Roadside Vegetation Assessment Report

Mid-Western REGIONAL COUNCIL

prepared August 2010

appliedecology
appliedecology.com.au

DOCUMENT VERIFICATION

Project Title	**RoadsideCorridor Assessment and Management Guidelines**
Document Title	**Roadside Vegetation Assessment Report**
Description	**Accompanies Database/Veg&TSC descriptions/condition discussion**
Client	**Mid Western Regional Council**
Client contact	**Shireen Murphy**

Revision	Prepared by	Reviewed by	Date
A	**MB, AC**	**AC**	**May 2010**
B	**AC,MB**	**Mid western Regional Council**	**June 2010**
C	**AC MB**	**various**	**June 2010**
0	**AC**		**August 2010**

ACKNOWLEDGMENTS

APPLIED ECOLOGY Pty Limited wishes to thank all representing organisations who contributed to the production or commented on the content of this report, including:
Shireen Murphy Mid-Western Regional Council
Linda Shreeve Mid-Western Regional Council

Table of Contents

Tables

Figures

1 INTRODUCTION

1.1 Mid-Western Regional Council

The Mid-Western Region covers a geographical area of more than 9,000 square kilometres, and includes the townships of Gulgong, Mudgee, Rylstone and Kandos. The region stretches from Wollemi National Park in the east to Lake Burrendong in the west and from Goulburn National Park in the north to the Macquarie and Turon rivers in the south. It incorporates a wide range of climatic and geological conditions, resulting in a diverse range of plants and plant communities.

Dominant land uses in the area include cattle grazing, wine growing and coal mining, with horse studs, grazing of other species and cropping of boutique foodstuff such as olives and nuts. The region is home to 25 listed threatened species of plants and several threatened populations and communities, including the River Red Gum Endangered Population in the Hunter Catchment, the Hunter Valley Weeping Myall Woodland of the Sydney Basin bioregion, the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Ecological Community, and the Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia Endangered Ecological Community. Around 100 weed species have been declared noxious in the Mid-Western region, and there are numerous environmental weeds that threaten crops, pastures and bushland.

1.2 The Project

Mid-Western Regional Council (MWRC) has approximately 2400 km of rural roads. This comprises of approximately 1070 km of sealed roads and 1375 km unsealed. The total area of roadside reserve is 6075 hectares. Issues for councils in the management of these corridors were identified in a recent consultation process with the Hunter Councils. The issues identified include:

- Loss of vegetation during road upgrade and construction works
- Noxious & environmental weeds
- Livestock grazing
- Impacts from roadside mowing, slashing and spraying
- Impacts of utility companies
- Hollow bearing trees and potential risk to safety
- Unauthorised or illegal activities
- Bush fire hazard reduction works
- Drain and road verge maintenance procedures
- Materials stockpiling
- Absence of roadside rehabilitation guidelines
- Drainage practices and water runoff
- Barriers to fish passage
- Materials stockpiling
- Littering and illegal waste dumping

- Inconsistent corporate objectives
- Funding
- Inconsistent road construction standards

To be in a position to manage these issues, councils require good quality, comprehensive information to be readily available and accessible.

1.3 Roadside Vegetation Assessment - Objectives

As part of a larger management process being implemented by MWRC, Applied Ecology was commissioned to complete an on-ground assessment of the composition and condition of roadside vegetation in the Mid-Western Regional LGA. This involved a 'windscreen' assessment, assessing roadside vegetation in terms of characteristics of the road reserve (ie. width, fencing); adjoining land use; vegetation characteristics (ie. vegetation type, structure); level of weed infestation (ie. high, medium, low).

Roadside Management Guidelines as noted above have also been prepared by the RTA and Greening Australia Central West. There are also approaches developed by the Roadside Environment Committee which allow assessments ranging from a 'windscreen' assessment through to a detailed assessment. These methodologies were reviewed and used as the basis for a tailored assessment protocol that focused primarily on vegetation assessment, providing a high-level identification of species and communities. Special conservation issues were also important target areas, as were other issues which require active management, eg erosion, weeds etc. Results of field surveys were required to provide information similar to the survey information in the Roadside Management Guidelines, and identify where areas of high conservation, medium conservation and low conservation value vegetation exist. All areas surveyed would be mapped with details of data recorded using GIS to streamline assessments. The resultant mapping will then describe roadside vegetation condition in a given area by detailing the vegetation composition and condition in identified polygons. This mapping is to be supported through a prior desktop study, incorporating all previously commissioned mapping data, and consultation with stakeholders who can contribute local knowledge.

This report incorporates the results of the roadside assessment, and uses these to identify conservation values in extant vegetation, areas that form important linkages, and the main threatening processes currently operating in MWRC's area.

2 METHODS

2.1 Field Survey Methods

The assessment protocol developed for this survey drew heavily on the RTA Roadside Rapid Assessment Method, with some minor modification to include additional information. Following this, roadside vegetation was assessed for the following criteria:

1) **Roadside vegetation corridor width**: 0-5m, 6-21m, unfenced
2) **Vegetation condition** (an overall visual assessment): near natural, modified (some or all canopy removed and/or predominantly weedy understorey), degraded (canopy removed, predominantly weedy understorey). For a patch of vegetation to achieve a ranking of near natural it must have more than 75% of the following:
    - Low grazing intensity – never farmed
    - Tree and shrub regeneration present (seedlings and saplings)
    - Infrequent fire regime (more than 10 years between fires)
    - Healthy mature trees (no dieback)
    - Little to no evidence of rabbits
    - Little to no evidence of foxes/cats
    - Low abundance of weeds (most remnants contain some weeds)
    - No evidence of firewood collection
    - No obvious signs of erosion or salinity
    - Not susceptible to fertiliser application, herbicide or pesticide drift
    - Less than 20% trees with mistletoe (some mistletoe is healthy)
    - Few tracks, trails or fence lines
    - Presence of native shrubs
    - Presence of large, old growth trees with hollows
    - Dead timber is left standing
    - Fallen timber and logs are left on the ground
    - Abundance of native ground flora
    - Presence of litter, cryptogams, cracks and rocks
    - Roadside corridor is large (> 15m wide in total is optimum)
    - Connected to or in close proximity to other remnant vegetation
3) **Canopy extent**: continuous, discontinuous, scattered, absent
4) **Weed density**: absent, isolated clumps, scattered throughout, dominant
5) **Regeneration** (evidenced by presence of seedlings/saplings): none noted, minor, moderate, extensive
6) **Habitat** (for a range of faunal groups, provided by presence of old growth trees with hollows, fallen logs, rock piles): none, minor, moderate, extensive
7) **Rare species**: none noted, present (species or populations listed)
8) **Linkage Corridor** (the roadside vegetation connects two or more patches of vegetation greater than 10Ha): yes, potential (ie. an effective linkage corridor could be achieved with some revegetation), no
9) **Noxious Weeds**: none noted, present (species listed)

10) **Environmental Weeds**: none noted, present (species listed)
11) **Native Species**: none noted, canopy present (species listed), grasses present (species listed)
12) **Road Works**: none noted, quarry, stockpile site, drainage/erosion
13) **Vegetation Classification**: vegetation communities are identified by the dominant tree association or key shrub species where appropriate; key species were used to define communities described after Specht (1970) and in line with DECCW community classifications
14) **Conservation Value Ranking** (1 – 5, with 1 best and 5 worst), final score is determined from 2, 3 and 4 above as follows:

Polygon LUE12 is given a ranking based on its scores for the following criteria:

Vegetation condition:	**Canopy extent**:	**Weed density**:	**Ranking Score**:
modified	scattered	scattered	3

Based on assessments for each of these criteria, it achieves a ranking score of 3 from the following table:

Table 1. Determining a Conservation Value Ranking Score.

Vegetation condition	**Canopy extent**	**Weed density**	**Ranking Score**
Near natural	(Continuous/Discontinuous)	(Isolated/Absent)	1
Modified ->	Continuous ->	Isolated ->	2
		Scattered ->	2
		Dominant ->	3
	Discontinuous ->	Isolated ->	2
		Scattered ->	3
		Dominant ->	4
	Scattered ->	Isolated ->	3
		Scattered ->	**3**
		Dominant ->	4
	Absent ->	Isolated ->	3
		Scattered ->	4
		Dominant ->	N/A

Degraded ->	Continuous ->	Isolated ->	N/A
		Scattered ->	3
		Dominant ->	4
	Discontinuous ->	Isolated ->	N/A
		Scattered ->	3
		Dominant ->	4
	Scattered ->	Isolated ->	N/A
		Scattered ->	4
		Dominant ->	5
	Absent ->	Isolated ->	N/A
		Scattered ->	4
		Dominant ->	5

When one or more of the above characteristics (1-13) changed sufficiently, a new polygon was started. If there were significant differences in vegetation structure or condition on each side of the road, a separate polygon was scored; otherwise, both sides were included in the one polygon.

2.2 Mapping Field Data

Mapping was carried out using Autodesk Geospatial software (AutoCad Civil 3D 2010, CADmap), which combines computer-aided design (CAD) and geographic information systems (GIS). By combining the two programs, this enabled Applied Ecology staff to combine existing mapping resources, reduce redundancy and errors, and increase operation efficiency. Autodesk Geospatial streamlines the process by eliminating disparate systems and creating an environment where data stored in a central data base can be constantly refreshed through real time updates from the field. AutoCAD Map 3D was used to access, edit and analyse spatial data in its native format using AutoCAD based software. Output from Autodesk Geospatial and AutoCAD Map 3D was then tailored for use in MapInfo and ArcView GIS formats.

The layers were also produced in kmz format for simple use in Google Earth. In this format, clicking on a polyline reveals the embedded data. These three formats enable a variety of technical and non-technical users to access the information. From the survey data, Applied Ecology's staff have produced the following GIS layers/maps:

- Vegetation community by classification including Endangered Ecological Communities (EECs)
- Vegetation community by condition

- Total area of each community within the study area
- Total number of patches and patch sizes by community
- Threatened species

The collected field data was overlaid on aerial photographs provided by the council. This base map was then used to map the type and health of roadside vegetation and surrounding land use and land tenure, including:

- Spatially locate and quantify threatening processes
- Spatially locate and quantify critical features
- Visually provide information on the rating of the corridor (high conservation, medium conservation and low conservation value)
- Include details of vegetation species and communities
- Include details of management issues that have been identified through this or previous assessments

Key outcomes of this process are the identification of high priority conservation areas, threatened species and communities.

2.3 Existing data

A variety of spatial and hard data sets were assessed and incorporated into the outputs of the project where possible. Threatened species and Endangered Ecological Community data was targeted for inclusion. Data included is illustrated in Figure 1 below. Note that some data sets were incomplete and were not included (for example the DECCW YETI database). Other hard and spatial data sources, whilst of excellent quality, were not included as they did not contain threatened species or EEC spatial data and/or were confined to discrete parts of the LGA. Community descriptions from disparate sources were difficult to extrapolate across the LGA for the purposes of this study, for example, from the comprehensive vegetation study completed for Munghorn Gap Nature Reserve (MGNR) and Goulburn River National Park (GRNP) the community described as "Narrow leaved Ironbark Alluvial Open Forests" has five equivalent vegetation types within GRNP/MGNR*:*

- Bell (1995d) Unit 3i: Narrow-leaved Ironbark Forest on Alluvium
- Bell (1997c) Unit Q2: Narrow-leaved Ironbark Forest on Alluvium
- McRae and Benson (1982) Unit 2: Woodland/Open Woodland on Quaternary Alluvium (in part)
- McRae and Cooper (1985) Unit 3: Woodland/Open Woodland on alluvium (in part)
- McRae *et al* (1982) Unit 2a: Woodland/Open Woodland on sandstone-derived alluvium (in part)

And outside of GRNP/MGNR:

- Bell (1997f) Unit Q2: Ironbark Forest on Alluvium, Manobalai Crown Land
- Bell (1998b & c) Unit W14: Goulburn Valley Alluvial Ironbark Woodland, northern Wollemi NP

- Sinclair Knight Merz (1995) Unit 1: Open Woodland-Creekline (in part), Myambat Logistics Area

Thus for consistency and simplicity community descriptions used (see next Section) were both a refinement and a generalisation of the descriptions used in the BioMetric Module (DECCW 2008). Data sources included are summarised in Figure 1:

Figure 1 Data sources

Data Source	Data type	Description	Use
Atlas of New South Wales Wildlife DECCW	point	species	Endangered and Vulnerable species' records were extracted and included in the Map set and provided as an excel database and GIS layer
Roadside Vegetation in the Rylstone Shire, NSW Central Tablelands and Central Western Slopes: Part 4 – Vascular Plant Species. Symbiosis Environmental Consulting Services	Point	species	Endangered and Vulnerable species' records were extracted and included in the Map set and provided as an excel database and GIS layer
Roadside Vegetation in the Rylstone Shire, NSW Central Tablelands and Central Western Slopes: Part 5 – Eucalyptus cannonii. A consultancy report prepared for the Rylstone District Environment Society Inc. by DeVries, R. J. and McCauley, A. C. (2001) Symbiosis Environmental Consulting Services, Bathurst.	Point	species	*Eucalyptus cannonii* (V) records were extracted and included in the Map set and provided as an excel database and GIS layer
Review of Environmental Factors-Hill End Road Upgrade 2010/2011. Molino Stewart, March 2010	Polygon	community	EEC polygons included in Map set and database and provided as an excel database and GIS layer
Review of Environmental Factors-Hill End Road Upgrade 2009/2010. Molino Stewart,March 2010	Polygon	community	EEC polygons included in Map set and database and provided as an excel database and GIS layer
Review of Environmental Factors, Ulan-Wollar Road Formation Widening. MWRC, July 2009, Pg 12	Polygon	community	EEC polygons included in Map set and database and provided as an excel database and GIS layer

Data Source	Data type	Description	Use
Review of Environmental Factors - Proposed road widening and tar seal, Queens Pinch Road, Meroo. Ecovision Consulting, March 2010	Polygon	community	EEC polygons included in Map set and database and provided as an excel database and GIS layer
Roadside vegetation assessment Linburn and Mud Hut Creek Roads in the Mid Western Regional Council LGA. Bioregen Ecological Assessment & Restoration 2007 , page 48.	Point	species	Endangered and Vulnerable species' records were extracted and included in the Map set and provided as an excel database and GIS layer
Nullo Mountain Road Draft REF, Ecovision Consulting	Point	species	Endangered and Vulnerable species' records were extracted and included in the Map set and provided as an excel database and GIS layer

2.4 Limitations

Surveys were conducted from vehicles moving at 40km/hour average speed. Daily survey requirements were to survey 125km of road per day; daily work plans included driving connecting roads in addition to target survey roads. On average 1-2 hours daily were spent identifying problematic individuals. Some species of Eucalyptus are known to hybridise readily with several other species, eg. *Eucalyptus viminalis*, which is reported to hybridise with 38 other species of Eucalypts. No attempt was made to identify hybrid specimens. In general, surveys aimed to identify species present on a stretch of road (polygon), and from this determine the vegetation community present, or historically present, and assess its current condition. Seasonal development in eucalypts and many other tree species mean that in mid to late autumn many of the important identifying characteristics (flowers, fruit) are past. As a result, fine scale identification in some cases was not possible.

In some cases, species differentiation was not attempted. These included canopy species, where there were difficulties differentiating between:

- stringybarks – many cannot be accurately differentiated without checking fruit
- redgums – cannot be accurately differentiated without checking flowers, fruit and seed characteristics

- White Box, Grey Box and Fuzzy Box have very similar bark characteristics and can be difficult to differentiate in poor light, rain, or foggy conditions. Leaves are generally slightly different colours.

Understorey species:

- Identification of grass species relies on presence of seed for accurate determination.
- Taller grasses were easier to note, eg. *Themeda australis*
- Grasses with distinctly characteristic seed heads were more easily noted, eg. *Paspalum dilatatum, Themeda australis*
- Noxious weeds were noted over environmental weeds
- Grass species were noted in preference to herbs and small shrubs
- Shrubs were only recorded when tree species were absent
- *Callitris* species were not identified to species
- *Casuarina* species were not identified to species
- Only threatened *Acacia* species were identified to species
- Wallaby Grasses were not identified to species, and were all recorded as *Austrodanthonia* sp
- *Poa, Austrostipa* and *Aristida* species were not identified beyond genus
- A number of weed grasses were not identified to species

3 COMMUNITY DESCRIPTIONS

Ninety-one communities were recorded during the survey. Communities were defined by the dominant and co-dominant species with the exception of EEC assemblages. A conservative approach was taken to naming polygons where EEC indicator species were equally co-dominant with one or more other species (as with more detailed investigations the assemblage may still fall within the definition of EEC) so was thus named after the EEC indicator species. For example in polygon BBS2 the community was classified as "Fuzzy box woodland" with an assemblage of *E. albens, E. conica, Angophora floribunda, Brachychiton populneus, Themeda australis, Botriochloa macra, Austrodanthonia sp, Sporobolus creber, Agrostis avenacea.*

Figure 2 A distinct and narrow transition between open forest and native grassland

Each community was allocated a structure class within the roadside vegetation database after Specht (1970; see Table 1). When compiling the list of community names in Table 2 below this has been simplified so there has been no further division of communities by structure. Variants on the communities listed below include ecotones and these are listed in the database, for example "Blakely's Red Gum Ecotone Open Woodland". Ecotones are areas where there is a shift in dominance between two adjacent but different plant communities. Sometimes these transition zones are very distinct and narrow but more often they are a gradual blend of adjacent communities where species from each community are found together and often along with species not found in the adjacent communities.

Table 2 Community Structure Specht (1970)

	Percentage foliage cover of tallest plant layer			
Life form and height of tallest stratum	**Dense (70-100%)**	**Mid-dense (30-70%)**	**Sparse (10-30%)**	**Very sparse (<10%)**
Trees > 30 m	Tall closed-forest	Tall open-forest	Tall woodland	Tall open-woodland
Trees 10-30 m	Closed-forest	Open -forest	Woodland	Open-woodland
Trees 5-10 m	Low closed-forest	Low open-forest	Low woodland	Low open-woodland
Shrubs 2-8 m	Closed -scrub	Open-scrub	Tall shrubland	Tall open-shrubland
Shrubs 0-2 m	Closed -heath	Open-heath	Low shrubland	Low open-shrubland

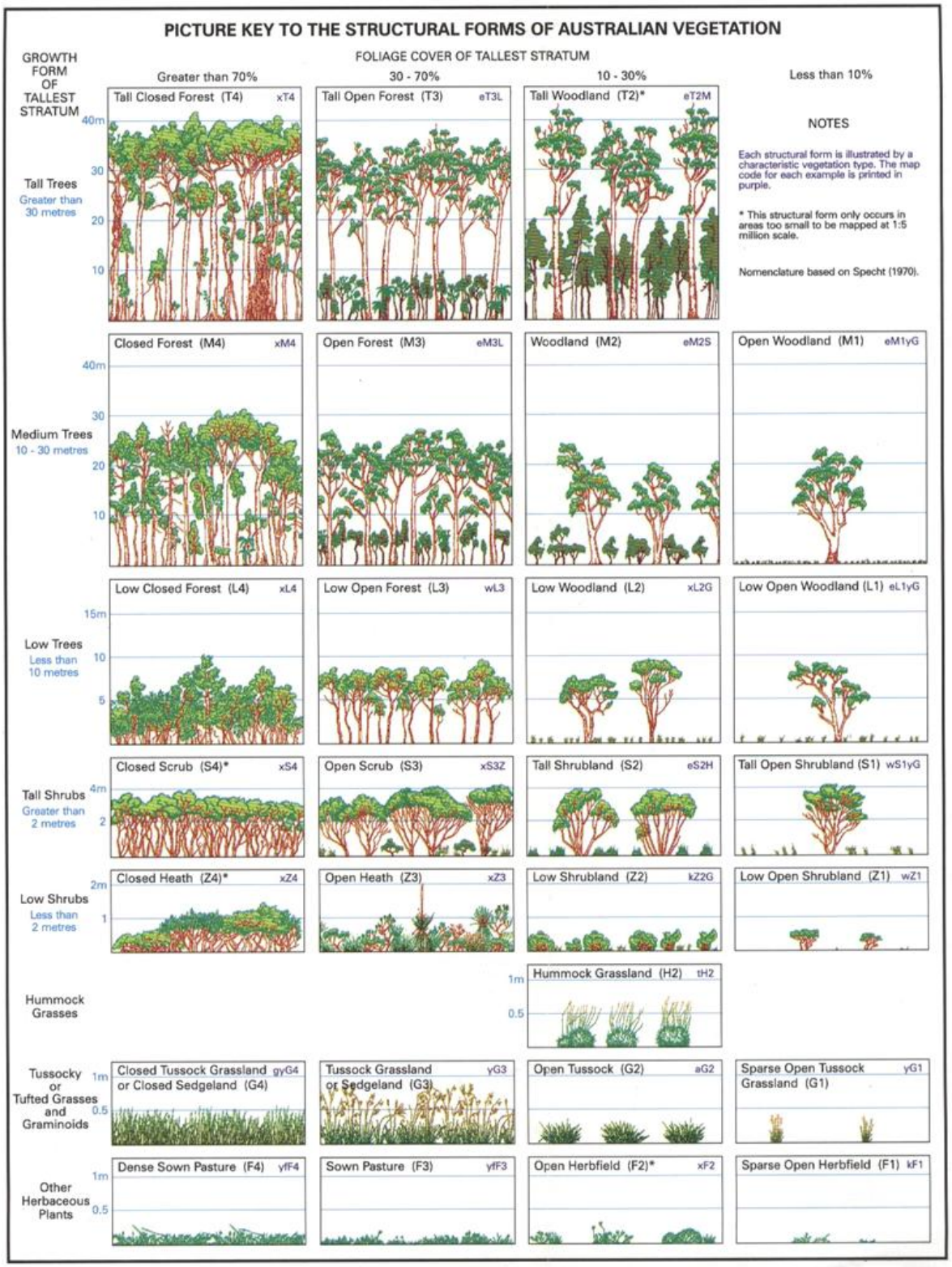


Figure 3 Pictorial key to structural definitions (after Specht)

Table 3 Mid-Western Roadside Vegetation Communities Database(MRVCD)

No.	Community	No.	Community
1	Apple Box-White Box-Red Stringybark Woodland/Forest	47	Peppermint Woodland/Forest
2	Apple-Box-Yellow-Box Woodland/Forest	48	Red Box- Mugga Ironbark Woodland/Forest
3	Blakely's Red Gum Open Woodland/Forest	49	Red Box Woodland/Forest
4	Blakely's Red Gum-Broad-Leaved ppermint Woodland/Forest	50	Red Box-Inland Grey Box Woodland/Forest
5	Blakely's Red Gum-Grey Gum Woodland/Forest	51	Red Box-Red Stringybark Woodland/Forest
6	Blakely's Red Gum-Mugga Ironbark Woodland/Forest	52	Red Ironbark-Blakely's Red Gum-Yellow Box Woodland/Forest
7	Blakely's Red Gum-Narrow-Leaved Ironbark Woodland/Forest	53	Red Stringybark Woodland/Forest
8	Blakely's Red Gum-Red Box Woodland/Forest	54	Red Stringybark-Broad-Leaved Peppermint Woodland/Forest
9	Blakely's Red Gum-Red Stringbark-Sydney Peppermint Woodland/Forest	55	Red Stringybark-Long-Leaved Box Woodland/Forest
10	Blakely's Red Gum-Red Stringybark Woodland/Forest	56	River Sheoak-Kurrajong Woodland/Forest
11	Blakely's Red Gum-Red Stringybark-Yellow Box Woodland/Forest	57	Rough-Barked Apple Woodland/Forest
12	Blakely's Red Gum-Sydney Peppermint Woodland/Forest	58	Rough-Barked Apple-White Box Woodland/Forest
13	Blakely's Red Gum-White Box-Tumbledown Gum Woodland/Forest	59	Scribbly Gum Grassy Woodland/Forest
14	Blakely's Red Gum-Yellow Box Woodland/Forest	60	Scribbly Gum-Blakely's Red Gum Woodland/Forest
15	Blakely's Red-Gum- Rough Barked Apple Woodland/Forest	61	Scribbly Gum-Grey Gum Woodand/Forest
16	Blakely's Red-Gum-Apple Box Woodland/Forest	62	Scribbly Gum-Inland Grey Box Woodland/Forest
17	Brittle Gum-Grey Gum Woodland/Forest	63	Scribbly Gum-Mugga Ironbark Woodland/Forest
18	Caley's Ironbark-White Box Woodland/Forest	64	Scribbly Gum-Narrow-Leaved Ironbark Woodland/Forest

No.	Community	No.	Community
19	Caleys's Ironbark Woodland/Forest	65	Scribbly Gum-Red Stringybark Woodland/Forest
20	Candlebark-Apple-Box Woodland/Forest	66	Scribbly Gum-Yellow Box Woodland//Forest
21	Cypress Open Woodland/Forest	67	Shrubland
22	Degraded Grassland Woodland/Forest	68	Southern Blue Gum Tall Woodland/Forest
23	Degraded Wet/Drainage Area	69	Spotted Gum Woodland/Forest
24	Forest Red Gum-Rough-Barked Apple Woodland/Forest	70	Sydney Peppermint Woodland/Forest
25	Fuzzy Box Open Woodland/Forest	71	Sydney Peppermint-Manna Gum Woodland/Forest
26	Grey Gum- Yellow Box Woodland/Forest	72	Sydney Peppermint-Yellow Box Woodland/Forest
27	Inland Grey Box- Blakely's Red Gum-Mugga Ironbark Woodland/Forest	73	Tumble-Down Gum Woodland/Forest
28	Inland Grey Box Woodland/Forest	74	Tumble-Down Gum-Red Stringybark Woodland/Forest
29	Inland Grey Box- Red Box Woodland/Forest	75	Tumble-Down Gum-Yellow Box Woodland/Forest
30	Inland Grey Box- Yellow Box Woodland/Forest	76	Tumble-Down Red Gum-Yellow Box-Apple Box Woodland/Forest
31	Inland Grey Box-Blakely's Red Gum Woodland/Forest	77	White Box- Blakely's Red Gum Woodland/Forest
32	Inland Grey Box-River Red Gum Woodland/Forest	78	White Box Woodland/Forest
33	Inland Grey Box-Rough-Barked Apple Woodland/Forest	79	White Box- Yellow Box- Blakely's Red Gum Woodland/Forest
34	Inland Grey Box-White Box- Yellow Box Woodland/Forest	80	White Box- Yellow Box- Red Box Woodland/Forest
35	Inland Grey Box-White Box-Blakely's Red Gum Woodland/Forest	81	White Box- Yellow Box -Red Stringybark Woodland/Forest
36	Inland Grey Box-Yellow Box Grassy Woodland/Forest	82	White Box-Manna Gum Woodland/Forest
37	Inland Grey Box-Yellow Box-Blakely's Red Gum Woodland/Forest	83	White Box-Mugga Ironbark Woodland/Forest
38	Kurrajong Woodland/Forest	84	White Box-Red Box Woodland/Forest

No.	Community	No.	Community
39	Mallee Ash-Manna Gum Woodland/Forest	85	White Box-Red Stringybark Woodland/Forest
40	Manna Gum Tall Woodland/Forest	86	White Box-Red Stringybark-Apple Box Woodland/Forest
41	Manna Gum-Yellow Box Woodland/Forest	87	White Box-Yellow Box Woodland/Forest
42	Modified Grassland	88	Yellow Box Grassy Woodland/Forest
43	Mountain Ash-Grey Gum Grassy Woodland/Forest	89	Yellow Box-Mugga Ironbark Woodland/Forest
44	Mugga Ironbark -Inland Grey Box Woodland/Forest	90	Yellow Box-Red Box Woodland/Forest
45	Mugga Ironbark -Tumble-Down Red Gum-Inland Grey Box Woodland/Forest	91	Yellow Box-Red Stringybark-Broad-Leaved Box Woodland/Forest
46	Narrow-Leaved Ironbark-Brown Bloodwood Forest		

The MRVCD communities were derived, in part, from descriptions compiled by the DECCW (2008) in the Biometric database- primarily for the South West Slopes Bioregion and sub regions based on CMA boundaries. BioMetric is the biodiversity module in the Native Vegetation Assessment Tool package that facilitates preparation of Property Vegetation Plans (PVPs) under the *NSW Native Vegetation Act 2003*. Biometric community descriptions were useful in three key areas during this study by:

1) indicating which broad communities descriptions fall within the definition of a given EEC (illustrated in Table 3);

2) indicating likely middle and lower stratum species in a given community (which are problematic to record in a rapid assessment); and

3) provision of an estimate of % of community cleared since European settlement (see Figure 5 for extant vegetation).

Figure 4 South Western Slopes Bioregion

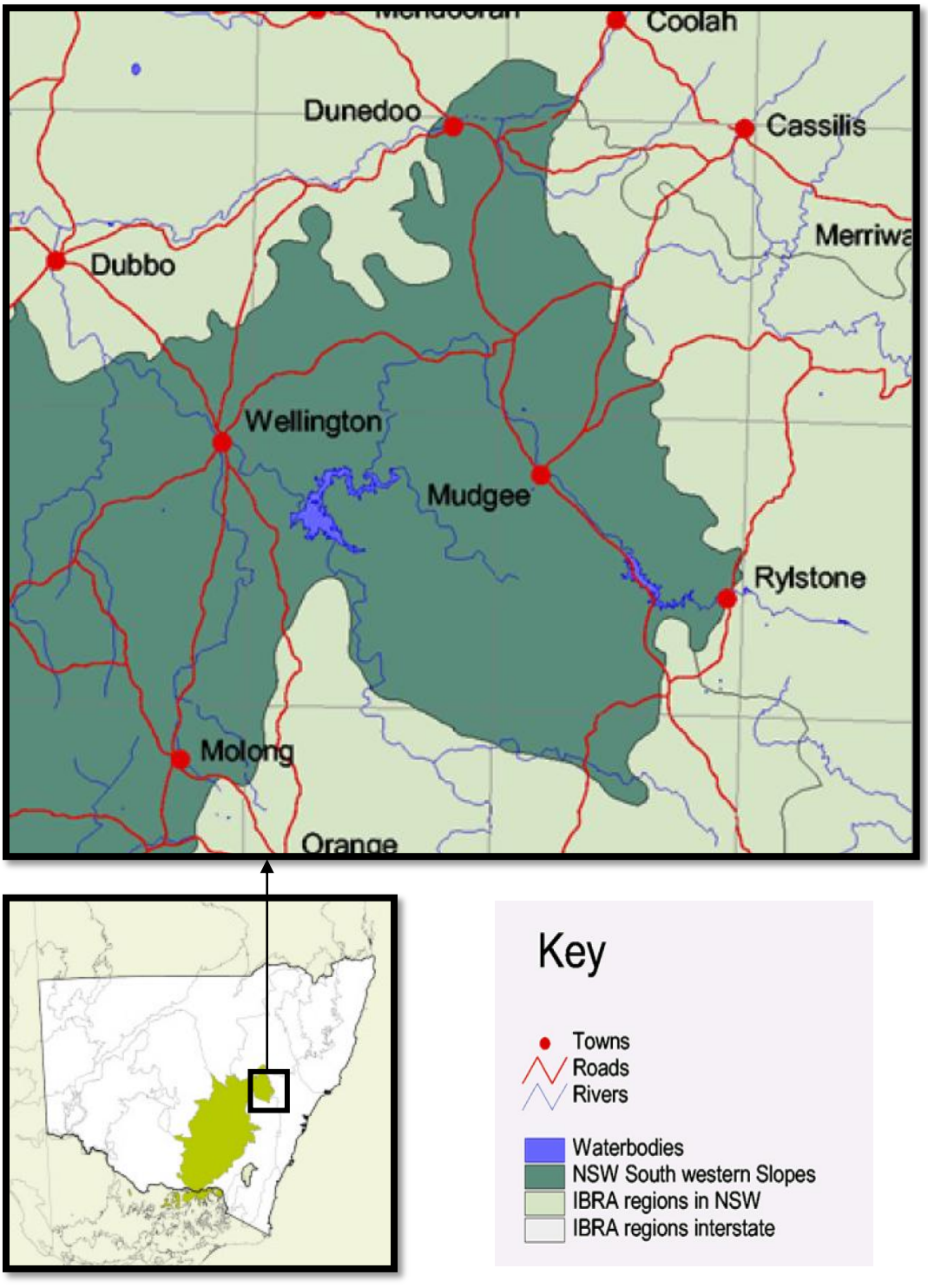
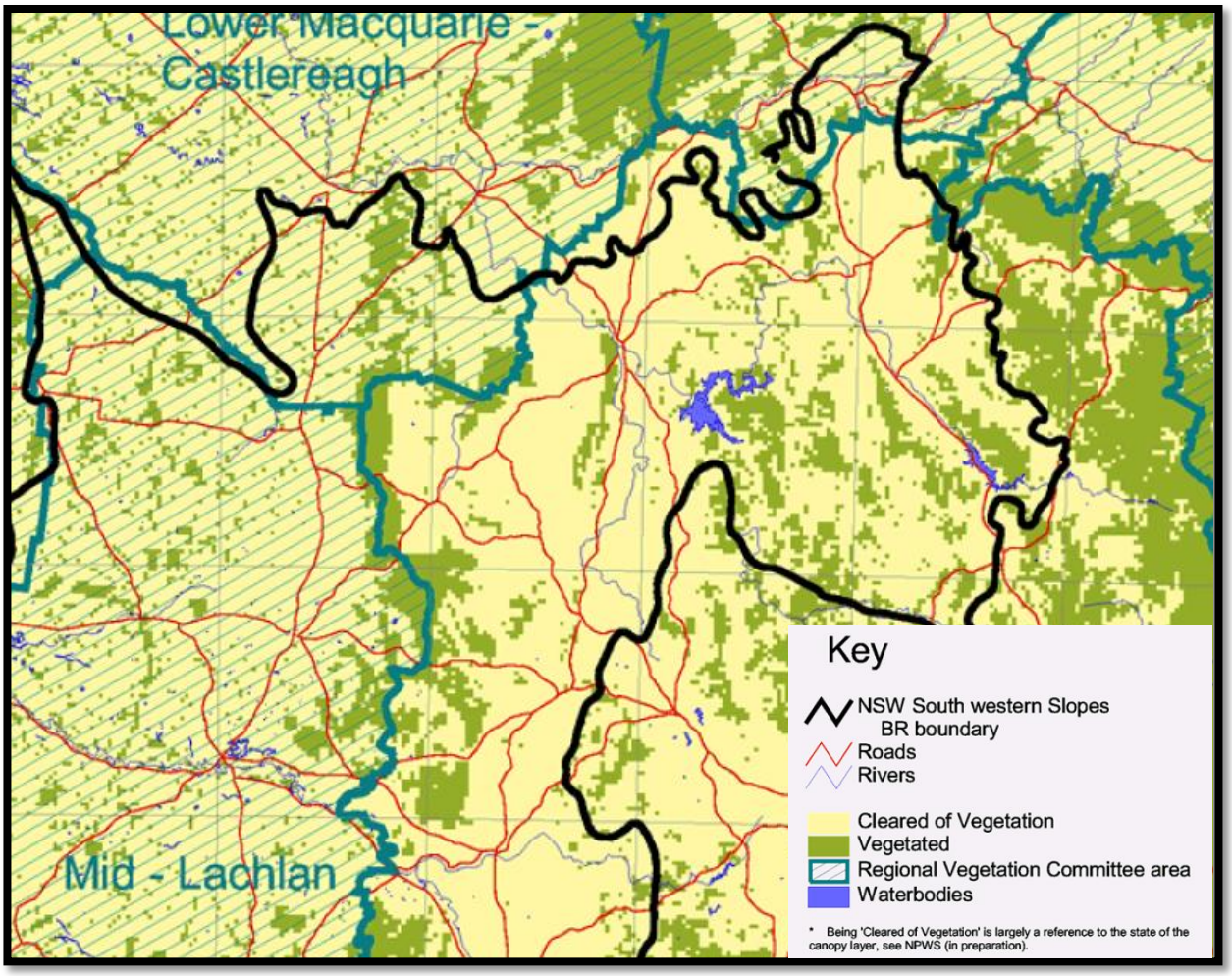


Figure 5 Indicative Canopy species clearing



The Mid Western Regional Council area has biometric assemblages that occur within three CMA sub-regions including the Central West CMA, Hunter-Central Rivers CMA, and the Hawkesbury Nepean CMA. Some of these assemblages are also typical of the Nandewar and Brigalow Belt South Bioregions that occur to the west and North of the South Western Slopes Biroegion. In Table 3, overleaf, the CWCMA assemblages are depicted in , HNCMA assemblages and HCRCMA assemblages . Vegetation types listed in the biometric that are also listed as EECs are coloured in the first column. The Inland Grey Box complexes were added to reflect the listing of this community during the study period.

Figure 10 Yellow Box (*Eucalyptus melliodora*)

Figure 6 Remnant vegetation - Apple box *(Eucalyptus bridgesiana*) **above**

Figure 9 Ironbark Open Forest *(Eucalyptus fibrosa)*

Figure 7 Scribbly gum-Red Stringybark Open Forest (below)

Figure 8 White Box, Yellow Box, Blakely's Red Gum open woodland.

Figure 11 Peppermint woodland (E.piperita)

Vegetation type	MRVCD	Dominant canopy spp	Main associated spp	Landscape position	Characteristic mid-storey spp	Characteristic groundcover spp	Profile source	Full reference details	Vegetation formation [CMA]	Cleared Estimate rounded to nearest 5%
Blakely's Red Gum - Rough-Barked Apple flats woodland of the NSW western slopes (Benson 281)	15	Blakely's Red Gum (Eucalyptus blakelyi), Rough-barked Apple (Angophora floribunda),	Dirty Gum (Eucalyptus chloroclada), Black Cypress Pine (Callitris endlicheri)	Valley floors, flats, drainage lines		Lomandra longifolia, Arundinella nepalensis, Aristida calycina var. calycina, Kangaroo Grass (Themeda australis), Juncus continuus	Benson 281 (Benson unpubl.)	Benson, unpublished data	Grassy Woodlands [CW]	75
Blakely's Red Gum - Yellow Box grassy woodland of the NSW South Western Slopes Bioregion (Benson 277)	14 16	Blakely's Red Gum (Eucalyptus blakelyi), Yellow Box (Eucalyptus melliodora)	Apple Box (Eucalyptus bridgesiana), White Box (Eucalyptus albens), Fuzzy Box (Eucalyptus conica), White Cypress Pine (Callitris glaucophylla)	Flats and on gentle slopes mainly in the upper slopes sub-region.	Silver Wattle (Acacia dealbata)	Kangaroo Grass (Themeda australis), Snowgrass (Poa sieberiana var. sieberiana), Redleg Grass (Bothriochloa macra), Juncus usitatus, Lomandra filiformis subsp. coriacea, Vittadinia cuneata, Chrysocephalum apiculatum, Sida corrugata	Benson 277 (Benson unpubl.)	Benson, unpublished data	Grassy Woodlands [CW]	95

Table 4 Community descriptions The Midwestern Roadside Vegetation Community Database(MRVCD) Community number (derived from Table 2) is listed in Column 2 of this table. Ecotones are excluded.

Vegetation type	MRVCD	Dominant canopy spp	Main associated spp	Landscape position	Characteristic mid-storey spp	Characteristic groundcover spp	Profile source	Full reference details	Vegetation formation [CMA]	Cleared Estimate rounded to nearest 5%
Brittle Gum - stringybark shrubby open forest on basalt residuals in the Capertee Valley, Sydney Basin	17	Brittle Gum (Eucalyptus mannifera), Eucalyptus cannonii	Red Stringybark (Eucalyptus macrorhyncha), Mountain Grey Gum (Eucalyptus cypellocarpa), Red Box (Eucalyptus polyanthemos subsp. polyanthemos)	Restricted to basalt geology, mainly on top of mesas, in the western parts of the Capertee Valley.	Acrotriche rigida, Cassinia uncata, Grevillea arenaria, Indigofera australis, Melichrus urceolatus, Styphelia triflora	Dianella revoluta var. revoluta, Gonocarpus tetragynus, Hydrocotyle laxiflora, Lomandra filiformis, Plantago hispida, Stellaria pungens, Veronica plebeia	WBM 10 (DEC 2006)	DEC (2006) The Vegetation of the Western Blue Mountains. Unpublished report funded by the Hawkesbury – Nepean Catchment Management Authority. Department of Environment and Conservation, Hurstville.	Grassy Woodlands	**70**

Vegetation type	MRVCD	Dominant canopy spp	Main associated spp	Landscape position	Characteristic mid-storey spp	Characteristic groundcover spp	Profile source	Full reference details	Vegetation formation [CMA]	Cleared Estimate rounded to nearest 5%
Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills, South Eastern Highlands	54	Broad-leaved Peppermint (Eucalyptus dives), Red Stringybark (Eucalyptus macrorhyncha)	Brittle Gum (Eucalyptus mannifera), Mountain Gum (Eucalyptus dalrympleana subsp. dalrympleana), Inland Scribbly Gum (Eucalyptus rossii), Argyle Apple (Eucalyptus cinerea)	Occurs on undulating hills between 550 and 1100m from the western Blue Mountains to near Braidwood.	Melichrus urceolatus	Microlaena stipoides var. stipoides, Gonocarpus tetragynus, Lomandra filiformis subsp. coriacea, Hydrocotyle laxiflora, Hypericum gramineum, Hibbertia obtusifolia, Goodenia hederacea, Oxalis perennans, Austrodanthonia racemosa	Vegetation Group 109 (Gellie 2005); GW p23 (Tozer et al. 2006)	Gellie, N.J.H. (2005) Native Vegetation of the Southern Forests: South-east Highlands, Australian Alps, South-west Slopes and SE Corner bioregions. Cunninghamia 9(2): 219-254. Tozer, M.G., Turner, K., Simpson, C., Keith, D.A., Beukers, P., MacKenzie, B., Tindall, D. & Pennay, C. (2006) Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands. Version 1.0	Grassy Woodlands	**80**

Vegetation type	MRVCD	Dominant canopy spp	Main associated spp	Landscape position	Characteristic mid-storey spp	Characteristic groundcover spp	Profile source	Full reference details	Vegetation formation [CMA]	Cleared Estimate rounded to nearest 5%
Common Reed - Bushy Groundsel reedland/forbland of inland river systems (Benson 181)	23	River Red Gum (Eucalyptus camaldulensis)	River Red Gum (Eucalyptus camaldulensis)	On the banks and edges of stream channels, ox-bow lakes or other water bodies on the floodplains of the major river systems in western NSW.	Common Reed (Phragmites australis), Cumbungi (Typha domingensis), Dillon Bush (Nitraria billardierei), Maireana brevifolia	Bushy Groundsel (Senecio cunninghamii var. cunninghamii), Nardoo (Marsilea drummondii), Centipeda cunninghamii, Persicaria decipiens, Juncus flavidus, Pratia concolor, Water Couch (Paspalum distichum), Cyperus gymnocaulos, Vallisneria gigantea, Potamogeton crispus, Lachnagrostis filiformis,	Benson 181 (Benson et al. 2006)	Benson, J.S., Allen, C.B., Togher, C.& Lemmon, J. (2006) New South Wales Vegetation Classification and Assessment: Part 1 Plant Communities of the NSW Western Plains. Cunninghamia 9(3): 383-450	Freshwater Wetlands [CW]	**35**

Vegetation type	MRVCD	Dominant canopy spp	Main associated spp	Landscape position	Characteristic mid-storey spp	Characteristic groundcover spp	Profile source	Full reference details	Vegetation formation [CMA]	Cleared Estimate rounded to nearest 5%
Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)	25 30 31 35	Fuzzy Box (Eucalyptus conica)	Inland Grey Box (Eucalyptus microcarpa), Yellow Box (Eucalyptus melliodora), Bulloak (Allocasuarina luehmannii), Blakely's Red Gum (Eucalyptus blakelyi), Kurrajong (Brachychiton populneus subsp. populneus), Poplar Box (Eucalyptus populnea subsp. bimbil), White Cypress Pine (Callitris glaucophylla)	On prior streams and abandoned channels, or slight depressions on the undulating plains or flats, or on lower slopes and on valley flats.	Acacia deanei subsp. deanei, Dodonaea viscosa subsp. cuneata, Wilga (Geijera parviflora), Acacia implexa, Silver Cassia (Senna form taxon 'artemisioides'), Western Boobialla (Myoporum montanum), Cassinia aculeata, Black Roly Poly (Sclerolaena muricata var. muricata), Maireana enchylaenoides	Speargrass (Austrostipa scabra subsp. scabra), Windmill Grass (Chloris truncata), Calotis cuneifolia, Eremophila debilis, Sida corrugata, Einadia hastata, Dianella revoluta var. revoluta, Xerochrysum viscosa, Elymus scaber, Kangaroo Grass (Themeda australis), Austrodanthonia setacea	Benson 201 (Benson et al. 2006)	Benson, J.S., Allen, C.B., Togher, C.& Lemmon, J. (2006) New South Wales Vegetation Classification and Assessment: Part 1 Plant Communities of the NSW Western Plains. Cunninghamia 9(3): 383-450	Grassy Woodlands [CW]	**95**

Vegetation type	MRVCD	Dominant canopy spp	Main associated spp	Landscape position	Characteristic mid-storey spp	Characteristic groundcover spp	Profile source	Full reference details	Vegetation formation [CMA]	Cleared Estimate rounded to nearest 5%
Grey Gum - Narrow-leaved Stringybark - Inland Scribbly Gum shrubby open forest of the western Capertee Valley, Sydney Basin	61	Grey Gum (Eucalyptus punctata), Narrow-leaved Stringybark (Eucalyptus sparsifolia) Inland Scribbly gum (Eucalyptus rossi)	Eucalyptus Red Box (Eucalyptus polyanthemos subsp. polyanthemos) Eucalyptus cannonii, Broad-leaved or Red Ironbark (Eucalyptus fibrosa), Inland Scribbly Gum (Eucalyptus rossii)	Occurs on moderate to steep slopes and ridge crests throughout the western Capertee Valley, with localised occurrences in the eastern parts.	Acacia decora, Acrotriche rigida, Brachyloma daphnoides, Blackthorn (Bursaria spinosa subsp. spinosa), Black Cypress Pine (Callitris endlicheri), Leucopogon muticus, Lissanthe strigosa, Melichrus urceolatus, Persoonia linearis, Pultenaea scabra	Astroloma humifusum, Cheilanthes austrotenuifolia, Dianella revoluta var. revoluta, Dichelachne micrantha, Goodenia hederacea, Hibbertia obtusifolia, Redanther Wallaby Grass (Joycea pallida), Lepidosperma gunnii, Lomandra confertifolia, Lomandra filiformis, Lomandra glauca, Microlaena stipoides var. stipoides, Pomax umbellata	WBM 38 (DEC 2006)	DEC (2006) The Vegetation of the Western Blue Mountains. Unpublished report funded by the Hawkesbury – Nepean Catchment Management Authority. Department of Environment and Conservation, Hurstville.	Dry Sclerophyll Forests (Shrubby subformation)	**40**

Vegetation type	MRVCD	Dominant canopy spp	Main associated spp	Landscape position	Characteristic mid-storey spp	Characteristic groundcover spp	Profile source	Full reference details	Vegetation formation [CMA]	Cleared Estimate rounded to nearest 5%
Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Benson 76)	2836	Inland Grey Box (Eucalyptus microcarpa)	White Cypress Pine (Callitris glaucophylla), Yellow Box (Eucalyptus melliodora), Bulloak (Allocasuarina luehmannii)	On undulating alluvial plains of south-central western NSW. Mainly restricted to the eastern section of the Riverina Bioregion and the western section of the NSW South Western Slopes Bioregion.	Dodonaea viscosa subsp. cuneata, Acacia buxifolia subsp. buxifolia, Blackthorn (Bursaria spinosa subsp. spinosa), Acacia oswaldii, Acacia pycnantha, Acacia hakeoides, Acacia brachybotrya, Santalum acuminatum, Yarran (Acacia homalophylla), Exocarpos aphyllus	Austrodanthonia caespitosa, Windmill Grass (Chloris truncata), Sida corrugata, Speargrass (Austrostipa scabra subsp. scabra) subsp. falcata, Wahlenbergia gracilis, Einadia nutans subsp. nutans, Paspalidium constrictum, Kangaroo Grass (Themeda australis), Plains Grass (Austrostipa aristiglumis), Aristida behriana, Elymus scaber, Austrodanthonia setacea, Carex inversa,	Benson 76 (Benson et al. 2006)	Benson, J.S., Allen, C.B., Togher, C.& Lemmon, J. (2006) New South Wales Vegetation Classification and Assessment: Part 1 Plant Communities of the NSW Western Plains. Cunninghamia 9(3): 383-450	Grassy Woodlands [CW]	**95**

Vegetation type	MRVCD	Dominant canopy spp	Main associated spp	Landscape position	Characteristic mid-storey spp	Characteristic groundcover spp	Profile source	Full reference details	Vegetation formation [CMA]	Cleared Estimate rounded to nearest 5%
Inland Scribbly Gum - Grey Gum - Narrow-leaved Ironbark shrubby open forest on hills of western Capertee Valley, Sydney Basin	64	Inland Scribbly Gum (Eucalyptus rossii), Narrow-leaved Ironbark (Eucalyptus crebra), Grey Gum (Eucalyptus punctata)	White Box (Eucalyptus albens), Tumbledown Red Gum (Eucalyptus dealbata), Black Cypress Pine (Callitris endlicheri)	Occurs in deep gorges of the western hills of the Capertee Valley.	Acacia decora, Kurrajong (Brachychiton populneus subsp. populneus), Black Cypress Pine (Callitris endlicheri), Leucopogon muticus, Olearia elliptica	Aristida vagans, Arthropodium milleflorum, Austrostipa scabra, Calotis lappulacea, Cheilanthes austrotenuifolia, Cymbopogon refractus, Desmodium varians, Dianella revoluta var. revoluta, Dichelachne micrantha, Dichondra species A, Digitaria diffusa, Goodenia hederacea, Redanther Wallaby Grass (Joycea pallida), Lomandra confertifolia, Lomandra filiformis, Notodanthonia longifolia, Opercularia diphylla, Oxalis perennans, Pomax umbellata	WBM 42 (DEC 2006)	DEC (2006) The Vegetation of the Western Blue Mountains. Unpublished report funded by the Hawkesbury – Nepean Catchment Management Authority. Department of Environment and Conservation, Hurstville.	Dry Sclerophyll Forests (Shrubby subformation)	**10**

Vegetation type	MRVCD	Dominant canopy spp	Main associated spp	Landscape position	Characteristic mid-storey spp	Characteristic groundcover spp	Profile source	Full reference details	Vegetation formation [CMA]	Cleared Estimate rounded to nearest 5%
Long-leaved Box - Red Box - Red Stringybark sheltered open forest of the NSW South Western Slopes Bioregion (Benson 287)	5551	Long-leaved Box (Eucalyptus goniocalyx), Red Box (Eucalyptus polyanthemos subsp. polyanthemos), Red Stringybark (Eucalyptus macrorhyncha)	Kurrajong (Brachychiton populneus subsp. populneus), Mugga Ironbark (Eucalyptus sideroxylon)	On sheltered slopes in hills of the southern part of the NSW South Western Slopes Bioregion.	Brachyloma daphnoides subsp. daphnoides, Acacia paradoxa, Persoonia sericea, Leptospermum continentale, Dillwynia sericea, Hibbertia obtusifolia	Red-anther Wallaby Grass (Joycea pallida), Snowgrass (Poa sieberiana var. sieberiana), Austrodanthonia pilosa, Senecio species E, Gonocarpus tetragynus, Cheilanthes austrotenuifolia, Lomandra multiflora subsp. multiflora, Lomandra filiformis subsp. coriacea	Benson 287 (Benson unpubl.)	Benson, unpublished data	Dry Sclerophyll Forests (Shrubby subformation) [CW]	60

Vegetation type	MRVCD	Dominant canopy spp	Main associated spp	Landscape position	Characteristic mid-storey spp	Characteristic groundcover spp	Profile source	Full reference details	Vegetation formation [CMA]	Cleared Estimate rounded to nearest 5%
Mugga Ironbark - Inland Grey Box - pine tall woodland of the NSW South Western Slopes Bioregion (Benson 217)	2744	Mugga Ironbark (Eucalyptus sideroxylon), Inland Grey Box (Eucalyptus microcarpa), White Cypress Pine (Callitris glaucophylla), Black Cypress Pine (Callitris endlicheri)	Dwyer's Red Gum (Eucalyptus dwyeri), Bulloak (Allocasuarina luehmannii), Green Mallee (Eucalyptus viridis), Currawang (Acacia doratoxylon), Kurrajong (Brachychiton populneus subsp. populneus)	On footslopes of rises or low hills in the undulating central western slopes of NSW.	Santalum, Exocarpos ,cupressiformis, Currawang (Acacia doratoxylon), Dodonaea Cassinia, Acacia deanei, Acacia hakeoides, Acacia buxifolia, Ozothamnus Olearia Bertya cunninghamii, Grevillea floribunda, Leptospermum divaricatum	Melichrus urceolatus, Austrodanthonia setacea, Speargrass (Austrostipa scabra subsp. scabra), Calotis cuneifolia, Austrostipa densiflora, Dianella revoluta var. revoluta, Xerochrysum viscosa, Einadia hastata, Goodenia hederacea subsp. hederacea, Eragrostis lacunaria, Austrodanthonia fulva, Austrodanthonia monticola,	Benson 217 (Benson et al. 2006)	Benson, J.S., Allen, C.B., Togher, C. & Lemmon, J. (2006) New South Wales Vegetation, Classification and Assessment: Part 1 Plant Communities of the NSW Western Plains. Cunninghamia 9(3): 383-450.	Dry Sclerophyll Forests (Shrubby subformation) [CW]	**75**

Vegetation type	MRVCD	Dominant canopy spp	Main associated spp	Landscape position	Characteristic mid-storey spp	Characteristic groundcover spp	Profile source	Full reference details	Vegetation formation [CMA]	Cleared Estimate rounded to nearest 5%
Mugga Ironbark - Inland Grey Box shrubby woodland of the Brigalow Belt South Bioregion	2950	Inland Grey Box (Eucalyptus microcarpa), Black Cypress Pine (Callitris endlicheri), Mugga Ironbark (Eucalyptus sideroxylon), Red Ironbark (Eucalyptus fibrosa)	Red Box (Eucalyptus polyanthemos subsp. polyanthemos)	Hills; Low hills	Astroloma humifusum, Babingtonia cunninghamii, Lissanthe strigosa, Cassinia arcuata, Acacia buxifolia	Wiry Panic (Entolasia stricta), Gahnia aspera, Aristida vagans, Austrodanthonia racemosa, Microlaena stipoides var. stipoides, Lepidosperma laterale, Red-anther Wallaby Grass (Joycea pallida), Lomandra filiformis	BBS Unit 129 (Planning NSW 2004)	Planning NSW. (2004). Draft Joint Vegetation Mapping Project. NSW Western Regional Assessments, Brigalow Belt South Bioregion. Report to Resource and Conservation Assessment Council NSW Western Regional Assessments Project WRA/24. Planning NSW, Dubbo	Dry Sclerophyll Forests (Shrubby subformation) [CW]	**50**

Vegetation type	MRVCD	Dominant canopy spp	Main associated spp	Landscape position	Characteristic mid-storey spp	Characteristic groundcover spp	Profile source	Full reference details	Vegetation formation [CMA]	Cleared Estimate rounded to nearest 5%
Apple Box - Yellow Box dry grassy woodland of the South Eastern Highlands	2	Apple Box (Eucalyptus bridgesiana), Yellow Box (Eucalyptus melliodora)		Gently undulating slopes		Kangaroo Grass (Themeda australis), Danthonia racemosa subsp. racemosa, Microlaena stipoides var. stipoides, Panicum effusum, Snowgrass (Poa sieberiana var. sieberiana), Gonocarpus tetragynus, Convolvulus erubescens, Acaena ovina, Common Woodruff (Asperula conferta)	Vegetation Group 154 (Gellie 2005)	Gellie, N.J.H. (2005) Native Vegetation of the Southern Forests: South-east Highlands, Australian Alps, South-west Slopes and SE Corner bioregions. Cunninghamia 9(2): 219-254	Grassy Woodlands [CW]	95
Red Stringybark - Scribbly Gum - Red Box - Long-leaved Box shrub - tussock grass open forest the NSW South Western Slopes Bioregion (Benson 290)	8 10 65	Red Stringybark (Eucalyptus macrorhyncha), Scribbly Gum (Eucalyptus rossii)	Red Box (Eucalyptus polyanthemos subsp. polyanthemos), Long-leaved Box (Eucalyptus goniocalyx), Blakely's Red Gum (Eucalyptus blakelyi),	Occurs on dry slopes and sometimes on crests of hills.	Dillwynia phylicoides, Phyllanthus hirtellus, Styphelia triflora, Grevillea spp., Melichrus urceolaris, Brachyloma daphnoides spp daphnoides	Red-anther Wallaby Grass (Joycea pallida), Snowgrass (Poa sieberiana var. sieberiana), Stypandra glauca, Lomandra filiformis subsp. coriacea, Goodenia hederacea	Benson 290 (Benson unpubl.)	Benson, unpublished data	Dry Sclerophyll Forests (Shrub/grass subformation) [CW]	85

Vegetation type	MRVCD	Dominant canopy spp	Main associated spp	Landscape position	Characteristic mid-storey spp	Characteristic groundcover spp	Profile source	Full reference details	Vegetation formation [CMA]	Cleared Estimate rounded to nearest 5%
			Allocasuarina verticillata			subsp. hederacea, Lomandra multiflora subsp. multiflora, Craspedia variabilis				
Red Stringybark woodland of the dry slopes of the South Western Slopes Bioregion	48 51 52 53	Red Stringybark (Eucalyptus macrorhyncha), Red Box (Eucalyptus polyanthemos subsp. polyanthemos)	Black Cypress Pine (Callitris endlicheri), Blakely's Red Gum (Eucalyptus blakelyi), Mugga Ironbark (Eucalyptus sideroxylon), Red Ironbark (Eucalyptus fibrosa), Long-leaved Box (Eucalyptus goniocalyx),), Scribbly Gum (Eucalyptus rossii)	On dry slopes hills and ridges at mid-altitudes on both sedimentary and volcanic substrates, .	Hibbertia obtusifolia, Macrozamia secunda, Currawang (Acacia doratoxylon), Brachyloma daphnoides, Acrotriche rigida, Leptospermum juniperinum, Acacia lanigera	Lomandra filiformis, Lepidosperma laterale, Lomandra multiflora, Patersonia sericea, Aristida calycina, Red-anther Wallaby Grass (Joycea pallida), Cheilanthes sieberi subsp. sieberi, Phyllanthus hirtellus, Calochilus campestris, Zieria cytisoides, Dipodium hamiltonianum, Stypandra glauca, Lomandra filiformis subsp. coriacea	Kerr, M., Jowett, A. & Robson, D. (2003). Reconstructed Distribution and the Extent of Native Vegetation within the Lower Macquarie-Castlereagh Region.	Austin, M.P., Cawsey, E.M., Baker, B.L., Grice, D.J. & Briggs, S.V. (2000). Predicted Vegetation Cover in the Central Lachlan Region. Final Report - Project: AA 1368.97. CSIRO.	Dry Sclerophyll Forests (Shrub/grass subformation) [CW]	**85**
Ribbon/Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the North Coast and New	40 41	Ribbon Gum (Eucalyptus viminalis)	Yellow Box (Eucalyptus melliodora), Rough-barked Apple (Angophora floribunda),	Scattered occurrences on the tablelands and escarpment.	Broad-leaved Hickory (Acacia falciformis), White Banksia (Banksia integrifolia subsp. monticola), Native Raspberry (Rubus	Snowgrass (Poa sieberiana var. sieberiana), Kangaroo Grass (Themeda australis), Redleg Grass	FE 195 (NPWS 1999)	NPWS (1999). Forest Ecosystem Classification and mapping for the upper and lower	Grassy Woodlands	**90**

Vegetation type	MRVCD	Dominant canopy spp	Main associated spp	Landscape position	Characteristic mid-storey spp	Characteristic groundcover spp	Profile source	Full reference details	Vegetation formation [CMA]	Cleared Estimate rounded to nearest 5%
England Tablelands			Messmate (Eucalyptus obliqua), New England Blackbutt (Eucalyptus campanulata)		parvifolius), Blackthorn (Bursaria spinosa subsp. spinosa), Pimelea curviflora	(Bothriochloa macra), Austrodanthonia racemosa, Sporobolus crebra, Geranium solanderi var. solanderi, Kidney Weed (Dichondra repens), Lomandra filiformis, Asperula confertus, Desmodium varians, Microlaena stipoides var. stipoides		north east CRA regions. CRA Unit Northern Zone National Parks and Wildlife Service.		

Vegetation type	MRVCD	Dominant canopy spp	Main associated spp	Landscape position	Characteristic mid-storey spp	Characteristic groundcover spp	Profile source	Full reference details	Vegetation formation [CMA]	Cleared Estimate rounded to nearest 5%
Tumbledown Red Gum - Black Cypress Pine - Red Box low woodland of hills of the South Western Slopes	45	Tumbledown Red Gum (Eucalyptus dealbata), Black Cypress Pine (Callitris endlicheri), Red Box (Eucalyptus polyanthemos subsp. polyanthemos), Mugga Ironbark (Eucalyptus sideroxylon)	Kurrajong (Brachychiton populneus subsp. populneus), Red Stringybark (Eucalyptus macrorhyncha), White Box (Eucalyptus albens), Scribbly Gum (Eucalyptus rossii), Green Mallee (Eucalyptus viridis)	On slopes and ridges	Currawang (Acacia doratoxylon), Allocasuarina verticillata, Cassinia aculeata, Acacia vestita, Western Boobialla (Myoporum montanum), Dodonaea viscosa, Styphelia triflora	Calotis cuneifolia, Gonocarpus elatus. Austrodanthonia monticola, Austrodanthonia racemosa, Kangaroo Grass (Themeda australis), Speargrass (Austrostipa scabra subsp. scabra), Dichelachne micrantha, Stypandra glauca, Microlaena stipoides var. stipoides, Lepidosperma laterale.	DEC (2006)	DEC (2006) Reconstructed and Extant Distribution of Native Vegetation in the Central West Catchment. Information and Assessment Section, North-west Branch, Dubbo	Dry Sclerophyll Forests (Shrubby subformation) [CW]	**75**

Vegetation type	MRVCD	Dominant canopy spp	Main associated spp	Landscape position	Characteristic mid-storey spp	Characteristic groundcover spp	Profile source	Full reference details	Vegetation formation [CMA]	Cleared Estimate rounded to nearest 5%
Tumbledown Red Gum - Black Cypress Pine - Red Box low woodland of hills of the South Western Slopes	73	Tumbledown Red Gum (Eucalyptus dealbata), Black Cypress Pine (Callitris endlicheri), Red Box (Eucalyptus polyanthemos subsp. polyanthemos), Mugga Ironbark (Eucalyptus sideroxylon)	Kurrajong (Brachychiton populneus subsp. populneus), Red Stringybark (Eucalyptus macrorhyncha), White Box (Eucalyptus albens), Scribbly Gum (Eucalyptus rossii), Green Mallee (Eucalyptus viridis)	On slopes and ridges	Currawang (Acacia doratoxylon), Allocasuarina verticillata, Cassinia aculeata, Acacia vestita, Western Boobialla (Myoporum montanum), Dodonaea viscosa, Styphelia triflora	Calotis cuneifolia, Gonocarpus elatus. Austrodanthonia monticola, Austrodanthonia racemosa, Kangaroo Grass (Themeda australis), Speargrass (Austrostipa scabra subsp. scabra), Dichelachne micrantha, Stypandra glauca, Microlaena stipoides var. stipoides, Lepidosperma laterale.	DEC (2006)	DEC (2006) Reconstructed and Extant Distribution of Native Vegetation in the Central West Catchment. Information and Assessment Section, North-west Branch, Dubbo	Dry Sclerophyll Forests (Shrubby subformation) [CW]	**75**
White Box - Apple Box valley herbaceous woodland mainly of the NSW western slopes (Benson 275)	1 86	White Box (Eucalyptus albens), Apple Box (Eucalyptus bridgesiana)	Long-leaved Box (Eucalyptus goniocalyx), Red Stringybark (Eucalyptus macrorhyncha), Blackwood (Acacia melanoxylon)	In valleys and along creeks at higher altitudes in the NSW South Western Slopes Bioregion.	Pomaderris angustifolia, Cassinia laevis, Acacia vestita, Callistemon sieberi, Dodonaea viscosa subsp. angustifolia	Austrodanthonia caespitosa, Microlaena stipoides var. stipoides, Lachnagrostis filiformis, Tussock Grass (Poa labillardierei), Snowgrass (Poa sieberiana var. sieberiana), Urtica incisa, Hydrocotyle laxiflora,	Benson 275 (Benson unpubl.)	Benson, unpublished data	Grassy Woodlands [CW]	**65**

Vegetation type	MRVCD	Dominant canopy spp	Main associated spp	Landscape position	Characteristic mid-storey spp	Characteristic groundcover spp	Profile source	Full reference details	Vegetation formation [CMA]	Cleared Estimate rounded to nearest 5%
						Alternanthera denticulata, Carex inversa				
White Box - Black Cypress Pine - Tumbledown Gum - Mugga Ironbark shrubby woodland in hills of the NSW central western slopes (Benson 272)	83	White Box (Eucalyptus albens), Black Cypress Pine (Callitris endlicheri), Tumbledown Red Gum (Eucalyptus dealbata)	Mugga Ironbark (Eucalyptus sideroxylon)	On hillslopes (often north-facing) in the 500-600 mm rainfall belt on the central western slopes of NSW.	Acacia penninervis, Acacia decora, Acacia implexa, Dodonaea viscosa subsp. angustifolia, Indigofera adesmiifolia, Black Cypress Pine (Callitris endlicheri)	Austrodanthonia spp, Austrostipa densiflora, Red-anther Wallaby Grass (Joycea pallida), Acaena ovina, Scutellaria humilis, Einadia hastata, Hydrocotyle laxiflora	Benson 272 (Benson unpubl.)	Benson, unpublished data	Grassy Woodlands [CW]	**60**
White Box - Blakely's Red Gum - Yellow Box grassy woodland of the NSW South Western Slopes Bioregion (Benson 282)	77 79 87	White Box (Eucalyptus albens), Blakely's Red Gum (Eucalyptus blakelyi)	Yellow Box (Eucalyptus melliodora), Apple Box (Eucalyptus bridgesiana)	On footslopes or lower slopes in hills or low hills mainly in the NSW South Western Slopes Bioregion.	Acacia decora, Acacia implexa	Kangaroo Grass (Themeda australis), Snowgrass (Poa sieberiana var. sieberiana), Elymus scaber, Arthropodium minus, Bulbine bulbosa, Dichopogon fimbriatus, Chrysocephalum apiculatum	Benson 282 (Benson unpubl.)	Benson, unpublished data	Grassy Woodlands [CW]	**85**

Vegetation type	MRVCD	Dominant canopy spp	Main associated spp	Landscape position	Characteristic mid-storey spp	Characteristic groundcover spp	Profile source	Full reference details	Vegetation formation [CMA]	Cleared Estimate rounded to nearest 5%
White Box - Rough-barked Apple alluvial woodland on the NSW western slopes (Benson 274)	58	White Box (Eucalyptus albens), Rough-barked Apple (Angophora floribunda)	Red Stringybark (Eucalyptus macrorhyncha), Blakely's Red Gum (Eucalyptus blakelyi)	In valley bottoms and on adjoining lower slopes in hill landscapes in the Central Western Slopes Botanical Division.	Acacia buxifolia, Acacia implexa, Sticky Daisybush (Olearia elliptica), Hibbertia obtusifolia, Hibbertia acicularis, Swainsona galegifolia.	Panicum effusum, Kangaroo Grass (Themeda australis), Microlaena stipoides var. stipoides, Lachnagrostis filiformis, Austrostipa ramosissima, Acaena novae-zelandiae, Arthropodium milleflorum, Daucus glochidiatus form F, Dichopogon fimbriatus, Carex appressa	Benson 274 (Benson unpubl.)	Benson, unpublished data	Grassy Woodlands [CW]	**90**

Vegetation type	MRVCD	Dominant canopy spp	Main associated spp	Landscape position	Characteristic mid-storey spp	Characteristic groundcover spp	Profile source	Full reference details	Vegetation formation [CMA]	Cleared Estimate rounded to nearest 5%
White Box grassy woodland on well drained podsolic clay soils on hills in the NSW South Western Slopes Bioregion (Benson 266)	78	White Box (Eucalyptus albens)	Apple Box (Eucalyptus bridgesiana), Kurrajong (Brachychiton populneus subsp. populneus)	On slopes and crests in hill landform patterns in the NSW South Western Slopes Bioregion.	Acacia decora, Acacia implexa, Acacia deanei subsp. paucijuga, Acacia genistifolia, Acacia penninervis var. longiracemosa, Dodonaea viscosa subsp. cuneata, Blackthorn (Bursaria spinosa subsp. spinosa), Cassinia aculeata	Kangaroo Grass (Themeda australis), Snowgrass (Poa sieberiana var. sieberiana), Elymus scaber, Austrodanthonia bipartita, Austrodanthonia auriculata, Wurmbea dioica, Gonocarpus elatior, Microseris lanceolata, Leptorhynchos squamatus, Craspedia variabilis, Podolepis jaceoides, Hypericum gramineum, Stackhousia monogyna, Ranunculus lappaceus	Benson 266 (Benson unpubl.)	Benson, unpublished data	Grassy Woodlands [CW]	**95**

Vegetation type	MRVCD	Dominant canopy spp	Main associated spp	Landscape position	Characteristic mid-storey spp	Characteristic groundcover spp	Profile source	Full reference details	Vegetation formation [CMA]	Cleared Estimate rounded to nearest 5%
White Box shrubby open forest on fine grained sediments on steep slopes in the Mudgee region of the of central western slopes of NSW (Benson 273)	85	White Box (Eucalyptus albens), Red Stringybark (Eucalyptus macrorhyncha)		On steep slopes in hill landscapes around Mudgee.	Dodonaea viscosa subsp. angustifolia, Sticky Daisybush (Olearia elliptica), Acacia paradoxa, Acacia implexa, Melichrus urceolatus, Persoonia linearis, Cassinia spp	Aristida ramosa var. speciosa, Snowgrass (Poa sieberiana var. sieberiana), Lomandra multiflora subsp. multiflora, Barbed Wire Grass (Cymbopogon refractus), Kangaroo Grass (Themeda australis), Speargrass (Austrostipa scabra subsp. scabra), Ajuga australis, Arthropodium milleflorum, Kidney Weed (Dichondra repens), Lomandra filiformis subsp. coriacea, Cheilanthes distans	Benson 273 (Benson unpubl.)	Benson, unpublished data	Dry Sclerophyll Forests (Shrubby subformation) [CW]	**70**

Vegetation type	MRVCD	Dominant canopy spp	Main associated spp	Landscape position	Characteristic mid-storey spp	Characteristic groundcover spp	Profile source	Full reference details	Vegetation formation [CMA]	Cleared Estimate rounded to nearest 5%
Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands	4 9 11 3	Yellow Box (Eucalyptus melliodora), Apple Box (Eucalyptus bridgesiana), Blakely's Red Gum (Eucalyptus blakelyi)	Broad-leaved Peppermint (Eucalyptus dives), Red Stringybark (Eucalyptus macrorhyncha), Candle Bark (Eucalyptus rubida subsp. rubida), Snow Gum (Eucalyptus pauciflora), Brittle Gum (Eucalyptus mannifera), Ribbon Gum (Eucalyptus viminalis)	Occurs on loamy soils on undulating terrain between 500 and 900m on the tablelands.	Lissanthe strigosa, Melichrus urceolatus	Kangaroo Grass (Themeda australis), Microlaena stipoides var. stipoides, Gonocarpus tetragynus, Redleg Grass (Bothriochloa macra), Hydrocotyle laxiflora, Snowgrass (Poa sieberiana var. sieberiana) Austrodanthonia racemosa, Goodenia hederacea, Lomandra filiformis subsp. coriacea	GW p24 (Tozer et al. 2006), possibly Vegetation Group 154 (Gellie 2005)	Tozer, M.G., Turner, K., Simpson, C., Keith, D.A., Beukers, P., MacKenzie, B., Tindall, D. & Pennay, C. (2006) Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands. Version 1.0; Gellie, N.J.H. (2005) Native Vegetation of the Southern Forests: South-east Highlands, Australian Alps, South-west Slopes and SE Corner bioregions. Cunninghamia 9(2): 219-254	Grassy Woodlands	**90**

Vegetation type	MRVCD	Dominant canopy spp	Main associated spp	Landscape position	Characteristic mid-storey spp	Characteristic groundcover spp	Profile source	Full reference details	Vegetation formation [CMA]	Cleared Estimate rounded to nearest 5%
Yellow Box tall grassy woodland on alluvial flats mainly in the NSW South Western Slopes Bioregion (Benson 276)	88	Yellow Box (Eucalyptus melliodora)	River Red Gum (Eucalyptus camaldulensis), Blakely's Red Gum (Eucalyptus blakelyi)	On floodplains or plains mainly in the NSW South Western Slopes Bioregion.	Acacia decora, Maireana microphylla, Acacia deanei subsp. deanei, Acacia implexa, Acacia montana, Acacia pycnantha	Redleg Grass (Bothriochloa macra), Austrostipa bigeniculata, Elymus scaber, Windmill Grass (Chloris truncata), Sida corrugata, Goodenia pinnatifida, Vittadinia cuneata.	Benson 276 (Benson unpubl.)	Benson, unpublished data	Grassy Woodlands [CW]	**90**

4 ENDANGERED ECOLOGICAL COMMUNITIES AND POPULATIONS

4.1 Hunter Valley Weeping Myall – Endangered Community

Description (DEC NSW, 2005)

Hunter Valley Weeping Myall Woodland of the Sydney Basin bioregion typically has a dense to open tree canopy up to about 15 m tall, depending on disturbance and regrowth history. The most common tree is *Acacia pendula* (Weeping Myall), which may occur with *Eucalyptus crebra* (Narrow-leaved Ironbark), *A. salicina* (Cooba) and/or trees within the *A. homalophylla-A. melvillei* complex. Understorey shrubs may include *Canthium buxifolium* (Stiff Canthium), *Dodonaea viscosa* (Sticky Hopbush), *Geijera parviflora* (Wilga), *Notelaea microphylla* var. *microphylla* (Native Olive) and *Senna zygophylla* (Silver Cassia). However, these shrubs are absent from some stands. The groundcover varies from dense to sparse, and is comprised of grasses such as *Austrodanthonia fulva* (a wallaby grass) and *Themeda australis* (Kangaroo Grass), and low shrubs and herbs such as *Chrysocephalum apiculatum* (Common Everlasting), *Einadia nutans* subsp. *nutans* (Climbing Saltbush), *Enchylaena tomentosa* (Ruby Saltbush), *Maireana microphylla* (Eastern Cotton Bush) and *Ptilotus semilanatus* (DEC NSW, 2005).

Distribution

Hunter Valley Weeping Myall Woodland of the Sydney Basin bioregion is currently known from parts of the Muswellbrook and Singleton Local Government Areas, but may occur elsewhere in the bioregion. It may also occur in the Upper Hunter LGA within the Brigalow Belt South bioregion, although its presence has not yet been confirmed there. The potential occurrence in the survey area led to its inclusion as a possible survey target; however, there are no records of this species' presence in MWRC on the NSW Wildlife Atlas at June, 2010.

Threats

Threats for this species/community include extensive clearing of native vegetation so that it persists only as very small remnants of less than one-hectare or as isolated trees. The total remaining area of Hunter Valley Weeping Myall Woodland is estimated to be less than ten hectares. Current threats are from small-scale vegetation clearing, fragmentation, and small-scale disturbance to soils and groundcover, many of the constituent species exhibit poor recruitment. Most examples of the community are grazed which impacts on the groundcover. Invasion by pasture and roadside weeds and *Asparagus asparagoides* (Bridal Creeper) pose significant threats throughout the range of the community.

4.2 White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Ecological Community

Description (NPWS, 2002a, 2002b)

This ecological community can occur as either woodland or derived grassland – by definition, this is grassy woodland from which the trees have been removed. It has a ground layer of native tussock

grasses and herbs, and a sparse, scattered shrub layer. White Box (*Eucalyptus albens*), Yellow Box (*E. melliodora*) and/or Blakely's Red Gum (*E. blakelyi*) dominate the community in areas where a tree layer still occurs. The density of trees is not relevant to the existence of the EEC. Where White Box, Yellow Box or Blakely's Red Gum trees have been killed, and the overstorey is now dominated by other species (e.g. White Cypress Pine), the EEC still exists as a degraded site.

The EEC occurs predominantly on the western slopes of NSW from Victoria to Queensland on soils that are moderately to highly fertile. Consequently, Box-Gum Woodland has been extensively cleared and modified by thinning, clearing, grazing, pasture improvement and cultivation. Remaining stands of Box-Gum Woodland are generally highly fragmented. Less than 5% of the pre-European extent is estimated to remain in the south and up to 10% in the north of the State. Less than 0.5% is estimated to retain pre-European levels of diversity and species composition.

The Final Determination (DEC, 2002) defines Box-Gum Woodland broadly. There are five main features in the Determination that govern whether the EEC exists at a site:

1. Whether the site is within the area defined in the Determination.
2. Whether the characteristic trees of the site are (or are likely to have been) White Box, Yellow Box or Blakely's Red Gum.
3. Whether the site is mainly grassy.
4. Whether any of the listed characteristic species occur (including as part of the seedbank in the soil).
5. If the site is degraded, whether there is potential for assisted natural regeneration of the overstorey or understorey.

Community Composition (NPWS, 2002a; DEH, 2006)

(NSW NPWS Identification guidelines are included as Appendix A of this report)

By definition, this community is characterised by the presence or prior occurrence of White Box, Yellow Box and/or Blakely's Red Gum. The trees may occur as pure stands, mixtures of the three species or in mixtures with other trees, including wattles. Some other canopy species that may occur in association with the Box-Gum Woodland EEC include Western or Inland Grey Box (*Eucalyptus microcarpa*), Coastal Grey Box (*E. moluccana*), Fuzzy Box (*E. conica*), Apple Box (*E. bridgesiana*), Red Box (*E. polyanthemos*), Red Stringybark (*E. macrorhyncha*), Long-leaved Box (*E. goniocalyx*), Brittle Gum (*E. mannifera*), Candlebark (*E. rubida*), Cabbage Gum (*E. amplifolia*), White Cypress Pine (*Callitris glaucophylla*), Black Cypress Pine (*Callitris enderlicheri*), Kurrajong (*Brachychiton populneus*), Drooping She-oak (*Allocasuarina verticillata*).

The understorey in undisturbed sites is characterised by native grasses and a high diversity of herbs; the most commonly encountered include Kangaroo Grass (*Themeda australis*), Poa Tussock (*Poa sieberiana*), wallaby grasses (*Austrodanthonia* spp.), spear-grasses (*Austrostipa* spp.), Common Everlasting (*Chrysocephalum apiculatum*), Scrambled Eggs (*Goodenia pinnatifida*), Small St John's Wort (*Hypericum gramineum*), Narrow-leafed New Holland Daisy (*Vittadinia muelleri*) and blue-bells (*Wahlenbergia* spp.).

Shrubs are generally sparse or absent, though they may be locally common. In some cases, shrubs may be dominant over parts of an EEC site. Shrub species are recognised as important constituents of the community as 27 of the 95 characteristic species listed in the Final Determination are shrubs. However, shrubby woodlands, which generally occur in upper or midslope situations on shallower soils, are not part of the EEC. In some other instances, the shrub layer consists primarily of *Acacia* species or *Cassinia* species, which are characteristically pioneer colonising species that invade sites after disturbances such as clearing, overgrazing or fires. These species generally only live 10-15 years and are replaced with a predominantly grassy understorey. These areas are regarded as Box-Gum Woodland. In most locations the understorey will vary considerably depending on the season, management history and rainfall in preceding months. Care in assessing a site is required when a flush of annual exotic species obscures native perennial species. Ideally sites should be assessed in both spring and in autumn so that seasonal native species such as orchids, lilies and native annuals can be identified.

Remnants generally occur on fertile lower parts of the landscape where resources such as water and nutrients are abundant. Sites with particular characteristics, including varying age classes in the trees, patches of regrowth, old trees with hollows and fallen timber on the ground are very important as wildlife habitat. Sites in the lowest parts of the landscape often support very large trees which have leafy crowns and reliable nectar flows - sites important for insectivorous and nectar feeding birds. Sites that retain a grassy groundlayer, with few or no trees remaining, are important for rehabilitation, and to rebuild connections between sites of better quality.

Remnants support many species of threatened fauna and flora. Retention of remnants is important as they contribute to productive farming systems (stock shelter, seed sources, sustainable grazing and water-table and salinity control). The fauna of remnants (insectivorous birds, bats, etc) can contribute to insect control on grazing properties. Some of the component species (e.g. wattles, she-oaks, and native legumes) fix nitrogen that is made available to other species in the community, while fallen timber and leaves recycle their nutrients.

Disturbed remnants are considered to form part of the community, including where the vegetation would respond to assisted natural regeneration. The condition of remnants of Box-Gum Woodland varies. The conservation value of a remnant, whatever its condition, will vary according to the locality. For example, whilst Box-Gum Woodland persisting as isolated paddock trees may be of limited conservation value in some areas, in highly modified agricultural landscapes they may be all that remain and thus their loss would be significant (NPWS, 2002a).

Conservation Value

The condition of remnants of this EEC varies. Examples of the various conditions the community may occur in include:

1 Multi-aged overstorey with a grassy, herb-rich understorey: Remnants in this condition are generally very scarce and are usually confined to travelling stock reserves, roadside vegetation, cemeteries, some national parks and the occasional private property. A number of good examples occur in the Mid-Western LGA, including along sections of Clarke's Creek Rd (Figure 12).

Figure 12. Box-Gum Woodland EEC in good condition on Clarke's Creek Rd, near Pyramul.

2 Partially cleared/thinned stands with a mixture of native and exotic understorey species: This condition is generally far more common than the above; however its longterm future is often insecure due to inadequate regeneration of overstorey species. Often current management (e.g. set-stocking) is inconsistent with tree regeneration. Numerous examples of Box-Gum EEC in this condition can be found in the Mid-Western Regional LGA, including unfenced sections of Browie Road, running through sheep paddocks (Figure 13).

Figure 13. Partially cleared Box-Gum EEC on Browie Rd, near Goolma. Grazing management practices can affect regeneration in this community.

3 Stands where White Box, Yellow Box or Blakely's Red Gum trees have been killed and other species dominate the canopy. This condition occurs in woodlands where the characteristic trees occur in conjunction with White Cypress Pine. The understorey is often in reasonable to very good condition. Identifying Box-Gum EECs in this condition can be problematic without a historical perspective on vegetation of a site, and may be present at a number of locations in the Mid-Western Regional LGA. As a result, areas where there may be, or may have been, Box-Gum EEC were recorded as potential EECs. Potential Box-Gum EEC occurs on Bara Rd, Bara, where the characteristic species are present along with a *Callitris* species and several other *Eucalyptus* species (Figure 14).

Figure 14. Potential Box-Gum EEC occurs on Bara Rd, Bara, where the characteristic species are present along with a *Callitris* species and several other *Eucalyptus* species.

4 Grasslands (secondary or derived grasslands), where the tree overstorey has been removed and only the Box-Gum Woodland understorey is present: This condition is reasonably common in many areas of the LGA, and is likely to be relatively easy to rehabilitate if appropriate management strategies are implemented. Unfortunately, conflicting land use requirements often result in continuing degradation of this form of the Box-Gum EEC, as is happening on Grattai Creek Rd, Grattai (Figure 15).

Figure 15. Derived grasslands, in which the characteristic canopy species have been removed, persist in many parts of Mid-Western Regional LGA, including along Grattai Creek Rd, Grattai.

5 Degraded remnants that have few, if any, native species in the understorey: This condition is typical of Box-Gum Woodland where agricultural practices have been more intensive (e.g. pasture improvement over long periods). There are many roadside areas in the LGA that retain a reasonable canopy cover with the characteristic species dominating, but with highly degraded understorey, including areas along Buckeroo Rd, Buckaroo (Figure 16).

Figure 16. In many parts of the LGA a degraded understorey occurs with good cover of mainly characteristic Box-Gum EEC canopy species.

Threats

- Clearing, degradation and fragmentation of remnants for agricultural, forestry, infrastructure and residential development.
- Continuous heavy grazing and trampling of remnants by grazing stock, resulting in losses of plant species (simplification of the understorey and groundlayer and suppression of overstorey), erosion and other soil changes (including increased nutrient status).
- Invasion of remnants by non-native plant species, including noxious weeds, pasture species and environmental weeds, including garden escapes, olives and pines.
- Invasion of remnants by feral animals resulting in the loss or modification of habitat.
- Disturbance and clearance of remnants during road, rail and infrastructure maintenance and upgrades.
- Harvesting of firewood (either living or standing dead, including material on the ground).
- Collection of on-ground woody debris in the guise of a 'clean-up'.

4.3 Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia Endangered Ecological Community

Description

Inland Grey Box Woodland includes those woodlands in which the most characteristic tree species, *Eucalyptus microcarpa* (Inland Grey Box), is often found in association with *E. populnea* subsp. *bimbil* (Bimble or Poplar Box), *Callitris glaucophylla* (White Cypress Pine), *Brachychiton populneus* (Kurrajong), *Allocasuarina luehmannii* (Bulloak) or *E. melliodora* (Yellow Box), and sometimes with *E. albens* (White Box). Shrubs are typically sparse or absent, although this component can be diverse and may be locally common, especially in drier western portions of the community. A variable ground layer of grass and herbaceous species is present at most sites. At severely disturbed sites the ground layer may be absent. The community generally occurs as an open woodland 15–25 m tall but in some locations the overstorey may be absent as a result of past clearing or thinning, leaving only an understorey.

Distribution

Inland Grey Box Woodland occurs predominately within the Riverina and South West Slopes regions of NSW down to the Victorian border. It includes Albury to the east and may extend out west towards Hay. This community also extends across the slopes and plains in Central and Northern NSW up to the Queensland Border. This includes Yetman and Inverell in the North, Molong to the east of the Central Slopes and plains and out towards Nymagee to the west (DECC 2009).

Figure 17. Inland Grey Box Woodland often has good canopy but degraded understorey flora, as seen at Smede's Lane, Turill.

Inland Grey Box Woodland occurs on fertile soils of the western slopes and plains of NSW. The community generally occurs where average rainfall is 375- 800 mm pa and the mean maximum annual temperature is 22- 26°C. The majority of remnant patches of Inland Grey Box Woodland survive with trees largely intact but with the shrub or ground layers degraded to varying degrees through grazing or pasture modification. Good examples of Grey Box Woodland in this condition can be found throughout the LGA, including areas along Smede's Lane, near Turill. Some species that are part of the community appear intolerant to heavy grazing by domestic stock and are confined to the least disturbed remnants.

Derived Grasslands

The Grey Box (*E. microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia ecological community includes patches of derived grassland, where the tree canopy and mid layer has been removed to less than 10% crown cover but the native ground layer remains largely intact. In order for the derived grassland to be included in the ecological community, a canopy or mid layer should formerly have been present that was consistent with the ecological community as described above. Evidence that these former layers existed may include: the presence of tree stumps or fallen logs; the type of vegetation in nearby native remnants; historical records and photographs; or reliable modelling of pre-European vegetation. It should be evident that the grassland patch is not derived from different types of woodland or be a naturally treeless patch of grassland. A patch of derived grassland should also retain sufficient ground layer species to be consistent with the ground layer for the woodland.

Given the extensive clearing of woodlands across the intensive land use zone, few sites are likely to be reliably identified as derived from the ecological community. It is more likely that trees have been retained as shelter belts but the understorey has been denuded of native species. Derived grasslands are most likely to occur on Travelling Stock Routes or reserves (TSRs), along roadsides, or localised patches of grassland that are part of a larger remnant with trees, such as under power easements or in fire breaks. These generally represent a continuation of the ground layer between the wooded and treeless parts of a patch, and are rare but important for conservation purposes.

Diagnostic features

The Grey Box (*E. microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia occupies a landscape zone transitional between semi-arid communities and the temperate woodlands and forests of the lower slopes and ranges. Many of the plant species present are widespread or occur in other vegetation types that adjoin or intergrade with the ecological community. The key diagnostic characteristics are:

- The ecological community occurs on low slopes and plains from central NSW, through northern and central Victoria into South Australia.
- The vegetation structure of the ecological community typically ranges from woodland to open forest.

- The tree canopy is dominated (≥ 50% canopy crown cover) by *Eucalyptus microcarpa* (Grey Box). Other tree species may be present in the canopy and, in certain circumstances, may be co-dominant with Grey Box but are never dominant on their own.
- The mid layer comprises shrubs of variable composition and cover, from absent to moderately dense. The mid layer usually has a crown cover of less than 30% with local patches up to 40% crown cover.
- The ground layer also is highly variable in development and composition, ranging from almost absent to mostly grassy to forb-rich. Ground layer flora commonly present include one or more of the graminoid genera: *Austrodanthonia*, *Austrostipa*, *Elymus*, *Enteropogon*, *Dianella* and *Lomandra*; and one or more of the chenopod genera: *Atriplex*, *Chenopodium*, *Einadia*, *Enchylaena*, *Maireana*, *Salsola* and *Sclerolaena.*
- Derived grasslands are a special state of the ecological community, whereby the canopy and mid layers have been mostly removed to <10% crown cover but the native ground layer remains largely intact, with 50% or more of the total vegetation cover being native.

4.4 River Red Gum Population in the Hunter Catchment – Endangered Population

Description (DEC NSW threatened species - River Red Gum population in the Hunter Catchment)

The population of River Red Gum in the Hunter is unique in NSW being the only one to occur in a coastal catchment. It is disjunct and at the limit of range of the species, it may be genetically distinct, and is of conservation significance as the community dominant in distinct riparian and floodplain vegetation types.

Distribution

The Hunter population occurs from the west at Bylong, south of Merriwa, to the east at Hinton, on the bank of the Hunter River, in the Port Stephens local government area. It has been recorded in the local government areas of Lithgow, Maitland, Mid-Western Regional, Muswellbrook, Port Stephens, Singleton and Upper Hunter. Several very large red gums associated with permanent drainage systems were observed during this survey, with the most noteworthy on Duridgere Rd, near Turill in the north of the LGA (Figure 18). These were believed to be River Red Gums due to their size and location, but due to seasonal constraints it was not possible to verify this. Prior to European settlement, between 10,000 and 20,000 ha of habitat suitable for the River Red Gum occurred in the Hunter catchment. Today only 19 stands are known, occupying at most c. 100 ha, the largest remnant being 15 - 20 ha in extent. Smaller remnants contain only one to several trees.

Habitat and ecology

River Red Gums may occur with *Eucalyptus tereticornis*, *Eucalyptus melliodora, Casuarina cunninghamiana* subsp. *cunninghamiana* and *Angophora floribunda*. Most of the occurrences are on private land and there are no known occurrences in conservation reserves.

Prior to European settlement, it is likely that the species formed extensive stands of woodland and open woodland on the major floodplains of the Hunter and Goulburn rivers, especially in areas where water impoundment occurs after flood. Since settlement, most of the floodplains have been cleared of woody vegetation.

Flood mitigation works now prevent most minor floods from inundating floodplains. These flow changes, coupled with the clearing of native vegetation, have greatly reduced the extent of habitat favourable to the River Red Gum in the Hunter catchment.

Threats

Main threat to this community is the lack of regeneration of trees, which is not occurring in most remnants because of changes in hydrology, cropping and grazing of the understorey or weed infestation by species including *Galenia pubescens*, *Cardiospermum grandiflorum* (Balloon vine), *Pennisetum clandestinum* (Kikuyu) and *Ricinus communis* (Castor oil plant). Tree dieback, from a variety of causes, has resulted in tree mortality and loss of vigour in a large proportion of trees.

A well intentioned effort at supplementing local populations has become an additional threat for this species in the population area. Planting of River Red Gum from non-local provenance introduces a potential threat to the genetic integrity of the Hunter catchment population. Other threats include illegal dumping of rubbish, clearing, and an overall risk of local extinction due to small population size.

Figure 18. River Red Gums on a tributary of Goulburn River, near Turill.

4.5 *Cymbidium canaliculatum* population in the Hunter Catchment

Cymbidium canaliculatum is a large epiphytic orchid, and has the common names of Tiger Orchid and Black Orchid. It has a scattered distribution in northern and eastern Australia from northeast NSW, through Queensland and the Northern Territory to Western Australia. In NSW it occurs within dry sclerophyll forests and woodlands of tablelands and western slopes, growing in hollows of trees. The population of *C. canaliculatum* in the Hunter Catchment is at the south-eastern limit of the geographic range for this species. This population is of significant conservation value because it is one of the few epiphytic orchids occurring at temperate latitudes.

Within the Hunter Catchment, *C. canaliculatum* is most commonly found in *Eucalyptus albens* (white box)-dominated woodlands, usually occurring singly or as a single clump, typically between two and six metres above the ground. It has been found, less commonly, to grow on *E. dawsonii* (slaty box), *E. crebra* (narrow-leaved ironbark), *E. moluccana* (grey box), *Angophora floribunda* (rough-barked apple), *Acacia salicina* (cooba) and on some other species. In MWRC, a number of host trees for this epiphytic orchid are present, and the NSW Wildlife Atlas lists records of the Tiger Orchid present at Murrumbo Gap on Bylong Valley Way, in Wollemi National Park east of Bylong. This specimen(s) is considered to be part of the endangered population.

The number of plants of *C. canaliculatum* in the Hunter Catchment is currently estimated to be very low, as few as 90. *Cymbidium canaliculatum* is known to occur within Wollemi and Goulburn River National Parks but it is estimated that about 90% of the population occurs on land not managed for conservation. This species was not sighted during roadside vegetation surveys.

Threats to the population of *C. canaliculatum* in the Hunter Catchment include land clearing and the associated fragmentation of habitat, on-going removal of remnant trees, and illegal collecting. It may be inferred from these threats that the population of *C. canaliculatum* in the Hunter Catchment may suffer a projected or continuing decline in abundance, geographic distribution or habitat quality.

5 THREATENED SPECIES

Before commencing roadside surveys, a review of threatened flora species databases was conducted, including PlantNet (Royal Botanical Gardens NSW) and the NPWS Atlas of NSW Wildlife. The results of these searches and information about each species are presented in Table 4, and include a general description and notes on distribution. The EPBC Act Protected Matters database listed an additional 10 species of plants and an EEC as potentially occurring in MWRC area (Table 5).

Table 5. Threatened species recorded in Mid-Western Regional LGA (NPWS Atlas of NSW Wildlife, 2010; Plantnet, 2010).

SCIENTIFIC NAME	COMMON NAME	DESCRIPTION AND DISTRIBUTION	LEGAL STATUS	SURVEY SIGHTINGS
Ozothamnus tesselatus **(Asteraceae)**		**Description** Dense shrub to 1 m high, branches woolly. Leaves spreading, oblong, 4 - 5 mm long, < 1 mm wide, base extending downwards on stem for 4 - 5 mm, margins rolled backwards; upper surface of leaves green, lower surface white-woolly. Heads in dense hemispherical corymbs; heads globose, about 4 mm long; bracts surrounding inflorescence obovate. Florets about 60, all bisexual. **Distribution** Restricted to a few locations north of Rylstone, where it grows in eucalypt woodland.	V	not sighted during roadside surveys
Pultenaea glabra **(Fabaceae - Faboideae)**	Smooth Bush-Pea	**Description** An erect shrub to 1.5 m tall with smooth hairless stems and leaves. Leaves are alternate, narrow, concave, to 20mm x 2mm, with a pointed tip. The yellow/orange pea-like flowers are borne in dense subterminal or apparently terminal inflorescences. Fruit is a swollen pod to 5 mm long. The *Pultenaea glabra* species complex is the subject of ongoing research. **Distribution** Grows in swamp margins, hillslopes, gullies and creekbanks and occurs within dry sclerophyll forest and tall damp heath on sandstone.	V	not sighted during roadside surveys

SCIENTIFIC NAME	COMMON NAME	DESCRIPTION AND DISTRIBUTION	LEGAL STATUS	SURVEY SIGHTINGS
		Restricted to the higher Blue Mountains and has been recorded from the Katoomba-Hazelbrook and Mount Victoria areas, with unconfirmed sightings in the Mount Wilson and Mount Irvine areas. All known populations occur within the Blue Mountains Local Government Area.		
Pultenaea sp. Olinda **(Fabaceae - Faboideae)**		**Description** An erect to procumbent shrub with spreading hairy stems. Leaves are alternate, crowded on upper parts of branches, linear, cylindrical, with a groove on the upper surface, lower surface darker than upper and are to 10 mm x 1 mm in size. The yellow pea-like flowers are borne in dense subterminal or apparently terminal inflorescences. Fruit is a swollen pod to 6 mm long. Considered part of the Pultenaea glabra species complex which is the subject of ongoing research. **Distribution** Has been found only in a very limited area of pagoda rock formation east of Rylstone. Known only from a small area at Currant Mountain Gap east of Rylstone within the former Rylstone Local Government Area. The majority of known individuals occur within Wollemi National Park.	E1	not sighted during roadside surveys
Swainsona recta **(Fabaceae - Faboideae)**	Mountain Swainson-pea/ Small Purple-pea	**Description** Small Purple-pea is a slender, erect perennial herb growing to 30cm tall. The leaves are divided into up to six pairs of 10 mm long, very narrow leaflets, each with a pointed tip. There is also a single leaflet at the end of each divided leaf. It bears one to several sprays of between 10 and 20 purple, pea-shaped flowers, between late September and early December. Flowers are followed by pods up to 10 mm long in summer. **Distribution**	E1	not sighted during roadside surveys A naturally occurring population of this species is reported from Burrendong Arboretum, April, 2010

SCIENTIFIC NAME	COMMON NAME	DESCRIPTION AND DISTRIBUTION	LEGAL STATUS	SURVEY SIGHTINGS
		Before European settlement Mountain Swainson-pea occurred in the grassy understorey of woodlands and open forests dominated by Blakely's Red Gum *Eucalyptus blakelyi*, Yellow Box *E. melliodora*, Candlebark Gum *E. rubida* and Long-leaf Box *E. goniocalyx*. Grows in association with understorey dominants that include Kangaroo Grass *Themeda australis*, poa tussocks *Poa* spp. and spear-grasses *Austrostipa* spp. Small Purple-pea was recorded historically from places such as Carcoar, Culcairn and Wagga Wagga where it is probably now extinct. Populations still exist in the Queanbeyan and Wellington-Mudgee areas. Over 80% of the southern population grows on a railway easement. It is also known from the ACT and a single population of four plants near Chiltern in Victoria.		
Swainsona sericea **(Fabaceae - Faboideae)**	Silky Swainson-pea	**Description** The Silky Swainson-pea is a prostrate or erect perennial, growing to 10 cm tall. The stems and leaves are densely hairy. The leaves are up to 7 cm long, composed of 5 - 13 narrow, pointed leaflets, each up to 15 mm long. The purple pea-shaped flowers are to 11mm long, and are held in groups of up to 8 flowers, on a stem to 10 cm tall. The spring flowers are followed by hairy pods, up to 17 mm long. **Distribution** Found in Natural Temperate Grassland and Snow Gum *Eucalyptus pauciflora* Woodland on the Monaro. Found in Box-Gum Woodland in the Southern Tablelands and South West Slopes. Sometimes found in association with cypress-pines *Callitris* spp. Silky Swainson-pea has been recorded from the Northern Tablelands to the Southern Tablelands and further inland on	V	not sighted during roadside surveys

SCIENTIFIC NAME	COMMON NAME	DESCRIPTION AND DISTRIBUTION	LEGAL STATUS	SURVEY SIGHTINGS
		the slopes and plains. There is one isolated record from the far northwest of NSW. Its stronghold is on the Monaro. Also found in South Australia, Victoria and Queensland.		
***Acacia ausfeldii* (Fabaceae-Mimosoideae)**	Ausfeld's Wattle	**Description** Erect or spreading shrub 1–4 m high; branchlets terete becoming angled (somewhat quadrangular) to flattened towards apex, resinous, glabrous. The branchlets are usually marked with several broad, ± flat to scarcely raised-convex, green longitudinal bands that sometimes age a darker colour in dry material, with the areas inbetween filled with yellow to reddish brown resin which is often raised above the bands and crenulated. Phyllodes narrowly elliptic to linear-oblong or oblanceolate, straight to slightly curved, 2–7 cm long, 2–6 (-7) mm wide, glabrous or with minute, white hairs along margins, dotted with resin glands, midvein prominent (some phyllodes may have a less prominent secondary longitudinal vein towards the upper margin), lateral veins obscure, apex obtuse with a mucro; 1 gland near base; pulvinus < 2 mm long. May be confused with *Acacia verniciflua*, e.g. due to similar characteristics of the branchlets (longitudinally banded with discontinous, crenulated 'resin ribs' inbetween) and when there are phyllodes with two longitudinal veins. Acacia ausfeldii usually differs by having a single longitudinal vein or only some phyllodes with a less pronounced secondary longitudinally vein, slightly finer punctae, more densely hairy peduncles with the white hairs more loosely spreading (the hairs are often masked by resin in *Acacia verniciflua*) and being less viscid (sticky). **Distribution** Occurs north from Mudgee, in Mudgee - Ulan - Gulgong area,	V	Sighted at locations along Lue Rd (west of Hayes Gap Rd), and on Summerhill Rd, Turill

SCIENTIFIC NAME	COMMON NAME	DESCRIPTION AND DISTRIBUTION	LEGAL STATUS	SURVEY SIGHTINGS
		predominantly in the northern part of the South Western Slopes. Grows in eucalypt woodland in sandy soil; often in remnant roadside patches of woodland.		
***Prostanthera discolor* (Lamiaceae)**		**Description** An open, erect shrub with a strong aroma and hairy branches, commonly growing 0.6 - 3 m high. Leaves are lanceolate to more or less oblong, 8 - 28 mm long, 1 - 5 mm wide, and the upper surface of the leaves are dull dark green, while the lower surface is paler. Flowers are deep mauve to purple and dotted in throat. **Distribution** Grows in dry sclerophyll forest in the side gullies of main creeklines, often on rocky or well-drained alluvial substrates. Restricted to only a few localities from Bylong to the Baerami Valley within the Rylstone and Muswellbrook local government areas.	V	not sighted during roadside surveys
***Prostanthera stricta* (Lamiaceae)**	Mount Vincent Mint-bush	**Description** An erect, bushy, aromatic shrub growing to 1-2m. It has hairy aromatic branches which are elongated and cylindrical, and small (7-14 mm by 4-6 mm) leaves which are lance-like with the upper surface covered by hairs. The leaf stalk is very short (approx. 0.5mm). Leaves dark coloured on the upper surface, whitish underneath, the midrib and lateral veins prominent underneath and impressed above, giving the surface a puckered appearance. Flowers are pale mauve to deep purple, rarely white, 6-9 mm long, occurring in compact arrangements on the upper end of branches which gives the plant a distinctive appearance. Plants assigned to *Prostanthera stricta* from the northern Wollemi area, referred to as *Prostanthera* aff. *stricta*, differ	V	not sighted during roadside surveys

SCIENTIFIC NAME	COMMON NAME	DESCRIPTION AND DISTRIBUTION	LEGAL STATUS	SURVEY SIGHTINGS
		from the type form by having leaves which are broad ovate to ovate(length 1-3 times the breadth), and leaf bases which are often broadly rounded. Its leaves may appear triangular when the leaf margins are strongly curved downwards, as in periods of drought or on dried herbarium specimens. The whole plant appears more hairy. **Distribution** *Prostanthera stricta* is often a locally dominant under-shrub in heath or scrub communities along cliff edges, or as an understorey species within a range of open forest or tall open forest types, or in adjacent transitional communities. *Prostanthera stricta* occurs in the Widden Valley district of New South Wales. The species is also known from Mt Vincent and Genowlan Mountain in the Central Tablelands. *Prostanthera* aff. *stricta* is found at Dingo Creek and the Widden and Baerami Valleys in the Central Western Slopes.		
Baeckea kandos **(Myrtaceae)**		**Description** A shrub to 2 m high. Leaves are solitary at each node, and are linear to linear - lance-shaped, with smooth margins. The white flowers are up to 5 mm across. **Distribution** Occurs in the Kandos area, NSW. Known from one population within Wollemi • National Park.	E1	not sighted during roadside surveys
Eucalyptus alligatrix **subsp. *miscella*** **(Myrtaceae)**		**Description** A spreading, woodland tree to 15 m tall, with thick, rough bark persistent to the small branches. Juvenile growth usually glaucous (dull blue-green in colour, with a whitish bloom); juvenile leaves always opposite, without a stalk, circular to ovate in shape, 2 – 4.5 cm long, 2.5 – 5 cm wide, margin entire or crenulate, green to grey-green or glaucous. Adult leaves disjunct (appearing alternate) or opposite, stalk 1 – 2 cm long,	V	not sighted during roadside surveys

SCIENTIFIC NAME	COMMON NAME	DESCRIPTION AND DISTRIBUTION	LEGAL STATUS	SURVEY SIGHTINGS
		lanceshaped, 7 – 17 cm long, 1.5 – 13.5 cm wide, strongly glaucous, dull, same colour on both surfaces. Inflorescences (groups of buds or flowers) 3- or 7-flowered, the stalk of the group cylindrical or slightly flattened, 4 – 6 mm long. Stalk of each individual bud/flower more or less angular, 0 – 2 mm long. Buds ovoid or shortly spindle-shaped, glaucous, 6 – 8 mm long, about 4 mm diam., scar present; bud cap (calyptrya) conical, slightly shorter than the basal half of the bud. Fruit cup-shaped or broadly conical, with 3 or 4 cells, 5 – 17 mm long, 4 – 16 mm diam.; disc flat or slightly raised; valves prominently exserted. The subspecies is also described as a small to medium, spreading woodland tree with thick, fibrous bark persistent on the trunk and larger branches. Bark longitudinally furrowed, 'stringy', reddish brown to grey-brown. The adult leaves are blue-green or light green, and inflorescences of 3 and 7 flowers occur on the same tree. **Distribution** Only known from a single area south-west of Rylstone. The population is confined to an area of about 10 hectares where an estimated 1000 to 1500 trees survive. Most of the population consists of moderately dense regenerating stands following previous clearing, but there are also larger scattered paddock trees, probably pre-dating European settlement.		
***Eucalyptus cannonii* (Myrtaceae)**	Capertee Stringybark	**Description** Usually occurs as a tree 10 – 15 m high with persistent, stringy bark. Leaves are lance-shaped, 9 – 15 cm long and 1. 5– 2.5 cm wide. Buds and bud stems are angular, and fruits are generally greater than 10 mm diameter, often with a distinct rim around the middle. Can be distinguished from *E. macrorhyncha*, a closely related species that may grow in	V	Recorded at Apple Tree Flat and Tongbong Rd during this survey and at numerous other locations during a previous targeted

SCIENTIFIC NAME	COMMON NAME	DESCRIPTION AND DISTRIBUTION	LEGAL STATUS	SURVEY SIGHTINGS
		similar habitat, by the angular buds and usually larger fruit with a medial rim and shorter pedicels. Hybrids between the two species are common in some places where they co-exist. Hybrids may be distinguished in the field on the basis of fruit diameter, lack of prominence of the medial rim and reduced angularity of buds. **Distribution** *Eucalyptus cannonii* is restricted to an area of about 100 by 60km in the central tablelands of NSW. The western border is approximately marked by a line between Bathurst and Mudgee, while the eastern locations occur approximately on a line between Lithgow and the town of Bylong. Within this area the species is often locally frequent.		survey in 1999. See accompanying GIS layer for full record of locations
***Eucalyptus corticosa* (Myrtaceae)**	Creswick Apple Box	**Description** A tree to 20 m high with thick, fibrous-flaky to shortly fibrous, grey-brown to red-brown persistent bark on trunk and larger branches. The bark above the trunk and on smaller branches is smooth, grey to grey-brown and sheds in short ribbons. Adult leaves are narrow-lanceolate to lanceolate, to 12 cm x 2 cm, grey -green, dull, and the same colour on upper and lower surfaces. Flowers occur in groups of seven and fruit is to 6 mm in diam., with raised disc and exserted valves. **Distribution** Restricted to a small area near Mount Coricudgy in the Rylstone area on the Central Tablelands. Occurs in sclerophyll woodland on shallow infertile soils on sandstone ridges associated with the upper reaches of the Cudgegong River. It may be locally frequent, and is often associated with *Eucalyptus rossii*.	V	not sighted during roadside surveys
Eucalyptus robertsonii* subsp. *hemisphaerica	Robertson's Peppermint	**Description** Tree to 30 m high, with persistent grey-brown bark on the	V	Recorded at numerous locations around

SCIENTIFIC NAME	COMMON NAME	DESCRIPTION AND DISTRIBUTION	LEGAL STATUS	SURVEY SIGHTINGS
(Myrtaceae)		trunk and larger branches. The bark is shortly fibrous (peppermint-type bark) and shedding in long ribbons. Juvenile leaves opposite, lance-shaped, dull grey-green. Adult leaves alternate, narrow lanceolate, 7-13 cm long, 0.8-1.5 cm wide, dull grey-green. Flowerheads with more than 11 flowers and a cylindrical stem 5-8 mm long. Buds club-shaped, grey-green, 3-5 mm long. Fruit spherical or pear-shaped, 4-6 mm long. *Eucalyptus robertsonii* is distinguished within the *Eucalyptus radiata* group by the combination of linear to narrow-lanceolate adult and juvenile leaves, glaucous (dull blue green in colour with a whitish bloom) leaves and buds, and (in the type subspecies) the conical calyptra (the cap on the buds of eucalypts). It is considered sufficiently distinct to warrant recognition as one of several closely-related and rather narrowly defined species comprising the *E. radiata* group. **Distribution** Found only in the central tablelands of NSW, from sites to the E and SE of Bathurst and Orange. Specimen localities include Glengowan (Upper Meroo), Burraga, Mullion Creek area, west of Bocoble Mountain and Isobella River. Locally frequent in grassy or dry sclerophyll woodland or forest, on lighter soils and often on granite. Usually found in closed grassy woodlands in locally sheltered sites. Habitats include quartzite ridges, upper slopes and a slight rise of shallow clay over volcanics. Associated vegetation includes variously mixed woodlands of *Eucalyptus piperita, E. goniocalyx, E. dalrympleana, E. dives, E. mannifera* and *E. rossii*.		Upper Meroo and Pyramul
Homoranthus darwinioides **(Myrtaceae)**		**Description** Slender hairless shrub, characterised by its distinctive drooping flower heads, each consisting of two flowers on a stalk. Leaves are linear, cylindrical, 2-5 mm long in some	V	not sighted during roadside surveys

SCIENTIFIC NAME	COMMON NAME	DESCRIPTION AND DISTRIBUTION	LEGAL STATUS	SURVEY SIGHTINGS
		populations, 6-11mm long in others. **Distribution** Rare in the central tablelands and western slopes of NSW, occurring from Putty to the Dubbo district. It is found west of Muswellbrook between Merriwa and Bylong, and north of Muswellbrook to Goonoo SF. The species has been collected from Lee's Pinch, but not relocated at its original locality north of Mt Coricudgy above the headwaters of Widden Brook. Goonoo SF is established as a definite locality. Grows in various woodland habitats with shrubby understoreys, usually in gravely sandy soils. Landforms the species has been recorded growing on include flat sunny ridge tops with scrubby woodland, sloping ridges, gentle south-facing slopes, and a slight depression on a roadside with loamy sand. Associated species include *Callitris endlicheri, Eucalyptus crebra, E. fibrosa, E. trachyphloia, E. beyeri* subsp. *illaquens, E. dwyeri, E. rossii, Leptospermum divaricatum, Melaleuca uncinata, Calytrix tetragona, Allocasuarina* spp. and *Micromyrtus* spp.		
***Diuris tricolor* (syn. *D. sheaffiana*) (Orchidaceae)**	Pine Donkey Orchid, Tricolour Diuris, Spotted Throat Cowslip	**Description** The Pine Donkey Orchid (formerly known as *Diuris sheaffiana*) is a terrestrial species (it grows from the ground rather than from rocks or vegetation). It has between one and three leaves, to 30 centimetres long and 4mm wide. The flower stalk is between 20-40 cm high, and has 2-6 flowers, which are bright yellow to orange, speckled with red to purple and white markings. The sepals (the down-pointing slender green segments) are very long and often crossed **Distribution** Sporadically distributed on the western slopes of NSW, extending from south of Narrandera all the way to the far	V	not sighted during roadside surveys

SCIENTIFIC NAME	COMMON NAME	DESCRIPTION AND DISTRIBUTION	LEGAL STATUS	SURVEY SIGHTINGS
		north of NSW. Localities include the Condobolin-Nymagee road, Wattamondara towards Cowra, Cooyal, Adelong, Red Hill north of Narrandera, Coolamon, near Darlington Point, Eugowra, Girilambone, Dubbo, Muswellbrook, and several sites west of Wagga Wagga The Pine Donkey Orchid grows in sclerophyll forest among grass, often with native Cypress Pine (*Callitris* spp.). It is found in sandy soils, either on flats or small rises. Also recorded from a red earth soil in a Bimble Box community in western NSW. Usually recorded as common and locally frequent in populations, however only one or two plants have also been observed at sites. The species has been noted as growing in large colonies.		
***Prasophyllum petilum* (Orchidaceae)**	Tarengo Leek Orchid	**Description** Tarengo Leek Orchid reaches to 35 cm tall. This species can be distinguished from the more common onion orchids (*Microtis* spp.) that grow in its habitat by the pinkish-purple base to the leaf. Each plant produces a solitary, tubular, fleshy, dull green leaf, growing to 35 cm tall. The flower-spike emerges in mid spring to early summer from a hole near the base of the leaf. The spike, reaching to 12 cm tall, has about 20 fragrant flowers with pointed petals. The flowers are usually a pale whitish-green, but can be pink or pale purple. Plants can be very cryptic when growing in small numbers and within tall grasses. **Distribution** Grows in open sites within Natural Temperate Grassland at the Boorowa and Delegate sites. Also grows in grassy woodland in association with River Tussock *Poa labillardieri* Black Gum *Eucalyptus aggregata* and tea-trees *Leptospermum*	E1	Known to occur at Ilford Cemetery but not sighted during recent survey (outside flowering period)

SCIENTIFIC NAME	COMMON NAME	DESCRIPTION AND DISTRIBUTION	LEGAL STATUS	SURVEY SIGHTINGS
		spp. at Captains Flat and within the grassy groundlayer dominated by Kanagroo Grass under Box-Gum Woodland at Ilford. Natural populations are known from a total of four sites in NSW, including areas at Boorowa, Captains Flat, Ilford and Delegate. Also occurs at Hall in the Australian Capital Territory. This species has also been recorded at Bowning Cemetery where it was experimentally introduced, though it is not known whether this population has persisted.		
Dichanthium setosum **(Poaceae)**	Bluegrass	**Description** Bluegrass is an upright grass less than 1 m tall. It has mostly hairless leaves about 2-3 mm wide. The flowers are densely hairy and are clustered together along a stalk in a cylinder-shape. The flower-clusters grow in pairs at the end of an 8 cm-long stem and appear mostly during summer. **Distribution** Bluegrass occurs on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes of NSW, as well as in Queensland and Western Australia. It occurs widely on private property, including in the Inverell, Guyra, Armidale and Glen Innes areas. Associated with heavy basaltic black soils. Often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture. (Often collected from disturbed open grassy woodlands on the northern tablelands, where the habitat has been variously grazed, nutrient-enriched and water enriched).	V	not sighted during roadside surveys
Grevillea evansiana **(Proteaceae)**	Evans Grevillea	**Description** A dense spreading shrub, rarely more than 0.5 m high, but can grow to 1.5 m, with white hairy stems. The leaves are grey-green, entire, to 40 mm x 8 mm, glossy green above, silver-	V	not sighted during roadside surveys

SCIENTIFIC NAME	COMMON NAME	DESCRIPTION AND DISTRIBUTION	LEGAL STATUS	SURVEY SIGHTINGS
		grey underneath and with a small pointed tip. Flowers are dark red (and rarely white) and occur in round clusters. The fruit is a hairless and smooth follicle. **Distribution** Restricted to a small area east of Rylstone on the Central Tablelands. Known populations occur on the western side of Wollemi National Park and nearby private lands, within the Rylstone Local Government Area. Grows in dry sclerophyll forest or woodland, occasionally in swampy heath, in sandy soils, usually over Hawkesbury sandstone.		
***Grevillea obtusiflora* subsp. *obtusiflora* and subsp. *fecunda* (Proteaceae)**		**Description** Two subspecies are included under this taxon. Subspecies *obtusiflora* is a low, multi-stemmed shrub to half a metre tall, with narrow leaves and pink to pinkish red flowers. Subspecies *fecunda* is a low, dense shrub to one metre tall with narrow leaves, and profuse pale to deep pink to crimson flowers. **Distribution** Subspecies *obtusiflora* occurs as scattered groups in the understorey of low open eucalypt forest at an altitude of 730 metres above sea level. Subspecies *fecunda* occurs in clusters within low, open scrub beneath open, dry sclerophyll forest, on orange, sandy loam soils with sandstone boulders, at an altitude of 570 metres. Subspecies *obtusiflora* occurs near Rylstone, while subspecies *fecunda* occurs in the Capertee Valley, north-west of Lithgow, and in the Gardens of Stone National Park. Occurrences of both subspecies are within the Central Tablelands botanical subdivision.	E1	not sighted during roadside surveys
***Persoonia marginata* (Proteaceae)**	Clandulla Geebung	**Description** A spreading shrub that grows to 50 cm high and up to 1 m	V	not sighted during roadside surveys

SCIENTIFIC NAME	COMMON NAME	DESCRIPTION AND DISTRIBUTION	LEGAL STATUS	SURVEY SIGHTINGS
		across. Young branches are hairy. Leaves are elliptic to obovate, 2 – 4 cm long and 6 – 23 mm wide, sparsely hairy when young and hairless when mature. Flowers are yellow with brownish hairs; have a densely hairy ovary; and occur on short stalks 2 –7 mm long. **Distribution** Grows in dry sclerophyll forest and woodland communities on sandstone. Known from only four disjunct locations on the Central Tablelands and Central Coast. Core of the species distribution is within Clandulla State Forest, west of Kandos. Disjunct populations occur; to the north at Dingo Creek and Mount Dangar within the Wollemi and Goulburn River National Parks; to the south within Ben Bullen State Forest, south-east of Capertee; and to the south-east at Devils Hole, north of Colo Heights within Parr State Recreation Area.		
***Pomaderris brunnea* (Rhamnaceae)**	Brown Pomaderris	**Description** Brown Pomaderris is a shrub to 3 m tall that has distinctively hairy stems. The stem-hairs are comprised of long brownish hairs above a thick white hairy under-coat. The leaves are to 4 cm long and 1.5 cm wide and have toothed margins. The upper leaf surface is hairless; the lower surface is densely hairy like the stem. The leaf veins extend to the margins. The small flowers have no petals, are yellowish and form dense clusters at the ends of the branches. **Distribution** Brown Pomaderris grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines Brown Pomaderris is found in a very limited area around the Nepean and Hawkesbury Rivers, including the Bargo area. It also occurs at Walcha on the New England tablelands and in	V	not sighted during roadside surveys

SCIENTIFIC NAME	COMMON NAME	DESCRIPTION AND DISTRIBUTION	LEGAL STATUS	SURVEY SIGHTINGS
		far eastern Gippsland in Victoria.		
***Pomaderris sericea* (Rhamnaceae)**	Silky Pomaderris	**Description** The Silky Pomaderris is a low shrub, less than 2 m tall, with shining, golden-brown hairs on new growth. Its leaves are elliptical, to 20 mm long by 5 mm wide, with shining golden brown hairs only on the lower surface. Its flowers are cream coloured, and grow in clusters at the branch tops. **Distribution** There are only two Silky Pomaderris records in NSW that give details of habitat so it is difficult to generalise about the habitat preferences of the species. Both of these records, however, are from open forest on sandstone. The Bundanoon collection was made at the foot of a cliff. In NSW, Silky Pomaderris is known only from Morton National Park near Bundanoon and from Wollemi National Park. Silky Pomaderris has also been recorded in north-eastern Victoria.	E1	not sighted during roadside surveys
***Leionema sympetalum* (Rutaceae)**	Rylstone Bell	**Description** A shrub (formerly known as *Phebalium sympetalum*) 2 - 3 metres high, with angled stems which have star-shaped hairs. Leaves are 1.5 - 3.5 cm long and 4 - 8 mm wide. Tubular flowers occur in groups of 1 to 3 at the ends of branches and are greenish yellow in colour. Stamens are longer than petals. The fruit has erect lobes (cocci) about 4 mm in length. **Distribution** Restricted to exposed rocky sandstone formations known as pagodas. The species occurs in dry sclerophyll forest and probably also occurs in open or closed heathland communities. Restricted to a small area within Wollemi National Park, east of Rylstone on the Central Tablelands. Has only ever been recorded at four sites. All known sites are in the former	V	not sighted during roadside surveys

SCIENTIFIC NAME	COMMON NAME	DESCRIPTION AND DISTRIBUTION	LEGAL STATUS	SURVEY SIGHTINGS
		Rylstone Local Government Area. May also occur at previously unrecorded locations.		
Derwentia blakelyi **(Scrophulariaceae)**		**Description** A small hairless and bluish shrub to 50 cm high, with one to several erect, softly woody stems arising from a narrow rootstock; stems are mostly unbranched below the flower sprays, and die back after fruiting. The roundish leaves are usually V-shaped in cross section, and are mostly 2.5 - 5.5 cm long, 10 - 20 mm wide, with a point at the tip. Sprays of the small bright blue - violet flowers are 8 - 40 cm long and produced in summer. The genus was renamed to *Parahebe* in 1994; however, this name change has not yet been recognised in the listing. **Distribution** Restricted to the western Blue Mountains, near Clarence, near Mt Horrible, on Nullo Mountain and in the Coricudgy Range. Occurs at fewer than 20 locations, none of which is in a conservation reserve. Occurs in eucalypt forest, often in moist areas; known locations all have small population sizes.	V	not sighted during roadside surveys
Euphrasia arguta **(Scrophulariaceae)**		**Description** Erect annual herb 20–35 cm high, branches densely hairy with recurved non-glandular hairs. Upper stem leaves ovate to elliptic, often broadly so, 6–14 mm long, 3.5–13 mm wide, margins ± deeply lobed, usually with 2–4 pairs of teeth. Racemes mostly 50–90-flowered. Calyx 5.5–7 mm long, usually scabrous. Corolla 10–14 mm long, white to lilac with yellow; tube 6.7–8.5 mm long, glabrous at base. Stamen filaments usually glabrous; anthers 0.9–1.7 mm long, connective hairy. **Distribution** Grows in grassy areas near rivers, recorded from Bathurst to	E4	not sighted during roadside surveys

SCIENTIFIC NAME	COMMON NAME	DESCRIPTION AND DISTRIBUTION	LEGAL STATUS	SURVEY SIGHTINGS
		Walcha area (presumed extinct).		

Table 6. EPBC Act Protected Matters database search results: additional communities and plant species requiring protection in MWRC.

SCIENTIFIC NAME	COMMON NAME	DESCRIPTION AND DISTRIBUTION	LEGAL STATUS	SURVEY SIGHTINGS
Austrostipa aristiglumis Grasslands of the Liverpool Plains in NSW	Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland.	**Description** Native tussock grasslands, such as the Natural grasslands on basalt and fine-textured alluvial plains of northern NSW and southern Queensland, once occurred over a large area of Australia (DEWR 2007). The species composition of tussock grasslands varies throughout its range and is influenced by factors such as rainfall, soil, geology, and land use history. The distribution of the ecological community is strongly reliant on soil type as it is associated with fine textured, often cracking clays derived from either basalt or quaternary alluvium. The clay minerals in these soils are generally expanding i.e. upon wetting, water is absorbed into the clay particles causing them to expand. The development of deep cracks as the soils dry, and the tearing of tap roots during the soil contraction and expansion cycle are possible reasons why trees and large woody shrubs are typically lacking in these grasslands. The ecological community generally occurs on flat to low slopes, of no more than 5 percent (or less than 1 degree) inclination. As slope increases, grassy woodlands dominated by trees such as *Acacia pendula* (Weeping Myall), *Eucalyptus coolabah* (Coolabah), *E. populnea* (Poplar Box) or *E. melliodora* (Yellow Box) occur. The ground layer component of these woodlands may be similar to the grassland but the	Critically endangered	potential EEC sighted during roadside surveys

SCIENTIFIC NAME	COMMON NAME	DESCRIPTION AND DISTRIBUTION	LEGAL STATUS	SURVEY SIGHTINGS
		soils will not be the same cracking clays as on the plains. Temperate grasslands are typically dominated by tussock grasses in the genera *Austrodanthonia, Austrostipa, Bothriochloa, Chloris, Enteropogon*, or *Themeda*. The native grassland flora also includes herbaceous legumes such as *Desmodium, Glycine, Lotus* and *Rhynchosia* that have an important role in soil nitrogen fixation. The native legumes of grasslands on the Liverpool Plains are now mainly restricted to sites that have not been heavily degraded by past land management practices. The shrub cover is typically a very minor component of the grassland. A tree canopy is typically absent. Where trees are present, they are of variable species composition and comprise less than 10% of projective crown cover. Tree species that may be present as scattered individuals include: *Acacia pendula* (Weeping Myall), *Eucalyptus albens* (White Box), *E. conica* (Fuzzy Box), *E. coolabah* (Coolabah), *E. melliodora* (Yellow Box), *E. populnea* (Poplar Box) or *E. tereticornis* (Forest Red Gum). **Distribution** The Natural Grasslands on basalt and fine-textured alluvial plains of northern NSW and southern Queensland ecological community may be recognised by the following diagnostic features: • Distribution mainly in the Darling Downs of southern Queensland and the Liverpool Plains and Moree Plains of northern NSW. Occurrence is mainly associated with fine textured, often cracking clay soils derived from either basalt or alluvium. • Occurrence on landforms that are typically flat to very low slopes (less than 5 percent/1 degree). The ground layer is typically dominated by perennial native		

SCIENTIFIC NAME	COMMON NAME	DESCRIPTION AND DISTRIBUTION	LEGAL STATUS	SURVEY SIGHTINGS
		grasses and contains 3 or more indicator native species: *Aristida leptopoda* (White Speargrass), *Astrebla elymoides* (Hoop Mitchell Grass), *Astrebla lappacea* (Curley Mitchell Grass), *Austrodanthonia bipartita* (Wallaby Grass, Bandicoot Grass), *Austrostipa aristiglumis* (Plains Grass), *Bothriochloa biloba* (Lobed Bluegrass), *Bothriochloa erianthoides* (Satin Top Grass), *Dichanthium sericeum* (Queensland Bluegrass), *Digitaria divaricatissima* (Umbrella Grass), *Elymus plurinervis* (Wheat Grass), *Eriochloa crebra* (Cup Grass), *Eulalia aurea* (Silky Brown Top), *Panicum decompositum* (Native Millett), *Panicum queenslandicum* (Yabila Grass), *Thellungia advena* (Coolibah Grass), *Themeda avenacea* (Native Oat Grass), *Themeda triandra* (syn. *T. australis*) (Kangaroo Grass), and *Walwhalleya proluta* (Rigid Panic). Known to occur in the Kerrabee and Hunter subregions of the Sydney Basin Bioregion. This ecological community differs from the natural temperate grassland communities that occur throughout south-eastern Australia as the northern component of Natural grasslands on basalt and fine-textured alluvial plains of northern NSW and southern Queensland has a summer rainfall regime and has a significant presence of subtropical and/or semi-arid genera (e.g. *Astrebla, Dichanthium, Eulalia*).		
***Acacia flocktoniae* (Fabaceae - Mimosoideae)**	Flockton Wattle	**Description** *Acacia flocktoniae* is an erect or spreading shrub growing 2–4 m high with golden yellow or creamy-white globular flower heads, appearing between June and August. **Distribution** *Acacia flocktoniae* has isolated occurrences in the central tablelands of NSW and grows in dry sclerophyll forest on low nutrient soils derived from sandstone. The species occurs at	Vulnerable	not sighted during roadside surveys

SCIENTIFIC NAME	COMMON NAME	DESCRIPTION AND DISTRIBUTION	LEGAL STATUS	SURVEY SIGHTINGS
		an altitude of 500–1000 m above sea level with an average annual rainfall of 800–1200 mm. Associated species include *A. stricta* and *Podolobium ilicifolium*. The species occurs within the Hawkesbury–Nepean and Hunter–Central Rivers (NSW) Natural Resource Management Regions. The distribution of *Acacia flocktoniae* overlaps with White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grasslands.		
***Apatophyllum constablei* (Celastraceae)**		**Description** A glabrous, diffuse many-branched shrub to 40 cm high. Leaves are needle-shaped, 7 - 15 mm long, about 0.5 mm wide, lower surface furrowed; sessile. Flowers are solitary, greenish cream; petals 1.2 - 1.5 mm long. Capsule compressed-pear-shaped, 4 - 5 mm long, 2 - 3 mm wide. Occurs in dry sclerophyll forest on slopes with a north to north-westerly aspect. It typically grows near cliffs (i.e. near the base or just above). The soils at sites are sandy and skeletal, mostly on Narrabeen sandstone. Found in association with *Eucalyptus piperita, E. punctata, E. sparsifolia, Banksia serrata, Acacia linifolia, Cleistochloa rigida, Lomandra obliqua*. **Distribution** Previously known from four sites, three of which are within Wollemi National Park near Gospers Mountain and Coorongooba Creek, the fourth of which is about 2 km from Glen Davis. *A. constablei* was surveyed in 2005 and the total numbers are estimated to be 5200-6000 mature individuals and about 500-600 seedlings/juveniles. There are estimated to be between nine and 13 populations of *A. constablei*, currently known over an area of approximately 230km². As a result the Scientific Committee made a final determination on 16/2/07 to delete this species from the endagered list.	Endangered (not listed in NSW)	not sighted during roadside surveys

SCIENTIFIC NAME	COMMON NAME	DESCRIPTION AND DISTRIBUTION	LEGAL STATUS	SURVEY SIGHTINGS
Bothriochloa biloba **(Poaceae)**	Lobed Blue-grass	**Description** Lobed Blue-grass is an erect or decumbent grass to 1 m high. It can easily be distinguished from other *Bothriochloa* species by its lobed upper lemma (bract enclosing the flower) which remains attached to the base of the awn when the awn is pulled out of the spikelet. **Distribution** Lobed Blue-grass is known from the Darling Downs district in Queensland, south along the western slopes of the Great Dividing Range to North Star, Warialda, Bingara and Merriwa in NSW. It occurs west to Dubbo and around Hunter Valley. Lobed Blue-grass grows in cleared eucalypt forests and relict grassland, often dominated by Purple Wiregrass (*Aristida ramosa*), Red-leg Grass (*Bothriochloa macra*), Red Grass (*B. decipiens*), Queensland Bluegrass (*Dicanthium sericeum*) or *Austrostipa aristiglumis.* Lobed Blue-grass prefers heavier-textured soils such as brown or black clay soils. The distribution of this species overlaps with White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grasslands.	Vulnerable	not sighted during roadside surveys
Digitaria porrecta **(Poaceae)**	Finger Panic Grass	**Description** Finger Panic Grass, is a loosely tufted perennial growing to 60 cm tall. It has grey leaves, 2–3 mm wide, with sharp hairs along the middle. Flowers appear in late summer in a cylindrical cluster along a stalk and spread stiffly from the flowering stem, with the lower clusters arranged in a whorl of four to six, each up to 30 cm long. It seeds from March to April but also reproduces vegetatively by dying back to the tussock base, from which it resprouts in summer. As the tussock ages the central portion dies and the resultant ring of plantlets eventually separate and become independent tussocks.	Endangered	not sighted during roadside surveys

SCIENTIFIC NAME	COMMON NAME	DESCRIPTION AND DISTRIBUTION	LEGAL STATUS	SURVEY SIGHTINGS
		Distribution Finger Panic Grass occurs in four disjunct areas extending over 1000 km. In NSW, it occurs from Graman and Croppa Creek (near Inverell), south to the Liverpool Plains near Coonabarabran and Werris Creek. Finger Panic Grass usually occurs in grasslands on extensive basaltic plains, and in undulating woodlands and open forests with an underlying basaltic geology. It usually occurs on dark and fine textured soils with some degree of seasonal cracking. It also persists in disturbed habitats, such as fallow paddocks, but its capability to maintain a viable population is unknown. The distribution of this species overlaps with White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grasslands.		
Philotheca ericifolia		**Description** Much-branched and wide spreading shrub, 1-2 m high, with sparsely warty branchlets. Leaves needle-like, 4-8 mm long and about 0.5 mm wide, sparsely warty and narrow-grooved above. Flowers 1-6 in stalkless clusters, petals about 9 mm long, possibly pink, glandular warty. Fruit composed of 5 small fruitlets, each about 5 mm long, abruptly narrowed to a beak. **Distribution** Known only from the upper Hunter Valley and Pilliga to Peak Hill districts of NSW. The records are scattered over a range of over 400 km between West Wyalong and the Pilliga Scrub. Site localities include Pilliga East State Forest, Goonoo State Forest, Hervey Range, Wingen Maid Nature Reserve, Toongi, Denman, Rylstone district and Kandos Weir. Grows chiefly in dry sclerophyll forest and heath on damp sandy flats and gullies, heath, open woodland, dry sandy creek beds, and rocky ridge and cliff tops. Associated species include *Melaleuca uncinata, Eucalyptus*	Vulnerable	not sighted during roadside surveys

SCIENTIFIC NAME	COMMON NAME	DESCRIPTION AND DISTRIBUTION	LEGAL STATUS	SURVEY SIGHTINGS
		crebra, E. rossii, E. punctata, Corymbia trachyphloia, Acacia triptera, A. burrowii, Beyeria viscosa, Philotheca australis, Leucopogon muticus and *Calytrix tetragona*.		
Pultenaea sp. Genowlan Point	Genowlan Point Pultenaea	**Description** The Genowlan Point Pultenaea is a small shrub of the pea family typically less than a metre in height with deep red flowers. It grows on well drained stony soil near the edge of an exposed, north-facing cliff. **Distribution** The Genowlan Point Pultenaea is endemic to NSW, occurring in a single location on Genowlan Mountain. Similar populations of taxa in the *Pultenaea glabra* complex in the western Wollemi area between the Glow Worm Tunnel and Nullo Mountain and a geographically near but morphologically dissimilar population in the *P. glabra* complex at Olinda are not included in the definition of this entity.	Critically endangered	not sighted during roadside surveys
Prasophyllum sp. Wybong	Wybong Leek Orchid	**Description** *Prasophyllum* sp. Wybong (C. Phelps ORG 5269) is a terrestrial orchid that grows to approximately 30 cm high. It has a single, tubular, fleshy, dull-green leaf and a single flower spike with numerous fragrant flowers. It is a perennial orchid, appearing as a single leaf over winter and spring. The species flowers in spring and dies back to a tuber over summer and autumn. **Distribution** Wybong Leek Orchid is known from seven populations in eastern NSW near Ilford, Premer, Muswellbrook, Wybong, Yeoval, Inverell and Tenterfield. It is known to occur in open eucalypt woodland and grassland.	Critically endangered	not sighted during roadside surveys
Prostanthera cryptandriodes (syn. P.	Wollemi Mint-bush	**Description** A low-spreading shrub with a distinctive, pleasant aroma commonly growing 0.5 - 1 m tall and up to 1 m wide. The	Vulnerable	not sighted during roadside surveys

SCIENTIFIC NAME	COMMON NAME	DESCRIPTION AND DISTRIBUTION	LEGAL STATUS	SURVEY SIGHTINGS
cryptandriodes ssp cryptandriodes)		branches are moderately dense and are often black or obscured due to sooty mould. Leaves are light green, 5 - 9 mm long, 1 - 3 mm wide, and strongly aromatic. Flowers are lilac to mauve and occur from September to May. **Distribution** Occurs in restricted areas but over a fairly broad range from the Lithgow and Sandy Hollow Districts into the Border Rivers/Gwydir Catchment and up into Queensland. Ocurs in the Wollemi National Park and is likely to also occur within the Goulburn River National Park. At Glen Davis, occurs in open forest dominated by *Eucalyptus fibrosa*. Other eucalypt species may be present as sub-dominants. In the Denman-Gungal and Widden-Baerami Valley areas, occurs on rocky ridgelines on Narrabeen Group Sandstones in association with a range of communities. Associated communities include: Narrabeen Rocky Heath, Narrabeen Acacia Woodland, Narrabeen Exposed Woodland; Open Heath of *Calytrix tetragona, Leptospermum parviflorum, Isopogon dawsonii*; and Open Scrubland of *Eucalyptus dwyeri, Baeckea densifolia, Dillwynia floribunda, Aotus ericoides* and *Hemigenia cunefolia*.		
Thesium australe	Austral Toadflax, Toadflax	**Description** Austral Toadflax is a small, straggling herb to 40 cm tall. Leaves are pale green to yellow-green, somewhat succulent, 1 - 4 cm long and 0.5 - 1.5 mm wide. Flowers are minute and white, emerging where the leaves meet the stems and appearing in spring. The fruit is small and nut-like, developing in summer. This species is often hidden amongst grasses and herbs. A root parasite that takes water and some nutrient from other plants, especially Kangaroo Grass. **Distribution**	Vulnerable	not sighted during roadside surveys

SCIENTIFIC NAME	COMMON NAME	DESCRIPTION AND DISTRIBUTION	LEGAL STATUS	SURVEY SIGHTINGS
		Austral Toad-flax is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Occurs in grassland or grassy woodland. Often found in damp sites in association with Kangaroo Grass (*Themeda australis*).		
Tylophora linearis		**Description** Slender, almost hairless twiner with a clear sap. Leaves dark green, linear, 1-5 cm long, 0.5-3 mm wide. Flowers purplish, 3-6 mm in diameter, in radiating groups of 3-8. Fruit is cigar shaped, up to 100mm long and approximately 5 mm diameter, hairless. **Distribution** Found in the Barraba, Mendooran, Temora and West Wyalong districts in the northern and central western slopes of NSW. Records include Crow Mountain near Barraba, Goonoo SF, Pillaga West SF, Cumbil SF, Eura SF, Coolbaggie NR, Goobang NP and Beni CCA. Also occurs in Qld, from near Glenmorgan in the western Darling Downs. Grows in dry scrub and open forest. Recorded from low-altitude sedimentary flats in dry woodlands of *Eucalyptus fibrosa, Eucalyptus sideroxylon, Eucalyptus albens, Callitris endlicheri, Callitris glaucophylla* and *Allocasuarina luehmannii*. Also grows in association with *Acacia hakeoides, Acacia lineata, Melaleuca uncinata, Myoporum* species and *Casuarina* species.	Endangered	not sighted during roadside surveys

6 NOXIOUS AND ENVIRONMENTAL WEEDS

6.1 What is a Weed?

There are many definitions of a weed, including "any useless, troublesome or noxious plant" or "a plant growing out of place". This second definition allows for differences between species that are considered an environmental weed, which includes all non-indigenous species that invade an area of native bush, and an agricultural weed, which includes all "useless, troublesome" plants in an agricultural setting. A classic example of this is Sifton Bush, also known as Biddy Bush (*Cassinia arcuata*), which is considered to be a nuisance plant that invades land that has been cleared for pasture. In this context it is considered an agricultural weed, but it is a native species that is a hardy coloniser and prolific seeder, and its normal role in a natural ecosystem is to migrate into areas that have become denuded of other species, and stabilise soils and provide groundcover. In the normal course of a natural ecosystem, the dominance of Sifton Bush lessens over time, until after 10-15 years it becomes only a minor species in the understorey of the developing canopy vegetation.

Noxious weeds, in contrast, are those weeds that have been declared noxious under the Noxious Weeds Act. This includes any plant which causes serious economic loss to agriculture, or has a detrimental effect on humans, animals or the environment. Declaration as a noxious weed can be nationwide, statewide, or on a regional or local basis. In NSW it binds the landowner to control the weed and its spread. Local councils are responsible for enforcing the Act, and failure to comply can result in financial penalties. Government authorities are also required to control noxious weeds on their land.

6.2 Noxious Weed Classes

Noxious weeds are categorized into weed classes based on the type and severity of threat they pose, with class one weeds considered capable of causing the greatest harm. Legal requirements for notification and control of noxious weeds are different for each class, and are outlined in Table 7.

Table 7. Control objectives and measures for noxious weeds in different classes in Mid-Western Regional LGA (NSW DPI, 2005).

WEED CLASS	CONTROL OBJECTIVES	CONTROL MEASURES
State Prohibited Weeds – Class One noxious weeds	The control objectives for weed control class 1 is to prevent the introduction and establishment of those plants in NSW.	The plant must be eradicated from the land and the land must be kept free of the plant. Class 1 weeds are notifiable and as such the presence of the weed on land must be notified to the local control authority (Mid-Western Regional Council) within 72 hours of detection
Class Two noxious weeds	The control objectives for weed control class 2 is to prevent the introduction and establishment of those plants in parts of NSW	The plant must be eradicated from the land and the land must be kept free of the plant. Class 2 weeds are notifiable and as such

WEED CLASS	CONTROL OBJECTIVES	CONTROL MEASURES
		the presence of the weed on land must be notified to the local control authority (Mid-Western Regional Council) within 72 hours of detection
Class Three noxious weeds	The control objectives for weed control class 3 is to reduce the area and the impact of those plants in parts of NSW	The plant must be fully and continuously suppressed and destroyed
Class Four noxious weeds – Locally Controlled Weeds	The control objective for weed control class 4 is to minimise the negative impact of these plants on the economy, community or environment of NSW	The growth and spread of the plants must be controlled according to the measures specified in a management plan published by the local control authority
Class Five noxious weeds – Restricted Plants	The control objective for class 5 weeds is to prevent the introduction of those plants into NSW, the spread of those plants within NSW or from NSW to another jurisdiction	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with and as such must not be sold or purchased and must not be moved from the land

6.3 Noxious Weeds in Mid-Western Regional LGA

A number of declared noxious weeds were recorded in the roadside corridor during recent surveys. Details of locations are provided separately in the mapping component of this report. A summary of this is presented in Table 8.

Table 8. Noxious weeds currently listed in Mid-Western Regional LGA, and their control requirements.

SPECIES NAME	WEED CLASS	RECORDED IN ROADSIDE SURVEYS	LEGAL REQUIREMENTS
African boxthorn (*Lycium ferocissimum*)	4	yes	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority
African feathergrass (*Pennisetum macrourum*)	5		The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
African turnipweed (*Sisymbrium runcinatum*)	5		The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
African turnipweed	5		The requirements in the Noxious Weeds Act

SPECIES NAME	WEED CLASS	RECORDED IN ROADSIDE SURVEYS	LEGAL REQUIREMENTS
(*Sisymbrium thellungii*)			1993 for a notifiable weed must be complied with This is an All of NSW declaration
Alligator weed (*Alternanthera philoxeroides*)	2		The plant must be eradicated from the land and the land must be kept free of the plant
Anchored water hyacinth (*Eichhornia azurea*)	1		The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Annual ragweed (*Ambrosia artemisiifolia*)	5		The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Arrowhead (*Sagittaria montevidensis*)	5		The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Artichoke thistle (*Cynara cardunculus*)	5		The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Athel pine (*Tamarix aphylla*)	5		The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Bathurst/Noogoora/Hunter/South American/Californian/cockle burr (*Xanthium* species)	4	yes (*X. spinosum, X. occidentale, X. orientale*)	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority
Bear-skin fescue (*Festuca gautieri*)	5		The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Black knapweed (*Centaurea nigra*)	1		The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Blackberry (*Rubus fruticosus* aggregate species) except cultivars Black satin, Chehalem, Chester Thornless, Dirksen Thornless, Loch Ness, Murrindindi, Silvan,	4	yes	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed This is an All of NSW declaration

SPECIES NAME	WEED CLASS	RECORDED IN ROADSIDE SURVEYS	LEGAL REQUIREMENTS
Smoothstem, Thornfree			
Blue heliotrope (*Heliotropium amplexicaule*)	4		The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority
Bridal creeper (*Asparagus asparagoides*)	5	yes	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Broadleaf Privet (*Ligustrum lucidum*)	4		The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed
Broomrapes (*Orobanche* species) Includes all *Orobanche* species except the native *O. cernua* variety *australiana* and *O. minor*	1		The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Burr ragweed (*Ambrosia confertiflora*)	5		The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Cabomba (*Cabomba caroliniana*)	5		The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Cayenne snakeweed (*Stachytarpheta cayennensis*)	5		The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Chilean needle grass (*Nassella neesiana*)	4		The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed
Chinese violet (*Asystasia gangetica* subspecies *micrantha*)	1		The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Cineraria (*Cineraria lyratiformis*)	4	yes	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local

SPECIES NAME	WEED CLASS	RECORDED IN ROADSIDE SURVEYS	LEGAL REQUIREMENTS
			control authority
Clockweed (*Gaura parviflora*)	5		The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Columbus grass (*Sorghum x almum*)	3	yes	The plant must be fully and continuously suppressed and destroyed
Coolatai grass (*Hyparrhenia hirta*)	3	yes	The plant must be fully and continuously suppressed and destroyed
Corn sowthistle (*Sonchus arvensis*)	5		The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Dodder (Cuscuta species) Includes all *Cuscuta* species except the native species, *C. australis, C. tasmanica* and *C. victoriana*	5		The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
East Indian hygrophila (*Hygrophila polysperma*)	1		The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Espartillo (*Achnatherum brachychaetum*)	5		The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Eurasian water milfoil (*Myriophyllum spicatum*)	1		The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Fine-bristled burr grass (*Cenchrus brownii*)	5	yes	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Fountain grass (*Pennisetum setaceum*)	5	yes	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Gallon's curse (*Cenchrus biflorus*)	5		The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Galvanised burr (*Sclerolaena birchii*)	4		The plant must be controlled where it impacts on normal agricultural practices including cropping and pasture management

SPECIES NAME	WEED CLASS	RECORDED IN ROADSIDE SURVEYS	LEGAL REQUIREMENTS
Glaucous starthistle (*Carthamus glaucus*)	5		The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Golden dodder (*Cuscuta campestris*)	4		The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority
Golden thistle (*Scolymus hispanicus*)	5		The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Green cestrum (*Cestrum parqui*)	3		The plant must be fully and continuously suppressed and destroyed
Harrisia cactus (*Harrisia* species)	4		The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed This is an All of NSW declaration
Hawkweed (*Hieracium* species)	1		The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Hemlock (*Conium maculatum*)	4	yes	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority
Horsetail (*Equisetum* species)	1		The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Hymenachne (*Hymenachne amplexicaulis*)	1		The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Johnson grass (*Sorghum halepense*)	3	yes	The plant must be fully and continuously suppressed and destroyed
Karoo thorn (*Acacia karroo*)	1		The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Kochia (*Bassia scoparia*) except *Bassia scoparia* subspecies *trichophylla*	1		The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Lacy ragweed (*Ambrosia tenuifolia*)	4		The growth and spread of the plant must be controlled according to the measures specified

SPECIES NAME	WEED CLASS	RECORDED IN ROADSIDE SURVEYS	LEGAL REQUIREMENTS
			in a management plan published by the local control authority
Lagarosiphon (*Lagarosiphon major*)	1		The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Lantana (*Lantana* species)	5		The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Leafy elodea (*Egeria densa*)	5		The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Long-leaf willow primrose (*Ludwigia longifolia*)	5		The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Long-style feather grass (*Pennisetum villosum*)	4	yes	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority
Mesquite (*Prosopis* species)	2		The plant must be eradicated from the land and the land must be kept free of the plant
Mexican feather grass (*Nassella tenuissima*)	1		The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Mexican poppy (*Argemone mexicana*)	5	yes	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Miconia (*Miconia* species)	1		The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Mimosa (*Mimosa pigra*)	1		The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Mintweed (*Salvia reflexa*)	4		The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority
Mossman River grass (*Cenchrus echinatus*)	5		The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with

SPECIES NAME	WEED CLASS	RECORDED IN ROADSIDE SURVEYS	LEGAL REQUIREMENTS
			This is an All of NSW declaration
Narrow-leaved Privet (*Ligustrum sinense*)	4		The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed
Nodding thistle (*Carduus nutans*)	4		The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority
Onion grass (*Romulea* species) Includes all *Romulea* species and varieties except *R. rosea* var. *australis*	5		The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Oxalis (*Oxalis* species and varieties) Includes all *Oxalis* species and varieties except the native species *O. chnoodes, O. exilis, O. perennans, O. radicosa, O. rubens*, & *O. thompsoniae*	5		The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Pampas grass (*Cortaderia* species)	4		The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority
Parkinsonia (*Parkinsonia aculeata*)	2		The plant must be eradicated from the land and the land must be kept free of the plant
Parthenium weed (*Parthenium hysterophorus*)	1		The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Perennial ragweed (*Ambrosia psilostachya*)	4		The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority
Pond apple (*Annona glabra*)	1		The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Prairie ground cherry (*Physalis viscosa*)	4		The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority
**Prickly acacia (*Acacia*	1		The plant must be eradicated from the land and

SPECIES NAME	WEED CLASS	RECORDED IN ROADSIDE SURVEYS	LEGAL REQUIREMENTS
***nilotica*)**			the land must be kept free of the plant This is an All of NSW declaration
Prickly pear (*Cylindropuntia* species)	4		The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed This is an All of NSW declaration
Prickly pear (*Opuntia* species except *O. ficusindica*)	4	yes	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed This is an All of NSW declaration
Red rice (*Oryza rufipogon*)	5		The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Rhus tree (*Toxicodendron succedaneum*)	4		The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority
Rubbervine (*Cryptostegia grandiflora*)	1		The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Sagittaria (*Sagittaria platyphylla)*	5		The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Salvinia (*Salvinia molesta*)	2		The plant must be eradicated from the land and the land must be kept free of the plant
Sand oat (*Avena strigosa*)	5		The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Scotch broom (*Cytisus scoparius*)	4	yes	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority
Scotch, Stemless, Illyrian and Taurian thistles (*Onopordum* species)	4	yes (*O. acanthium*)	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority

SPECIES NAME	WEED CLASS	RECORDED IN ROADSIDE SURVEYS	LEGAL REQUIREMENTS
Senegal tea plant (*Gymnocoronis spilanthoides*)	1		The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Serrated tussock (*Nassella trichotoma*)	4	yes	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed
Siam weed (*Chromolaena odorata*)	1		The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Silk forage sorghum (*Sorghum* species hybrid cultivar)	3		The plant must be fully and continuously suppressed and destroyed
Silver-leaf nightshade (*Solanum elaeagnifolium*)	4		The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority
Smooth-stemmed turnip (*Brassica barrelieri* subspecies *oxyrrhina*)	5		The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Soldier thistle (*Picnomon acarna*)	5		The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Spiny burrgrass (*Cenchrus incertus*)	4		The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed
Spiny burrgrass (*Cenchrus longispinus*)	4		The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed
Spotted knapweed (*Centaurea maculosa*)	1		The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
St. John's wort (*Hypericum perforatum*)	4	yes	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority

SPECIES NAME	WEED CLASS	RECORDED IN ROADSIDE SURVEYS	LEGAL REQUIREMENTS
Sweet briar (*Rosa rubiginosa*)	4	yes	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority
Texas blueweed (*Helianthus ciliaris*)	5		The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Tree-of-heaven (*Ailanthus altissima*)	4	yes	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority
Water caltrop (*Trapa* species)	1		The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Water hyacinth (*Eichhornia crassipes*)	2		The plant must be eradicated from the land and the land must be kept free of the plant
Water lettuce (*Pistia stratiotes*)	1		The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Water soldier (*Stratiotes aloides*)	1		The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Willows (*Salix* species) Includes all *Salix* species except *S. babylonica, S.* x *reichardtii, S.* x *calodendron*	5	yes	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Witchweed (*Striga* species) Includes all *Striga* species except native species and *Striga parviflora*	1		The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Yellow burrhead (*Limnocharis flava*)	1		The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Yellow nutgrass (*Cyperus esculentus*)	5		The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration

7 DISCUSSION

7.1 The Ecological Setting

7.1.1 Historical Context

Early settlements were built next to streams that became the essential water source for drinking, washing, domestic animals, crops, and power generation for sawmills or gristmills. Streams were also used as transportation corridors to haul goods between homesteads. Footpaths developed along these streams to connect the settlements by land. Streamside terrain offered relatively easy slopes for construction and subsequent use by horses and wagons. These footpaths became the roads, many of which survive today as our dirt and gravel roads. This close proximity of roads and streams, dictated by historical development, began the conflict of erosion and sediment degradation affecting both roads and streams.

Like many parts of rural New South Wales, major change in the Mid-Western Regional LGA landscape began as a loss of soil condition and biodiversity through poor land management practices and the replacement of native vegetation with European monoculture. All ecosystem types were affected: wetlands were modified for grazing, regulation of rivers altered floodplain hydrology and biology, while burning, sedimentation, extraction and the introduction of foreign plants catalysed catchment scale changes (CWCMA, 2008).

Pressure from increasing population, a consistent demand for land, changes to land tenure and mining propelled land degradation throughout the century. Demand for water, wood and land for a rising population was high. Streams and rivers were diverted, mass forest clearance increased; both consequently exacerbated surface and gully erosion. Settlement and the development of infrastructure continued - wells were sunk, earthen dams were built, and rail networks were constructed as the main form of bulk transport over long distances. An extensive rural road network began to evolve to improve the connection between farms and smaller villages, and then to larger towns and cities.

By the 1860s the effects of poor land management were beginning to manifest themselves beyond farm soil health. When NSW was hit by drought in the 1870s, the history of poor land management, together with emerging environmental degradation (soil erosion and exhaustion, continued clearing, salt scalding), and infestations of weeds and rabbits (introduced in 1859) led to economic collapse of wool production, which was the primary industry of the time. Landscape changes continued apace and by 1900 large tracts of forest cover were cleared; deep rooted perennial grasses were replaced by faster growing annual grass with shallower roots and the rate of soil erosion was increasing due to poor land management such as the practice of bare fallow, ploughing hill slopes, meadow drainage, road construction and the development of animal tracks. The development of the internal combustion engine and its introduction to rural NSW around the turn of the century changed the face of road traffic forever. Horses, carts and carriages were replaced with motorbikes, cars and trucks.

7.1.2 Roads and the Abiotic Environment

Erosion is a natural occurrence in the environment. When roads are constructed, however, they create an interference with the natural systems and collect water, increasing its volume and velocity, resulting in accelerated erosion. Water is the key factor affecting roads: Alone or combined with other factors, water can be disastrous. The subgrade of the road is what it is built on, the soils. If this foundation is poor, the road's life will be significantly reduced. If the subgrade is water saturated, the condition will be worse.

Maintained dirt and gravel roads are often quite old. Current maintenance crews were not involved in the construction. If poor quality materials were used or the workmanship was substandard, maintenance crews inherit numerous problems with the road. Even when materials and workmanship are up to standards, the road may not have been built to handle today's heavier traffic loads. Traffic volumes and weights have increased substantially in the last 20 years. The combination of water and increased traffic loads is disastrous for roads. If there are drainage problems even the best maintenance will be inadequate unless drainage problems are taken care of first.

The environment (vegetation, soil, sand, rocks, drainage conditions, and the geological stability of the area) and climate also affect road conditions. Climate dictates the local weather conditions, including rain, freeze-thaw cycles, and hot sun that can dry out soils and road materials. The same factors that affect the road affect the environment. Water feeds vegetation and streams and creates habitats, but also causes erosion, flooding, and sedimentation. Poor road structure and material quality, increased traffic levels, and proximity to waterways lead to erosion, sediment and dust pollution problems.

Road conditions are deeply intertwined with the surrounding environment. Concentrated water flows accelerate erosion, overloading natural systems. Excess sediment clogs our streams. Dust becomes sediment in streams, generates complaints from residents and harms plants, animals, people and equipment. Chemical contamination complicates the picture even more because oils, nutrients, pesticides, herbicides, and other toxic substances bind to dust and sediment and are also introduced to streams and waterways. Dirt and gravel roads are a major potential source of these pollutants. Many roads have unstable surfaces and bases. Roads act like dams, concentrating flows that accelerate erosion of road materials and roadsides. Both unstable surfaces and accelerated erosion then lead to sediment and dust.

7.1.3 Roads and the Biotic Environment

Construction of roads is the first step in agricultural and urban expansion, instigating a process of landscape modification that results in habitat reduction, and fragmentation and/or isolation of remnants. Animals are directly impacted through mortality attributed to the construction event, or from vehicle collision. Less direct effects include disturbance through alteration to the environment and creation of boundaries between potential habitats. These barriers to free movement inhibit dispersal, often resulting in modification of behaviours within species groups. Increasing competition with humans as a result of road facilitated expansion interferes with freedom of movement within areas and dispersal

to other areas. Thus the presence of a road can alter habitat ranges and disrupt local biological integrity of endemic populations (Burgin & Brainwood, 2008).

There is a similar pattern of disruption to species distribution evident in flora. Clearing for road construction, erosion control measures, and other traffic infrastructure has also led to habitat reduction, fragmentation, and isolation of remnants. Disruption to animal movements can reduce opportunities for pollination or for distribution of seeds to a new part of the environment. Populations within a species can become isolated, leading to a reduction in survival capacity. Habitat fragmentation or loss is the leading cause of reduced biodiversity. Modification of vegetation such as that associated with road construction and management (or the absence of management) is not as obvious as broad-scale activities such as clearing, excavating or infilling, but, together with small scale activities like removing dead wood or bush rock, can amount to significant environmental damage.

Despite the generally detrimental impact of roads on extant vegetation, in many rural communities the only native vegetation retained is in the road corridor. Road reserve allocations are often based on standard widths, so that one or two lane dirt roads have equivalent strips of intact native vegetation along one or both sides. In some areas these roadside environments conserve good quality remnant vegetation. They can provide linking habitat between larger reserves even in a modified condition. Roads and transport vehicles, however, are a major vector for the distribution of weed propagules. These can be transported by vehicles themselves, in runoff on poorly drained roads, or by wind across exposed road surfaces. Cleared areas associated with road construction and management activities provide a ready habitat for the establishment of opportunistic species –it is these characteristics of rapid spread and establishment that define the more serious weed problems.

7.1.4 Roadside Environments

The non-urban roadside environments observed in Mid-Western Region LGA can be broadly grouped into three categories, including:

- **Main rural roads**, including highways and other main roads (previously known as trunk roads). These roads are designed to carry high volume traffic loads, including trucks and buses, and are usually sealed. Public safety and visibility are key management outcomes on these roads.
- **Peri-urban roads**, including minor sealed and unsealed roads around towns. These roads are often associated with small acreage farm holdings, vineyards, and other areas with higher than average traffic volumes in rural areas. Informal and unstructured management of roadside environments by local residents is usually much higher on these roads.
- **Minor rural roads**, including sealed and unsealed roads away from urban centres. These roads generally handle lower volumes of traffic, and can be more readily managed as biodiversity assets. In all circumstances, however, safety of the travelling public should be a prime objective of Council policy.

Good quality remnant vegetation isn't just trees, rather, it is the original vegetation, or patches of native bush, that have remained intact in the landscape. It contains a mixture of plants made up of three main structural layers, including:

- An upper storey – or canopy layer, with trees of varying heights and spacing
- An under storey – a layer of shrubs of varying heights and densities
- Groundcover – a layer of grasses, creepers, herbs forbs, mosses and lichens

Remnant vegetation areas are important even if they are partly degraded as they retain some value that can be improved. Features that are found in healthy bushland include:

- Mistletoes
- Living old trees with hollows
- Standing dead trees with hollows
- Mature trees with several species
- Sapling sized trees
- Variety of native herbs, grasses and shrubs
- Seedling sized trees
- Native tussock grasses
- Water
- Logs and fallen timber
- Litter, comprising leaves and twigs

7.2 Conservation Values

Different categories of rural roads are more likely to have different conservation values. Values of main rural roads are usually less than those of other rural roads, except in areas where they pass through designated reserves. In most cases, however, these roads have a lengthy history of modification to manage changing traffic loads. As a result, there is often little vegetation left in the road corridor. In some cases road widening has meant that the road takes up most or all of the road reserve, leaving little opportunity for maintenance or rehabilitation of native vegetation.

Values of peri-urban rural roads are generally mixed. Private landholdings are generally smaller, with more intense land uses, such as vineyards, horse studs, and small acreage private dwellings. In some areas these road reserves retain the only remaining native vegetation in the area. Private "management" of the road reserve is common, so that the road edges are cleared, slashed, and even mown, and planting of inappropriate species is common. The result is a mosaic of native vegetation conditions, from absent or highly degraded to good quality bushland. Unfortunately the ongoing health of these better bushland remnants is quite fragile – they are usually small, narrow strips with degrading impacts encroaching from all sides.

On the other hand, values of gravel/dirt roads often include the best opportunities for ongoing conservation of bush remnants. The roads are generally narrower, often one to one and a half lanes wide, with narrow roadside infrastructure - table drains are replaced by periodic cutouts, with frequency intervals determined by soil types and slope. The overall impacts on surrounding vegetation are much less, and the roadside corridor is generally wider in a similar sized road reserve. Population densities are much lower, and residents are less inclined to manage the roadside environment in an urban manner.

Good roadside habitat, therefore, forms more effective links between generally larger remnants of bushland, in conservation reserves or in private ownership.

7.2.1 Conservation of Native Vegetation and Fauna

Roadside vegetation is often a significant part of the remaining native vegetation in a locality, and so provides valuable habitat and linkage between bushland areas. Significant remnants of native vegetation in good condition are retained in many parts of Mid-Western Regional LGA, and include several Endangered Ecological Communities (see section 4 of this document, and mapping component of this project). In addition to these EECs, a diverse array of forests, woodlands, open forests, open woodlands, shrublands and grasslands were noted across the Region LGA. Many of these are, or were, part of the larger vegetation mosaic that is now classified as part of an Endangered Ecological Community. Maintenance and enhancement of these remnants needs to be encouraged on a Region LGA-wide basis, by private landholders and government authorities alike. Roadside corridors wider than 6m, ideally with canopy cover that projects across the road surface, is important for maintaining good connectivity between larger reserves. This provides movement corridors for animals and migratory pathways for native plants, improving resilience to climate change impacts.

There are numerous occurrences of rare plants within road reserves, such as Ausfeld's Acacia (*Acacia ausfeldii*), which was recorded at a number of locations along Lue Rd, near Havilah, and Summerhill Rd, near Turill. The Capertee Stringybark (*Eucalyptus cannonii*) was recorded at a number of roadside locations, mainly around Apple Tree Flat. This species is difficult to differentiate from other stringybarks in a windscreen assessment, particularly the widespread and co-occurring Red Stringybark (*E. macrorhyncha*), and is probably more widely distributed in roadside vegetation than was recorded. Robertson's Peppermint (*E. robertsonii* subsp*. hemisphaerica*) was recorded at numerous roadside locations throughout the Upper Meroo and Pyramul districts. In many places this species was recorded in modified bushland, and often with a high weed density understorey. Good roadside management will preserve and enhance the habitat for these and other threatened species that may be present in the area. An effective management plan should aim to:

- Minimise clearing and degradation of native vegetation.
- Protect rare plants and plant communities, native fauna and their habitats.
- Maintain aesthetic values of roadsides.

7.2.2 Heritage Sites

Heritage sites include Aboriginal and other cultural sites as well as areas of natural significance, and can comprise artefacts, trees, geological formations, buildings and other structures, and locations of historical significance. Road construction and maintenance activities can pose a risk of damaging these sites so activities must be planned and managed for heritage protection. While most buildings are generally outside the road corridor, historic remains of bridges and other road infrastructure can provide important historical insights, including evidence of convict construction activities. These sites are difficult to identify as part of a windscreen assessment, and were not targeted for this reason;

however, the roadside environment should be inspected for these before commencing any road maintenance activities. An effective roadside management plan will aim to identify and protect Aboriginal and other cultural heritage items.

7.3 Ecological Linkages

7.3.1 Biodiversity and Ecosystem Processes

As noted previously, roadside environments provide an important resource in the maintenance of natural systems and their associated biodiversity reserves. The main reasons for preserving biodiversity relate to the following:

Ecosystem Processes

Biodiversity provides the critical processes that make life possible. A healthy and functioning ecosystem is necessary to maintain the quality of the atmosphere as well as maintaining and regulating the climate, freshwater, soil formation, cycling of nutrients and disposal of wastes; this is often referred to as ecosystems services. Biodiversity is important in the control of pest plants, animals and diseases, for pollinating crops and for providing food and many raw materials. The conservation of biodiversity can also have a positive impact on water quality.

Ethics

All species have an inherent right to exist. Biodiversity belongs to the future as well as the present and no species or generation has the right to take away this inherent right by destroying the existence of a species. This belief underpins threatened species legislation.

Aesthetics and Culture

Biodiversity provides opportunities for a range of intrinsic values such as beauty, tranquility and isolation. Many Australians place a high value on the presence of native plants and animals. For many, this contributes to a sense of cultural identity and is important for the spiritual enrichment of the community as well as providing for recreation.

Economic

Some components of biodiversity have an economic value that can be used to generate wealth. The variety of plants and animals in Australia provide an attraction for tourism, as well as providing food, medicines and other pharmaceutical products and energy and building materials.

The reality is that there are many opportunities for enhancing biodiversity reserves in the roadside corridor; however, there are just as many processes acting to degrade these native vegetation resources. An effective management plan will include simple but effective vegetation management practices, combined with a community education program that highlights the values of roadside native vegetation for large and small holdings.

7.3.2 Vegetation Management

There are three key areas of vegetation management practice that are impacting on native remnants in the LGA. The responsibility for these activities falls to employees of government authorities, and to local residents. Minor changes to each of these will make a significant improvement to the overall health of native bushland in the roadside corridor.

Removal, pruning, slashing, and mowing of vegetation

Trees and other vegetation on roadsides can affect road safety by restricting vision of road users, and encroach on the road asset in such a way as to contribute to its degradation. Vegetation type and growth vary across the State, so control techniques and timing of their application vary accordingly. Control needs to be undertaken in a way that avoids unnecessary damage to vegetation. In Mid-Western Regional LGA this has been done very effectively in conjunction with road widening and improvement works on Hill End Rd. This is a important transport route in the southwestern part of the LGA, and works have recently been focused on sealing the road and generally improving road safety conditions. Elsewhere in the LGA, road widening along Lue Rd, another major transport route just outside Mudgee, road improvements are currently under way. These include widening and improving road safety, and some effort has been made to preserve a small population of *Acacia ausfeldii*, a threatened species, in the area. In contrast, road widening along Castlereagh Highway north of Gulgong has resulted in native vegetation being removed, and subsequent revegetation has been with inappropriate species. Tree planting includes a number of eucalypt species that are not native to the area.

Mid-Western Regional LGA is home to an industrial boom in the form of major expansion to coal mining operations. The result of this is a significant increase in the volume of traffic on many smaller roads. This traffic includes numerous large trucks that are bringing infrastructure for the mines and associated power generation plants, and as part of an associated rail network upgrade. An effective management plan will provide techniques to maintain vegetation clearances and sightlines in a way that preserves or enhances aesthetic and conservation values of roadsides.

Weeds

Weeds impede agricultural production, compete with and displace native vegetation, become a visual blight on the landscape and increase fire hazard. Weeds are classed as either noxious by regulations and require specific actions to be taken (see section 6 of this document), or environmental weeds that involve voluntary actions by individuals and organizations for effective control. Transport corridors such as roads are a means of spreading weeds, either by road construction and maintenance activity or by actions of road users. At this point in time, there are very few parts of the road reserve that are unimpacted by weeds in the LGA, although a number of areas of bushland in near natural condition persist. Protection of these areas is important: weedy herbs and grasses rapidly displace native understorey species which are considered an important component of many of the Endangered Ecological Communities present in the LGA.

An effective management plan will provide a range of work practices and techniques that control the spread of weeds. Treatment of weed infestations already established also needs to be considered as part of the control process.

Herbicide use

Herbicides can be an effective means of controlling declared and environmental weeds, Application of herbicide can involve risk to non-target species of plants and sensitive fauna, crops and drinking water, so correct use is essential. Numerous examples of appropriate and inappropriate weed control spraying were noted during roadside surveys. These included blanket spraying of roadside vegetation by landholders, spraying of roadside regeneration growth along fence lines, and spraying by landholders and government employees without meeting relevant OH&S requirements.

An effective management plan will include techniques that minimise the use of herbicides and reduce associated risks through training and appropriate application techniques.

7.3.3 Benefits of remnant roadside vegetation for farms

The protection of remnant vegetation is important for agricultural sustainability on farms. Locally occurring native vegetation gives resilience, allowing agricultural land to bounce back more quickly after severe weather conditions, such as drought. A property that is protected by layers of trees, shrubs and perennial grasses will protect the top soil, enhance biodiversity and provide a pleasant environment in which to work and live.

Native plants interact with soil microbes to create more fertile soils and provide water purification and filtration systems. They prevent and reverse the effects of land degradation, including erosion, poor soil structure, dryland salinity and rising water tables. Remnants provide food and shelter for a wide variety of bird species that feed on and naturally control exotic insect pests. They provide food for insects that pollinate crops and native fodder species. Natural weed control is provided by competition from native shrubs and pastures, all of which reduces the need for chemicals such as fertilizers, pesticides and herbicides.

Some other long term benefits from roadside native vegetation for adjoining farms are:

- Shade and shelter for livestock: Trees and shrubs provide shade and shelter from extreme weather conditions. Mortality of sheep after shearing, lambs and calves is reduced and livestock is healthier.
- Prevention of erosion: By sheltering the land surface, native trees, shrubs and groundcover species stabilize the soil and shelter it from wind and rain.
- Holding water in the landscape: A good cover of native vegetation provides buffering against extreme weather conditions and improves soil structure.
- Improved land property values: Properties with good remnant vegetation have increased value.
- Corridors for animals: By providing a way for animals to move through the region in search of mates breeding, better habitat and food sources. They are essential to the survival and continuation of species.

- Essential wildlife habitat: This is particularly important for threatened species.

7.4 Threatening Processes

Numerous threatening processes were observed for roadside native vegetation in Mid-Western Regional LGA. These are described in the following section, including examples, and giving an indication of frequency or intensity of impacts.

7.4.1 Noxious & environmental weeds

Noxious and environmental weeds are widespread throughout the LGA. More recent developments in the introduction and mismanagement of weed species include activities associated with coal mine expansion and acquisition of farming lands – weeds are introduced on mine-owned vehicles, and farm lands are no longer managed as agricultural lands which allows new weed species to spread into road reserves and adjoining properties (for example, whiskey grass around the Ulan-Wollar Rd, east of Ulan). Causeways are also a common location for noxious weed infestations.

7.4.2 Livestock grazing

Livestock grazing is common on unfenced and partially fenced minor rural roads, and in TSRs; in some areas stock was allowed to graze on the road reserve from paddocks with poorly maintained fences, including goats and cattle (more common around Kandos and Rylstone); over-grazing of TSRs by landholders using these areas as stock transport corridors, including sheep movements to and from shearing sheds (more common in northwestern areas).

7.4.3 Impacts from roadside mowing, slashing and spraying

Roadside slashing, mowing and spraying are all widespread practices on peri-urban and some rural roads in areas associated with small acreage residential properties and wineries. Impacts include removal of native vegetation, introduction of weeds, and erosion by wind and water.

7.4.4 Littering and illegal waste dumping

Littering was more common on main rural roads and peri-urban roads, and was focused around larger towns in the LGA; dumping of green waste contributing to weed problems was more common in small acreage areas; dumping of household and building waste was more common in small acreage areas, and may be linked to current issues associated with positioning of local waste transfer stations.

7.4.5 Unauthorised or illegal activities

- Removal of fallen timber for firewood was more common in small acreage areas
- Inappropriate signposting suggesting that the road is private property, rather than the road goes through private property - a common practice on many rural roads, discouraging access and resulting in poor identification of road management issues, prevention of maintenance activities in a timely manner, and encouraging landholders to manage these areas according to their own ideas (more common in areas where coal mines have acquired property)
- Spraying of native vegetation in roadside corridors by operators who were not using appropriate PPE was more common in small acreage areas
- Planting inappropriate species in roadside corridors was more common in small acreage areas and around wineries
- Grazing of stock in non-TSR areas was noted occasionally throughout the LGA, resulting in degradation of native vegetation and distribution of weed propagules

- Grazing of horses in areas maintained by temporary electric fences was noted in the road reserve in a number of locations (mainly around Rylstone)
- Unauthorised destruction of animals, evidenced by carcasses (wild dogs) hanging on fences (near Nullo Mountain)
- Transport of uncovered loads such as hay bales – a common occurrence on minor rural roads, resulting in the spread of weed propagules along the road corridor
- Construction of private structures in the road reserve – including a set of stockyards and loading ramp at the end of Woorawa Rd, Bocoble.

7.4.6 Drain and road verge maintenance procedures

- Lack of maintenance of culverts was common throughout much of the LGA
- In areas where table drains were cleaned regularly the removed sediments were deposited on the adjoining land and piled around the base of trees – this type of practice will kill these trees in around 5 years
- Inappropriate deposition of sediments does not treat the weed propagules they contain
- Inadequate sediment control structures, including sediment fences that had not been maintained, rock check dams that were eroded or completely bypassed – examples of this were noted on Wollar Rd at Munghorn Gap, Broadhead Rd, south of Mudgee, and were occasionally seen elsewhere in the LGA
- Road runoff can contain pollutants and affect the quality of receiving waters such as wetlands, watercourses, ground water, and drinking water supply. Pollutants include hydrocarbons such as oils, zinc and other metals especially in urban areas, and sediment. Large volumes of runoff from cleared areas can cause significant erosion and general land degradation.

7.4.7 Privately commissioned road maintenance on unmaintained Council roads

Grader operators on many unmaintained roads show poor understanding and skill in road construction and drainage management, resulting in roads with insufficient cutaways, cutaways that drain water back onto the road, banks cleared and graded to the edge of the road corridor, introduction of inappropriate road base material, poor distribution of introduced road base material – the results of these activities are increased erosion and sediment discharge to the receiving environments.

7.4.8 Materials stockpiling

Selection of informal stockpile sites can involve dumping of material on areas of native vegetation, crushing and killing these species; weeds are often introduced along with stockpiled materials; inadequate sediment control measures creates a ready source of sediment that is discharged to the downstream environment along with weed propagules – a noteworthy example of this is on Bylong Valley Way, just west of the Goulburn River National Park boundary, where Columbus Grass is speading into nearby drainage gullies from a roadside stockpile site, and will move downstream into the national park; deposition and storage of stockpiled materials causes compaction of soils and crushes trees roots, eventually killing them.

7.4.9 Drainage practices and water runoff

Other drainage issues were associated with driveways which became major sources of sediment discharged to the receiving environment; occurring more commonly in small acreage areas; unmaintained roads and roads with poorly constructed road beds are rapidly eroded, endangering vehicles and motorists, and providing a source of sediments – common in more remote parts of the LGA.

7.4.10 Road grids

Road grid areas function as a major source of weed propagules – seeds are shaken from vehicles as they pass over the grid; many grids are poorly maintained and are no longer adequately aligned with the road surface, potentially damaging vehicles and encouraging motorists to detour around them.

7.4.11 Causeways

Unmaintained or poorly maintained causeways are dangerous to motorists, and provide an erosion point and sediment source that is discharged to the downstream environment.

7.4.12 Impacts of utility companies

Main impacts noted are associated with high and low voltage power lines. High voltage power line corridors are much larger and regularly cleared to ground level, creating opportunities for weed invasion. A number of power line easements has localised infestations with weed species not present in nearby areas, or present in much lower densities, suggesting that the point of introduction was from maintenance vehicles accessing sites.

7.4.13 Use of mature trees as signposts and fence posts

Wrapping fencing wire around a tree will ringbark it, while nailing signs on will cause the tree to become ill and die more slowly.

7.4.14 Bush fire hazard reduction works

Most common in eastern part of the LGA, in areas near the Greater Blue Mountains World Heritage Area national parks; roadside burns around small acreage holdings

7.4.15 Hollow bearing trees and potential risk to safety

Hollow bearing trees are more common in areas of better bushland, and were noted for their habitat contribution. Safety of individual trees should be assessed separately. It is important to note that many tree species in Mid-Western Regional LGA do not begin to form hollows until the tree is around 100 years old. These hollows are important nesting habitat for a range of bird and animal species.

7.4.16 Diseases in trees

Mistletoe can be present in high proportions in narrow strips of vegetation – branches in open spaces are more susceptible to infestation, and a heavy mistletoe burden is a sign of poor tree health, and will kill the tree. Phytopthera is a soil borne fungus that affects large and small plants, causing a slow death. This fungus is spread by the movement of spores in water, and by human activity that moves infected soil. Phytophthora is restricted to the south-western part of the State where approximately a third of native flora is susceptible to attack. Phytophthora cannot be eradicated once an area is infested, therefore it is imperative that road management activities avoid introducing and spreading it. No evidence was recorded for the presence of this fungus in the LGA at the time of survey.

7.4.17 Loss of vegetation during road upgrade and construction works

Impacts on vegetation were noted on several roads, including Lue Rd and Ulan-Cassilis Rd, near Budgee Budgee and Frog Rock; appropriate management practices can reduce these, as evidenced by works along Hill End Rd, south of Hargraves, where extensive stands of native vegetation have been retained throughout the process of road widening, sealing and construction of drainage structures.

7.4.18 Removal of rocks, soil and sand

Roadside quarries remove vegetation from the road reserve; illegal private access of these and associated stockpile sites exacerbates poor drainage problems and dispersal of weeds; removal of bush rock, sand and soil from the road reserve is occurring but not common in the LGA – more frequent in areas with small acreage dwellings.

7.4.19 Salinity

About 70-80% of irrigated land in NSW is threatened by rising watertables and associated salinity problems. Many NSW rural towns and villages are experiencing the effects of rising watertables causing salinity and waterlogging. This is resulting in corrosion damage to buildings, amenities and infrastructure such as roads, paths, pipes and bridges. Effects of salinity were noted for roadside vegetation on Wattlegrove Lane, Cooks Gap, Narrango Rd, Olinda, and several roads in the western part of the LGA and is noted to occur in the localaties of Rylstone and Dabee.

7.4.20 Barriers to fish passage

Use of causeways in areas with permanent baseflows can disrupt fish passage – not common in Mid-Western Regional LGA.

7.4.21 Road construction activities

Generation of dust, causing a health hazard and degrading impacts on nearby landholders and residences; noise and vibration from construction activities can cause damage to buildings and create a nuisance for nearby landholders and residents; waste materials associated with work camps causing pollution; hazardous materials associated with construction activities, including bitumen products, fuels and oils, pesticides, wetting agents and dust suppressants – can cause health and environmental hazards unless handled and stored correctly.

7.4.22 Absence of roadside rehabilitation guidelines

Requirements for rehabilitation activities associated with road widening and other maintenance works are inconsistent – replanting is absent, inconsistent, or merely unclear whether it is targeting habitat creation, soil stabilisation, or beautification.

7.4.23 Inconsistent road construction standards

This is further exacerbated by the level of maintenance offered by Council resources, leading to greater differences between maintained Council roads and unmaintained Council roads.

7.4.24 Funding

Shortfalls in financial resources are a key limiting factor in the allocation of road maintenance resources, highlighted by the increased road use impacts associated with the recent expansion of mining activities in the eastern part of the LGA. Larger vehicles and greater volumes of traffic has required that some roads need to be widened and/or reconstructed, and others repaired on a more regular basis.

7.4.25 Inconsistent corporate objectives

Conflicts in management outcomes can arise among maintenance workers on roads work crews, weed management crews, environmental resource managers, and planners – there is some evidence of this associated with roadworks on Lue Rd, where several road crews are involved in construction activities, with the result that some areas are constructed in an environmentally friendly manner while others are

not. It is important to remember that public safety is the highest priority outcome associated with road construction and maintenance.

8 REFERENCES

Anderson, J.A., Gedford, A.L., 2007. Environmentally Sensitive Maintenance for Dirt and Gravel Roads. Technical Report No. USEPA-PA-2005, Pennsylvania Department of Transportation and USEPA

Burgin, S., Brainwood, M.A. (2008) Comparison of road kills in peri-urban and regional areas of New South Wales (Australia) and factors influencing death. In: Too close for comfort: Contentious issues in human-wildlife encounters, Royal Zoological Society of New South Wales, pp. 137-144

CWCMA, 2008. Management and Rehabilitation of Riparian Lands: A Best Practice Guide for the Central West Catchment. Central West Catchment Management Authority, Wellington, NSW

DEC NSW, 2005 River Red Gum population in the Hunter Catchment – endangered population. http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile_print.aspx?id=109 accessed 4/25/2010

DEC NSW, 2005. Hunter Valley Weeping Myall Woodland – species profile. http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile_print.aspx?id=200 accessed 4/20/2010

DEH (2006). White Box-Yellow Box-Blakely's Red Gum (Box-Gum) Grassy Woodlands and derived native grasslands. EPBC Act Policy Statements. Dept. Environment and Heritage, Australian Government, Canberra

Eddy, D. (2002). Managing Native Grassland: a guide to management for conservation, production and landscape protection. World Wide Fund for Nature Australia. Sydney, NSW.

Eddy, D., Mallinson, D., Rehwinkel, R and Sharp. S. (1998) Grassland Flora: a field guide for the Southern Tablelands (NSW & ACT). Environment ACT, NSW National Parks and Wildlife Service, World Wide Fund for Nature Australia, Australian National Botanic Gardens, Natural Heritage Trust. Canberra, ACT.

NSW NPWS, (2002a) White Box-Yellow Box-Blakely's Red Gum (Box-Gum) Woodland: Factsheet for NSW.

NSW NPWS (2002b) Identification Guidelines for Endangered Ecological Communities: White Box Yellow Box Blakely's Red Gum Woodland (Box-Gum Woodland), DECC Sydney

NSW Scientific Committee, (2002) Final Determination: White Box Yellow Box Blakely's Red Gum Woodland. Threatened Species Conservation Act 1995, DECC, Sydney

NSW Scientific Committee, (2005) Final Determination*: Eucalyptus camaldulensis* (a tree) in the Hunter catchment – endangered population listing. Threatened Species Conservation Act 1995, DECC

NSW Scientific Committee, (2006) Final Determination*: Cymbidium canaliculatum* R. Br. in the Hunter catchment – endangered population listing. Threatened Species Conservation Act 1995, DECC NSW

NSW Scientific Committee (2007) Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions - endangered ecological community. Final determination DEC (NSW), Sydney

NSW Scientific Committee (2010) Inland Grey Box (*E. microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia listing advice. DEC (NSW), Sydney

Identification Guidelines for Endangered Ecological Communities:

White Box Yellow Box Blakely's Red Gum Woodland (Box-Gum Woodland)

NSW NATIONAL PARKS AND WILDLIFE SERVICE

Introduction

These guidelines provide background information and assist land managers and approval authorities to identify remnants of White Box Yellow Box Blakely's Red Gum Woodland (hereafter referred to as Box-Gum Woodland) Endangered Ecological Community (EEC). The Scientific Committee published this Determination on 15/3/2002. Copies of the Determination are available on the NPWS website at http://www.npws.nsw.gov.au/news/tscdets/f020315a.htm

Text in italics in this document is taken from the Final Determination, unless otherwise indicated.

What is Box-Gum Woodland?

Box-Gum Woodland is characterised by the presence or prior occurrence of White Box, Yellow Box or Blakely's Red Gum. The EEC occurs predominantly on the western slopes of NSW from Victoria to Queensland on soils that are moderately to highly fertile. Consequently, Box-Gum Woodland has been extensively cleared and modified by thinning, clearing, grazing, pasture improvement and cultivation. Remaining stands of Box-Gum Woodland are generally highly fragmented. Less than 5% of the pre-European extent is estimated to remain in the south and up to 10% in the north of the State. Less than 0.5% is estimated to retain pre-European levels of diversity and species composition.

The Final Determination defines Box-Gum Woodland broadly. There are five main features in the Determination that govern whether the EEC exists at a site:

1. Whether the site is within the area defined in the Determination.
2. Whether the characteristic trees of the site are (or are likely to have been) White Box, Yellow Box or Blakely's Red Gum.
3. Whether the site is mainly grassy.
4. Whether any of the listed characteristic species occur (including as part of the seedbank in the soil).
5. If the site is degraded, whether there is potential for assisted natural regeneration of the overstorey or understorey.

It is important to note that the size or ages of the remnant are not determining factors as to whether it constitutes the listed EEC or not.

The condition of remnants of this EEC varies. Examples of the various conditions the community may occur in include:

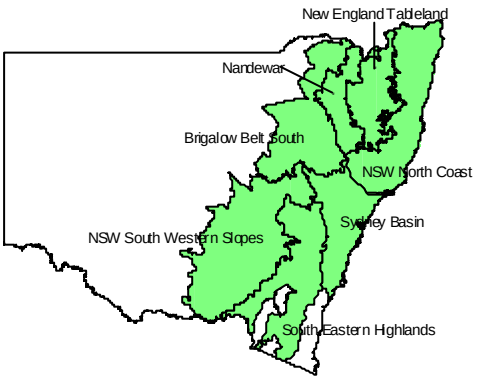
1. Multi-aged overstorey with a grassy, herb-rich understorey:
   - Remnants in this condition are very scarce and are generally confined to travelling stock reserves, roadside vegetation, cemeteries, some national parks and the occasional private property.
2. Partially cleared/thinned stands with a mixture of native and exotic understorey species:
   - This condition is far more common than the above, however its long-term future is often insecure due to inadequate regeneration of overstorey species. Often current management (e.g. set-stocking) is inconsistent with tree regeneration.
3. Stands where White Box, Yellow Box or Blakely's Red Gum have been killed and other species dominate the canopy:
   - This condition occurs in woodlands where the characteristic trees occur in conjunction with White Cypress Pine. The understorey is often in reasonable to very good condition.
4. Grasslands (secondary or derived grasslands), where the tree overstorey has been removed and only the Box-Gum Woodland understorey is present:
   - This condition is likely to be reasonably common in some areas

and is likely to be relatively easy to rehabilitate if appropriate management strategies are implemented.

5. Degraded remnants that have few, if any, native species in the understorey:
   - This condition is typical of Box-Gum Woodland where agricultural practices have been more intensive (e.g. pasture improvement over long periods).

Where is Box-Gum Woodland found?

Box-Gum Woodland is found on relatively fertile soils on the tablelands and western slopes of NSW, extending from an altitude of approximately 170 m on the lower slopes to and including the tablelands. Rainfall is between 400 and 800 mm with a slight winter dominance in the south to a slight summer dominance in the north. According to the Final Determination, the EEC is confined to the IBRA bioregions (EA 2000) as mapped below.



The overstorey

The characteristic trees are White Box, Yellow Box or Blakely's Red Gum. The density of trees is not relevant to the existence of the EEC. Where White Box, Yellow Box or Blakely's Red Gum trees have been killed, and the overstorey is now dominated by other species (e.g. White Cypress Pine), the EEC still exists (see section on Degraded Sites). The Final Determination specifically includes treeless areas in the EEC *"as a result of past clearing or thinning*."

The understorey

Box-Gum Woodland includes vegetation where "*Grass and herbaceous species generally characterise the ground layer…. Shrubs are generally sparse or absent, though they may be locally common.*"

The term *"locally common*" is not defined, but the intent of the statement is that shrubs may be dominant over parts of an EEC site. Shrub species are recognised as important constituents of the community as 27 of the 95 characteristic species listed in the Final Determination are shrubs.

However, shrubby woodlands, which generally occur in upper or midslope situations on shallower soils, are not part of the EEC. Such woodlands are more prevalent on hillsides of the North Western Slopes (Nandewar and Brigalow Belt South Bioregions). Where shrubby woodlands dominated by White Box, Yellow Box or Blakely's Red Gum intergrades with the Box-Gum Woodland the more shrub-free sections of the community should be regarded as Box-Gum Woodland.

In some other instances, the shrub layer is primarily *Acacia* spp. or *Cassinia* spp., which are characteristically pioneer colonising species that invade sites after disturbances such as clearing, overgrazing or fires. These species generally only live 10-15 years and are replaced with a predominantly grassy understorey. These areas are regarded as Box-Gum Woodland.

In most locations the understorey will vary considerably depending on the season, management history and rainfall in preceding months. Care in assessing a site is required when a flush of annual exotic species obscures native perennial species. Reassessment of the site after the annuals have died is desirable. Ideally sites should be assessed in both spring and in autumn so that seasonal native species such as orchids, lilies and native annuals can be identified.

Characteristic species

The Final Determination of Box-Gum Woodland has a list of 95 species that are characteristic of the community.

The Final Determination for Box-Gum Woodland, in common with other Endangered Ecological Community Determinations, states, "*In any particular site not all the assemblage listed above may be present. At any one time, seeds of some species may only be present in the soil seed bank with no above-ground individuals present*". Hence the potential of the seedbank must be considered when assessing degraded sites.

The NSW *Threatened Species Conservation Act*, 1995 defines an ecological community as "*an assemblage of species occupying a particular area*." Thus any EEC includes species occurring in association with the species listed as characteristic for the community.

For example, Box-Gum Woodland includes fauna and fungi, although these groups are not included in the lists of characteristic species.

Fauna

Many sites may be degraded and yet remain important for fauna. Fauna habitat value of individual trees is dependent on a number of features. Generally large old trees have greater value to fauna. Such trees support a diverse and abundant array of insects and the animals that feed upon them, and have numerous hollows, cracks or fissures that provide shelter and nesting sites.

Mature box and gum trees readily form hollows and thus provide important habitat for hollow-dependent fauna such as Squirrel Gliders, Barking Owls and Superb Parrots. Critically, in some areas, White Box and Yellow Box provide significant nectar flows during winter when such resources are crucial for threatened species such as the Regent Honeyeater and Swift Parrot. Large old trees on more fertile sites have been observed to produce more significant nectar flows for fauna than nearby trees on poorer sites such as hillsides.

Degraded sites

The definition of the Box-Gum Woodland explicitly recognises that some remnants are degraded. Highly disturbed sites that have few if any native species in the understorey are specifically included in the community provided "*vegetation, either understorey or overstorey or both, would, under appropriate management, respond to assisted natural regeneration, such as where the natural soil and associated seed bank are still at least partially intact.*"

In some parts of NSW Box-Gum Woodlands are only represented by isolated paddocks trees with a highly modified understorey. Such remnants or vestiges of the community may still constitute valuable fauna habitat in agricultural areas and may provide a valuable source of seed for potential future regeneration.

Determining whether the vegetation will respond to assisted natural regeneration will often be highly problematic. Sites where there is unlikely to be sufficient seed remaining in the soil for the understorey or overstorey to regenerate are not part of the EEC. For example, trees under which intensive cropping of annual crop species has occurred and is ongoing, and trees within urban backyards are unlikely to be part of the community. Conversely, trees with exotic pastures underneath and those in larger urban open spaces will generally be part of the community.

Inevitably difficulties will arise when faced with decisions on whether particular sites are able to respond to assisted natural regeneration. Expert advice may need to be sought in these circumstances. One of the recovery actions for this community is the further investigation of the regeneration potential of various conditions of this EEC in a range of environmental situations. Only then will definitive advice be able to be given.

Identifying Box-Gum Woodland

Following is a key for use in determining whether Box-Gum Woodland exists on a site. Where doubt exists over an appropriate category (e.g. whether the site is mainly grassy or is shrubby), use a precautionary approach that assumes that the community is present.

At each stage there are two alternatives. Choose which is most like the site under consideration, and proceed to the alternative numbered in the right margin.

1 The site is in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands or NSW South Western Slopes Bioregions: **2**

1* The site is outside the above bioregions: **the site is not Box-Gum Woodland**

2 There are no native species in the understorey, and the site is unlikely to respond to assisted natural regeneration (see section on Degraded Sites, page 3): **the site is not Box-Gum Woodland**

2* The understorey is otherwise: **3**

3 The site has trees: **4**

3* The site is treeless, but is likely to have supported White Box, Yellow Box or Blakely's Red Gum prior to clearing: **5**

4 White Box, Yellow Box or Blakely's Red Gum, or a combination of these species, are or were present: **5**

4* White Box, Yellow Box or Blakely's Red Gum have never been present: **the site is not Box-Gum Woodland**

5 The site is predominantly grassy: **the site is Box-Gum Woodland**

5* The understorey of the site is dominated by shrubs excluding pioneer species (see section on The Understorey: page 2): **the site is not Box-Gum Woodland**

Determining the conservation value of remnants

The condition of remnants of Box-Gum Woodland varies. The conservation value of a remnant, whatever its condition, will vary according to the locality. For example, whilst Box-Gum Woodland persisting as isolated paddock trees may be of limited conservation value in some areas, in highly modified agricultural landscapes they may be all that remain and thus their loss would be significant.

Additional guidelines are being prepared to assist in determining the local and regional conservation significance of Box-Gum Woodland remnants.

Useful References

Eddy D., Mallinson D., Rehwinkel R., Sharp S., (1998) *Grassland Flora: a field guide for the Southern Tablelands.* EACT, NSW NPWS, WWF. ANBG.

Environment Australia (2000) Revision of the Interim Biogeographic Regionalisation of Australia (IBRA) and the Development of Version 5.1. - Summary Report. Department of Environment and Heritage, Canberra.

Grassy Box Woodlands Conservation Management Network, (2000-2002), *Woodland Wanderings* (magazine). GBWCMN.

Lambert J., Elix J., (2002) *Grassy White Box Woodlands: Information Kit*. Community Solutions.

NSW NPWS, (2001) *Paddock Tree Brochure.* NSW NPWS.

NSW NPWS, (2002*) White Box-Yellow Box-Blakely's Red Gum (Box-Gum) Woodland: Fact-sheet for NSW*.

Southern Tablelands Grassy Ecosystems Conservation Management Network, (2002), *Austral Bugle* (magazine). STGECMN.

Threatened Species Conservation Act 1995, NSW Scientific Committee, (March 2002) *Final Determination: White Box Yellow Box Blakely's Red Gum Woodland.*

Walker K., Burrows G., McMahon L., (2001) '*Bidgee Bush*. Greening Australia.

Website: Community Solutions http://www.communitysolutions.com.au/gwbw_project/index.html

Website: Conservation Management Network http://www.conservation-management-networks.net/

Website: NPWS http://www.npws.nsw.gov.au

For further information contact the Threatened Species Unit in your area

Threatened Species Unit
Western Directorate
NSW National Parks and Wildlife Service
PO Box 2111
DUBBO NSW 2830
Tel: (02) 6883 5330 Fax: (02) 6884 9382

Threatened Species Unit
Central Directorate
NSW National Parks and Wildlife Service
PO Box 1967
HURSTVILLE NSW 2220
Tel: (02) 9585 6678 Fax: (02) 9585 6442

Threatened Species Unit
Northern Directorate
NSW National Parks and Wildlife Service
PO Box 914
COFFS HARBOUR NSW 2450
Tel: (02) 6651 5946 Fax: (02) 6651 6187

Threatened Species Unit
Southern Directorate
NSW National Parks and Wildlife Service
PO Box 2115
QUEANBEYAN NSW 2620
Tel: (02) 6298 9700 Fax: (02) 6299 4281