agreement on the final decision asserted for every landscape reviewed during the process;

9. the process was transparent, and all comments were documented and noted;

10. some pertinent issues regarding the conservation values of derived grasslands were raised, and these help define recommendations asserted in this report.

Specific outcomes

On completion of the review of %-cleared values assigned to each of 48 individual landscapes, 46 were considered to be 'overcleared' (>70% cleared) as determined by the DEC assessment, and their %-cleared values were retained.

The possibility of areas of intact natural grassland occurring in some landscapes was noted, however the extent of residual grassland was not considered extensive enough to warrant downward revision of the %-cleared estimate for all but one landscape:

1. **Burroway Plains**, Central West CMA :

   Visual inspection of the Spot5 image across the Burroway Plains landscape revealed a modest but not substantial cropping footprint across an almost treeless extent, implicating the possibility of a significant amount of remnant natural native grassland, albeit somewhat modified. This landscape was estimated to be 81% cleared following the DEC assessment, however, in the absence of grassland mapping, it was considered to contain enough unmapped natural grassland to warrant expert revision of the clearing estimate from 81% to 70%, effectively taking it under the 'overcleared' threshold.

The %-cleared value provided by DEC for each landscape in this review was generally consistent with a rapid visual inspection of its cleared extent against Spot5 imagery, even through a few appeared slightly more cleared than their estimate suggested. In one case, however, there was an obvious discrepancy between the new %-cleared estimate and the woody cover as observed against Spot5:

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2. **Coolah Tops**, Central West and Namoi CMAs.

   Visual inspection of the Spot5 image across the Coolah Tops landscape revealed a significant amount of woody vegetation, clearly more than the new 78%-cleared value based on new API layers collated and analysed by DEC. While it was agreed that no native grasslands were likely to have occurred in this relatively rugged landscape prior to European settlement, it was also agreed that the original %-cleared value of 61% was more likely than the revised value. As such, a value of 61% was unanimously agreed.

   Various comments were provided for each of the 48 reviewed Landscapes during the expert workshop, supporting their recommended outcome in terms of %-cleared upgrade. These are summarised in Appendix V.

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Appendix I – Land use types with potential to support retention of native grassland

MAPCODE	LUTYPE
50	Cemetery
56	Coastal marsh/estuary swamp
167	Crown reserve
157	Cultural heritage site
58	DLWC foreshore lands
57	Drainage channel
121	Drainage depression in cropping paddock
47	Energy corridor
47A	Energy corridor
131	Flood chute
74	Floodplain swamp
21	Floodplain swamp - backswamp
45	Grass airstrip
45A	Grass airstrip
82	Grassland with mining lease
168	Grazing - unmodified vegetation
4	Grazing - volunteer, naturalised or improved pasture
4A	Grazing - volunteer, naturalised or improved pasture
4SR	Grazing - volunteer, naturalised or improved pasture
4SS	Grazing - volunteer, naturalised or improved pasture
76	Lagoon/inland lake/open depression/playa
145	Land restoration areas - erosion
97	No identified use
113	Power easement
27	Private conservation agreement
169	Protected areas
143	Regeneration area
19	Road/road reserve
19A	Road/road reserve
130	Rural recreation
148	Sydney Catchment Authority unused land
59	Water catchment area
117	Wide road reserve/TSR
117f	Wide road reserve/TSR
117g	Wide road reserve/TSR
HISTORICAL SITE	
NOTMAPPED	
NP	
NR	
SCA	
SF	
SRA	

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Appendix II – Land use types with no potential to support retention of native grassland

MAPCODE	LUTYPE
87	Abandoned orchard
147	Abandoned urban area
60	Abbatoir
36	Aerodrome/airport
144	agroforestry
98	Aquaculture
122	Artificial wetland
102	Banana Plantation
102I	Banana Plantation - irrigation
64	Beach
110	Camphor Laurel dominant forest
107	Canal
109	Cliff, rock outcrop
109A	Cliff, rock outcrop
105	Coastal lake
129	Cotton
129I	Cotton - irrigation
1	Cropping - continuous or rotation
1A	Cropping - continuous or rotation
1TS	Cropping - continuous or rotation
1TV	Cropping - continuous or rotation
1I	Cropping - continuous or rotation - irrigation
1ITV	Cropping - continuous or rotation - irrigation
1Q	Cropping - continuous or rotation - irrigation
1TI	Cropping - continuous or rotation - irrigation
40I	Cropping - continuous or rotation - irrigation
186	Cropping - flood irrigation
140	Cropping - legumes for seed
140I	Cropping - legumes for seed - irrigation
116	Cut flowers
116I	Cut flowers - irrigated
32	Defence facility
83	Degraded land (salt/erosion)
83A	Degraded land (salt/erosion)
83TV	Degraded land (salt/erosion)
162	Dense shrubland
43	Derelict mining land
43A	Derelict mining land
58R	DLWC foreshore lands
58SD	DLWC foreshore lands
58SM	DLWC foreshore lands
58TM	DLWC foreshore lands
58TS	DLWC foreshore lands
159	Dog kennels/runs
79	Drain
12	Drainage channel

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MAPCODE	LUTYPE
12A	Drainage channel
12SD	Drainage channel
12SM	Drainage channel
12TI	Drainage channel
12TM	Drainage channel
12TS	Drainage channel
12TV	Drainage channel
106	Estuarine waters
120	Eucalyptus oil plantation
120I	Eucalyptus oil plantation - irrigation
91	Evaporation basin
142	Exotic plantation
14	Exotic timber plantation
14A	Exotic timber plantation
14I	Exotic timber plantation
15	Exotic timber plantation
15I	Exotic timber plantation
52	Exotic timber plantation
8	Farm dam
8A	Farm dam
137	Firebreak
34	Fish/prawn farm
134	Flood refuge
71	Flood/irrigation structure
22	Floodplain swamp - billabong
84	Fodder Cropping (eg. oats)
84L	Fodder Cropping (eg. oats)
84I	Fodder Cropping (eg. oats) - irrigation
84Q	Fodder Cropping (eg. oats) - irrigation
119	Grass waterway
82L	Grassland with mining lease
82R	Grassland with mining lease
82TM	Grassland with mining lease
82TS	Grassland with mining lease
82TV	Grassland with mining lease
5	Grazing - improved perennial pasture
5A	Grazing - improved perennial pasture
5TM	Grazing - improved perennial pasture
5TS	Grazing - improved perennial pasture
5TV	Grazing - improved perennial pasture
5W	Grazing - improved perennial pasture
5Q	Grazing - improved perennial pasture - irrigation
5TI	Grazing - improved perennial pasture - irrigation
6	Grazing - irrigated pasture
168R	Grazing - unmodified vegetation
168SR	Grazing - unmodified vegetation
4L	Grazing - volunteer, naturalised or improved pasture
4Q	Grazing - volunteer, naturalised or improved pasture
4R	Grazing - volunteer, naturalised or improved pasture
4RA	Grazing - volunteer, naturalised or improved pasture
4RTS	Grazing - volunteer, naturalised or improved pasture

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MAPCODE	LUTYPE
4RTV	Grazing - volunteer, naturalised or improved pasture
4SD	Grazing - volunteer, naturalised or improved pasture
4SM	Grazing - volunteer, naturalised or improved pasture
4SRA	Grazing - volunteer, naturalised or improved pasture
4TD	Grazing - volunteer, naturalised or improved pasture
4TM	Grazing - volunteer, naturalised or improved pasture
4TS	Grazing - volunteer, naturalised or improved pasture
4TV	Grazing - volunteer, naturalised or improved pasture
4W	Grazing - volunteer, naturalised or improved pasture
4WTS	Grazing - volunteer, naturalised or improved pasture
4WTV	Grazing - volunteer, naturalised or improved pasture
4RTI	Grazing - volunteer, naturalised or improved pasture - irrigation
4TI	Grazing - volunteer, naturalised or improved pasture - irrigation
4WTI	Grazing - volunteer, naturalised or improved pasture - irrigation
41	Hardwood plantation
41A	Hardwood plantation
41I	Hardwood plantation
151	Hobby Farm
90	Horse stud
35	Horticulture - cut flowers
35I	Horticulture - cut flowers - irrigation
154I	Horticulture - Jojoba
38	Horticulture - olives
38I	Horticulture - olives - irrigation
2	Horticulture - orchard
2I	Horticulture - orchard - irrigation
37	Horticulture - seed production
126I	Horticulture - Truffles
39	Horticulture - vegetables
39I	Horticulture - vegetables - irrigation
3	Horticulture - vineyard
3I	Horticulture - vineyard - irrigation
166	Illegal recreation
103	Infrastructure
112	Infrastructure
115	Infrastructure
127	Infrastructure
139	Infrastructure
141	Infrastructure
163	Infrastructure
53	Infrastructure
63	Infrastructure
80	Infrastructure
81	Infrastructure
93	Infrastructure
86	Inland salt lake
124	Intensive animal production
135	Intensive animal production
26	Intensive animal production

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MAPCODE	LUTYPE
26a	Intensive animal production
26b	Intensive animal production
26c	Intensive animal production
26d	Intensive animal production
26g	Intensive animal production
26h	Intensive animal production
26o	Intensive animal production
26p	Intensive animal production
26r	Intensive animal production
26s	Intensive animal production
26u	Intensive animal production
132	Irrigation dam
136	Irrigation supply channel
146	Land restoration areas - riparian
48W	Lantana Infestations
54	Mangrove
54A	Mangrove
100	Marina
44	Mine
44A	Mine
78	Mining activities
78A	Mining activities
114	Mining activity
133	Mining activity
55	Mudflat
55A	Mudflat
13	Native forest
13A	Native forest
9	Native forest
9A	Native forest
9SR	Native forest
10	Native forest - logged
10A	Native forest - logged
11	Native forest - regeneration
11A	Native forest - regeneration
11SR	Native forest - regeneration
70	Native woodland
67	Native woody scrub
42	Nursery
42I	Nursery - irrigation
104	Nut Plantation
104I	Nut Plantation - irrigation
158	Oyster lease
113R	Power easement
113TM	Power easement
113TS	Power easement
7	Quarry
7A	Quarry
20	Railway
20v	Railway
68	Recently cleared

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MAPCODE	LUTYPE
68R	Recently cleared
24	Remnant linear forest/woodland
24R	Remnant linear forest/woodland
24TS	Remnant linear forest/woodland
24TV	Remnant linear forest/woodland
46	Reservoir
46A	Reservoir
149	Resort
49	Restored mining site
49A	Restored mining site
95	Restored sand mining area
30	Riparian vegetation (mainly willows)
65	River gravel deposit
51	River training
19TI	Road/road reserve
19TV	Road/road reserve
152	Rural residential - forest blocks
152A	Rural residential - forest blocks
125	Salt treatment site
125E	Salt treatment site
164	Saltbush planting (for grazing)
96	Sand spit/island
165	Sawmill
101	Secondary grassland
101A	Secondary grassland
23	Swamp
23R	Swamp
23TD	Swamp
23TM	Swamp
23TS	Swamp
69	Tea-Tree Plantation
85	Temporary water storage
25	Treelot
25E	Treelot
25N	Treelot
25TV	Treelot
72	Trig station
88	Turf farm
88I	Turf farm - irrigation
155	Urban
16	Urban
160	Urban
16A	Urban
17	Urban
17TM	Urban
17TS	Urban
18	Urban
18R	Urban
18TI	Urban
18TM	Urban
18TS	Urban

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MAPCODE	LUTYPE
29	Urban
29I	Urban
31	Urban
31A	Urban
31I	Urban
31TS	Urban
33	Urban
33A	Urban
61	Urban
75	Urban
77	Urban
92	Urban
92A	Urban
94	Urban
94A	Urban
99	Vegetated foredune
111	Vineyard
111TS	Vineyard
118	Vineyard
62	Wastewater irrigation
123	Water supply infrastructure
128	Water supply infrastructure
73	Wetland - dunal swamp
170	
185	
MP	
NA	

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Appendix III – Workshop Agenda and Participants

'Overcleared' Landscapes Workshop
Wednesday 25th – Thursday 26th October, 2006.
Department of Environment and Conservation
43 Bridge Street,
Hurstville NSW.

Level 5, Room 5.01

Agenda

Wednesday 25th

10:00 – 10:30	*morning tea & welcome*
10:30 – 10:45	overview of project
10:45 – 11:45	methodology for %-cleared revision – DEC
11:45 – 12:30	issues re. native grasslands in 'overcleared' landscapes
12:30 – 13:30	*lunch*
13:30 – 14:15	methodology for initial screening of 'overcleared' landscapes
14:15 – 17:00	review of individual landscapes - Lachlan

Thursday 26th

09:00 – 10:30	review of individual landscapes – Central West
10:30- 10:45	*morning tea*
10:45 – 12:30	review of individual landscapes - Namoi
12:30 – 13:30	*lunch*
13:30 – 16:00	review of individual landscapes – Border Rivers/Gwydir

Participants

Ron Avery	Head, GIS Major Programs Unit, DEC
John Benson	Senior Plant Ecologist, BGT Sydney
Dennis Boschma	Catchment Coordinator, Native Vegetation, Namoi CMA
Alan Ede	Catchment Coordinator, Border Rivers/Gwydir CMA
Charles Huxtable	Terrestrial Ecologist, DNR
Gary Hyde	Project Manager, Biodiversity Information, DEC
Silvana Keating	Catchment Coordinator, Lachlan CMA
Steve Lewer	Regional Biodiversity Conservation Officer, DEC
Bruce Mullins	Manager, Strategic Planning and Assessment, ELA
Dominic Sivertsen	Senior Natural Resources Project Leader, DNR
Peter Smith	Senior Ecologist, DNR
Greg Steenbeeke	Catchment Officer, Border Rivers/Gwydir CMA
Julian Wall	Senior Consultant, ELA

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Appendix IV – Summary information for Mitchell Landscapes in the four priority CMAs

Mitchell Landscape	CMA(s)	Total Area (km²)	%-cleared (original)	%-cleared (revised)	'Overcleared' Status	Workshop Review	Justification
Ardlethan Hills	L	1833	90	90	retain	no	90-100% cleared (previously 'overcleared')
Ashford Karst	BRG	12	83	78	retain	yes	70-89% cleared, no grassland mapping
Ashford Mole Valleys	BRG	2055	66	66		no	not 'overcleared'
Attunga Karst	N	13	77	55	loss	no	not 'overcleared'
Baldwin Mountains	N	51	22	10		no	not 'overcleared'
Barradine - Coghill Channels and Floodplains	N	529	20	20		no	not 'overcleared'
Barradine Alluvial Plains	CW,N	2278	33	36		no	not 'overcleared'
Barwon Aeolian Sands	BRG	16	0	14		no	not 'overcleared'
Barwon Alluvial Plains	BRG,CW,N	1527	14	38		no	not 'overcleared'
Barwon Channels and Floodplains	BRG,CW,N	1214	22	34		no	not 'overcleared'
Bathurst Granites	CW,L	1514	80	84	retain	no	within mapped grasslands extent
Bebo Ranges and Slopes	BRG	1168	38	38		no	not 'overcleared'
Belata Sands	BRG	144	89	69	loss	no	not 'overcleared'
Belmont Hills	CW,L	669	72	71	retain	no	within mapped grasslands extent
Bimbi Plains	CW,L	8053	93	93	retain	no	90-100% cleared (previously 'overcleared')
Black Range	CW,L	271	35	28		no	not 'overcleared'
Bodangora Granites	CW	137	93	98	retain	no	90-100% cleared (previously 'overcleared')
Bogan Alluvial Plains	CW,L	4416	57	63		no	not 'overcleared'
Bogan Channels and Floodplains	CW	1807	29	44		no	not 'overcleared'
Bogan Swamps and Lagoons	CW	72	72	75	retain	no	within mapped grasslands extent
Boggy Cowal Alluvial Plains	CW	2392	88	82	retain	no	within mapped grasslands extent
Boggy Cowal Channels and Floodplains	CW	1183	77	65	loss	no	not 'overcleared'
Boggy Cowal Swamps and Lagoons	CW	141	86	82	retain	no	within mapped grasslands extent
Boona Mountains	CW,L	300	50	34		no	not 'overcleared'
Boorowa Volcanics	L	1665	88	90	retain	no	90-100% cleared (previously 'overcleared')
Boyd Plateau Granites	L	9	0	0		no	not 'overcleared'
Breadalbane Swamps and Lagoons	L	117	96	91	retain	no	90-100% cleared (previously 'overcleared')
Breeza Hills Basalt Caps	N	208	9	36		no	not 'overcleared'
Breeza Hills Sandstone-Shale Slopes	N	1001	32	53		no	not 'overcleared'
Buckambool - Jackermaroo Hills	L	150	5	9		no	not 'overcleared'

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Bugaldie Uplands	CW,N	2155	28	26		no	not 'overcleared'
Bugwah Alluvial Plains	CW	666	76	82	retain	yes	70-89% cleared, no grassland mapping
Bugwah Channels and Floodplains	CW	489	81	70	loss	no	not 'overcleared'
Bugwah Swamps and Lagoons	CW	65	77	69	loss	no	not 'overcleared'
Bundarra Valley	BRG,N	1193	78	79	retain	yes	70-89% cleared, no grassland mapping
Burgooney Plains	L	2158	94	95	retain	no	90-100% cleared (previously 'overcleared')
Burroway Plains	CW	1350	82	81	retain	yes	70-89% cleared, no grassland mapping
Byng Ultramafics	CW,L	96	82	96	retain	no	90-100% cleared (previously 'overcleared')
Calarie Plains	L	396	95	94	retain	no	90-100% cleared (previously 'overcleared')
Canbellego - Boppy Hills	CW	30	0	6		no	not 'overcleared'
Canobolas Peaks	CW,L	25	27	56		no	not 'overcleared'
Canobolas Sheet Basalts	CW,L	732	92	94	retain	no	90-100% cleared (previously 'overcleared')
Canobolas Slopes	L	1222	93	96	retain	no	90-100% cleared (previously 'overcleared')
Capertee Plateau	CW	717	58	59		no	not 'overcleared'
Capertee Slopes	CW	60	34	28		no	not 'overcleared'
Carcour Intrusives	CW,L	96	95	99	retain	no	90-100% cleared (previously 'overcleared')
Cassilis Slopes	CW	767	65	62		no	not 'overcleared'
Castlereagh Alluvial Plains	CW,N	10911	80	78	retain	yes	70-89% cleared, no grassland mapping
Castlereagh Channels and Floodplains	CW	4092	69	60		no	not 'overcleared'
Castlereagh Swamps, Lagoons and Dunes	CW,N	380	43	61		no	not 'overcleared'
Cherry Tree Plateau	CW	28	64	74	gain	yes	70-89% cleared, no grassland mapping
Cobar Downs	CW	3168	14	13		no	not 'overcleared'
Cobar Isolated Hills	CW	70	4	6		no	not 'overcleared'
Cobar Plains	CW	18	4	3		no	not 'overcleared'
Cocoparra Ranges and Footslopes	L	1298	68	69		no	not 'overcleared'
Coghill Alluvial plains	N	1817	37	40		no	not 'overcleared'
Collarenebri Tablelands and Downs	BRG	8	22	20		no	not 'overcleared'
Coolah Tops	CW,N	38	61	78	gain	yes	70-89% cleared, no grassland mapping
Cootamundra - Tumut Serpentinite and Ultramafics	L	41	83	91	retain	no	90-100% cleared (previously 'overcleared')
Cope Hills Granite	CW	510	83	85	retain	yes	70-89% cleared, no grassland mapping
Cowal Lakes, Swamps and Lunettes	L	369	25	71	gain	yes	70-89% cleared, no grassland mapping
Crookwell Basalts and Sands	L	260	94	92	retain	no	90-100% cleared (previously 'overcleared')
Croppa Clay Plains	BRG	2936	85	92	retain	no	90-100% cleared (previously 'overcleared')

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Croppa Creek Channels and Floodplains	BRG	269	79	90	retain	no	90-100% cleared (previously 'overcleared')
Cubbo Uplands	CW,N	3115	13	16		no	not 'overcleared'
Cudgegong Channels and Floodplains	CW	161	94	97	retain	no	90-100% cleared (previously 'overcleared')
Curriba Basalt Hills	L	134	94	93	retain	no	90-100% cleared (previously 'overcleared')
Dalton Hills	L	1301	72	85	retain	yes	70-89% cleared, no grassland mapping
Dingo Spur Meta-sediments	BRG	258	39	39		no	not 'overcleared'
Dubbo Basalts	CW	175	97	82	retain	yes	70-89% cleared, no grassland mapping
Dumaresq Channels	BRG	138	90	88	retain	yes	70-89% cleared, no grassland mapping
Dumaresq Gorges	BRG	30	30	47		no	not 'overcleared'
Eugowra Plains	L	1438	92	96	retain	no	90-100% cleared (previously 'overcleared')
Fifield Intrusives	CW,L	98	77	82	retain	yes	70-89% cleared, no grassland mapping
Frampton Hills	L	288	81	83	retain	no	within mapped grasslands extent
Ganantagi Mountain and Footslopes	CW,L	98	67	57		no	not 'overcleared'
Gap Hills	N	76	53	41		no	not 'overcleared'
Geurie Granites	CW	1445	63	74	gain	yes	70-89% cleared, no grassland mapping
Gilgunnia - Broken Ranges	L	253	0	3		no	not 'overcleared'
Glen Innes - Guyra Basalts	BRG	2479	84	82	retain	yes	70-89% cleared, no grassland mapping
Goobothery Hills and Footslopes	L	366	67	67		no	not 'overcleared'
Goonoo Slopes	CW	6377	67	66		no	not 'overcleared'
Goonumbla Hills	CW,L	1085	94	92	retain	no	90-100% cleared (previously 'overcleared')
Goulburn River Gorges	CW	6	19	30		no	not 'overcleared'
Gulgong Ranges	CW	1858	71	81	retain	no	within mapped grasslands extent
Gumble Hills	CW,L	52	69	70		no	not 'overcleared'
Gundary Plains	L	761	78	72	retain	yes	70-89% cleared, no grassland mapping
Gunning Hills	L	1564	82	94	retain	no	90-100% cleared (previously 'overcleared')
Gunningbland Range and Slopes	L	294	74	67	loss	no	not 'overcleared'
Guyra Lagoons and Swamps	BRG	4	60	37		no	not 'overcleared'
Guyra Tops Granite	BRG	162	54	51		no	not 'overcleared'
Gwydir Alluvial Plains	BRG,N	14369	46	80	gain	yes	70-89% cleared, no grassland mapping
Gwydir Channels and Floodplains	BRG	2365	52	68		no	not 'overcleared'
Gwydir Swamps and Lagoons	BRG	190	22	66		no	not 'overcleared'
Harvey Ranges and Slopes	CW,L	1812	52	55		no	not 'overcleared'
Hillston Sandplains	L	4938	48	52		no	not 'overcleared'

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Inverell Basalts	BRG	933	82	83	retain	yes	70-89% cleared, no grassland mapping
Inverell Plateau Granites	BRG	4917	40	37		no	not 'overcleared'
Inverell Plateau Slopes	BRG	810	83	86	retain	yes	70-89% cleared, no grassland mapping
Ivanhoe - Nangara Dunes	L	382	2	2		no	not 'overcleared'
Ivanhoe - Nangara Fresh Lakes and Swamps	L	15	0	0		no	not 'overcleared'
Ivanhoe - Nangara Linear Dunes	L	947	0	1		no	not 'overcleared'
Ivanhoe - Nangara Sandplains	L	3262	1	3		no	not 'overcleared'
Jemalong Range and Slopes	CW,L	330	76	64	loss	no	not 'overcleared'
Jenolan - Wombeyan Karst	CW,L	6	73	57	loss	no	not 'overcleared'
Kaputar Hill Crest Flows and Sands	BRG,N	522	67	57		no	not 'overcleared'
Kaputar Slopes	BRG,N	1534	42	35		no	not 'overcleared'
Kaputar Tops	BRG,N	25	28	0		no	not 'overcleared'
Kelvin Range	N	86	17	6		no	not 'overcleared'
Kerringle Outwash Sands	N	131	20	25		no	not 'overcleared'
Lachlan - Bland Channels and Floodplains	L	3618	86	82	retain	no	within mapped grasslands extent
Lachlan Channels and Floodplains	L	5295	12	34		no	not 'overcleared'
Lachlan Depression Plains	L	4407	8	28		no	not 'overcleared'
Lachlan Gorge	L	55	25	55		no	not 'overcleared'
Lachlan Lakes, Swamps and Lunettes	L	504	80	26	loss	no	not 'overcleared'
Lachlan Sandplains	L	329	18	24		no	not 'overcleared'
Lachlan Scalded Plains	L	6112	0	5		no	not 'overcleared'
Lachlan Terrace Gravels	L	12	66	98	gain	yes	90-100% cleared (previously 0-70%)
Leadley Hills	CW,L	52	77	68	loss	no	not 'overcleared'
Lightning Ridge Tablelands and Downs	CW,N	137	8	9		no	not 'overcleared'
Liverpool Alluvial Plains	N	5954	72	84	retain	yes	70-89% cleared, no grassland mapping
Liverpool Range Valleys and Footslopes	CW,N	1936	80	81	retain	yes	70-89% cleared, no grassland mapping
Liverpool Tops	CW,N	202	20	25		no	not 'overcleared'
Macintyre Aeolian Sands	BRG	103	4	49		no	not 'overcleared'
Macintyre Alluvial Plains	BRG	3013	55	87	gain	yes	70-89% cleared, no grassland mapping
Macintyre Swamps and Lagoons	BRG	16	57	74	gain	yes	70-89% cleared, no grassland mapping
Macquarie - Turon Gorges	CW	286	68	84	gain	no	within mapped grasslands extent
Macquarie Alluvial Plains	CW,L	3408	60	78	gain	yes	70-89% cleared, no grassland mapping
Macquarie Channels and Floodplains	CW	1981	59	58		no	not 'overcleared'

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Macquarie Marshes	CW	1096	12	55		no	not 'overcleared'
Macquarie Valley Basalts	CW	43	70	95	gain	yes	90-100% cleared (previously 0-70%)
Mandurama Slopes	CW,L	1229	60	79	gain	no	within mapped grasslands extent
Manitoba Hills and Footslopes	L	2028	93	94	retain	no	90-100% cleared (previously 'overcleared')
Manna Hills and Footslopes	L	278	75	63	loss	no	not 'overcleared'
Marilba Range	L	78	85	84	retain	no	within mapped grasslands extent
Marra Alluvial Plains	CW	1013	32	36		no	not 'overcleared'
Marra Swamps and Lagoons	CW	29	17	17		no	not 'overcleared'
Marron Hills	CW	173	80	97	retain	no	90-100% cleared (previously 'overcleared')
Merrygoen Hills and Slopes	CW	550	66	87	gain	yes	70-89% cleared, no grassland mapping
Merulya Alluvial Plains	CW,L	1974	82	81	retain	no	within mapped grasslands extent
Mole Valley	BRG	129	70	74	gain	yes	70-89% cleared, no grassland mapping
Mollyan Hills	CW,N	1030	65	76	gain	yes	70-89% cleared, no grassland mapping
Molong Ridges	CW,L	601	82	79	retain	yes	70-89% cleared, no grassland mapping
Mooki - Namoi Channels and Floodplains	N	226	86	75	retain	yes	70-89% cleared, no grassland mapping
Mooki Swamps and Lagoons	N	164	95	98	retain	no	90-100% cleared (previously 'overcleared')
Moonbi - Walcha Granites	BRG,N	5559	53	52		no	not 'overcleared'
Mount David Basalts	CW,L	292	77	74	retain	yes	70-89% cleared, no grassland mapping
Mount Foster	CW	6	0	23		no	not 'overcleared'
Mount Horrible Plateau	CW	1485	51	61		no	not 'overcleared'
Mount Royal Ridges	N	183	46	56		no	not 'overcleared'
Mount Royal Tops	N	173	39	30		no	not 'overcleared'
Mullion Slopes	CW,L	2443	92	93	retain	no	90-100% cleared (previously 'overcleared')
Mungo - Marona Lakes and Swamps	L	3	0	3		no	not 'overcleared'
Mungo - Marona Relic Lakes	L	63	1	11		no	not 'overcleared'
Mungo - Marona Sandplains	L	1442	1	15		no	not 'overcleared'
Mungo Lakes Complex	L	509	0	18		no	not 'overcleared'
Murrumbidgee - Tarcutta Channels and Floodplains	L	7	91	91	retain	no	90-100% cleared (previously 'overcleared')
Murrumbidgee Channels and Floodplains	L	61	21	55		no	not 'overcleared'
Murrumbidgee Lakes, Swamps and Lunettes	L	6	68	46		no	not 'overcleared'
Murrumbidgee Scalded Plains	L	2	24	67		no	not 'overcleared'
Myall Glen Basalts	CW	3	100	75	retain	yes	70-89% cleared, no grassland mapping
Namoi Aeolian Sands	N	25	0	11		no	not 'overcleared'

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Namoi Alluvial Plains	N	3152	37	79	gain	yes	70-89% cleared, no grassland mapping
Namoi Channels and Floodplains	N	793	39	58		no	not 'overcleared'
Nangar Slopes and Ranges	CW,L	1630	80	84	retain	yes	70-89% cleared, no grassland mapping
Nangarybone Hills	CW,L	1226	24	31		no	not 'overcleared'
Narromine Hills	CW	160	87	89	retain	yes	70-89% cleared, no grassland mapping
Newnes Plateau	CW	35	9	4		no	not 'overcleared'
Niangala Plateau and Slopes	BRG,N	1961	67	65		no	not 'overcleared'
Nombi Plateau and Pinnacles	CW,N	783	63	67		no	not 'overcleared'
Nowendoc - Yarras Serpentinite	N	7	48	49		no	not 'overcleared'
Nundle Hills	N	573	76	72	retain	yes	70-89% cleared, no grassland mapping
Nymagee Downs	CW,L	6603	30	35		no	not 'overcleared'
Nymagee Granite Downs	CW,L	1628	35	46		no	not 'overcleared'
Nymagee Incised Streams	CW	112	67	55		no	not 'overcleared'
Nymagee Isolated Bedrock Hills	CW,L	137	18	10		no	not 'overcleared'
Nymagee Linear Dunes	L	35	8	6		no	not 'overcleared'
Nymagee Ranges	CW,L	168	5	5		no	not 'overcleared'
Nymagee Sandplains	CW,L	1296	37	42		no	not 'overcleared'
Nymagee Wide Valleys	L	1182	48	61		no	not 'overcleared'
Oberon - Kialla Granites	CW,L	383	96	89	retain	yes	70-89% cleared, no grassland mapping
Old Harbour Lagoon	CW	2	100	100	retain	no	90-100% cleared (previously 'overcleared')
Ophir - Hargraves Plateau	CW	3795	67	84	gain	no	within mapped grasslands extent
Pangee Alluvial Plains	CW,L	3549	73	71	retain	yes	70-89% cleared, no grassland mapping
Peel Channels and Floodplain	N	402	89	84	retain	yes	70-89% cleared, no grassland mapping
Purlewaugh Plains	CW,N	737	66	75	gain	yes	70-89% cleared, no grassland mapping
Quandong Hills	L	255	88	94	retain	no	90-100% cleared (previously 'overcleared')
Rockley Plains	CW,L	4149	62	62		no	not 'overcleared'
Scone - Gloucester Foothills	N	0	76	75	retain	yes	70-89% cleared, no grassland mapping
Scotts Craig Hills	L	121	32	49		no	not 'overcleared'
Shepherds Hill	L	461	53	58		no	not 'overcleared'
Shooters Hill	CW,L	199	77	66	loss	no	not 'overcleared'
Slippery Rock Range	N	619	48	41		no	not 'overcleared'
Split Yard Plateau	BRG,N	429	51	33		no	not 'overcleared'
Springdale Hills	L	553	92	93	retain	no	90-100% cleared (previously 'overcleared')

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Strathmore Sandstones	BRG	3455	53	50		no	not 'overcleared'
Sydney Basin Basalt Caps	CW	8	38	32		no	not 'overcleared'
Sydney Basin Diatremes	CW	20	27	32		no	not 'overcleared'
Sydney Basin Western Escarpment	CW	152	32	29		no	not 'overcleared'
Talabung Mountain	L	133	84	80	retain	yes	70-89% cleared, no grassland mapping
Talbragar - Upper Macquarie Terrace Sands and Gravels	CW	912	93	93	retain	no	90-100% cleared (previously 'overcleared')
Tamworth - Keepit Slopes and Plains	BRG,N	8720	71	64	loss	no	not 'overcleared'
Teriderie Alluvial Plains	CW,N	2074	71	73	retain	yes	70-89% cleared, no grassland mapping
Teriderie Channels and Floodplains	CW	188	67	73	gain	no	within mapped grasslands extent
The Needles Basalt Peaks	N	52	52	27		no	not 'overcleared'
Tia Tops	N	130	79	67	loss	no	not 'overcleared'
Tottenham Hills	CW,L	909	59	55		no	not 'overcleared'
Trangie Terrace	CW	1088	93	86	retain	yes	70-89% cleared, no grassland mapping
Trinkey Plateau	CW,N	1499	37	42		no	not 'overcleared'
Tullamore Hills	CW,L	230	75	68	loss	no	not 'overcleared'
Ulandra - Narrabulla Hills and Slopes	L	281	65	62		no	not 'overcleared'
Upper Castlereagh Alluvial Plains	CW	353	86	95	retain	no	90-100% cleared (previously 'overcleared')
Upper Castlereagh Channels and Floodplains	CW	481	89	93	retain	no	90-100% cleared (previously 'overcleared')
Upper Gwydir Channels and Floodplains	BRG	237	62	64		no	not 'overcleared'
Upper Lachlan Channels and Floodplains	L	577	94	96	retain	no	90-100% cleared (previously 'overcleared')
Upper Macquarie Channels and Floodplains	CW	73	100	96	retain	no	90-100% cleared (previously 'overcleared')
Upper Namoi Swamps and Lagoons	N	17	34	49		no	not 'overcleared'
Uralla Basalts and Sands	BRG,N	112	93	92	retain	no	90-100% cleared (previously 'overcleared')
Waranary - Yathong Ranges	L	1045	1	4		no	not 'overcleared'
Warraderry Range	L	885	72	81	retain	yes	70-89% cleared, no grassland mapping
Warrumba Range and Slopes	L	615	33	42		no	not 'overcleared'
Warrumbungle Slopes	CW,N	1036	46	51		no	not 'overcleared'
Warrumbungle Tops	CW,N	63	2	18		no	not 'overcleared'
Weddin Range and Slopes	CW,L	827	73	70	loss	no	90-100% cleared (previously 'overcleared')
Wellington - Molong Karst	N	119	93	99	retain	no	70-89% cleared, no grassland mapping
Werris Creek Basalt Hills and Valleys	N	553	85	80	retain	yes	70-89% cleared, no grassland mapping
Wollemi Ranges	BRG,N	503	7	5		no	not 'overcleared'
Woods Reef Serpentinite	L	88	37	45		no	90-100% cleared (previously 'overcleared')

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Mitchell Landscape	CMA(s)	Total Area (km^2)	%-cleared (original)	%-cleared (revised)	'Overcleared' Status	Workshop Review	Justification
Woodstock Basalts	L	172	98	99	retain	no	90-100% cleared (previously 'overcleared')
Wyangla Hills	BRG	1417	76	94	retain	no	70-89% cleared, no grassland mapping
Yallaroi Basalts	BRG	1054	85	87	retain	yes	90-100% cleared (previously 'overcleared')
Young Hills and Slopes	L	1363	86	91	retain	no	90-100% cleared (previously 'overcleared')

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Appendix V – Summary of workshop outcomes for each reviewed CMA

Landscape	CMA(s)	%-cleared	Workshop Outcome	Workshop Comments
Ashford Karst	BRG	78	retain as 'overcleared'	ex open forest and woodland; no former native grasslands
Bugwah Alluvial Plains	CW	82	retain as 'overcleared'	restricted grassland and saltbush areas; ex low open woodlands; heavily disturbed
Bundarra Valley	BRG,N	79	retain as 'overcleared'	ex open forest and woodland; no former grasslands
Burroway Plains	CW	81	not 'overcleared' = 70%	significant areas of uncropped native grassland remaining, albeit disturbed; NOT OVERCLEARED
Castlereagh Alluvial Plains	CW,N	78	retain as 'overcleared'	large areas of ex-grassy woodland; limited native grasslands
Cherry Tree Plateau	CW	74	retain as 'overcleared'	ex-forest/woodland, high elevation; no former native grasslands
Coolah Tops	CW,N	78	not 'overcleared' = 61%	default to previous %-cleared; visual overview = NOT 'OVERCLEARED'
Cope Hills Granite	CW	85	retain as 'overcleared'	ex open forest and woodland; no or very little former native grasslands on granitic soil
Cowal Lakes, Swamps and Lunettes	L	71	retain as 'overcleared'	Heavily cropped around wetland margins; true wetlands rather than grasslands with swampy areas
Dalton Hills	L	85	retain as 'overcleared'	up to 1% of unmapped native grasslands associated with frost hollows, otherwise ex open forest and woodland
Dubbo Basalts	CW	82	retain as 'overcleared'	ex open forest and woodland; no former native grasslands
Dumaresq Channels	BRG	88	retain as 'overcleared'	ex riverine vegetation
Fifield Intrusives	CW,L	82	retain as 'overcleared'	ex open forest and woodland; heavily cleared; no former native grasslands
Geurie Granites	CW	74	retain as 'overcleared'	ex open forest and woodland; no or very little former native grasslands on granitic soil
Glen Innes - Guyra Basalts	BRG	82	retain as 'overcleared'	ex open forest and woodland; no former native grasslands; extensive pasture improvement
Gundary Plains	L	72	retain as 'overcleared'	little remaining true native grassland, with former range reduced by fertilising, introduced pasture, and weeds
Gwydir Alluvial Plains	BRG,N	80	retain as 'overcleared'	mainly ex grassy woodland; extensive clearing and cropping

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Landscape	CMA(s)	%-cleared	Workshop Outcome	Workshop Comments
Inverell Basalts	BRG	83	retain as 'overcleared'	ex grassy woodland, heavy cropping
Inverell Plateau Slopes	BRG	86	retain as 'overcleared'	ex open forest and woodland; no former native grasslands
Lachlan Terrace Gravels	L	98	retain as 'overcleared'	heavily cleared, likely to have mostly been grassy woodland
Liverpool Alluvial Plains	N	84	retain as 'overcleared'	some remnant areas of true native grassland persists, but not enough to impact on the 'overcleared' status of this landscape
Liverpool Range Valleys and Footslopes	CW,N	81	retain as 'overcleared'	All grassland derived in this mainly hilly landscape, ex grassy forest and woodland
Macintyre Alluvial Plains	BRG	87	retain as 'overcleared'	some native grasslands likely to remain, but most has been lost to cropping, which is extensive in this landscape
Macintyre Swamps and Lagoons	BRG	74	retain as 'overcleared'	ex riverine vegetation and ephemeral wetlands/sedgelands
Macquarie Alluvial Plains	CW,L	78	retain as 'overcleared'	some areas of existing grasslands likely to persist in north, but heavy cropping throughout, particularly in the south
Macquarie Valley Basalts	CW	95	retain as 'overcleared'	ex grassy open forest and woodland, extensive pasture improvement
Merrygoen Hills and Slopes	CW	87	retain as 'overcleared'	ex open forest and woodland; no former native grasslands
Mole Valley	BRG	74	retain as 'overcleared'	ex open forest and woodland; no former native grasslands
Mollyan Hills	CW,N	76	retain as 'overcleared'	ex open forest and woodland; no former native grasslands
Molong Ridges	CW,L	79	retain as 'overcleared'	ex open forest and woodland; no former native grasslands
Mooki - Namoi Channels and Floodplains	N	75	retain as 'overcleared'	some native grasslands likely to remain, but most has been lost to cropping, which is extensive in this landscape
Mount David Basalts	CW,L	74	retain as 'overcleared'	mainly ex grassy woodlands; some frost hollow *Poa* grasslands likely to persist, but restricted
Myall Glen Basalts	CW	75	retain as 'overcleared'	ex open forest and woodland; no former native grasslands
Namoi Alluvial Plains	N	79	retain as 'overcleared'	some native grasslands likely to remain, but most has been lost to cropping, which is extensive in this landscape
Nangar Slopes and Ranges	CW,L	84	retain as 'overcleared'	ex grassy woodland; no former native grasslands
Narromine Hills	CW	89	retain as 'overcleared'	ex open forest and woodland; no former native grasslands
Nundle Hills	N	72	retain as 'overcleared'	ex open forest and woodland; no former native grasslands

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Landscape	CMA(s)	%-cleared	Workshop Outcome	Workshop Comments
Oberon - Kialla Granites	CW,L	89	retain as 'overcleared'	ex open forest and woodland; no or very little former native grasslands on granitic soil
Pangee Alluvial Plains	CW,L	71	retain as 'overcleared'	open woodland country; heavy cropping; no extensive areas of true native grassland prior to settlement
Peel Channels and Floodplain	N	84	retain as 'overcleared'	ex riverine vegetation
Purlewaugh Plains	CW,N	75	retain as 'overcleared'	ex open forest and woodland; no former native grasslands
Scone - Gloucester Foothills	N	75	retain as 'overcleared'	very small sliver; should not map into Namoi CMA
Talabung Mountain	L	80	retain as 'overcleared'	ex open forest and woodland; no former native grasslands within this rugged ridgetop landscape
Teriderie Alluvial Plains	CW,N	73	retain as 'overcleared'	mostly ex- low open woodland, with restricted areas of remnant grassland; heavily cropped landscape
Trangie Terrace	CW	86	retain as 'overcleared'	possibility of ex-grassland, but most lost due to heavy cropping
Warraderry Range	L	81	retain as 'overcleared'	ridgelines and ranges; ex low open forest-woodland
Werris Creek Basalt Hills and Valleys	N	80	retain as 'overcleared'	ex grassy woodland
Yallaroi Basalts	BRG	87	retain as 'overcleared'	ex grassy/shrubby woodland

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