CHARLES STURT UNIVERSITY

Biocertification Report

FLORA AND FAUNA INVESTIGATIONS OF THE WAGGA WAGGA CAMPUS OF CHARLES STURT UNIVERSITY, ESTELLA

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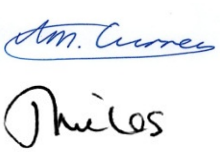
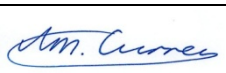
Draft	10.09.08	name		name		name	
Final	07.01.09	name		name		name	

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EXECUTIVE SUMMARY

In 2008, Charles Sturt University were approached by Wagga Wagga City Council and the NSW Department of Environment and Climate Change (DECC) with a preliminary plan for including the CSU Wagga Wagga Estella Campus in a future Biocertification scheme of the Wagga Wagga LEP. Biocertification would allow up-front strategic assessment of conservation values and enable informed community participation in planning outcomes and development projects.

Legislation that is relevant to this report includes the Wagga Wagga Local Environmental Plan, *Threatened Species Conservation Act 1995*, and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*. The purpose of this study is to inform Charles Sturt University of potential Biocertification options should Wagga Wagga City Council opt to pursue such a scheme for its new LEP. CSU is not able to independently biocertify its own site.

Field investigations involved undertaking detailed background searches to obtain information on vegetation structure and connectivity, and flora and fauna characteristics of the site. Flora and fauna surveys were conducted with a particular emphasis on the moderate to high conservation/ecological areas. The field surveys were guided by the Threatened Biodiversity Survey and Assessment Guidelines (DECC 2004) and the Biometric and Threatened Species Tool (DECC, 2008).

A number of vegetation communities were evident within the CSU land boundaries, two of which are listed as Endangered Ecological Communities (EEC) by the NSW Scientific Committee, under the TSC Act, and one of which is listed under the EPBC Act.

A total of 120 plants species were recorded during the field investigations, none of which are listed as threatened under the NSW *TSC Act* or Commonwealth *EPBC Act*. This is unlikely to include all plants present within the study area, given the survey constraints, however it is considered to provide adequate information to assess the types of vegetation communities and habitats present in the study area and determine the likelihood of the presence of threatened biota.

Dominant tree species were White Cypress Pine (*Callitris glaucophylla*) on the hilly areas and Yellow Box (*Eucalyptus melliodora*), White Box (*Eucalyptus albens*), Grey Box (*Eucalyptus microcarpa*) and Kurrajong (*Brachychiton populneus*) on lower slopes.

A total of 55 fauna species (48 birds, 5 mammals and 2 reptiles) were recorded within the CSU land boundaries during the field investigations, with a total of three threatened fauna species (Superb Parrot, Speckled Warbler, and Grey Crowned Babbler) observed and recorded utilising the CSU site, all of which are listed as vulnerable under the *TSC Act*. The Superb Parrot is also listed as threatened under the *EPBC Act*.

Although none of the study area carries remnant Endangered Ecological Community in good condition, degraded stands may still be of significance for fauna, including several species listed as threatened in NSW or nationally. Consequently, an assessment of the overall ecological value of the campus was undertaken. Ecological values across the CSU site were categorised into three classes: high, moderate and low. In general, none of the vegetation on the Wagga Wagga Campus provides continuous linkage with other vegetation off site. The surrounding landscape is heavily cleared and large gaps in native vegetation are present between remnant stands of vegetation. Whilst regionally the vegetation on the campus does not provide direct linkages to other vegetation, there are a number of corridors and links within the CSU campus that assist in the movement of fauna species locally, especially non-mobile species. Overall the site provides a number of areas of ideal habitat for many fauna species including threatened woodland birds which are of great ecological value to the area. although there are some areas with minimal ecological value, with the implementation of some mitigation measures these areas could be possibly enhanced.

1 INTRODUCTION

1.1 BACKGROUND

Under s.126G of the *Threatened Species Conservation Act 1995*, the NSW Minister for the Environment has the ability to confer certification on an Environmental Planning Instrument (EPI) if the Minister is satisfied that the EPI will lead to the overall improvement or maintenance of biodiversity values. By gaining Biocertification, it will allow up-front strategic assessment of conservation values and enable informed community participation in planning outcomes and development projects. Certification offers opportunities to execute planning strategies that will assist in reversing the long term decline in the quality and extent of our biodiversity resources.

In early 2008, Charles Sturt University (CSU) in Wagga Wagga were approached by Wagga Wagga City Council and the NSW Department of Environment and Climate Change (DECC) with a preliminary plan for including the CSU Wagga Wagga Estella Campus in a future Biocertification scheme of the Wagga Wagga LEP. Key elements that were identified by DECC as being of relevance to Biocertification qualification include the following:

- On ground distribution of viable remnants of Endangered Ecological Communities. (Previous surveys undertaken by DECC Officer Dr. Michael Mulvaney and David Read of Wagga Wagga City Council found two endangered ecological communities (EEC) to be present within the CSU site);
- Distribution of mature hollow bearing trees;
- Refinement of the distribution of breeding habitat of threatened fauna; and
- Refinement of offset rules for threatened species occurring within CSU land boundaries.

nghenvironmental were then engaged by CSU to survey and document biodiversity values within CSU lands at the Wagga Wagga campus to inform CSU of the key biodiversity values on the campus. The study would specifically inform CSU of:

- The key vegetation on the campus, including the location, condition and conservation status of vegetation communities;
- Areas of habitat for threatened flora and fauna species; and
- Opportunities for conservation, enhancement and management of biodiversity values on the campus, in line with potential Biocertification schemes and sustainability targets set by CSU.

1.2 OBJECTIVES OF THIS STUDY

The primary aim of the study is to identify and assess the biodiversity values on the Wagga Wagga, Estella campus of CSU. Objectives of the study include:

- Identify areas of low, moderate and high conservation value within the CSU Wagga Wagga campus. Areas of particular interest include those that support endangered ecological communities, areas of habitat for threatened species, and areas that include feature/species/communities of national environmental significance;
- Undertake surveys to improve CSU's knowledge and understanding of the distribution of key habitat features of threatened and otherwise important species;

- Implement the findings of the surveys and existing information to extend the strategic desktop assessment to the remainder of land at the CSU Wagga Wagga Campus;
- Document the current condition of vegetation and habitat and the location of targeted flora and fauna species;
- Identify areas suitable for retention, enhancement or other conservation goals;
- Indicate the distribution of known biodiversity values within CSU boundary areas;
- Target threatened species and biodiversity information gaps and make recommendations about how current biodiversity can be maintained and improved in the long term.

1.3 STUDY AREA

The township of Wagga Wagga is located on the western fall of NSW southern tablelands within the NSW South Western Slopes bioregion. The town is located on the Murrumbidgee River, which meanders through the town in an east-ward direction. Considered the capital of the Riverina region, Wagga Wagga has a population of approximately 60,000.

Charles Sturt University was first established in 1989 and has campuses at Bathurst, Albury, Wagga Wagga, Dubbo and Orange. The university was formed from the merger of several existing separately-administered colleges including the Riverina College of Advanced Education in Wagga Wagga. The Wagga Wagga campus is CSU's largest campus spreading over 640ha and is home to a number of technical facilities and industry standard production services such as CSU's cheese which has been in operation since 1998. Other facilities include the world class Equine centre and commercial winery and television production studio.

CSU's Wagga Wagga Campus is located approximately 7kms north of Wagga Wagga CBD, near the suburb of Estella. Figure 1 displays the land boundaries in which CSU's Wagga Wagga campus owns and operates.

1.3.1 Facilities of the Wagga Wagga Campus

Main Campus

The Wagga Wagga Campus is the largest of CSU's campuses and comprises of a number of facilities including an amphitheatre, four storey library, medical services, laboratories, convention centre, cafes, children's centre and sporting facilities such as a swimming pool, gymnasium, sporting ovals, tennis and basketball courts and a squash centre. The campus also accommodates a variety of on campus accommodation for students attending the university. A mini mart, post office, and canteen are also available within the campus area.

Equine Centre

The Charles Sturt Equine Centre covers approximately 25ha within the CSU farm area and is just a short walk from the main campus. The Centre provides facilities for teaching in Equine Science, Veterinary Science and Animal Science – facilities which are recognised as amongst the best in Australasia.

Major features of the equine centre include a 3000 square metre indoor arena, the second largest in the Southern Hemisphere, and a world class cross country eventing course that caters for all levels. The centre also accommodates two sand arenas, six stable blocks, an amenities block with classroom and kitchen, showers, and dressing facilities.

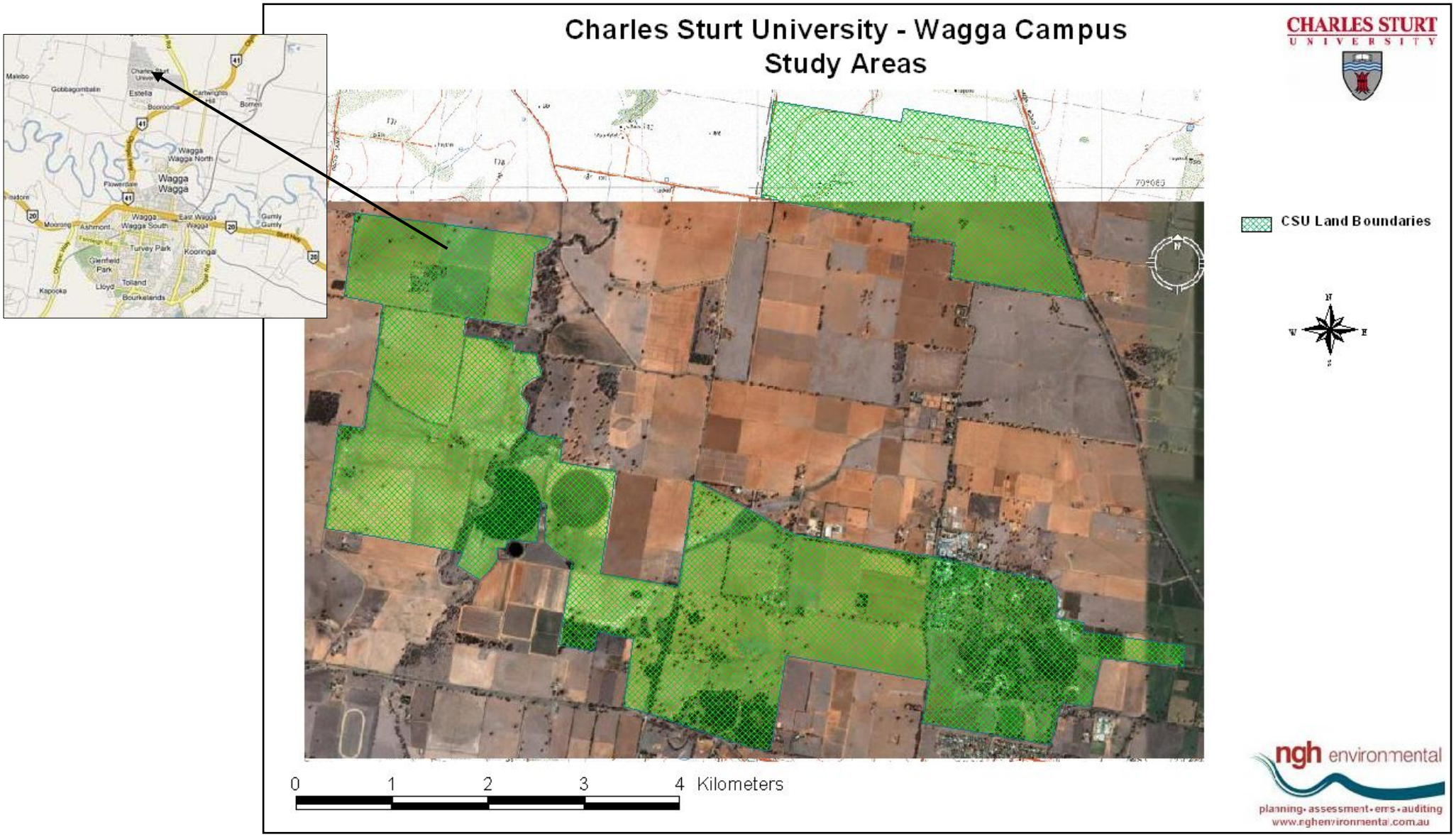

Figure 1 – CSU Land Boundaries

Cheese Factory

The cheese factory is located along the eastern side of CSU's Wagga Wagga Campus and has been in production since 1999. The cheese made at CSU is all handmade using Riverina fresh milk.

Winery

The Charles Sturt University Winery is a producer of premium varietal table wines. It is part of Australia's leading wine and food science school and as such is at the forefront of viticultural practices and wine making techniques.

1.4 CONSERVATION VALUE: DEFINITIONS

The aim of this report is to describe the conservation significance of land in a way which allows government land managers to identify areas where:

i) No additional biodiversity loss can be withstood;

ii) Some biodiversity loss can be withstood, providing the loss is offset locally; and

iii) There are no biodiversity constraints to development.

Guided by the *Biometric Tool*, version 1.8 (DECC, 2008), the analysis of conservation values has been undertaken with reference to four main factors:

i) The condition of remaining native vegetation (including paddock trees);

ii) The level of clearance of the vegetation type in the catchment;

iii) Whether the vegetation qualifies as an Endangered Ecological Community (EEC);

iv) The habitat value of the vegetation for threatened and migratory species.

The vegetation classification has been undertaken with reference to Biometric terminology as follows:

- Native vegetation in moderate to good condition
- Native vegetation in poor condition
- Cleared land which retains paddock trees
- Cleared land without paddock tress

As categorical definitions are likely to require change over time as new information becomes available, this study has aimed to make the data collected transparent enough to allow refinement of categories at a later date. That is, quantitative data has been collected wherever possible and all data has been included in this report. The following table defines the categories have been used in this report.

Table 1 – Conservation Value Definitions

Term	Data Source	Specific Requirements
Endangered Ecological Communities (EEC's)	Defined by the NSW *Threatened Species Conservation Act 1995 (TSC Act)*.	Refer to the NSW Scientific Committee determinations: *http://www.nationalparks.nsw.gov.au/npws.nsf/Content/List+of+Scientific+Commitie+determinations*
Cleared Lands	Derived by **ngh**environmental	Vegetation that does not meet the *Biometric Manual's* definition of low, moderate to good native vegetation. Predominately exotic in the understorey and overstorey (if present).
High potential habitat value	Derived by **ngh**environmental.	The habitat is known to be suitable habitat for the entire lifecycle of the threatened species, i.e. For fauna, breeding resources are present.
Moderate potential habitat value	Derived by **ngh**environmental.	The habitat appears highly suitable for a component of the lifecycle of a threatened species, i.e. For fauna, foraging resources are present.
Marginal potential habitat value	Derived by **ngh**environmental.	The habitat has some elements which make it suitable for a threatened species however elements such as size, composition or their condition are not optimal.
Nil potential habitat value	Derived by **ngh**environmental.	The habitat provided is not suitable for a threatened species.
Mature trees	Derived by **ngh**environmental.	For the purpose of this report, mature trees are defined as those with an diameter at breast height (DBH) greater than 60 cm.

2 LEGISLATIVE CONTEXT

2.1 WAGGA WAGGA LOCAL ENVIRONMENTAL PLAN

The Draft Wagga Wagga Local Environmental Plan (LEP) 2008 has currently been placed on public exhibition for public comment. Under the current (1985) LEP, all land contained within CSU's Wagga Campus is zoned 5 "special uses".

2.2 NSW THREATENED SPECIES CONSERVATION ACT 1995 (TSC ACT)

Threatened flora and fauna species, populations and ecological communities of relevance to the study were obtained from the schedules of the *TSC Act*. This Act lists threatened biota for NSW.

2.3 COMMONWEALTH ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 (EPBC ACT)

Nationally listed threatened flora and fauna species, populations and ecological communities of relevance to the study were obtained from the schedules of the *EPBC Act*.

2.4 BIOCERTIFICATION

The purpose of this study is to inform Charles Sturt University of potential Biocertification options should Wagga Wagga City Council opt to pursue such a scheme for its new LEP. CSU is not able to independently biocertify its own site.

126G Biodiversity certification

(1) The Minister may by order published in the Gazette confer biodiversity certification on an EPI if satisfied that the EPI, in addition to any other relevant measures to be taken, will lead to the overall improvement or maintenance of biodiversity values. Biodiversity values include threatened species, populations and ecological communities, and their habitats.

(2) In deciding whether to confer biodiversity certification on an EPI the Minister must also have regard to the following considerations:

(a) the likely social and economic consequences of implementation of the EPI,

(b) the most efficient and effective use of available resources for the conservation of threatened species, populations and ecological communities,

(c) the principles of ecologically sustainable development,

(d) conservation outcomes resulting from any reservation or proposed reservation of land under Part 4 of the NPW Act or the entering into of a conservation agreement relating to the land under that Act, or resulting from any other action to secure the protection of land for conservation purposes,

(e) conservation outcomes resulting from the operation outside the area of operation of the EPI of strategies, plans, agreements and other instruments (whether or not they are EPIs).

(3) In deciding any matter under this section the Minister is to have regard to the objects of this Act.

(4) An EPI cannot be biodiversity certified unless:

(a) notice is given of proposed biodiversity certification of the EPI in the course of the public exhibition of a draft of the EPI under section 66 of the *Environmental Planning and Assessment Act 1979* or by public exhibition following a procedure that substantially accords with the procedure for public exhibition required by that section, and

(b) copies of submissions made in response to an invitation for submissions in the course of that public exhibition have been provided to the Minister.

(5) The Minister may issue guidelines for the purpose of assisting in the preparation of EPIs for biodiversity certification.

2.5 STAKEHOLDERS

This study has been commissioned by Charles Sturt University (CSU), Wagga Wagga Campus. No property owners, adjacent stakeholders, or residents located near the University have been included in this study.

3 DATA SOURCES

In preparing this report, the following data sources were utilised:

Source	Information
Wagga Wagga City Council	• Consultation with David Read, Biodiversity Management Officer. • Land Zoning.
Charles Sturt University – Wagga Campus	• Mapped areas of CSU land boundaries and recent land purchased.
Department of Environment and Climate Change (DECC)	• Biocertification Operation Manual, version 2.0. *"A Terrestrial Biodiversity Assessment Tool for the NSW Native Vegetation Assessment Tool".* • Benchmark Data on vegetation types and Mitchell Landscapes obtained from DECC website, August 2008. • GIS data of threatened flora and fauna species recorded within wagga map sheet 8327. • Biometric Vegetation types of the Murrumbidgee CMA area, obtained from DECC website, August 2008.
Commonwealth Department of Environment Water Heritage and the arts (DEWHA)	• Environmental Reporting Tool (Matters of National Environmental Significance) and EPBC database, generated on the 14th August 2008.
nghenvironmental	• Internally produced reports within or relevant to the study site.

4 SURVEY METHODOLOGY

4.1 BACKGROUND REVIEW

Prior to undertaking field investigations, a desktop review was conducted to obtain information on vegetation structure and connectivity, and flora and fauna characteristics of the CSU's Wagga Wagga campus area (Appendix 1). The following was undertaken as part of the background review:

- Review of relevant databases;
- Review of vegetation maps for the CSU Wagga Wagga Campus and surrounding region; and
- Review of literature pertaining to threatened species and endangered ecological communities (EEC's) within the CSU land boundaries and adjoining areas.

4.1.1 Database Searches

The desktop review ensures that the results from surveys conducted during different climatic and seasonal periods are considered. This approach increases the probability of considering the presence of, and possible impacts on, all known and likely native species, particularly any plants and animals that are of regional, state or national conservation significance that were not located during the field survey.

Database searches were obtained from DECC Wildlife Atlas on recorded threatened fauna and flora species found to occur within the wagga map sheet 8327 (Appendix 1). Background searches also focused on records of threatened biota within the Wagga Wagga LGA using:

- Bionet;
- The EPBC Protected Matters search tool; and
- Previous surveys undertaken in regards to CSU and the surrounding landscape including:
    - New South Wales Vegetation Classification and Assessment (Benson, 2006);
    - A state wide classification of vegetation in NSW (Keith, 2004);
    - Proposed New Dentistry Building for Charles Sturt University, Wagga Wagga Campus: Flora and Fauna Impact Assessment (**ngh**environmental, 2007).
    - Proposed New Academic Accommodation Building 29 for Charles Sturt University, Wagga Wagga Campus: Flora and Fauna Impact Assessment (**ngh**environmental, 2008); and
    - The Native Vegetation and Threatened Species of the City of Wagga Wagga, Department of Environment and Conservation (Priday & Mulvaney, 2005).

4.1.2 Landscape and regional evaluation (desktop)

A qualitative landscape summary was undertaken to consider CSUs Wagga Campus study site in terms of vegetation type and extent, extent of clearing, the distribution of EECs, threatened species and their habitats and corridors. This evaluation was undertaken using aerial imagery, topographic maps and analysis of existing information.

The following online databases were reviewed for further information on threatened species and vegetation mapping:

- EPBC Species Profile and Threats Database;

- PlantNet;
- Threatened Species profiles obtained from the Department of Environment and Climate Change website (http://threatenedspeices.environement.nsw.gov.au/tsprofile/index.aspx);
- New South Wales Vegetation Classification and Assessment: Introduction – the classification, database, assessment of protected areas and threat status of plant communities (Benson 2006);
- New South Wales Vegetation Classification and Assessment: Part 1: Plant communities of the NSW Western Plains (Benson 2006);
- New South Wales Vegetation Classification and Assessment: Part 2A: NSW South-western Slopes Bioregion and Update of NSW Western Plains (Benson in press); and
- Bioregions of New South Wales: their biodiversity, conservation and history (NPWS 2003).

A full list of reference material is provided in chapter 9.

4.2 FIELD INVESTIGATIONS

A detailed flora and fauna survey of the study area was undertaken with a particular emphasis on the moderate to high conservation/ecological areas. Field investigations took place over three days from the 5th to the 7th August 2008 by **ngh**environmental ecologists with a total of 40 person hours devoted to the field surveys. Weather conditions during the three days of fieldwork were as follows:

Table 2 – Weather Conditions during Fieldwork

	Minimum	Maximum	Rainfall (mm)
Day 1 – 5th August	1.8°C	14.5°C	0.0mm
Day 2 – 6th August	2.0°C	15.5°C	0.0mm
Day 3 – 7th August	2.2°C	8.2°C	0.4mm

(Weatherzone, 2008)

4.2.1 Flora Surveys

The CSU study area is located within the South West Slopes botanical division and parts of the campus carrying woodland or forest have been tentatively identified previously as consisting of the Endangered Ecological Community (EEC) White Box-Yellow Box-Blakely's Red Gum Woodland (or Box-Gum Woodland) listed as Endangered in NSW under the TSC Act, and as Critically Endangered nationally under the EPBC Act. The South West Slopes are within the area identified as formerly carrying this vegetation community, most of which has been cleared for agriculture.

Also listed as an Endangered Ecological Community (EEC) in NSW is Inland Grey Box Woodland, which is dominated by Grey box (*Eucalyptus microcarpa*). Though not previously identified as present, this community also occurs in the Wagga Wagga Local Government Area (NSW Scientific Committee 2007) and could occur on the site.

Rather than conducting a comprehensive flora survey of the entire study site which is just over 1,000 ha in size, the fieldwork aimed to identify which areas of vegetation could fall within the definition of the two EEC's predicted to occur, and which areas would not fall within any current EEC definition.

Areas that were identified as being EEC were placed in one of two condition classes, moderate or poor. In terms purely of plant species composition, no areas of EEC in good condition were found, although in terms of fauna habitat many areas of the site appear to support good quality resources.

The field investigations adopted the "Random Meander" method (Cropper, 1993) whereby sections of the site which appeared fairly uniform in terms of dominant plant species were traversed slowly on foot, and a species list compiled. As the location of hollow bearing trees were being documented with a GPS unit, the route taken for the flora surveys generally involved zigzagging from one large tree to the next.

Large old trees that were located within cropped paddocks or pasture areas consisting of entirely sown exotic grasses and/or cattle/sheep were mapped via aerial photography rather than by GPS, and as such these areas were not traversed, being of minimal botanical interest. These trees therefore will not contain data such as DBH size and hollow sizes etc.

Areas investigated in most detail included the main campus and associated paddock areas in the regions between the student residences and the University entrance, the equestrian cross country jumping area located north of Old Narrandera and Harris Roads (containing a jump training course in its northern area) and the riparian vegetation along Houlaghans Creek south of Cambourne Lane.

Road verges were included within the survey, whether CSU land occurred on both sides of the road (e.g. The Gap Road southern end) or only on one side (e.g. Cambourne Lane). Road verges assessed on foot included Old Narrandera Road, the southern end of The Gap Road, Agriculture Avenue (one small regrowth patch) and part of Cambourne Lane. Areas of road verge with only sparse native vegetation or a predominantly exotic groundcover were assessed from a vehicle, and hollow bearing trees recorded with a GPS. These include Prices Road and Coolamon Road where they adjoin CSU grounds and any other areas of the CSU boundary accessible by road.

One area outside the CSU grounds was assessed briefly to assist with establishing condition classes, an area of Crown Reserve east of Coolamon Road, 200-300 metres east of the most easterly point of the CSU grounds. This is one of the areas previously identified as probable Box-Gum Woodland EEC.

Where a boundary was distinguished between two differing vegetation communities a number of GPS points were recorded along the boundary, to facilitate mapping of EEC boundaries. In practise, this was generally the boundary between eucalypt dominated woodland and cypress pine dominated woodland. Boundaries between denser woodland and sparser paddock trees were drawn using air photos. In addition to the aerial images produced by David Read and Michael Mulvaney, which have areas of putative EEC cross-hatched, the Wagga Wagga 1:25,000 topographic map was used to locate other areas of remnant vegetation.

The naming of those species recorded or known for the region follows the nomenclature present in Harden, 1990-1993, and particularly PlantNet. The classification of those vegetation communities recorded in the study area is described according to Specht (1981). Other references used for this report, but not listed above, can be found in the Reference section.

The conservation significance of those plants, animals and vegetation communities recorded is made with reference to the:

- *EPBC* and *TSC Acts*; and
- DECC, Threatened Species, populations and ecological communities of NSW, homepage.

4.2.2 Fauna Surveys

The fauna survey included the following:

- Targeted searches within suitable habitat areas for threatened diurnal fauna species with an emphasis on threatened woodland bird species such as the Grey Crowned Babbler, Superb Parrot, Speckled Warbler and Hooded Robin;
- General consideration of potential for reptile habitat to occur within the study site, especially in regards to the rocky outcrop areas located along the higher points of the campus;
- Continuous bird surveys during field investigations, allowing all species identified utilising land within the CSU boundaries to be recorded;
- Opportunistic sightings of fauna during the field investigations;
- An assessment of habitat types and quality (e.g woodland abundance of hollows, ground cover, vegetation structure, wetland/riparian vegetation); and
- Any incidental sightings of evidence of fauna (scat collections, scratch marks, footprints, etc).

A detailed avifauna survey was conducted across the entire study area, focusing on key habitat areas. Opportunistic fauna surveys and a habitat assessment were also conducted within the CSU land boundaries to identify key areas of ecological value.

Field investigations also included identifying and recording all hollow bearing trees observed during field studies. A waypoint was taken at each tree to determine the easting and northing (for use in mapping) and Diameter at Breast Height (DBH) and number of hollows and their sizes were recorded to gain a better understanding of potential habitat for hollow - dependant fauna species that may utilise the area.

As stated above in section 4.2.1 large older scattered remnant trees located within cropped paddock areas were mapped and recorded via aerial imagery as the flora of these areas were of low ecological integrity and therefore was not surveyed in detail. However, isolated paddock trees may be of ecological value due to their age and size as they may potentially contain hollows.

The survey field methodology was guided by the Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working draft), Department of Environment and Conservation, November, 2004, and the Biometric and Threatened Species Tool (DECC, 2008).

4.3 LIMITATIONS

In the main, this report considers only terrestrial flora and terrestrial vertebrate fauna.

The survey timing was not ideal for determining the plant species present and hence vegetation condition, as annuals have generally disappeared by late winter or are present only as seedlings and grasses have shed seed, making them more difficult to identify. It is quite likely that some species of grasses and forbs have been overlooked. However, given the level of disturbance of much of the site it is considered unlikely that many significant species have been overlooked. Such a survey provides only a snapshot of the biodiversity of a site. Therefore a precautionary approach has been used when evaluating potential for species to occur, to compensate for this limitation.

Several constraints to the current study were encountered during the field investigations including:

- Medium and long-term climatic conditions (ie drought) have resulted in a lack of abundance of annual species; and
- Snapshot survey limitations. The survey was conducted over a brief period of time to obtain an indicative assessment of the site. Survey results may vary during different seasons and if conducted over a longer period of time.

5 CSU – Wagga Wagga Campus Overview

5.1 LAND FORMS AND LAND MANAGEMENT

The city of Wagga Wagga is the largest inland city within NSW with a population of approximately 60,000 people on an area of roughly 480,000 hectares. It is recognised as the "capital" of the Riverina Region. The study site is located on the southern side of the South Western Slopes Bioregion (Figure 2).

The NSW South Western Slopes Bioregion is an extensive area of foothills and isolated ranges comprising the lower inland slopes of the Great Dividing Range extending from north of Cowra through southern NSW into western Victoria with an area of 8,657,426 ha. About 8,070,608 ha or 93.22% of this bioregion occurs in NSW, with the remainder in Victoria. The NSW portion of the bioregion occupies about 10.1% of the state (NPWS 2003).

The bioregion includes parts of the Murray, Murrumbidgee, Lachlan and Macquarie River catchments. It is located within a temperate climate zone, characterised by hot summers and no dry season. Mean annual temperature increases across the bioregion from mild temperatures in the south and east to higher temperatures in the north and west. Rainfall follows a similar distribution with higher rainfall (1200mm per year) in the south east falling to low rainfall (400mm per year) in the west.

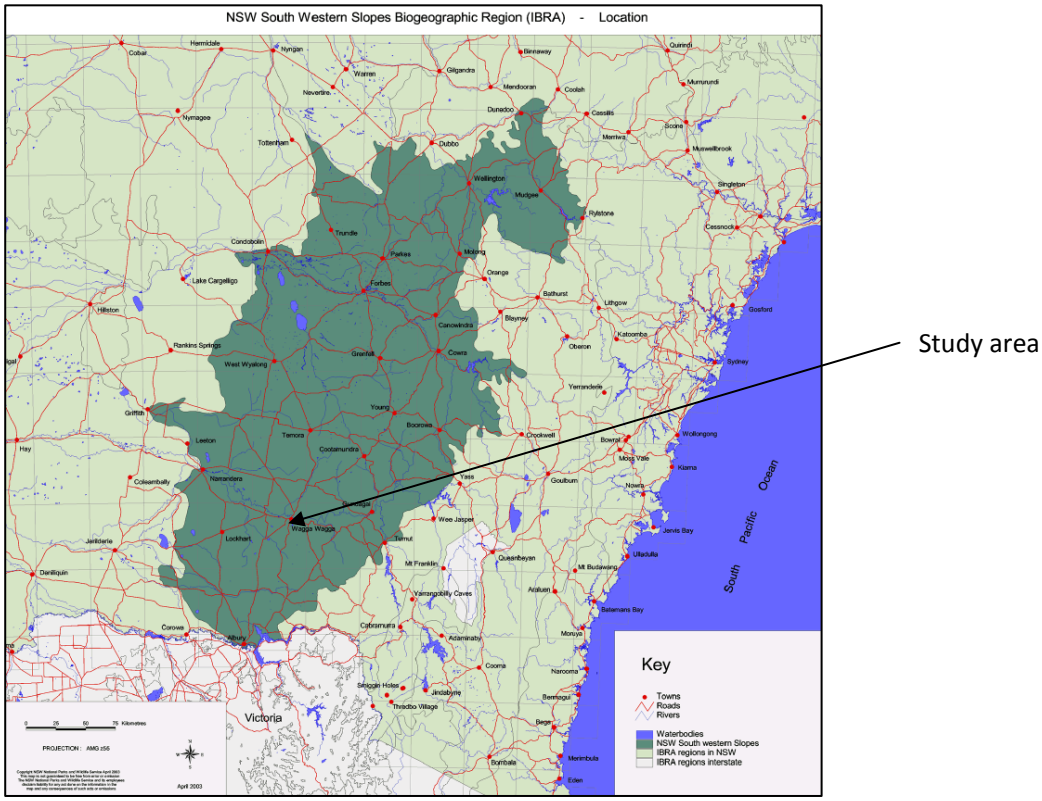

Figure 2 – South Western Slopes Bioregion

Land uses surrounding the study area include agricultural land and major road networks. The city is located upstream from the Riverina plain in the mid-catchment range of the Murrumbidgee River in an alluvial valley confined by low bedrock hills (Page *et al,* 2007). Much of Wagga Wagga is situated on heavy clay soils in a large drainage basin with a small catchment discharge point.

A number of major facilities apart from Charles Sturt University are located within the Wagga Wagga district including the Australian Army base at Kapooka which includes the Army recruit training centre. The Royal Australian Air Force (RAAF) is also based within the Wagga district at Forest Hill, which is the administration and logistics training base for Air Forces personnel and the tri service electronic and aircraft trades school.

Over 90% of the native vegetation within the Wagga Wagga LGA has been cleared for urbanisation and agricultural uses. The remaining 10% exists in pockets and is threatened by isolation, grazing and weed invasion. The loss of native vegetation has led to the loss of native wildlife as well as more trouble with dryland and urban salinity (WWCC, 2008).

The Wagga Wagga City Council, Landcare groups and NSW scouts have planted thousands of grasses, shrubs and trees over the last 12 years in an effort to manage salinity problems and provide a more aesthetic environment and habitat resources for many threatened and endangered fauna species that have been recorded within the Wagga LGA.

5.2 VEGETATION COMMUNITIES OF CONSERVATION SIGNIFICANCE

5.2.1 Endangered Ecological Communities (EECs)

The following vegetation communities which occur within the Wagga Wagga Local Government Area are listed as Endangered Ecological Communities (EEC) by the NSW Scientific Committee, under the *Threatened Species Conservation Act:*

- *White Box Yellow Box Blakely's Red Gum Woodland*
- *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions*

White Box Yellow Box Blakely's Red Gum Woodland (commonly referred to as Box-Gum Woodland) is an open woodland community (sometimes occurring as a forest formation).

Inland Grey Box Woodland includes the dominant tree species *Eucalyptus microcarpa* (Inland Grey Box), and is often found in association with *Eucalyptus populnea* subsp. *bimbil*, *Callitris glaucophylla*, *Brachychiton populneus*, *Allocasuarina luehmannii* or *Eucalyptus melliodora*, and sometimes with *Eucalyptus albens*.

For both communities, shrubs are usually sparse or absent, and a variable ground layer of grass and herbaceous species is often present. At severely disturbed sites the ground layer may be absent.

The DEWHA administered 'Matters of National Environmental Significance' reporting tool identified one threatened ecological community under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*) for the Wagga Wagga LGA:

- *White Box Yellow Box Blakely's Red Gum Grassy Woodland and derived Native Grassland*

This community, also commonly known as Box-Gum Woodland, has a different description to that listed under the *TSC Act* although in many locations the vegetation can meet both criteria. To qualify as Box-Gum Woodland under the *EPBC Act*, an area needs to have, in addition to one or more of the three relevant tree species (or no trees but a high diversity secondary grassland), a predominantly native understorey and an area of greater than 0.1ha (50x20m). If it is also greater than 2ha in size then it need not have a high diversity of native species to be included within the EEC definition, but if less than 2ha in size then it must have 12 or more native understorey species (excluding grasses), at least one of them being a species designated as "important" in the list provided by the Department of Environment and Heritage (2006).

5.3 THREATENED SPECIES

5.3.1 Flora

The DECC administered NSW Wildlife Atlas database returned a total of nine records for four species of flora listed as threatened under the NSW *TSC Act* for the Wagga Wagga map sheet 8327 (accessed 12th August 2008). The habitat requirements of all of these species is considered in Table 3 below, along with species listed as threatened in NSW or Nationally which grow in grassy woodland habitat and occur on the South West Slopes.

Table 3 – Threatened Flora recorded from Wagga Wagga LGA, or occurring on the South West Slopes in grassy woodland habitat

Species	Category*	Habitat required
Swainsona recta forb (Fabaceae)	E, e	Known mostly from the Southern Tablelands, south from Canberra and Queanbeyan, where it grows in secondary grassland and woodland, often on rocky slopes. There are two old (1900) records from the Wagga Wagga area. Given the lack of any more recent records and the paucity of woodland with an intact understorey in the region now, it is extremely unlikely that this species would occur anywhere on the site.
Swainsona sericea forb (Fabaceae)	V	A declining small perennial pea recorded in grassland and grassy woodland from the northern to southern tablelands, and western slopes and plains. Flowers Oct-Dec. There are no records from Wagga Wagga LGA. Given the apparent grazing history of the site and the lack of diversity in the groundcover, it is very unlikely that this species would occur there.
Cullen parvum forb (Fabaceae)	E, e	A perennial forb to 30cm high, recorded mainly from grassland or forest on the plains of the Murrumbidgee and Murray Rivers (Harden 2002). There are no records from Wagga Wagga LGA. Given the apparent grazing history of the site and the lack of diversity in the groundcover, it is very unlikely that this species would occur there.
Pultenaea humilis shrub (Fabaceae)	V	This small shrub grows in dry sclerophyll forest, heath or swamp (Harden, 2002) and there are two records south of Wagga Wagga. In Victoria it is quite widespread and is said to grow on sandy soils in habitats including dry open forest and dry or wet heath (Walsh & Entwisle, 1996). Given the absence of shrubs over most of the site due to past grazing pressure, it is very unlikely to occur.
Ammobium craspedioides forb (Asteraceae)	V, v	Yass Daisy grows in sclerophyll forest, woodland and secondary grassland, chiefly in the Yass district, though extending from near Crookwell to near Wagga Wagga. There are recent (1992-2005) records from Livingstone National Park south of Wagga Wagga. Given the apparent grazing history of the site and the lack of diversity in the groundcover, it is extremely unlikely that this species would occur there.

Species	Category*	Habitat required
Brachyscome muelleroides forb (Asteraceae)	V, v	Claypan Daisy grows in damp areas in moist grassland and on lagoon margins. There is a single old (1889) record from the Wagga Wagga area. It is extremely unlikely that this species would occur on the site.
Senecio garlandii Annual forb (Brassicaceae)	V, v	Woolly Ragwort grows in rocky sites and is known from The Rock and Mt Tabletop. While the two hills on the campus proper are rocky, with extensive granite outcropping, the level of grazing by sheep makes it very unlikely this species would occur there. There are few or no areas steep enough to prevent access by sheep.
Leucochrysum albicans ssp *albicans* var. *tricolor* annual or short-lived perennial forb (Asteraceae)	v	Hoary sunray may be locally common on the Southern Tablelands, and is therefore not listed as threatened in NSW, but is very rare in Victoria and Tasmania. It occurs in the Southern and Central Tablelands and Central Western Slopes botanical divisions, and could perhaps also occur in the SWS. It grows in natural and secondary grasslands and grassy woodlands, often colonising disturbed sites such as road verges, but does not persist well in grazed situations. It is easy to identify from vegetative features when not in flower, and was not recorded on the site during targeted surveys?.

E listed as Endangered under Schedule 1 of the NSW *TSC Act 1995*
e listed as Endangered under the Commonwealth *EPBC Act 1999*
V listed as Vulnerable under Schedule 2 of the *TSC Act 1995.*
v listed as Vulnerable under the Commonwealth *EPBC Act 1999*

5.3.2 Fauna

Approximately 606 records of 29 native terrestrial fauna species listed as threatened under the NSW *TSC Act* have been recorded within the Wagga map sheet 8327 from the DECC administered NSW Wildlife Atlas database (accessed 12th August 2008). These species include two species of frogs, 20 birds and seven mammals.

A search on the DEWHA administered "Matters of National Environmental Significance" reporting tool identified a total of 16 fauna species which have been predicted to occur within 5kms of the CSU study area. A total of 11 migratory species were listed under the Commonwealth *EPBC Act* for the Wagga Wagga LGA (accessed 19th August 2008) and five species of fauna listed as threatened under the *EPBC Act*. Threatened species included one frog, one mammal, two fish and 12 birds. These are listed below with a summary of their ecological requirements.

Table 4 – Threatened Fauna recorded from the Wagga Wagga Map sheet 8327

Species & Listing*	Category	Ecology
FAUNA		
Southern Bell Frog	TSC-E	One of the largest frog species in Australia, these animals may reach up to 104 mm in length, with females usually larger than males. Usually found in

Species & Listing*	Category	Ecology
Litoria raniformis	EPBC-V	or around permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys. They are also found in irrigated rice crops, particularly where there is no available natural habitat. Breeding occurs during the warmer months and is triggered by flooding or a significant rise in water levels. The species has been known to breed anytime from early spring through to late summer/early autumn (Sept to April) following a rise in water levels.
Sloane's Froglet *Crinia sloanei*	TSC-V	*Crinia sloanei* has been recorded from widely scattered sites in the floodplains of the Murray-Darling Basin, with the majority of records in the Darling Riverine Plains, NSW South Western Slopes and Riverina bioregions in New South Wales. It is typically associated with periodically inundated areas in grassland, woodland and disturbed habitats. Habitats it is found in include woodlands, grasslands and disturbed areas.
Blue Billed Duck *Oxyura australis*	TSC-V	The Blue-billed Duck is one of only two Australian species of stiff-tailed ducks - diving ducks with spine-like tail-feathers. The Blue-billed Duck is endemic to south-eastern and south-western Australia. It is widespread in NSW, but most common in the southern Murray-Darling Basin area. The Blue-billed Duck prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation. The species is completely aquatic, swimming low in the water along the edge of dense cover. It will fly if disturbed, but prefers to dive if approached. Blue-billed Ducks will feed by day far from the shore, particularly if dense cover is available in the central parts of the wetland. They feed on the bottom of swamps eating seeds, buds, stems, leaves, fruit and small aquatic insects such as the larvae of midges, caddisflies and dragonflies.
Freckled Duck *Stictonetta naevosa*	TSC-V	The Freckled Duck is a dark, greyish-brown bird with a large head that is peaked at the rear, and a distinctive narrow, slightly up-turned bill. The Freckled Duck is found primarily in south-eastern and south-western Australia, occurring as a vagrant elsewhere. It breeds in large temporary swamps created by floods in the Bulloo and Lake Eyre basins and the Murray-Darling system, particularly along the Paroo and Lachlan Rivers, and other rivers within the Riverina. Prefer permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree.
Brolga *Grus rubicundus*	TSC-V	Though Brolgas often feed in dry grassland or ploughed paddocks or even desert claypans, they are dependent on wetlands, especially shallow swamps, where they will forage with their head entirely submerged. They feed using their heavy straight bill as a 'crowbar' to probe the ground or turn it over, primarily on sedge roots and tubers. They will also take large insects, crustaceans, molluscs and frogs. The famous Brolga 'dance' is apparently at least in part a courtship or bonding display where a pair or many pairs face each other, crouch down and stretch upwards, trumpet, leap and toss grass and sticks into the air. The nest comprises a platform of grasses and sticks, augmented with mud, on an island or in the water. Two eggs are laid from

Species & Listing*	Category	Ecology
		winter to autumn.
Bush Stone Curlew *Burhinus grallarius*	TSC-E	The Bush Stone-curlew stands about 55 cm tall. It has a grey to light brown back, marked with black blotches, and a streaked rump. Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber. Largely nocturnal, being especially active on moonlit nights. Feed on insects and small vertebrates, such as frogs, lizards and snakes. Nests on the ground in a scrape or small bare patch. Two eggs are laid in spring and early summer.
Major Mitchell Cockatoo *Cacatua leadbeateri*	TSC-V	An unmistakable cockatoo of the dry inland, the Pink Cockatoo is the only Australian cockatoo that is salmon-pink below and white above. Inhabits a wide range of treed and treeless inland habitats, always within easy reach of water. Feeds mostly on the ground, especially on the seeds of native and exotic melons and on the seeds of species of saltbush, wattles and cypress pines. Normally found in pairs or small groups, though flocks of hundreds may be found where food is abundant. Nesting, in tree hollows, occurs throughout the second half of the year; nests are at least 1 km apart, with no more than one pair every 30 square kilometres.
Gang Gang cockatoo *Callocephalon fimbriatum*	TSC-V	The Gang-gang Cockatoo is distributed from southern Victoria through south- and central-eastern New South Wales. In New South Wales, the Gang-gang Cockatoo is distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes. It occurs regularly in the Australian Capital Territory. It is rare at the extremities of its range, with isolated records known from as far north as Coffs Harbour and as far west as Mudgee.
Glossy Black cockatoo *Calyptorhynchus lathami*	TSC-V	The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. An isolated population exists on Kangaroo Island, South Australia. Inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 m in which stands of she-oak species, particularly Black She-oak (*Allocasuarina littoralis*), Forest She-oak (*A. torulosa*) or Drooping She-oak (*A. verticillata*) occur. In the Riverina area, inhabits open woodlands dominated by Belah (*Casuarina cristata*). Feeds almost exclusively on the seeds of several species of she-oak (*Casuarina* and *Allocasuarina* species), shredding the cones with the massive bill. Dependent on large hollow-bearing eucalypts for nest sites. One or two eggs are laid between March and August.
Swift Parrot *Lathamus discolour*	EPBC-E TSC-E EPBC-MM	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering

Species & Listing*	Category	Ecology
		species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*. Commonly used lerp infested trees include Grey Box *E. microcarpa*, Grey Box *E. moluccana* and Blackbutt *E. pilularis*. Return to home foraging sites on a cyclic basis depending on food availability.
Turquoise Parrot *Neophema pulchella*	TSC-V	The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Usually seen in pairs or small, possibly family, groups and have also been reported in flocks of up to thirty individuals. Prefers to feed in the shade of a tree and spends most of the day on the ground searching for the seeds or grasses and herbaceous plants, or browsing on vegetable matter. Forages quietly and may be quite tolerant of disturbance. However, if flushed it will fly to a nearby tree and then return to the ground to browse as soon as the danger has passed. Nests in tree hollows, logs or posts, from August to December.
Superb Parrot *Polytelis swainsonii*	TSC-V EPBC-V	Inhabit Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. In the Riverina the birds nest in the hollows of large trees (dead or alive) mainly in tall riparian River Red Gum Forest or Woodland. On the South West Slopes nest trees can be in open Box-Gum Woodland or isolated paddock trees. Species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box. Nest in small colonies, often with more than one nest in a single tree. Breed between September and January. May forage up to 10 km from nesting sites, primarily in grassy box woodland. Feed in trees and understorey shrubs and on the ground and their diet consists mainly of grass seeds and herbaceous plants. Also eaten are fruits, berries, nectar, buds, flowers, insects and grain.
Barking Owl *Ninox connivens*	TSC-V	The Barking Owl is a typical hawk-owl, with staring, yellow eyes and no facial-disc. It is grey to greyish-brown above, with white spots on the wings and almost white underneath with greyish-brown vertical streaks. Is found throughout Australia except for the central arid regions and Tasmania. It is quite common in parts of northern Australia, but is generally considered uncommon in southern Australia. Inhabits eucalypt woodland, open forest, swamp woodlands and, especially in inland areas, timber along watercourses. Feeds on a variety of prey, with invertebrates predominant for most of the year, and birds and mammals such as smaller gliders, possums, rodents and rabbits becoming important during breeding. Live alone or in pairs. Territories range from 30 to 200 hectares and birds are present all year.
Brown treecreeper	TSC-V	The Brown Treecreeper is endemic to eastern Australia and occurs in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range. Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the

Species & Listing*	Category	Ecology
Climacteris picumnus		Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and River Red Gum (*Eucalyptus camaldulensis*) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging..
Speckled Warbler *Pyrrholaemus sagittatus*	TSC-V	The Speckled Warbler is a small well-camouflaged very heavily streaked ground-dwelling bird related to the scrubwrens, reaching a length of 13cm. The Speckled Warbler has a patchy distribution throughout south-eastern Queensland, the eastern half of NSW and into Victoria, as far west as the Grampians. The Speckled Warbler lives in a wide range of *Eucalyptus* dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. Large, relatively undisturbed remnants are required for the species to persist in an area.
Black Chinned Honeyeater *Melithreptus gularis gularis*	TSC-V	The Black-chinned Honeyeater is the largest of its genus, reaching 17 cm in length. The cap is black, with a white crescent around the nape, and there is a diagnostic black centre line down the white throat. There is a small crescent of blue skin above the eye. The back and wings are a dull olive-green and the tail is greyish-brown. The underparts are white, with a greyish-buff tint on the breast. The bill is short, black and slightly downcurved. Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (*Eucalyptus sideroxylon*), White Box (*Eucalyptus albens*), Grey Box (*Eucalyptus microcarpa*), Yellow Box (*Eucalyptus melliodora*) and Forest Red Gum (*Eucalyptus tereticornis*). Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks and tea-trees. A gregarious species usually seen in pairs and small groups of up to 12 birds.
Regent Honeyeater *Xanthomyza Phrygia*	TSC-E EPBC-E EPBC-MT	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region although breeding has been observed outside these areas. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. The Regent Honeyeater is a generalist forager, which mainly feeds on the nectar from a wide range of eucalypts and mistletoes. Key eucalypt species include Mugga Ironbark, Yellow Box, Blakely's Red Gum, White Box and Swamp Mahogany. Also

Species & Listing*	Category	Ecology
		utilises : *E. microcarpa, E. punctata, E. polyanthemos, E. mollucana, Corymbia robusta, E. crebra, E. caleyi, Corymbia maculata, E.mckieana, E. macrorhyncha, E. laevopinea,* and *Angophora floribunda*. Nectar and fruit from the mistletoes *A. miquelii, A. pendula, A. cambagei* are also eaten during the breeding season.
Hooded Robin *Melanodryas cucullate*	TSC-V	The Hooded Robin is considered a sedentary species, but local seasonal movements are possible. The south-eastern form is found from Brisbane to Adelaide throughout much of inland NSW, with the exception of the north-west. The species is widespread, found across Australia, except for the driest deserts and the wetter coastal areas - northern and eastern coastal Queensland and Tasmania. Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses. Territories range from around 10 ha during the breeding season, to 30 ha in the non-breeding season.
Grey Crowned Babbler *Pomatostomus temporalis temporalis*	TSC-V	Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. Flight is laborious so birds prefer to hop to the top of a tree and glide down to the next one. Birds are generally unable to cross large open areas. Live in family groups that consist of a breeding pair and young from previous breeding seasons. Usually two to three eggs are laid and incubated by the female.
Gilbert's Whistler *Pachycephala inornata*	TSC-V	Gilbert's Whistler is one of the less colourful of the Australian whistler species. The Gilbert's Whistler occurs in ranges, plains and foothills in arid and semi-arid timbered habitats. In NSW it occurs mostly in mallee shrubland, but also in box-ironbark woodlands, Cypress Pine and Belah woodlands and River Red Gum forests. Within the mallee the species is often found in association with an understorey of spinifex and low shrubs including acacias, hakeas, sennas and grevilleas. In woodland habitats, the understorey comprises dense patches of shrubs. The Gilbert's Whistler forages on or near the ground in shrub thickets and in tops of small trees.
Diamond Firetail *Stagonopleura guttata*	TSC-V	Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum *Eucalyptus pauciflora* Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland. Feeds exclusively on the ground, on ripe and partly-ripe grass and herb seeds and green leaves, and on insects (especially in the breeding season). Usually encountered in flocks of between five to 40 birds, occasionally more. Groups separate into small colonies to breed, between August and January.
Spotted Tailed Quoll	TSC – V EPBC – E	The Spotted-tailed Quoll is about the size of a domestic cat, from which it differs most obviously in its shorter legs and pointed face. The range of the Spotted-tailed Quoll has contracted considerably since European settlement. It is now found on the east coast of NSW, Tasmania, eastern Victoria and

Species & Listing*	Category	Ecology
Dasyurus maculatus		north-eastern Queensland. Only in Tasmania is it still considered common. Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites. Mostly nocturnal, although will hunt during the day; spends most of the time on the ground, although also an excellent climber and may raid possum and glider dens and prey on roosting birds.
Bilby *Macrotis lagotis*	TSC-E4	Bilbies have the characteristic long bandicoot muzzle and very long ears. As compared with other bandicoots, they have a longer tail, bigger ears, and softer, silky fur. They are nocturnal omnivores that do not need to drink water, as they get all the moisture they need from their food, which includes insects and their larvae, seeds, spiders, bulbs, fruit, fungi and very small animals. Most food is found by digging or scratching in the soil, and using their very long tongues. Once widespread in arid, semi-arid and relatively fertile areas, the Greater Bilby is now restricted to arid wastelands and remains endangered.
Koala *Phascolarctos cinereus*	TSC-V	In NSW it mainly occurs on the central and north coasts with some populations in the western region. It was historically abundant on the south coast of NSW, but now occurs in sparse and possibly disjunct populations. Koalas are also known from several sites on the southern tablelands. Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Inactive for most of the day, feeding and moving mostly at night. Spend most of their time in trees, but will descend and traverse open ground to move between trees. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size.
Squirrel Glider *Petaurus norfolcensis*	TSC-V	Adult Squirrel Gliders have a head and body length of about 20 cm. They have blue-grey to brown-grey fur above, white on the belly and the end third of the tail is black. There is a dark stripe from between the eyes to the mid-back and the tail is soft and bushy averaging about 27 cm in length. Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstorey. Live in family groups of a single adult male one or more adult females and offspring. Require abundant tree hollows for refuge and nest sites.
Large Footed Myotis *Myotis adversus*	TSC-V	The Large-footed Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers. Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface. In NSW females have one young each year usually

Species & Listing*	Category	Ecology
		in November or December.
Eastern Long Eared Bat *Nyctophilus bifax*	TSC-V EPBC-V	Overall, the distribution of the south eastern form coincides approximately with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species. Inhabits a variety of vegetation types, including mallee, bulloke Allocasuarina leuhmanni and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Roosts in tree hollows, crevices, and under loose bark.
Inland Forest Bat Vespadelus baverstocki	TSC-V	Recorded from scattered localities in western NSW, but may be more widespread. Roosts in tree hollows and abandoned buildings. It has been recorded from a variety of woodland formations, including mallee, mulga and River Red Gum. Colony size ranges from a few individuals to more than fifty. Females congregate to raise young. The single young is carried by its mother until its weight affects her flight, and is then left in the roost at night. These bats fly rapidly and cover an extensive foraging area.
Greater Long-Eared Bat Nyctophilus timoriensis	TSC-V EPBC-V	The south eastern form of the Greater Long-eared Bat is also known as Eastern Long-eared Bat. It is uniformly dark grey-brown. The ears are about 3 cm long and larger than the head. It has a low ridge of skin running between the eyes and across the nose. Inhabits a variety of vegetation types, including mallee, bulloke *Allocasuarina leuhmanni* and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Roosts in tree hollows, crevices, and under loose bark. Slow flying agile bat, utilising the understorey to hunt non-flying prey - especially caterpillars and beetles - and will even hunt on the ground.
Murray Cod *Maccullochella peelii peelii*	EPBC-V	The Murray Cod is the largest freshwater fish found in Australia. It is a long lived predator species that is highly territorial and aggressive. It occurs naturally in the waterways of the Murray–Darling Basin in a wide range of warm water habitats that range from clear, rocky streams to slow flowing turbid rivers and billabongs. The upper reaches of the Murray and Murrumbidgee Rivers are considered too cold to contain suitable habitat.
Macquarie Perch *Macquaria australasica*	EPBC-E TSC-V	Macquarie perch are found in both river and lake habitats, especially the upper reaches of rivers and their tributaries. They are quiet, furtive fish that feed on aquatic insects, crustaceans and molluscs. Sexual maturity occurs at two years for males and three years for females. Macquarie perch spawn in spring or summer in shallow upland streams or flowing parts of rivers. Females produce around 50,000-100,000 eggs which settle among stones and gravel of the stream or river bed.
Australian Painted Snipe	EPBC-MT	The Painted Snipe has a scattered distribution in Australia, primarily occurring along the east coast from north Queensland to the Eyre Peninsula in South Australia, and including the majority of New South Wales and Victoria. Scattered records indicate that it may also occur in western

Species & Listing*	Category	Ecology
Rostratula australis		Queensland, throughout Western Australia and the Northern Territory. A single record is known from Tasmania. The Painted Snipe inhabits inland and coastal shallow freshwater wetlands, occurring in both ephemeral and permanent wetlands, particularly where there is grass. The Painted Snipe nests on the ground amongst tall vegetation such as grass tussocks and reeds.
White Bellied Sea Eagle *Haliaeetus leucogaster*	EPBC-MT	White-bellied Sea-Eagles are a common sight in coastal and near coastal areas of Australia. White-bellied Sea-Eagles are normally seen perched high in a tree, or soaring over waterways and adjacent land. Birds form permanent pairs that inhabit territories throughout the year. The White-bellied Sea-Eagle feeds mainly off aquatic animals, such as fish, turtles and sea snakes, but it takes birds and mammals as well. The female carries out most of the incubation of the white eggs, but the male performs this duty from time to time.
White Throated Needletail *Hirundapus caudacutus*	EPBC-MT	White-throated Needletails often occur in large numbers over eastern and northern Australia. They arrive in Australia from their breeding grounds in the northern hemisphere in about October each year and leave somewhere between May and August. They are aerial birds and for a time it was commonly believed that they did not land while in Australia. It has now been observed that birds will roost in trees, and radio-tracking has since confirmed that this is a regular activity. Birds usually feed in rising thermal currents associated with storm fronts and bushfires and they are commonly seen moving with wind fronts. White-throated Needletails are non-breeding migrants in Australia.
Rainbow Bee-eater *Meropus ornatus*	EPBC-MT	The Rainbow Bee-eater is found throughout mainland Australia, as well as eastern Indonesia, New Guinea and, rarely, the Solomon Islands. In Australia it is widespread, except in desert areas, and breeds throughout most of its range, although southern birds move north to breed. The Rainbow Bee-eater is most often found in open forests, woodlands and shrublands, and cleared areas, usually near water. Rainbow Bee-eaters eat insects, mainly catching bees and wasps, as well as dragonflies, beetles, butterflies and moths. They catch flying insects on the wing and carry them back to a perch to beat them against it before swallowing them. Bees and wasps are rubbed against the perch to remove the stings and venom glands.
Great Egret *Ardea alba*	EPBC-MM	Great Egrets prefer shallow water, particularly when flowing, but may be seen on any watered area, including damp grasslands. Great Egrets can be seen alone or in small flocks, often with other egret species, and roost at night in groups. The Great Egret usually hunts in water, wading through the shallows, or standing motionless before stabbing at prey. Birds have also been seen taking prey while in flight. The Great Egret breeds in colonies, and often in association with cormorants, ibises and other egrets. Both sexes construct the nest, which is a large platform of sticks, placed in a tree over the water.
Cattle Egret	EPBC-	In Australia it is most widespread and common in north-eastern Western

Species & Listing*	Category	Ecology
Ardea ibis	MM	Australia across the Top End, Northern Territory, and in south-eastern Australia from Bundaberg, Queensland to Port Augusta, South Australia, including Tasmania. The Cattle Egret is found in grasslands, woodlands and wetlands, and is not common in arid areas. It also uses pastures and croplands, especially where drainage is poor. Will also forage at garbage dumps, and is often seen with cattle and other stock. It also eats frogs, cane toads, lizards and some small mammals. Their shallow platform nests are made in wetland areas in trees and bushes, usually as high up as possible.
Forktailed Swift *Apus pacificus*	EPBC-MM	Low to very high airspace over varied habitat, rainforest to semi-arid desert. Most active just ahead of summer storm fronts. Stays on the wing day and night, sleeping in high, circling flocks.
Latham's Snipe *Gallinago hardwickii*	EPBC-MM	Latham's Snipe is a non-breeding migrant to the south east of Australia including Tasmania, passing through the north and New Guinea on passage. Latham's Snipe is a migratory wader, moving to Australia in our warmer months. Birds may fly directly between Japan and Australia, stopping at a few staging areas. They leave their breeding areas from August to November, arriving in Australia mainly in September. They leave the south-east by the end of February, moving northwards along the coast. Most have left Queensland by mid-April. Latham's Snipe feed by thrusting their long bill into mud with an up and down 'sewing machine' action in soft mudflats or shallow water.

* Listing:

EPBC-MT	Environmental Protection and Biodiversity Conservation Act-Migratory terrestrial species
TSC-CES	Threatened Species Conservation Act-Critically Endangered species
TSC-EP	Threatened Species Conservation Act-Endangered population
TSC-V	Listed as Vulnerable under the Threatened Species Conservation Act
TSC-E	Listed as Endangered under the Threatened Species Conservation Act
TSC-EEC	Listed as an Endangered Ecological Community under the Threatened Species Conservation Act
EPBC-V	Listed as Vulnerable under the Environment Protection and Biodiversity Conservation Act
EPBC-E	Listed as Endangered under the Environment Protection and Biodiversity Conservation Act
EPBC-CE	Listed as Critically Endangered under the Environment Protection and Biodiversity Conservation Act
FM-V	Listed as Vulnerable under the Fisheries Management Act
FM-E	Listed as Endangered under the Fisheries Management Act

5.4 OTHER EPBC ACT MATTERS

Matters of national environemental significance, listed under the *Environment Protection and Biodiversity Conservation Act 1999* for the Wagga Wagga Local Government Area were investigated using the EPBC reporting tool (accessed 26th August 2008, Appendix 1). The following matters were returned by the search:

- One wetland of international significance

  Fivebough and Tuckerbil Swamp was returned. This wetland is not located near the study area.

- Commonwealth marine areas – Not relevant. The study area is located approximately 500 kms inland.

6 SURVEY RESULTS

6.1 FLORA FIELD SURVEY RESULTS

6.1.1 General

No flora species or populations listed as threatened under the NSW *Threatened Species Conservation Act 1995* or listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* were found to occur within the CSU land boundaries. Although the timing of the survey in late winter was not ideal for detecting the presence of some plants, in view of the degraded nature of the groundcover vegetation over much of the site it is considered unlikely that any threatened species occur on the site. Some areas of road verge may have some potential to carry threatened flora species, being in better condition with less grazing history.

The dominant tree species comprised White Cypress Pine (*Callitris glaucophylla*) on the hilly areas, and Yellow Box (*Eucalyptus melliodora*), White Box (*Eucalyptus albens*), Grey Box (*Eucalyptus microcarpa*), and Kurrajong (*Brachychiton populneus*) on lower slopes. Two endangered ecological communities were found to occur within the CSU land boundaries.

6.1.2 Diversity of Flora Species

A composite plant species list for the CSU grounds (excluding cropping and exotic pasture areas) is provided in Appendix 2, with individual composite lists for some areas regarded as typical of the different vegetation communities in Appendix 3. No data were collected from representative quadrats, although concentrated random meanders were undertaken in areas of better quality vegetation, to maximise the number of species detected.

A total of 120 plant species were recorded during the field investigations (Appendix 2). This is unlikely to list all plants present within the study area, given the survey constraints, however it is considered to provide adequate information to assess the types of vegetation communities and habitats present in the study area and determine the likelihood of the presence of threatened biota.

Of the 120 species recorded, approximately 60 (50%) are exotic species or non endemic to the Wagga Wagga region.

6.1.3 Noxious Weeds

Five species of noxious weeds were found to occur within the CSU land boundaries including Paterson's Curse (*Echium plantagineum*), Bathurst Burr (*Xanthium spinosum*), Horehound (*Marrubium vulgare*), St John's Wort (*Hypericum perforatum*) and Soursob (*Oxalis pes-caprae*). The latter four have been categorised as Class 4 within the Wagga Wagga LGA, while oxalis has been categorised as Class 5. The characteristics of these two classes are as follows:

Class 4 - are plants that pose a threat to primary production, the environment or human health, are widely distributed in an area to which the order applies and are likely to spread in the area or to another area.

Class 5 - are plants that are likely, by their sale or the sale of their seeds or movement within the State or an area of the State, to spread in the State or outside the State.

6.1.4 Vegetation Communities

The vegetation within the CSU land boundaries represents a number of remnant and planted elements within a largely urbanised and agricultural environment. There are a number of planted revegetated areas located within the immediate main campus area and also along road verges within the CSU land boundaries.

Scattered remnant Yellow Box (*Eucalyptus melliodora*) and White Box (*Eucalyptus albens*) are found throughout the campus areas and within cropped paddock areas. To the west of the study area there is a large remnant patch of *Callitris* woodland that integrades into Inland Greybox Woodland, providing ideal habitat for a number of threatened fauna species, including woodland birds such as the Grey Crowned Babbler and Speckled Warbler.

A number of vegetation communities were identified during the field investigations (Figure 3) with only two vegetation types qualifying as endangered ecological communities (EEC's), that being Box Gum Woodland and Inland Grey Box. Vegetation communities found within CSU land comprised of:

- Areas dominated by Cypress Pine (*Callitris glaucophylla*);
- River Red Gum Woodland;
- Planted Areas;
- Box Gum Woodland; and
- Inland Grey Box Woodland;

Areas dominated by Cypress Pine (Callitris glaucophylla)

The guidelines for the *TSC Act* definition of Box-Gum Woodland state that one of the condition classes into which Box-Gum Woodland remnants may fall is:

"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."

This raises the question of whether cypress pine-dominated stands within the CSU grounds could be considered part of the Box-Gum Woodland EEC. It is our opinion that such stands are not part of the EEC.

Two large areas of such pine-dominated woodland occur on the two rocky hills on either side of the main campus area (Figure 3). Granite outcrops are abundant on these steep-sided hills. The prominent trees in these areas are white cypress pine, kurrajong (*Brachychiton populneus*) and the exotic olive, while eucalypts (alive or dead) are sparse, and small. It therefore appears likely that these areas are naturally pine or kurrajong dominated, rather than being an artefact of past clearing of eucalypts.

There is an obvious and fairly sharp boundary with eucalypt dominated woodland (in which both pine and kurrajong still occur but at lower frequency and usually as younger plants), on the lower slopes of these hills.

The other large tract of pine-dominated woodland occurs in the equestrian paddock north of Harris Road and the Old Narrandera Road. This is not on a steep or rocky site and does include a few large old eucalypts, including White Box (*E. albens*), Yellow Box (*E. melliodora*) and Grey Box (*E. microcarpa*). However, eucalypts are very sparse over most of this area, and there are many old cypress pine trees present.

The south-west corner of this paddock includes areas where Grey Box is dominant, or co-dominant with pine, and this area has been mapped as the Inland Grey Box Woodland EEC, along with the adjacent verge of Old Narrandera and Harris Roads and the nearby verges of The Gap Road.

The remainder of this paddock has been mapped as not being EEC, but the argument for this being the case is less strong than in the case of the two rocky hills. The groundcover in this paddock is less degraded by grazing than on the bulk of the campus proper, and it is predominantly native, but of relatively low species diversity (as far as could be determined in a winter survey). There are dense stands of cypress pine regeneration suppressing much of the groundcover over large areas, and partially cleared edges have a greater proportion of exotics. While the section of this paddock dominated by pine has not been mapped as EEC, it is nevertheless in relatively good condition compared with the remainder of the campus, and appears to be valuable to fauna, including threatened species. It does include enough hollow-bearing eucalypts to be of value for hollow-dependent fauna species.

River Red Gum Woodland

River Red Gum (*Eucalyptus camaldulensis*) woodland is located on the banks of Houlaghans Creek south of Cambourne Lane (Figure 3). This community is not currently listed as an EEC. However, it is of some conservation concern as it has been highly degraded by clearing, grazing and weed invasion, at least in the eastern part of its range, where it is restricted to narrow strips along watercourses.

The stand on Houlaghans Creek is narrow and has a largely exotic understorey. A planting of eucalypts and other tree species along the western upper bank may eventually increase its value for fauna, but currently this does not appear to be very high, compared to other parts of the site.

Planted Areas

Areas within the main campus which may include some old Yellow Box (*E. melliodora*), White Box (*E. albens*) or Blakely's Red Gum (*E. blakelyi*) trees, but in which canopy trees are predominantly planted and relatively young cannot be considered to belong to the Box-Gum Woodland EEC. In some cases the planted trees are Yellow Box or Blakely's Red Gum, but many are sugar gum (*E. cladocalyx*), a South Australian species, lemon-scented gum (*Corymbia citriodora*), a Queensland species, or mugga ironbark (*E. sideroxylon*), a species which grows south and east of Wagga Wagga, but does not appear to occur naturally nearby.

In some areas there has been an attempt to replace some local understorey species, with plantings of wattles (*Acacia pycnantha, A. cardiophylla, A. genistifolia*) and other shrubs (*Bursaria spinosa, Dodonaea viscosa*). The groundcover in most of these areas is predominantly of exotic grasses, with occasional patches of natives, *Austrodanthonia* or *Austrostipa* species (wallaby and spear grasses).

While not part of the Box-Gum Woodland EEC, due to being mainly planted, these areas are also of value as fauna habitat, and many of them include large old hollow-bearing trees. Such trees are also scattered among the buildings and carparks. Examples of this type of vegetation occur north and west of the roundabout at the university entrance and south of the roundabout at the link of Nathan Cobb Drive and Tooma Drive (Figure 3).

Box Gum Woodland (an EEC)

Box Gum Woodland land was found throughout extensive parts of the study area. It dominated three areas within the CSU grounds and was assessed as being either of moderate or poor condition. This community is discussed in more detail in section 6.1.5.

Inland Grey Box Woodland (an EEC)

Areas of Inland Grey Box Woodland were found dominating the western areas of the CSU boundaries near the cross country area and along the road verges of Gap Road about 500m from its junction with the Old Narrandera Road. This community will be discussed in more detail in section 6.1.5.

Table 5 summarises the vegetation types discussed above and their condition and location within the CSU land boundaries.

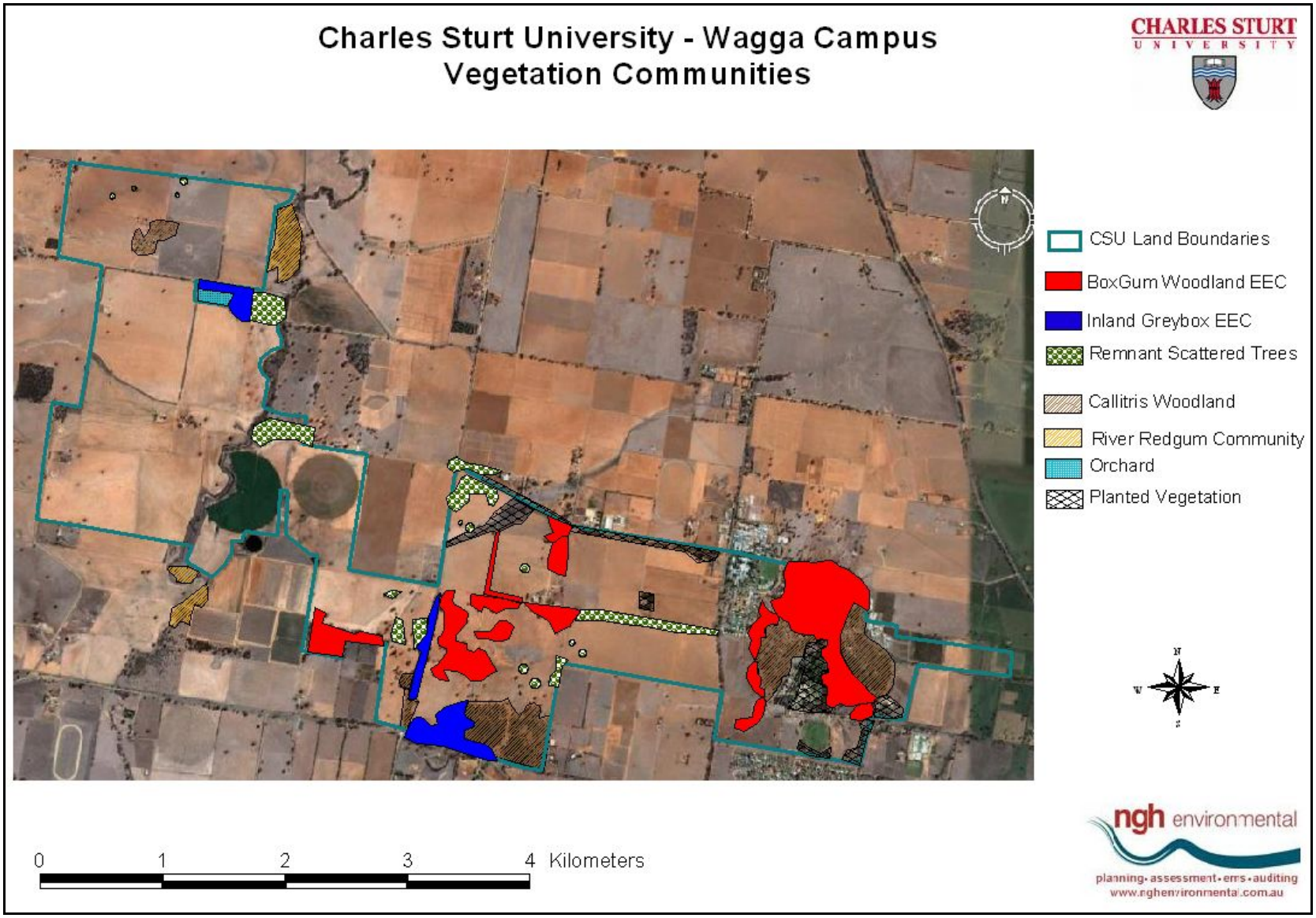

Figure 3 – Vegetation Communities

Table 5 – Summary of Vegetation Communities, Condition and Location

Vegetation type	Location	EEC, TSC Act?	EEC, EPBC Act?	Condition	Fauna value
Cypress pine/kurrajong woodland on rocky hills, heavily grazed and largely exotic groundcover	Two hills within campus proper	No	No	Poor	Moderate
Cypress pine woodland on lower slopes and flats, more lightly grazed with mostly native groundcover	Eastern side of equestrian paddock	No	No	Moderate	High
Cypress pine woodland on lower slopes and flats, remnants in cropped or heavily grazed paddocks	West of The Gap Road southern end, north of Cambourne Lane	No	No	Poor	Low
River red gum woodland	Houlaghans Creek banks south of Cambourne Lane	No	No	Poor	Moderate
Planted woodland with scattered remnant eucalypts, including yellow box and white box	Throughout more developed parts of campus proper	No	No	Poor to moderate	Moderate
Overgrazed yellow box woodland on lower slopes and flats	Less developed parts of campus proper	Yes	No	Poor	Moderate to high
Yellow box woodland on road verges and two small areas of campus, with more intact understorey	Prices and Coolamon Road verges, near Dentistry building site, small patch on Agriculture Avenue (mostly on road verge)	Yes	No	Moderate	Moderate
Grey box – Yellow box – cypress pine woodland on road verges, mainly native understorey	Road verges: The Gap Road southern end, Old Narrandera Road. Western side of equestrian paddock	Yes	No (unless considered to be Box-Gum Woodland)	Moderate	High
Grey box regrowth woodland with no shrub layer and mixed native and exotic groundcover	Cambourne Lane verges and adjacent paddock to south	Yes	No	Poor	Moderate
Remnant paddock trees (mostly yellow box or grey box) in intensively “improved” or cropped paddocks	Paddocks east of The Gap Road southern end, north of Cambourne Lane, other small patches throughout.	No	No	Poor	Moderate

6.1.5 Endangered Ecological Communities (EECs)

Two endangered ecological communities were identified during the field investigations within the CSU land boundaries: White Box-Yellow Box-Blakely's Red Gum Woodland and Inland Greybox Woodland (Figure 4). Both of these EEC's have been identified under the *Threatened Species Conservation Act 1995*, while White Box-Yellow Box-Blakely's Red Gum has also been identified under the *Environmental Protection Biodiversity Conservation Act 1999*, however with two very different definitions (refer to Appendix 4 for Final Determinations on this community in regards to the *TSC Act*).

White box-Yellow Box-Blakely's Red Gum Woodland

In regards to Box Gum Woodland, some areas on the site (or adjacent to it on road verges) fall within the definition under both Acts, while others are too degraded to satisfy the criteria for listing under the *Environment Protection and Biodiversity Conservation Act*, but would qualify under the less stringent guidelines provided under the *Threatened Species Conservation Act*.

Two condition classes are present, moderate and poor. The moderate condition class may also qualify as the *EPBC Act* listed Box-Gum Woodland, but the poor condition areas would only qualify as this EEC under the *TSC Act*.

EPBC Qualification

To qualify as Box-Gum Woodland under the *EPBC Act*, an area needs to have, in addition to one or more of the three relevant tree species (or no trees but a high diversity secondary grassland), a predominantly native understorey and an area of greater than 0.1ha (50 x 20m). If it is also greater than 2ha in size then it need not have a high diversity of native species to be included within the EEC definition, but if less than 2ha in size then it must have 12 or more native understorey species (excluding grasses), at least one of them being a species designated as "important" in the list provided by the Department of Environment and Heritage (2006).

One such species, the forb *Sida corrugata*, does occur in most yellow or white box remnants within the CSU grounds. However, very few areas appear to have such a diversity of native understorey species present, although the timing of the survey would have reduced detection of species such as lilies and orchids. Higher diversity remnants are confined to road verges within the study area.

TSC Qualification

Under the *TSC Act*, much more degraded stands must be considered as belonging to the Box-Gum Woodland EEC, under guidelines prepared by NSW NPWS (undated). Under these guidelines the only category of remnant excluded from the EEC definition is isolated paddock trees above crops or intensively managed exotic pasture (that is, "sites where there is unlikely to be sufficient seed remaining in the soil for the understorey or overstorey to regenerate"). Sites where tree or understorey regeneration (but not necessarily both) could occur if degrading influences such as grazing or weeds were controlled are regarded as part of the EEC under these guidelines. Similar comments with regard to condition can be found in the Final Determination at *(www.environment.nsw.gov.au/determinations/EucalyptusMicrocarpaEndCom.htm).*

Areas of Box Gum Woodland within CSU Lands

Moderate Condition*:* The moderate class Box-Gum Woodland comprised of two very small patches (50 x 50m or less) dominated by yellow box, with a predominantly native understorey, one located west of the entrance to the new dentistry building construction site and north of the overflow parking area, and one located on Agriculture Avenue west of the Agricultural Research Institute (mostly on road verge, but extending into the adjacent paddock).

These areas have a groundcover dominated by wallaby and spear grasses, with a modest complement of native forbs, and not too many weeds. The road verge section of the Agriculture Avenue site includes abundant yellow box regeneration, albeit over a very small area. Given their small area, the modest native species diversity would not qualify these areas for listing under the *EPBC Act*, but they are of moderate condition under the *TSC Act* definition.

***Poor Condition**:* The Poor class Box Gum Woodland is located on the lower slopes of the rocky hills within the main campus, extending to the campus boundary in the north, and to the edge of the student residential area or new construction site to the west.

These areas are all fenced and heavily grazed by sheep, with the result that they have no native shrub layer (although exotic small trees and shrubs olive, pepper tree and African boxthorn do function as a shrub layer for fauna habitat purposes), and the groundcover is now largely dominated by exotic annual grasses and weeds, principally Paterson's curse (*Echium plantagineum*).

These areas would certainly be capable of tree regeneration if grazing pressure was removed, and groundcover condition might improve a little in some areas. They must therefore be considered as EEC in poor condition under the *TSC Act*.

Poor condition Box Gum Woodland is also located along road verges on Prices Road and Coolamon Road adjacent to the recent northern addition to the CSU grounds, but not remnant vegetation within this area, which is restricted to isolated trees within cropping paddocks.

Remnant vegetation on Coolamon Road is better than on Prices Road, as the verges are quite wide and the vegetation includes a few wattles (*Acacia deanei, A. montana*) beneath a continuous yellow box canopy. Hollow-bearing trees are more or less absent on both these roads and the groundcover is a mixture of exotics and a low diversity of native species but they would still be of value as fauna habitat and as movement corridors, as well as being EEC in moderate condition.

Inland Greybox Woodland

Inland Greybox Woodland is currently listed under the *Threatened Species Conservation Act 1995*. Degraded examples of this community must also be regarded as belonging to this EEC (refer to Appendix 4 for the Final Determinations for this EEC in regards to the TSC Act.).

***Moderate Condition**:* A number of areas within the CSU land boundaries were identified as containing Inland Greybox Woodland. The main section was located along the western part of the cross country "equestrian paddock", just north of the Old Narrendera Road. Included within this area would be the more modified north-western part of this paddock, which includes large clearings containing a horse jumping course. However, the groundcover (excluding tracks and a few small weedy areas) is predominantly native and remnant trees include grey box, so all of this western section of the paddock could be included within the EEC definition.

There is little or no shrub layer (other than cypress pine regrowth), and the groundcover is sparse, being mostly litter under the eucalypts and mostly moss or lichen under dense pine stands, but this area has the greatest regeneration potential, as it comprises relatively few weeds and appears to have been grazed more lightly than paddocks within the main campus.

The adjacent road verge includes a few shrubs and greater groundcover diversity, and gives some indication of what the original vegetation may have been like. Condition is moderate in this stand (both paddock and road verge).

The second area that comprised of moderate condition Inland Greybox Woodland included the verges of The Gap Road up to about 500m from its junction with Old Narrandera Road. This area had the best floristic

diversity found on the entire site, with three wattle species (*Acacia deanei, A. montana, A. decora*) and ten native herbaceous species recorded, some of them quite abundant.

It could be interpreted as being either Inland Grey Box Woodland (as grey box is the dominant tree for most of its length) or as Box-Gum Woodland, as large old yellow box trees are present at either end and in the adjacent paddocks. If it were interpreted as Box-Gum Woodland, then it would meet the *EPBC Act* criteria for this community, as the aggregate area of both verges and some adjacent remnant vegetation in paddocks to the west is likely to be over 2ha and at least 12 non-grass understorey species are present. The Condition is moderate on the road verges, but the contiguous vegetation in a fenced-off area of paddock to the west appears to have a mostly exotic grass groundcover, though with some *Acacia montana*. It may be in poor condition, but closer assessment at a more appropriate time of year would be needed to be sure of this.

***Poor Condition**:* An area of Inland Greybox Woodland in poor condition is found within the CSU land boundaries was located along the southern verge of Cambourne Lane west from the Houlaghan's Creek crossing for a distance of about 500m. While the groundcover does appear to be dominated mostly by native wallaby and spear grasses, it is apparently of low species diversity. Dense regrowth stands in the adjacent paddock appear similar in quality. This area is in poorer condition than the two areas discussed above, and also includes fewer large old trees with hollows.

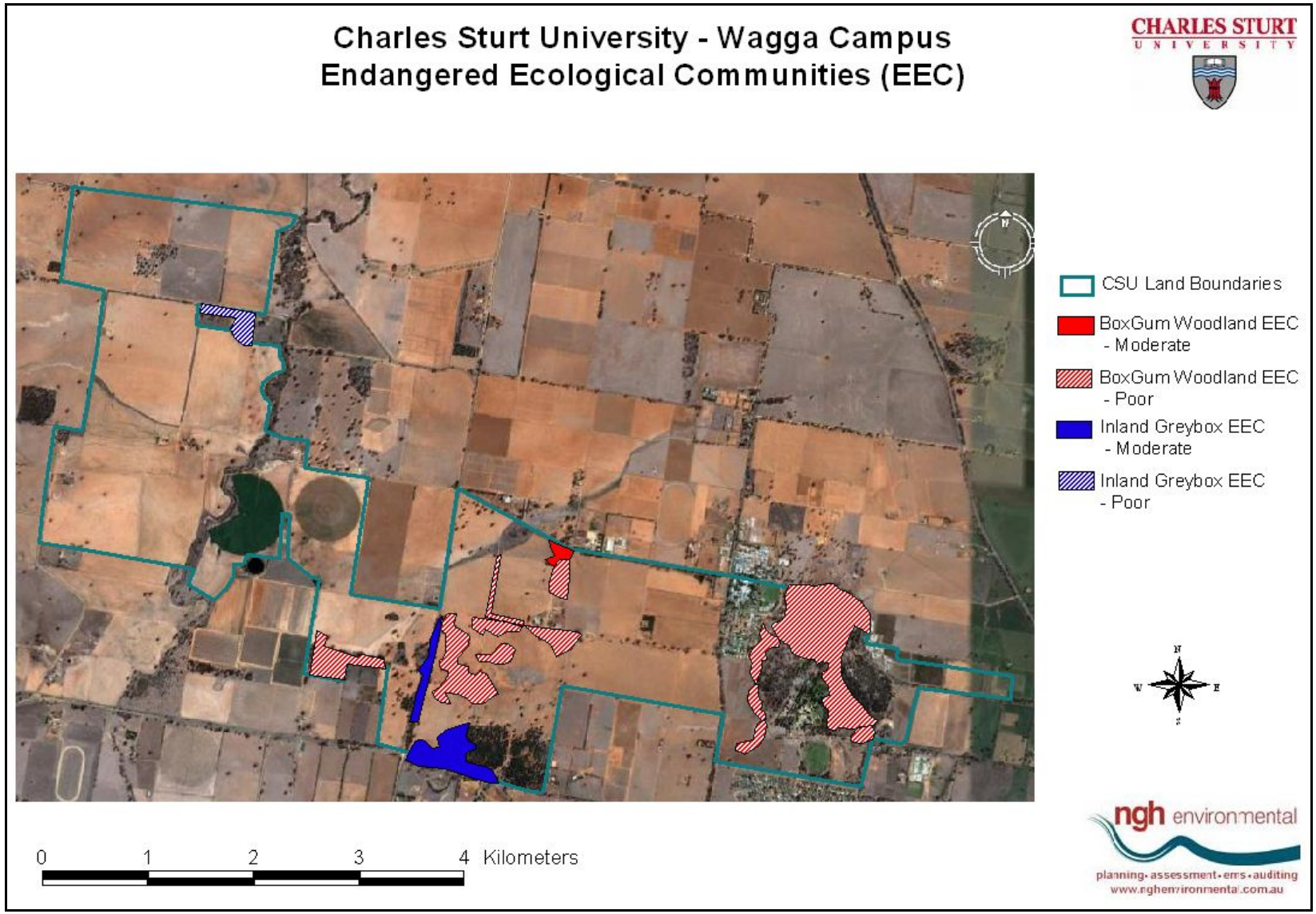

Figure 4 – Endangered Ecological Communities within the CSU Campus

6.2 FAUNA SURVEY RESULTS

6.2.1 Diversity of Fauna Species recorded

A total of 55 fauna species (48 birds, 5 mammals and 2 reptiles) were recorded within the CSU land boundaries during the field investigations (Appendix 5). The majority of species are commonly found within woodland and open forest/grassland vegetation within western NSW.

Three threatened fauna species (Superb Parrot, Speckled Warbler, and Grey-crowned Babbler) were observed and recorded utilising the CSU site, all of which are listed as vulnerable under the *TSC Act 1995*. The Superb Parrot is also listed as threatened under the *EPBC Act 1999*. Two introduced mammals were observed utilising the site, along with a number of domesticated stock animals including sheep, cattle and horses.

6.2.2 Threatened species

No threatened flora or fauna habitat has been mapped by DECC for the study area. From the DECC atlas database there were a number of threatened fauna records within the CSU land boundaries. However no flora species have been recorded within the land boundaries or within 5 kms of the site. The Superb Parrot, Swift Parrot and Major Mitchell's Cockatoo have all been previously recorded within the CSU site. All three of these species, along with the threatened avifauna recorded during the field investigations are highly mobile and can easily traverse to better stands of vegetation within the CSU land boundaries.

6.2.3 Threatened populations

There are no endangered populations in the study area. However an endangered population of squirrel gliders exist within the Wagga Wagga LGA. It is proposed that all hollow bearing trees be retained within CSU land boundaries, therefore retaining potential and suitable habitat for this species if it were to utilise land within CSU, Wagga Wagga campus.

6.2.4 Fauna Ecological Values

Although none of the study area carries remnant Endangered Ecological Community in good condition, degraded stands may still be of significance for fauna, including several species listed as threatened in NSW or nationally. Features of significance for fauna include:

- Large old trees containing hollows (shelter and breeding sites for bats, some birds, Squirrel Glider)
- Large trees, which flower more profusely than younger trees and are of greater value to nectar-feeders and insectivorous species (birds, bats, Squirrel Glider)
- Mistletoe (nest sites for birds, food resources for nectar and fruit-eating birds)
- Areas with native grasses (seed-eating birds, reptiles)
- Fallen timber (ground-feeding birds, reptiles)
- Presence of a shrub layer, preferably native but including exotic species (shelter, nesting sites and feeding niches for birds)
- Rocky outcrops (reptile shelter, potential refugia from grazing, although not on this site, due to intensive use by sheep).

While only the first three items are available in the more heavily grazed remnants, the remnant on the rocky hill west of Tooma Drive includes all of these items, and was found to include more small and ground-feeding birds than other grazed remnants on the campus proper.

The first three items can be highly significant, and otherwise very degraded remnants which include large old trees with hollows and mistletoe can be of high value to more mobile fauna species, particularly when trees are

flowering. Yellow box was in flower at the time of the survey, and some relatively degraded areas were found to be carrying large numbers of nectar-feeding birds, albeit only common and widespread species.

However, some threatened species such as Swift Parrot, Purple-crowned Lorikeet and Regent Honeyeater could also use such areas. Such remnants can also be important as corridors and stepping stones between remnants in better condition, for both migratory and nomadic species (such as honeyeaters) and dispersing resident species.

Consequently, an assessment of the overall ecological value of the campus was undertaken with reference to the above criteria and conditions. Ecological values were categorised into three classes from high, moderate and low across the CSU site (Figure 5).

***High Ecological Value**:* The area of highest ecological value was found to occur within parts of the southern section of CSU where the cross country equestrian paddock is located. This remnant patch of vegetation transits from Callitris woodland to open Inland Greybox, providing a number of important habitat values for threatened species. As such two of the threatened avifauna species recorded during the field investigations were recorded within this area.

***Moderate Ecological Value**:* Moderate ecological values were identified throughout the majority of main campus area, where a large number of hollow bearing trees were recorded (Appendix 6). Other areas of moderate ecological value include a number of road verge areas that link up the surrounding landscape, the revegetation area to the south west of the cross country equestrian area and a number of small patches to the north west of the site.

Low Ecological Value: Some areas within the southern section of the main campus, along with some old scattered remnant paddock trees and revegetated sites were classified as having low ecological values for fauna species. These areas mainly only provided foraging habitat at best and assisted with linking up other more important stands of vegetation within the landscape.

The remainder of the site can be considered to be of low or no ecological value. Open paddock and crop areas might provide limited foraging resources for mobile and disturbance tolerant species such as kangaroos and birds. Areas within more urban parts of the campus may similarly provide some habitats and resources for disturbance tolerant bird and mammal species. However, these areas do not contain unusual or rare values and similar habitats are widespread throughout inland NSW.

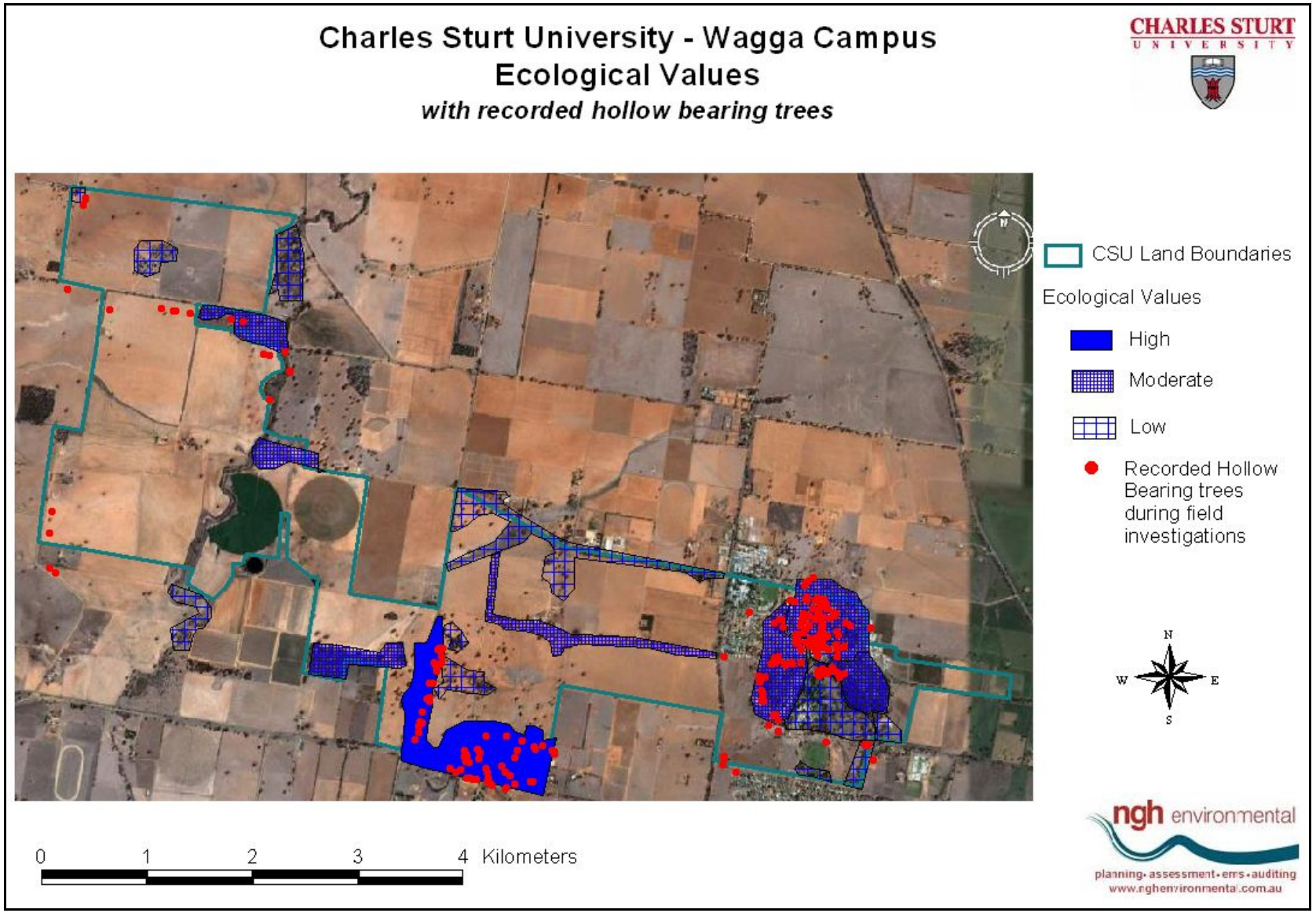

Figure 5 – Fauna Ecological Value Classes identified within the CSU land boundaries

6.2.5 Corridors and links

In general, none of the vegetation on the Wagga Wagga Campus provides continuous linkage with other vegetation off site. The surrounding landscape is heavily cleared and large gaps in native vegetation are present between remnant stands of vegetation. Major vegetation patches are located along the Murrumbidgee River to the south and along the rocky ridges to the west. Smaller patches of isolated vegetation are located to the east and along some road corridors in the region. None of these patches are connected by vegetation to the study area.

Whilst regionally the vegetation on the campus does not provide direct linkages to other vegetation, there are a number of corridors and links within the CSU campus that assist in the movement of fauna species locally, especially non mobile species. The best corridor that was evident within the area was located along The Gap road where Inland Greybox dominated the road verges. A number of hollow bearing trees were also present, providing suitable habitat for a range of diverse fauna species. The Speckled Warbler and Superb Parrot were recorded foraging through this section during the field investigations.

Connectivity throughout the remainder of the site is largely from revegetation along roadside areas. Although this comprises mostly of low ecological value to a number of fauna species they do assist in acting as stepping stones to greater stands of vegetation that are contain higher ecological values.

6.3 RESULTS SUMMARY: CSU – WAGGA WAGGA CAMPUS

The following table summarises the key biodiversity values of the CSU, Wagga Wagga Campus land boundaries.

Table 6 – Summary of Biodiversity Values with CSU, Wagga Wagga Campus.

Endangered ecological communities	White Box-Yellow Box-Blakey's Red Gum Woodland.	Occurs within the land boundaries of CSU in two classes, moderate and poor. A moderate portion is found just south of the Equestrian centre, while poor condition Box Gum woodland is scattered throughout the entire study area (refer to Figure 4).
	Inland Greybox Woodland	This community is found in two condition classes within the CSU land boundaries, moderate and poor. Moderate condition woodland occurs in the southern section of the study area just west of the cross country area and also along the Gap Road verges. Poor condition Inland Greybox is found in the north west section along Cambourne Lane near the Orchard area.
Threatened species records during field investigations	Grey Crowned Babbler:	Species was found utilising Callitris woodland within the cross country area. Approximately 3 individuals were observed within this area.

	Speckled Warbler:	Three individual birds were observed in two locations within the CSU land boundaries. Two individuals were observed also within the Callitris woodland within the cross country area, while the other individual was observed foraging along the road verge near the Gap Road.
	Superb Parrot:	A pair of superb parrots was found foraging and flying along the Gap Road roughly 300metres north of the junction of the Gap Road and Old Narrandera Road.
Local Corridors	Along Gap Road	Is quite wide in some areas and contains a diverse range of native ground cover species. This corridor also links up the vegetation patch within the cross country area with the regeneration area just west of the Gap Road.
	Agricultural Avenue:	Although this area is considered low in terms of ecological value it does sustain a corridor link that acts as a stepping stone to other more remnant patches of vegetation that are more suitable for fauna habitat.
	CSU Main Campus:	Although the main campus is predominately urbanised and has a high visitation usage it has maintained and planted corridors of vegetation that allows more flight dependant fauna species to utilise this vegetation as stepping stones to more ideal habitat such as the Callitris hills which are situated both west and east of the main campus.

7 MANAGEMENT RECOMMENDATIONS

The following management recommendations are made resulting from this study:

1. Protect areas containing Moderate condition Endangered Ecological Communities. These areas should be protected from further clearing. Any co-existence with university activities should not further degrade these areas and where possible, should include measures to enhance ecological values.
2. Protect and enhance existing habitat for the threatened birds species recorded on the site.
3. Assess the impacts of the Cross Country Equestrian Circuit on the vegetation and determine appropriate management measures to allow co-existence of this activity with the vegetation community in a way that does not degrade, and if possible enhances, the vegetation.
4. Protect and manage hollow resources. Hollow-bearing trees across the campus should be protected as much as possible. A retention target should be set within defined areas appropriate to the needs of local fauna and future development should consider impacts at a campus-wide scale to ensure hollow resources are not depleted to unsustainable levels.
5. Enhance and improve areas of high, moderate and low conservation value. This need not be limited to endangered ecological communities but should instead incorporate the range of values identified in this report. A campus-wide rehabilitation strategy and plan should be developed and implemented. These areas could then be used as off-sets for future development.
6. Obtain an agreement with Wagga Wagga City Council and the DECC on the proposed offset strategy in the event of future native vegetation clearing events where this would lead to increased certainty for both conservation outcomes as well as development approvals.

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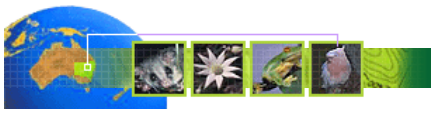
9 APPENDICES

Appendix 1 – Background Searches



NSW National Parks & Wildlife Serv
atlas of nsw wildl

view map
search again
clear selection

Search Results

Your selection: Fauna, threatened species, LGA - WAGGA WAGGA returned a total of 880 records of 30 species.

Report generated on 16/07/108 - 15:05 (Data valid to 13/07/2008)

view map search again clear selection

Choose up to 3 species to map.

** Exotic (non-native) species*

Amphibia	Map	Scientific Name	Common Name	Legal Status	Count	Info
Hylidae						
	☐	Litoria booroolongensis	Booroolong Frog	E1	1	
	☐	Litoria raniformis	Southern Bell Frog	E1	2	
Myobatrachidae						
	☐	Crinia sloanei	Sloane's Froglet	V	2	

Aves	Map	Scientific Name	Common Name	Legal Status	Count	Info
Acanthizidae						
	☐	Pyrrholaemus saggitatus	Speckled Warbler	V	28	
Anatidae						
	☐	Stictonetta naevosa	Freckled Duck	V	1	
Burhinidae						
	☐	Burhinus grallarius	Bush Stone-curlew	E1	5	
Cacatuidae						
	☐	Cacatua leadbeateri	Major Mitchell's Cockatoo	V	2	
	☐	Callocephalon fimbriatum	Gang-gang Cockatoo	V	12	
	☐	Calyptorhynchus lathami	Glossy Black-Cockatoo	V	2	
Climacteridae						
	☐	Climacteris picumnus	Brown Treecreeper	V	458	
	☐	Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V	6	
Estrildidae						
	☐	Stagonopleura guttata	Diamond Firetail	V	26	
Gruidae						
	☐	Grus rubicunda	Brolga	V	7	
Meliphagidae						
	☐	Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V	18	
	☐	Xanthomyza phrygia	Regent Honeyeater	E1	2	
Pachycephalidae						
	☐	Pachycephala inornata	Gilbert's Whistler	V	5	
Petroicidae						
	☐	Melanodryas cucullata	Hooded Robin	V	12	
Pomatostomidae						

	☐ Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V	7	
Psittacidae					
	☐ Lathamus discolor	Swift Parrot	E1	40	
	☐ Neophema pulchella	Turquoise Parrot	V	20	
	☐ Polytelis swainsonii	Superb Parrot	V	59	
Strigidae					
	☐ Ninox connivens	Barking Owl	V	7	

Mammalia	Map	Scientific Name	Common Name	Legal Status	Count	Info
Dasyuridae						
	☐	Dasyurus maculatus	Spotted-tailed Quoll	V	5	
Peramelidae						
	☐	Macrotis lagotis	Bilby	E4	2	
Petauridae						
	☐	Petaurus norfolcensis	Squirrel Glider	V	68	
	☐	Petaurus norfolcensis	Squirrel Glider in the Wagga Wagga Local Government Area	E2	68	
Phascolarctidae						
	☐	Phascolarctos cinereus	Koala	V	12	
Vespertilionidae						
	☐	Myotis adversus	Large-footed Myotis	V	1	
	☐	Vespadelus baverstocki	Inland Forest Bat	V	1	

Reptilia	Map	Scientific Name	Common Name	Legal Status	Count	Info
Pygopodidae						
	☐	Delma impar	Striped Legless Lizard	V	1	

** Exotic (non-native) species*

Choose up to 3 species to map.

search & map species | taxonomic search | feedback

BioNet

Add species to map groups

Selected Area: Local Government Area - WAGGA WAGGA
Search Type: Fauna
Agencies: Australian Museum, NSW Fisheries, NSW State Forests, National Parks & Wildlife Service
Threatened Status: E1,E4,FE,FV,V
Search Term: Search All Records

You can now determine which species you would like to map. You do this by adding the species you want to map to a map group. There are five map groups. The species allocated to each map group are displayed on the map in the same symbol.

By default only the first 500 species found are displayed. If your search produces more results than this, then please choose "Next 500" to view the next five hundred search results, or choose "Show All" to view all records (upto 3000 results).

Note that a MAXIMUM total of 20 species can be assigned to Map Groups.

Matching Records: 33 (Showing: 1 - 33)

Auto assign to Group 1 | Next Step

Order Family Sci Name	Common Name	Agency	Threat	Count	MapGroup
AMPHIBIANS					
Anura	Frogs and Reptiles				
Hylidae	Tree frogs				
Litoria booroolongensis	Booroolong Frog	NPPub	E1	1	
Litoria raniformis	Southern Bell Frog	NPPub	E1	2	
BIRDS					
Anseriformes	Geese, Swans and Ducks				
Anatidae					
Stictonetta naevosa	Freckled Duck	AMPub	V	1	
Stictonetta naevosa	Freckled Duck	NPPub	V	1	
Charadriiformes	Oystercatchers, Snipes, Terns, Gulls, Sandpipers,				
Burhinidae					
Burhinus grallarius	Bush Stone-curlew	NPPub	E1	5	
Gruiformes	Cranes, Rails and the Australian Bustard				
Gruidae					
Grus rubicunda	Brolga	NPPub	V	7	
Passeriformes	Songbirds				
Climacteridae					
Climacteris picumnus	Brown Treecreeper	NPPub	V	455	
Estrildidae					
Stagonopleura guttata	Diamond Firetail	NPPub	V	22	
Meliphagidae					
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	NPPub	V	17	
Xanthomyza phrygia	Regent Honeyeater	NPPub	E1	2	
Pachycephalidae					
Pachycephala inornata	Gilbert's Whistler	NPPub	V	5	
Petroicidae					
Melanodryas cucullata	Hooded Robin	NPPub	V	12	
Pomatostomidae					
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	NPPub	V	7	
Psittaciformes	Parrots (including Cockatoos)				
Cacatuidae					
Cacatua leadbeateri	Major Mitchell's Cockatoo	NPPub	V	2	
Callocephalon fimbriatum	Gang-gang Cockatoo	NPPub	V	12	
Calyptorhynchus lathami	Glossy Black-Cockatoo	NPPub	V	1	
Psittacidae					
Lathamus discolor	Swift Parrot	NPPub	E1	40	
Neophema pulchella	Turquoise Parrot	NPPub	V	20	
Polytelis swainsonii	Superb Parrot	AMPub	V	10	
Polytelis swainsonii	Superb Parrot	NPPub	V	55	
Strigiformes	Owls				

Strigidae					
Ninox connivens	Barking Owl	NPPub	V	7	
Acanthizidae					
Pyrrholaemus saggitatus	Speckled Warbler	NPPub	V	28	
FISH					
Perciformes	Perches and allies				
Percichthyidae	Australian Freshwater Basses, Australian Freshwate				
Maccullochella macquariensis	Trout cod	AMPub	FE	6	
Maccullochella macquariensis	Trout cod	FishPub	FE	5	
Terapontidae					
Bidyanus bidyanus	Silver Perch	FishPub	FV	3	
MAMMALS					
Chiroptera	Bats				
Vespertilionidae	Long-eared, Broad-nosed and other bats				
Myotis adversus	Large-footed Myotis	NPPub	V	1	
Dasyuromorphia	Numbats, Antechinus', Dunnarts and Quolls				
Dasyuridae	Antechinus', Dunnarts and Quolls				
Dasyurus maculatus	Tiger Quoll	AMPub	V	1	
Dasyurus maculatus	Spotted-tailed Quoll	NPPub	V	5	
Diprotodonta	Possums, Kangaroos, Wombats and the Koala				
Macropodidae	Kangaroos and Wallabies				
Onychogalea fraenata	Bridled Nail-tail Wallaby	AMPub	E4	1	
Petauridae	Possums, Gliders				
Petaurus norfolcensis	Squirrel Glider	NPPub	V	67	
Phascolarctidae	Koala				
Phascolarctos cinereus	Koala	NPPub	V	12	
Peramelina	Bandicoots and Bilbies				
Peramelidae	Bandicoots				
Macrotis lagotis	Bilby	NPPub	E4	2	
REPTILES					
Squamata	Snakes and Lizards				
Pygopodidae	Legless lizards				
Delma impar	Striped Legless Lizard	NPPub	V	1	

Auto assign to Group 1 Next Step

DECC home

Search Results

Your selection: Flora, threatened species, LGA - WAGGA WAGGA returned a total of 10 records of 5 species.

Report generated on 16/07/2008 - 15:28 (Data valid to 13/07/2008)

view map | search again | clear selection

Choose up to 3 species to map.

** Exotic (non-native) species*

Plants	Map	Scientific Name	Common Name	Legal Status	Count	Info
Asteraceae						
	☐	Ammobium craspedioides	Yass Daisy	V	3	
	☐	Brachycome muelleroides	Claypan Daisy	V	1	
	☐	Senecio garlandii	Woolly Ragwort	V	2	
Fabaceae (Faboideae)						
	☐	Pultenaea humilis		V	2	
	☐	Swainsona recta	Mountain Swainson-pea	E1	2	

** Exotic (non-native) species*

Choose up to 3 species to map.

DISCLAIMER: The Atlas of New South Wales Wildlife contains data from a number of sources including government agencies, non-government organisations and private individuals. These data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Find out more about the Atlas.

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search & map species | taxonomic search | feedback

Add species to map groups

Selected Area:	Local Government Area - WAGGA WAGGA
Search Type:	Flora
Agencies:	NSW State Forests, National Parks & Wildlife Service, Royal Botanic Garden
Threatened Status:	E1,E4,FE,FV,V
Search Term:	Search All Records

You can now determine which species you would like to map. You do this by adding the species y map group. There are five map groups. The species allocated to each map group are displayed or symbol.

By default only the first 500 species found are displayed. If your search produces more results th choose "Next 500" to view the next five hundred search results, or choose "Show All" to view all r results).

Note that a MAXIMUM total of 20 species can be assigned to Map Groups.

Matching Records: 6 (Showing: 1 - 6)

Auto assign to Group 1 | Next Step

Order	Family	Sci Name	Common Name	Agency	Threat
	Asteraceae				
		Ammobium craspedioides		RBGPub	V
		Ammobium craspedioides	Yass Daisy	NPPub	V
		Brachycome muelleroides	Claypan Daisy	NPPub	V
		Senecio garlandii		RBGPub	V
	Fabaceae (Faboideae)				
		Swainsona recta		RBGPub	E1
		Swainsona recta	Mountain Swainson-pea	NPPub	E1

Auto assign to Group 1 | Next Step

Protected Matters Search Tool

You are here: Environment Home > EPBC Act > Search

19 August 2008 14:50

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

You may wish to print this report for reference before moving to other pages or websites.

The Australian Natural Resources Atlas at http://www.environment.gov.au/atlas may provide further environmental information relevant to your selected area. Information about the EPBC Act including significance guidelines, forms and application process details can be found at http://www.environment.gov.au/epbc/assessmentsapprovals/index.html

Search Type: Area

Buffer: 5 km

Coordinates: -34.99723,147.36907, -34.99610,147.29857, -35.05798,147.30457, -35.06435,147.32220, -35.06773,147.35970, -35.0658,147.37807

Report Contents:

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Significance: (Ramsar Sites)	1
Commonwealth Marine Areas:	None
Threatened Ecological Communities:	1
Threatened Species:	11
Migratory Species:	12

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage/index.html.

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory

species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at http://www.environment.gov.au/epbc/permits/index.html.

Commonwealth Lands:	4
Commonwealth Heritage Places:	None
Places on the RNE:	11
Listed Marine Species:	9
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Other Commonwealth Reserves:	None
Regional Forest Agreements:	None

Details

Matters of National Environmental Significance

Wetlands of International Significance [Dataset Information] (Ramsar Sites)		
FIVEBOUGH AND TUCKERBIL SWAMPS		Within same catchment as Ramsar site
Threatened Ecological Communities [Dataset Information]	Status	Type of Presence
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area
Threatened Species [Dataset Information]	Status	Type of Presence
Birds		
Lathamus discolor	Endangered	Species or species habitat may

Swift Parrot		occur within area
Leipoa ocellata Malleefowl	Vulnerable	Species or species habitat likely to occur within area
Polytelis swainsonii Superb Parrot	Vulnerable	Breeding likely to occur within area
Rostratula australis Australian Painted Snipe	Vulnerable	Species or species habitat may occur within area
Xanthomyza phrygia Regent Honeyeater	Endangered	Species or species habitat may occur within area
Frogs		
Litoria raniformis Growling Grass Frog, Southern Bell Frog, Warty Bell Frog, Green and Golden Frog	Vulnerable	Species or species habitat may occur within area
Mammals		
Nyctophilus timoriensis (South-eastern form) Eastern Long-eared Bat	Vulnerable	Species or species habitat may occur within area
Ray-finned fishes		
Maccullochella peelii peelii Murray Cod, Cod, Goodoo	Vulnerable	Species or species habitat may occur within area
Macquaria australasica Macquarie Perch	Endangered	Species or species habitat may occur within area
Plants		
Diuris sheaffiana Tricolour Diuris	Vulnerable	Species or species habitat may occur within area
Swainsona murrayana Slender Darling-pea, Slender Swainson, Murray Swainson-pea	Vulnerable	Species or species habitat likely to occur within area
Migratory Species [Dataset Information]	Status	Type of Presence
Migratory Terrestrial Species		
Birds		
Haliaeetus leucogaster White-bellied Sea-Eagle	Migratory	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail	Migratory	Species or species habitat may occur within area
Leipoa ocellata Malleefowl	Migratory	Species or species habitat likely to occur within area
Merops ornatus	Migratory	Species or species habitat may

Rainbow Bee-eater		occur within area
Xanthomyza phrygia Regent Honeyeater	Migratory	Species or species habitat may occur within area
Migratory Wetland Species		
Birds		
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe	Migratory	Species or species habitat may occur within area
Rostratula benghalensis s. lat. Painted Snipe	Migratory	Species or species habitat may occur within area
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift	Migratory	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Dataset Information]	Status	Type of Presence
Birds		
Apus pacificus Fork-tailed Swift	Listed - overfly marine area	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Listed - overfly marine area	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Listed - overfly marine area	Species or species habitat may occur within area
Gallinago hardwickii	Listed -	Species or species habitat may occur

Latham's Snipe, Japanese Snipe	overfly marine area	within area
Haliaeetus leucogaster White-bellied Sea-Eagle	Listed	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail	Listed - overfly marine area	Species or species habitat may occur within area
Lathamus discolor Swift Parrot	Listed - overfly marine area	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater	Listed - overfly marine area	Species or species habitat may occur within area
Rostratula benghalensis s. lat. Painted Snipe	Listed - overfly marine area	Species or species habitat may occur within area

Commonwealth Lands [Dataset Information]

Communications, Information Technology and the Arts - Australian Broadcasting Corporation

Communications, Information Technology and the Arts - Telstra Corporation Limited

Defence

Defence - Defence Housing Authority

Places on the RNE [Dataset Information]
Note that not all Indigenous sites may be listed.

Historic

CBC Bank (former) NSW

Church and Cathedral Group NSW

Civic Group NSW

Hampden Bridge NSW

Police Station NSW

St Andrews Manse NSW

St Andrews Presbyterian Church NSW

St Michaels Cathedral NSW

St Michaels Presbytery (The Bishops House) NSW

Wagga Wagga Courthouse NSW

Wagga Wagga Post Office (former) NSW

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the *Environment Protection and Biodiversity Conservation Act 1999*. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under "type of presence". For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the migratory and marine provisions of the Act have been mapped.

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites;
- seals which have only been mapped for breeding sites near the Australian continent.

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgments

This database has been compiled from a range of data sources. The Department acknowledges the following custodians who have contributed valuable data and advice:

- New South Wales National Parks and Wildlife Service
- Department of Sustainability and Environment, Victoria
- Department of Primary Industries, Water and Environment, Tasmania
- Department of Environment and Heritage, South Australia Planning SA
- Parks and Wildlife Commission of the Northern Territory
- Environmental Protection Agency, Queensland
- Birds Australia
- Australian Bird and Bat Banding Scheme
- Australian National Wildlife Collection
- Natural history museums of Australia
- Queensland Herbarium
- National Herbarium of NSW
- Royal Botanic Gardens and National Herbarium of Victoria
- Tasmanian Herbarium
- State Herbarium of South Australia
- Northern Territory Herbarium
- Western Australian Herbarium
- Australian National Herbarium, Atherton and Canberra
- University of New England
- Other groups and individuals

ANUCliM Version 1.8, Centre for Resource and Environmental Studies, Australian National University was used extensively for the production of draft maps of species distribution. Environment Australia is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

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Appendix 2 – Composite Flora List from entire CSU site

Composite List for the entire CSU – Wagga Campus Site including adjacent road verges

Relative abundance is given by a cover abundance scale (modified Braun-Blanquet):

1 1 to a few individuals present, less than 5% cover
2 many individuals present, but still less than 5% cover
3 5 - < 20% cover
4 20 - < 50% cover
5 50 - < 75% cover
6 75 - 100% cover

Cover/abundance scores relate to general abundance over the relevant parts of the site, not to representative quadrats.

*Introduced species or planted Australian natives (whether native to the Wagga area or not) are preceded by an asterisk.

Scientific name	**Common name**	**Family**	**Abundance**	
			Poor	**Mod**
TREES				
**Acacia baileyana*	Cootamundra wattle	Fabaceae	1	
Acacia deanei ssp*. paucijuga*	green wattle	Fabaceae	1	1
Acacia implexa	lightwood or hickory	Fabaceae	1	1
Allocasuarina verticillata	dryland drooping sheoak	Casuarinaceae	1	
Brachychiton populneus	kurrajong	Sterculiaceae	1-3	1
Callitris glaucophylla	white cypress pine	Cupressaceae	0-3	2-4
**Corymbia citriodora*	lemon-scented gum	Myrtaceae	0-3	
Eucalyptus albens	white box	Myrtaceae	1	1
Eucalyptus blakelyi	Blakely's red gum	Myrtaceae	1	1
Eucalyptus camaldulensis	river red gum	Myrtaceae	0-3	
**Eucalyptus cladocalyx*	sugar gum	Myrtaceae	0-3	
**Eucalyptus mannifera*	brittle gum	Myrtaceae	1	
Eucalyptus melliodora	yellow box	Myrtaceae	0-3	0-3
Eucalyptus microcarpa	grey box	Myrtaceae	0-3	0-3
**Eucalyptus sideroxylon*	mugga ironbark	Myrtaceae	0-3	
**Melia azedarach*	white cedar	Meliaceae	1	
**Olea europaea* ssp*. europaea*	European olive	Oleaceae	0-4	1
Pittosporum angustifolium	berrigan	Pittosporaceae	1	
**Schinus areira*	pepper tree	Anacardiaceae	1	1
SHRUBS				
**Acacia cardiophylla*	Wyalong wattle	Fabaceae	1	
Acacia decora	western golden wattle	Fabaceae		1
**Acacia genistifolia*	early wattle	Fabaceae	1	
Acacia montana	mallee wattle	Fabaceae	0-2	0-2
**Acacia pycnantha*	golden wattle	Fabaceae	1	
Amyema miquelii	box mistletoe	Loranthaceae	2	2
**Bursaria spinosa* ssp *spinosa*	blackthorn	Pittosporaceae	1	
**Dodonaea viscosa* ssp *spatulata*	hop bush	Sapindaceae	1	
?Eutaxia microphylla var. *microphylla*		Fabaceae		1
**Lycium ferocissimum*	African boxthorn	Solanaceae	1-3	1
FERNS				
Cheilanthes sieberi ssp *sieberi*	rock or mulga fern	Sinopteridaceae	1	1-3

VINES AND TWINERS				
Hardenbergia violacea	native sarsaparilla	Fabaceae		1
FORBS				
**Amaranthus powellii*	Powell's amaranth	Amaranthaceae	0-2	
**Arctotheca calendula*	capeweed	Asteraceae	1-4	1
?Arthropodium milleflorum	pale vanilla lily	Anthericaceae		0-2
?Arthropodium sp. A		Anthericaceae		0-3
?Calandrinia sp.		Aizoaceae	1	
**Capsella bursa-pastoris*	shepherd's purse	Brassicaceae	1	
**Carduus tenuiflorus*	winged slender thistle	Asteraceae	1	
**Centaurea solstitialis*	St Barnaby's thistle	Asteraceae	0-2	
**Cerastium* sp.	chickweed	Caryophyllaceae	0-2	
Chenopodium desertorum ssp. *microphyllum*		Chenopodiaceae		1
Chenopodium pumilio	green crumbweed	Chenopodiaceae	1	
**Cirsium vulgare*	black or spear thistle	Asteraceae	1	
**Conyza* sp.	fleabane	Asteraceae	1	
Cotula australis	carrot weed	Apiaceae	1	1
Crassula sieberiana	Australian stonecrop	Crassulaceae	0-2	0-3
Dianella revoluta	blue flax lily	Phormiaceae		0-2
**Echium plantagineum*	Paterson's curse	Boraginaceae	2-5	0-2
**Echium ?vulgare*	viper's bugloss	Boraginaceae	0-3	
Einadia nutans ssp *nutans*	berry saltbush	Chenopodiaceae	1	1-3
?Enchylaena tomentosa		Chenopodiaceae		1
**Erodium cicutarium*	common crowfoot	Geraniaceae	0-4	1
?Erodium crinitum	blue storksbill	Geraniaceae		1
**Fumaria* sp.	fumitory	Fumariaceae	1	
*?*Geranium molle*		Geraniaceae	1	
Geranium ?retrorsum	native geranium	Geraniaceae		1
?Goodenia pinnatifida		Goodeniaceae		1
**Hypericum perforatum*	St John's wort	Clusiaceae		1
**Hypochaeris radicata*	cat's ear, flatweed	Asteraceae	0-2	1
**Lepidium africanum*	peppercress	Brassicaceae	1	1
?Linum marginale	native flax	Linaceae		1
Lythrum hyssopifolia		Lythraceae	0-2	
?Maireana sp.		Chenopodiaceae		1
**Malva parviflora*	small-flowered mallow	Malvaceae	0-2	1
**Marrubium vulgare*	horehound	Lamiaceae	0-3	1
**Medicago* sp.	medic	Fabaceae	1	
**Modiola caroliniana*	orange flowered mallow	Malvaceae	1	
Oxalis ?perennans	native oxalis	Oxalidaceae	1	1
**Oxalis pes-caprae*	soursob	Oxalidaceae	0-3	1
Parietaria debilis	smooth nettle	Urticaceae	1	
Persicaria prostrata		Polygonaceae	0-2	
Plantago ?varia		Plantaginaceae		1
Ptilotus spathulatus forma *spathulatus*		Amaranthaceae		1
**Romulea ?rosea*	onion weed	Iridaceae	0-4	0-4
Rumex brownii	native dock	Polygonaceae	1	1
**Salvia verbenaca*	wild sage	Lamiaceae	0-3	
*?*Sanguisorba minor* ssp *muricata*	sheep's burnet	Rosaceae	1	
Sida corrugata		Malvaceae	1	0-2
**Silybum marianum*	variegated thistle	Asteraceae		1

**Sisymbrium irio*	London rocket	Brassicaceae		0-2
**Sisymbrium orientale*	Indian hedge mustard	Brassicaceae		1
develi esuriale	quena	Solanaceae	1	
**Solanum ?nigrum*	black nightshade	Solanaceae	0-3	
Solenogyne dominii		Asteraceae		0-2
**Sonchus oleraceus*	sow thistle	Asteraceae	0-3	1
**Stellaria media*	common chickweed	Caryophyllaceae	0-3	1
**Taraxacum officinale*	dandelion	Asteraceae	1	1
Tricoryne elatior	yellow rush lily	Anthericaceae		1
**Trifolium arvense*	hare's foot clover	Fabaceae	0-2	0-2
**Trifolium* spp.	clover	Fabaceae	0-3	1
**Urtica urens*	short-leaf nettle	Urticaceae	1	
**Verbascum virgatum*	twiggy mullein	Scrophulariaceae	1	
**Vicia* sp.	vetch	Fabaceae	1	
Vittadinia cuneata var. *cuneata*	fuzzweed	Asteraceae		1
Vittadinia gracilis		Asteraceae		0-2
**Xanthium spinosum*	Bathurst burr	Asteraceae	1	
Wahlenbergia luteola		Campanulaceae		0-2
Wahlenbergia spp.		Campanulaceae		1
Wurmbea latifolia	early nancy	Colchicaceae		0-2
GRASSES				
Aristida ramosa var. *ramosa*	wiregrass	Poaceae		1
Austrodanthonia caespitosa	whitetop	Poaceae	0-3	0-4
Austrodanthonia sp.	wallaby grass	Poaceae		1
Austrostipa ?bigeniculata		Poaceae	0-3	0-4
Austrostipa scabra	corkscrew grass	Poaceae	1	0-3
**Avena* sp.	wild oats	Poaceae	1	
Bothriochloa macra	red-stem grass	Poaceae	0-3	0-3
Chloris truncata	windmill grass	Poaceae	1	1
**Cynodon dactylon*	couch grass	Poaceae	0-4	
**Dactylis glomerata*	cocksfoot	Poaceae	0-3	
**Ehrharta longiflora*	annual veldtgrass	Poaceae	0-2	0-2
**Eragrostis ?cilianensis*	stinking lovegrass	Poaceae	1	1
*?*Lolium perenne*	perennial ryegrass	Poaceae	0-3	1
Panicum effusum	hairy panic	Poaceae	1	0-3
**Phalaris aquatica*	phalaris	Poaceae	0-2	
**Poa annua*	winter grass	Poaceae	1	
**Vulpia* sp.	rat's tail fescue	Poaceae	0-3	
GRAMINOIDS				
Juncus sp.	tussock rush	Juncaceae	1	
Lomandra filiformis ssp *coriacea*		Lomandraceae		1
Lomandra filiformis ssp *filiformis*		Lomandraceae		2
Lomandra multiflora ssp *multiflora*		Lomandraceae		1

Appendix 3 – Flora Species Lists for Differing Areas

Flora Species List for Differing Sites

Relative abundance is given by a cover abundance scale (modified Braun-Blanquet):

1	1 to a few individuals present, less than 5% cover
2	many individuals present, but still less than 5% cover
3	5 - < 20% cover
4	20 - < 50% cover
5	50 - < 75% cover
6	75 - 100% cover

Cover/abundance scores relate to general abundance over the relevant parts of the site, not to representative quadrats.

*Introduced species or planted Australian natives (whether native to the Wagga area or not) are preceded by an asterisk.

Area 1

A sample from the best area of EEC (Inland Grey Box Woodland) on The Gap Road verges

Significant features in this area are the relative abundance of old trees with hollows, and the presence of a native shrub layer, as well as the relatively low density of exotic species. The presence of >12 non-grass understorey species (shrubs, ferns, forbs, graminoids) would put this within the *EPBC Act* definition of Box-Gum Woodland, if it were interpreted as this EEC rather than Inland Grey Box Woodland. Given the presence of both grey box and yellow box, it could be interpreted either way, as the understorey plants are similar.

Scientific name	**Common name**	**Family**	**Abundance**
TREES			
Acacia deanei ssp*. paucijuga*	green wattle	Fabaceae	1
Callitris glaucophylla	white cypress pine	Cupressaceae	1-4
Eucalyptus blakelyi	Blakely's red gum	Myrtaceae	1
Eucalyptus melliodora	yellow box	Myrtaceae	0-3
Eucalyptus microcarpa	grey box	Myrtaceae	0-4
**Olea europaea* ssp*. europaea*	European olive	Oleaceae	1
SHRUBS			
Acacia decora	western golden wattle	Fabaceae	1
Acacia montana	mallee wattle	Fabaceae	2
Amyema miquelii	box mistletoe	Loranthaceae	1
**Lycium ferocissimum*	African boxthorn	Solanaceae	1
FERNS			
Cheilanthes sieberi ssp *sieberi*	rock or mulga fern	Sinopteridaceae	1
FORBS			
?Arthropodium sp. A		Anthericaceae	0-3
Chenopodium desertorum ssp. *microphyllum*		Chenopodiaceae	1
Einadia nutans ssp *nutans*	berry saltbush	Chenopodiaceae	2
Geranium sp.		Geraniaceae	1
Goodenia ?pinnatifida		Goodeniaceae	0-2
?Maireana sp.		Chenopodiaceae	1
**Marrubium vulgare*	horehound	Lamiaceae	1
Oxalis ?perennans	native oxalis	Oxalidaceae	1
**Oxalis pes-caprae*	soursob	Oxalidaceae	1
Ptilotus spathulatus forma *spathulatus*		Amaranthaceae	1

**Romulea ?rosea*	onion weed	Iridaceae	0-4
Rumex brownii		Polygonaceae	1
**Salvia verbenaca*	wild sage	Lamiaceae	0-2
Sida corrugata		Malvaceae	1
**Stellaria media*	chickweed	Caryophyllaceae	1
Tricoryne elatior	yellow rush-lily	Anthericaceae	1
Vittadinia gracilis		Asteraceae	1
Wahlenbergia luteola		Campanulaceae	1
GRASSES			
Aristida ramosa var. *ramosa*	wiregrass	Poaceae	0-4
Austrodanthonia caespitosa	whitetop	Poaceae	2
Bothriochloa macra	red-stem grass	Poaceae	1
**Ehrharta longiflora*	annual veldtgrass	Poaceae	0-2
*?*Lolium perenne*	perennial ryegrass	Poaceae	2
Panicum effusum	hairy panic	Poaceae	1
GRAMINOIDS			
Lomandra filiformis ssp *filiformis*		Lomandraceae	1
Lomandra multiflora ssp *multiflora*		Lomandraceae	1

Area 2

Relatively intact Inland Grey Box Woodland in the equestrian paddock and adjacent verges of Old Narrandera Road, species list from extensive random meander.

Significant features of this area are the presence of several large old eucalypts with hollows, the relative scarcity of exotic species and presence of two shrub species on the road verge (but not in the paddock). This area produced three records of threatened fauna (Speckled Warbler at two sites, Grey-crowned Babbler) and had the highest density of bird species for the whole site. Additional features for fauna include a litter layer (where eucalypts rather than cypress pine are dominant) and fallen timber/bark.

Scientific name	**Common name**	**Family**	**Abundance**	
			Padd-ock	**Rd**
TREES				
Acacia implexa	lightwood or hickory	Fabaceae	1	
Callitris glaucophylla	white cypress pine	Cupressaceae	0-5	3
Eucalyptus albens	white box	Myrtaceae	1	
Eucalyptus blakelyi	Blakely's red gum	Myrtaceae	1	
Eucalyptus melliodora	yellow box	Myrtaceae	1	
Eucalyptus microcarpa	grey box	Myrtaceae	0-4	3
**Schinus areira*	pepper tree	Anacardiaceae	1	
SHRUBS				
Amyema miquelii	box mistletoe	Loranthaceae	2	1
?Eutaxia microphylla var. *microphylla*		Fabaceae		0-3
**Lycium ferocissimum*	African boxthorn	Solanaceae	1	1
FERNS				
Cheilanthes sieberi ssp *sieberi*	rock or mulga fern	Sinopteridaceae	0-3	
VINES AND TWINERS				
Hardenbergia violacea	native sarsaparilla	Fabaceae	1	
FORBS				
**Arctotheca calendula*	capeweed	Asteraceae	1	
?Arthropodium milleflorum	pale vanilla lily	Anthericaceae		0-2

?Arthropodium sp. A		Anthericaceae	0-3	2
Chenopodium desertorum ssp. *microphyllum*		Chenopodiaceae		1
**Cirsium vulgare*	black or spear thistle	Asteraceae	1	
Cotula australis	carrot weed	Apiaceae	2	
Crassula sieberiana	Australian stonecrop	Crassulaceae	0-3	
**Echium plantagineum*	Paterson's curse	Boraginaceae	1	
Einadia nutans ssp *nutans*	berry saltbush	Chenopodiaceae	1	3
?Enchylaena tomentosa		Chenopodiaceae		1
?Erodium crinitum	blue storksbill	Geraniaceae	1	
Geranium ?retrorsum	native geranium	Geraniaceae	1	1
**Hypochaeris radicata*	cat's ear, flatweed	Asteraceae		1
?Linum marginale	native flax	Linaceae	1	
Oxalis ?perennans	native oxalis	Oxalidaceae	1	1
**Oxalis pes-caprae*	soursob	Oxalidaceae	0-3	
**Romulea ?rosea*	onion weed	Iridaceae	0-4	3
**Silybum marianum*	variegated thistle	Asteraceae		1
**Sisymbrium irio*	London rocket	Brassicaceae	0-3	1
**Sisymbrium orientale*	Indian hedge mustard	Brassicaceae	1	
Solenogyne dominii		Asteraceae	0-2	
**Sonchus oleraceus*	sow thistle	Asteraceae		1
**Stellaria media*	common chickweed	Caryophyllaceae	0-2	
**Taraxacum officinale*	dandelion	Asteraceae	1	
**Vicia* sp.	vetch	Fabaceae	1	
Vittadinia cuneata var. *cuneata*	fuzzweed	Asteraceae		1
Wahlenbergia luteola		Campanulaceae	0-2	
Wahlenbergia spp.		Campanulaceae	1	
Wurmbea latifolia	early nancy	Colchicaceae	0-2	
GRASSES				
Austrodanthonia caespitosa	whitetop	Poaceae	0-4	4
Austrostipa scabra	corkscrew grass	Poaceae		3
**Avena* sp.	wild oats	Poaceae		1
Bothriochloa macra	red-stem grass	Poaceae	1	
Chloris truncata	windmill grass	Poaceae	1	
*?*Dactylis glomerata*	cocksfoot	Poaceae		0-3
**Eragrostis ?cilianensis*	stinking lovegrass	Poaceae		2
Panicum effusum	hairy panic	Poaceae	0-3	1
GRAMINOIDS				
Lomandra filiformis ssp *coriacea*		Lomandraceae	1	
Lomandra filiformis ssp *filiformis*		Lomandraceae	0-2	1

Area 3
Large grazed paddock on western rocky hill on the main campus.

This species list covers mostly the lower slopes which are Box-Gum Woodland in poor condition, but includes some areas of upper slope dominated by white cypress pine (the list for this area from an area of roughly 20 x 20m). Significant features in parts of this area are large old trees with hollows, relatively abundant fallen timber in parts, presence of rock outcrops, and the presence of some small ground-feeding woodland birds (Red-capped Robin, Double-barred Finch). An interesting botanical feature is the presence of a few plants of berrigan (*Pittosporum angustifolium*, formerly *P. phylliraeoides*) on the western side of the hill, well east of its normal range. The Flora of NSW does not have this species occurring on the SW Slopes, but on the SW Plains (west from Narrandera). This could be an extension of range, or the plants may be naturalised from a cultivated plant somewhere in the vicinity.

Scientific name	Common name	Family	Abundance	
			Euc.	Pine
TREES				
Acacia deanei ssp. *paucijuga*	green wattle	Fabaceae	1	
Acacia implexa	lightwood or hickory	Fabaceae	1	
Brachychiton populneus	kurrajong	Sterculiaceae	1-3	3
Callitris glaucophylla	white cypress pine	Cupressaceae	0-2	3
Eucalyptus albens	white box	Myrtaceae	1	
Eucalyptus blakelyi	Blakely's red gum	Myrtaceae	0-2	1
Eucalyptus melliodora	yellow box	Myrtaceae	0-2	
**Melia azedarach*	white cedar	Meliaceae	1	
**Olea europaea* ssp. *europaea*	European olive	Oleaceae	1-3	3
Pittosporum angustifolium	berrigan	Pittosporaceae	1	
**Schinus areira*	pepper tree	Anacardiaceae	1	
SHRUBS				
Amyema miquelii	box mistletoe	Loranthaceae	2	
**Lycium ferocissimum*	African boxthorn	Solanaceae	2	1
FERNS				
Cheilanthes sieberi ssp *sieberi*	rock or mulga fern	Sinopteridaceae		1
FORBS				
**Amaranthus powellii*	Powell's amaranth	Amaranthaceae		1
**Arctotheca calendula*	capeweed	Asteraceae	2	1
?Arthropodium sp. A		Anthericaceae		1
?Calandrinia sp.		Aizoaceae		1
**Centaurea solstitialis*	St Barnaby's thistle	Asteraceae		1
**Cerastium* sp.	chickweed	Caryophyllaceae	1	
Chenopodium pumilio	green crumbweed	Chenopodiaceae	1	1
**Conyza* sp.	fleabane	Asteraceae		1
Crassula sieberiana	Australian stonecrop	Crassulaceae	1-4	3
**Echium plantagineum*	Paterson's curse	Boraginaceae	2	2
**Echium ?vulgare*	viper's bugloss	Boraginaceae	2	2
**Erodium cicutarium*	common crowfoot	Geraniaceae	1-4	2
**Fumaria* sp.	fumitory	Fumariaceae		1
*?*Geranium molle*		Geraniaceae	1	0-2
**Hypochaeris radicata*	cat's ear, flatweed	Asteraceae	1-2	1
**Lepidium africanum*	peppercress	Brassicaceae	1	
**Marrubium vulgare*	horehound	Lamiaceae	0-2	
Oxalis ?perennans	native oxalis	Oxalidaceae	1	2
Parietaria debilis	smooth nettle	Urticaceae		1
Rumex brownii	native dock	Polygonaceae	1	
**Sonchus oleraceus*	sow thistle	Asteraceae		1
**Stellaria media*	common chickweed	Caryophyllaceae		0-3
**Trifolium* spp.	clover	Fabaceae	1-4	1
**Urtica urens*	short-leaf nettle	Urticaceae	1	
GRASSES				
Austrostipa scabra	corkscrew grass	Poaceae	1	1
**Avena* sp.	wild oats	Poaceae		1
Bothriochloa macra	red-stem grass	Poaceae	2	3
Chloris truncata	windmill grass	Poaceae	1	
**Ehrharta longiflora*	annual veldtgrass	Poaceae		1
**Eragrostis ?cilianensis*	stinking lovegrass	Poaceae	2	1

Microlaena stipoides	weeping grass	Poaceae		1
Panicum effusum	hairy panic	Poaceae	2	
**Phalaris aquatica*	phalaris	Poaceae	0-3	1
**Vulpia* sp.	rat's tail fescue	Poaceae		1
Unidentified exotic grasses		Poaceae		4

Area 4
Large heavily grazed paddock between student residences and Nathan Cobb Drive/ Tooma Drive junction.

Although this area is very degraded it does include a large number of old yellow box trees which are significant for fauna (birds and probably bats), very many of them with hollows. It would be classified as EEC under the *TSC Act* despite the lack of a shrub layer other than the noxious weed African boxthorn, and the largely exotic groundcover. It is in poor condition.

Scientific name	Common name	Family	Abundance
TREES			
Eucalyptus albens	white box	Myrtaceae	1
Eucalyptus blakelyi	Blakely's red gum	Myrtaceae	2
Eucalyptus melliodora	yellow box	Myrtaceae	2
**Olea europaea* ssp. *europaea*	European olive	Oleaceae	1
SHRUBS			
Amyema miquelii	box mistletoe	Loranthaceae	2
**Lycium ferocissimum*	African boxthorn	Solanaceae	0-2
**Arctotheca calendula*	capeweed	Asteraceae	2
**Cerastium* sp.	chickweed	Caryophyllaceae	1
**Echium plantagineum*	Paterson's curse	Boraginaceae	5
**Echium ?vulgare*	viper's bugloss	Boraginaceae	0-3
**Erodium cicutarium*	common crowfoot	Geraniaceae	3
**Lepidium africanum*	peppercress	Brassicaceae	1
**Malva parviflora*	small-flowered mallow	Malvaceae	1
**Marrubium vulgare*	horehound	Lamiaceae	1
Oxalis ?perennans	native oxalis	Oxalidaceae	1
Rumex brownii	native dock	Polygonaceae	1
**Salvia verbenaca*	wild sage	Lamiaceae	0-3
Sida corrugata		Malvaceae	1
**Solanum ?nigrum*	black nightshade	Solanaceae	1
**Stellaria media*	common chickweed	Caryophyllaceae	1
**Trifolium* spp.	clover	Fabaceae	3
**Urtica urens*	short-leaf nettle	Urticaceae	1
**Xanthium spinosum*	Bathurst burr	Asteraceae	1
GRASSES			
Bothriochloa macra	red-stem grass	Poaceae	0-4
Panicum effusum	hairy panic	Poaceae	1
Unidentified exotic grasses		Poaceae	2-4

Area 5
Small remnant patch of Box-Gum Woodland EEC in moderate condition west from access track to Dentistry Building site

Features of this area are the dominance of the groundcover by native species and relative scarcity of weeds. It would qualify as Box-Gum Woodland under the *TSC Act* and is in moderate condition. It would not qualify under the *EPBC Act*, as it has <12 non-grass understorey species and is less than 2ha in size.

Scientific name	Common name	Family	Abundance
TREES			
Eucalyptus albens	white box	Myrtaceae	1
Eucalyptus melliodora	yellow box	Myrtaceae	3
**Olea europaea* ssp. *europaea*	European olive	Oleaceae	1
SHRUBS			
**Acacia cardiophylla*	Wyalong wattle	Fabaceae	1
FORBS			
**Arctotheca calendula*	capeweed	Asteraceae	1
?Arthropodium sp. A		Anthericaceae	2
**Echium plantagineum*	Paterson's curse	Boraginaceae	1
Rumex brownii	native dock	Polygonaceae	1
Sida corrugata		Malvaceae	0-2
**Trifolium* spp.	clover	Fabaceae	1
**Verbascum virgatum*	twiggy mullein	Scrophulariaceae	1
Vittadinia gracilis		Asteraceae	2
GRASSES			
Austrodanthonia caespitosa	whitetop	Poaceae	4
Austrostipa ?bigeniculata		Poaceae	4
Bothriochloa macra	red-stem grass	Poaceae	1
**Ehrharta longiflora*	annual veldtgrass	Poaceae	2
Panicum effusum	hairy panic	Poaceae	2

Area 6

Part of Crown Reserve east of Coolamon Road (outside CSU grounds) for purposes of comparing condition of CSU remnants with other remnants in the vicinity

Features of this site are an absence of large old trees and abundance of relatively young regrowth. The site is currently or recently grazed by cattle. The groundcover is predominantly native. Condition is moderate. It would qualify as Box-Gum Woodland EEC under the *TSC Act*, and possibly also under the *EPBC Act*, since the groundcover is predominantly native and the area >2ha, though native species diversity does not appear to be high.

Scientific name	Common name	Family	Abundance
TREES			
Acacia deanei		Fabaceae	1
Eucalyptus blakelyi	Blakely's red gum	Myrtaceae	1
Eucalyptus melliodora	yellow box	Myrtaceae	1-3
**Olea europaea* ssp. *europaea*	European olive	Oleaceae	1
**Schinus areira*	pepper tree	Anacardiaceae	1
SHRUBS			
Amyema miquelii	box mistletoe	Loranthaceae	1
**Lycium ferocissimum*	African boxthorn	Solanaceae	1
Unidentified cactus sp.		Cactaceae	1
FORBS			
**Arctotheca calendula*	capeweed	Asteraceae	1
**Echium plantagineum*	Paterson's curse	Boraginaceae	1
?Enchylaena tomentosa		Chenopodiaceae	1
**Hypericum perforatum*	St John's wort	Clusiaceae	1
Oxalis ?perennans	native oxalis	Oxalidaceae	2
**Romulea ?rosea*	onion weed	Iridaceae	2
Rumex brownii	native dock	Polygonaceae	1
**Salvia verbenaca*	wild sage	Lamiaceae	2

*?*Sanguisorba minor* ssp *muricata*	sheep's burnet	Rosaceae	1
**Trifolium arvense*	hare's foot clover	Fabaceae	2
Vittadinia cuneata var. *cuneata*	fuzzweed	Asteraceae	2
Vittadinia gracilis		Asteraceae	1
GRASSES			
Aristida ramosa var. *ramosa*	wiregrass	Poaceae	1
Austrodanthonia caespitosa	whitetop	Poaceae	3
Austrodanthonia sp.	wallaby grass	Poaceae	2
Austrostipa ?bigeniculata		Poaceae	3
Bothriochloa macra	red-stem grass	Poaceae	2
**Eragrostis ?cilianensis*	stinking lovegrass	Poaceae	1
Panicum effusum	hairy panic	Poaceae	1

Area 7

Species list from Mates Gully Road Travelling Stock Reserve near Tarcutta (an example of Box-Gum Woodland EEC in good condition)

This flora list was compiled from two surveys of about 1-1.5 hours duration in September 2007 and August 2008, made by Jackie Miles. Features of this site include a high diversity of tree species, including many with hollows, presence of a relatively diverse though sparse native shrub layer and the relatively diverse native groundcover, with a low representation of exotics. It would qualify as EEC under both the *EPBC* and *TSC Acts*. The TSR is heavily used by birds and two threatened species (Brown Treecreeper and Black-chinned Honeyeater) have been recorded there during these two surveys. Fallen timber is present, though not abundant.

Scientific name	**Common name**	**Family**	**Abundance**
TREES			
Brachychiton populneus	kurrajong	Sterculiaceae	1
Eucalyptus albens	white box	Myrtaceae	2
Eucalyptus blakelyi	Blakely's red gum	Myrtaceae	0-2
Eucalyptus macrorhyncha	red stringybark	Myrtaceae	2
Eucalyptus melliodora	yellow box	Myrtaceae	1
Eucalyptus polyanthemos ssp *polyanthemos*	red box	Myrtaceae	3
Eucalyptus sideroxylon	mugga ironbark	Myrtaceae	3
SHRUBS			
Acacia genistifolia	early wattle	Fabaceae	2
Acacia lanigera var. *lanigera*	woolly wattle	Fabaceae	1
Acacia paradoxa	hedge wattle	Fabaceae	2
Acacia pycnantha	golden wattle	Fabaceae	2
Amyema miquelii	box mistletoe	Loranthaceae	2
Brachyloma daphnoides		Epacridaceae	1
Cassinia arcuata	sifton bush	Asteraceae	1
Daviesia leptophylla		Fabaceae	1
Daviesia mimosoides		Fabaceae	1
Dillwynia phylicoides		Fabaceae	1
Indigofera australis		Fabaceae	1
Melichrus urceolatus	urn heath	Epacridaceae	1
Pultenaea foliolosa		Fabaceae	1
VINES AND TWINERS			
Convolvulus erubescens s. lat.		Convolvulaceae	1
Hardenbergia violacea	native sarsaparilla	Fabaceae	1

FORBS			
**Arctotheca calendula*	capeweed	Asteraceae	1
?Arthropodium milleflorum	pale vanilla lily	Anthericaceae	0-3
?Arthropodium sp. A		Anthericaceae	1
Caladenia carnea	pink fingers	Orchidaceae	1
Chrysocephalum apiculatum	common everlasting	Asteraceae	0-4
Cymbonotus sp.	bear's ear	Asteraceae	1
Daucus glochidiatus		Apiaceae	2
Dianella longifolia	blue flax lily	Phormiaceae	1
Dianella revoluta	blue flax lily	Phormiaceae	1
Diuris ?sulphurea	tiger orchid	Orchidaceae	1
Einadia nutans ssp *nutans*	berry saltbush	Chenopodiaceae	0-2
Galium gaudichaudii		Rubiaceae	1
Geranium ?retrorsum	native geranium	Geraniaceae	1
Gonocarpus tetragynus		Haloragaceae	1
Goodenia hederacea var. *hederacea*		Goodeniaceae	2
?Goodenia pinnatifida		Goodeniaceae	2
Hydrocotyle laxiflora	stinking pennywort	Apiaceae	0-2
**Hypericum perforatum*	St John's wort	Clusiaceae	1
**Hypochaeris radicata*	cat's ear, flatweed	Asteraceae	1
Microseris sp.	yam daisy	Asteraceae	1
Opercularia aspera	stinkweed	Rubiaceae	1
Oxalis ?perennans	native oxalis	Oxalidaceae	2
Plantago varia		Plantaginaceae	1
**Romulea ?rosea*	onion weed	Iridaceae	1
Rumex brownii	native dock	Polygonaceae	1
Senecio sp		Asteraceae	1
Solenogyne dominii		Asteraceae	2
**Stellaria media*	chickweed	Caryophyllaceae	1
Stypandra glauca	nodding blue lily		1
Tricoryne elatior	yellow rush lily	Anthericaceae	1
**Trifolium arvense*	hare's foot clover	Fabaceae	1
Vittadinia muelleri	fuzzweed	Asteraceae	1
Xerochrysum viscosum	sticky everlasting	Asteraceae	1
Wahlenbergia stricta		Campanulaceae	1
Wurmbea latifolia	early nancy	Colchicaceae	0-2
GRASSES			
Aristida ramosa var. *ramosa*	wiregrass	Poaceae	1
Austrodanthonia spp.	wallaby grass	Poaceae	3
Austrostipa ?bigeniculata		Poaceae	3
Austrostipa scabra	corkscrew grass	Poaceae	2
**Briza maxima*	quaking grass	Poaceae	0-2
*?*Lolium perenne*	perennial ryegrass	Poaceae	1
Microlaena stipoides	weeping grass	Poaceae	1
Panicum effusum	hairy panic	Poaceae	1
Poa ?sieberiana	snow grass	Poaceae	1
GRAMINOIDS			
Lomandra filiformis ssp *coriacea*		Lomandraceae	2
Lomandra filiformis ssp *filiformis*		Lomandraceae	1
Lomandra multiflora ssp *multiflora*		Lomandraceae	1

Appendix 4 – Final Determinations for both EEC's

White box yellow box Blakely's red gum woodland - endangered ecological community listing

NSW Scientific Committee - final determination

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list the White Box Yellow Box Blakely's Red Gum Woodland as an ENDANGERED ECOLOGICAL COMMUNITY on Part 3 of Schedule 1 of the Act. The listing of Endangered Ecological Communities is provided for by Part 2 of the Act.

The Scientific Committee previously made a Preliminary Determination to support the proposal to list the White Box-Yellow Box Woodland. The Scientific Committee considers that the White Box Yellow Box Blakely's Red Gum Woodland is a more appropriate name for this Community.

The Scientific Committee has found that:

1. White Box Yellow Box Blakely's Red Gum Woodland is the name given to the ecological community characterised by the assemblage of species listed in paragraph 3. **White Box Yellow Box Blakely's Red Gum Woodland is found on relatively fertile soils on the tablelands and western slopes of NSW** and generally occurs between the 400 and 800 mm isohyets extending from the western slopes, at an altitude of c. 170m to c. 1200 m, on the northern tablelands (Beadle 1981). The community occurs within the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands and NSW South Western Slopes Bioregions.

2. **White Box Yellow Box Blakely's Red Gum Woodland includes those woodlands where the characteristic tree species include one or more of the following species in varying proportions and combinations - *Eucalyptus albens* (White Box), *Eucalyptus melliodora* (Yellow Box) or *Eucalyptus blakelyi* (Blakely's Red Gum). Grass and herbaceous species generally characterise the ground layer. In some locations, the tree overstorey may be absent as a result of past clearing or thinning and at these locations only an understorey may be present. Shrubs are generally sparse or absent, though they may be locally common**.

3. White Box Yellow Box Blakely's Red Gum Woodland is characterised by the following assemblage of species.

Acacia buxifolia
Acacia implexa
Acacia paradoxa
Allocasuarina verticillata
Alectryon oleifolius
Aristida behriana
Aristida ramosa
Asperula conferta
Atalaya hemiglauca
Austrodanthonia auriculata
Austrodanthonia bipartita
Austrodanthonia racemosa
Austrodanthonia richardsonii
Austrostipa aristiglumis
Austrostipa blackii
Austrostipa nodosa
Austrostipa scabra
Bothriochloa macra
Brachychiton populneus
Brachyloma daphnoides
Bracteantha viscosa
Brunoniella australis
Bulbine bulbosa
Bursaria spinosa
Callitris endlicheri
Callitris glaucophylla
Capparis mitchellii
Cassinia longifolia
Cassinia quinquefaria
Cheilanthes sieberi

Chloris truncata
Chloris ventricosa
Chrysocephalum apiculatum
Cymbopogon refractus
Dianella longifolia
Dianella revoluta
Dichanthium sericeum
Dichelachne micrantha
Dichelachne sciurea
Diuris dendrobioides
Dodonaea viscosa
Echinopogon caespitosus
Ehretia membranifolia
Elymus scaber
Eremophila mitchellii
Eucalyptus blakelyi
Eucalyptus albens
Eucalyptus bridgesiana
Eucalyptus conica
Eucalyptus goniocalyx
Eucalyptus melliodora
Eucalyptus microcarpa
Eucalyptus nortonii
Eulalia aurea
Exocarpos cupressiformis
Geijera parviflora
Geranium solanderi
Glycine clandestina
Glycine tabacina
Glycine tomentella
Gonocarpus elatus
Goodenia pinnatifida
Hibbertia linearis
Hibbertia obtusifolia
Hypericum gramineum
Jacksonia scoparia
Jasminum lineare
Jasminum suavissimum
Leptorhynchos squamatus
Lissanthe strigosa
Lomandra filiformis
Melichrus urceolatus
Microseris lanceolata
Notelaea microcarpa
Olearia elliptica
Olearia viscidula
Oxalis perennans
Pandorea pandorana
Panicum queenslandicum
Parsonsia eucalyptophylla
Pimelea curviflora
Plantago debilis
Plantago gaudichaudii
Poa labillardieri
Poa sieberiana
Rostellularia adscendens
Rumex brownii
Sida corrugata
Sorghum leiocladum
Stackhousia monogyna
Stackhousia viminea
Swainsona galegifolia
Templetonia stenophylla
Themeda australis
Wahlenbergia communis

The total flora and fauna species list for the community is considerably larger than that given above, with many species present in only some sites or in very small quantity. In any particular site not all of 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. The species composition of the site will be influenced by the size of the site, recent rainfall or drought conditions, its disturbance history and geographic and topographic location. The community is an important habitat for a diverse fauna (vertebrates and invertebrates), but detailed records are not available from most stands and the invertebrate fauna is poorly known.

4. Woodlands with *Eucalyptus albens* are most common on the undulating country of the slopes region while *Eucalyptus blakelyi* and *Eucalyptus melliodora* predominate in grassy woodlands on the tablelands. Drier woodland areas dominated by *Eucalyptus albens* often form mosaics with areas dominated by *Eucalyptus blakelyi* and *Eucalyptus melliodora* occurring in more moist situations, while areas subject to waterlogging may be treeless. ***E microcarpa* is often found in association with *E. melliodora* and *E. albens* on the south western slopes**. Woodlands including *Eucalyptus crebra, Eucalyptus dawsonii* and *Eucalyptus moluccana* (and intergrades with *Eucalyptus albens*), for example in the Merriwa plateau, Goulburn River National Park and western Wollemi National Park, are also included. Intergrades between *Eucalyptus blakelyi* and *Eucalyptus tereticornis* may also occur here.

5. Latitudinal and climatic gradients in the patterns of species present are found across the range of the community (eg. see Prober 1996 for variation in White Box). This is reflected in a gradual change in herb and grass species from northern to southern NSW (eg. Prober 1996). Within White Box Yellow Box Blakely's Red Gum Woodland, species such as *Rostellularia adscendens, Chloris ventricosa, Austrodanthonia racemosa, Brunoniella australis, Cymbopogon refractus, Swainsona galegifolia, Notelaea microcarpa, Stackhousia viminea, Olearia elliptica, Jasminum suavissimum, Plantago gaudichaudii, Dichanthium sericeum, Plantago debilis* and *Wahlenbergia communis* are generally more restricted to more northern areas (eg. Prober 1996). Some other species in White Box Yellow Box Blakely's Red Gum Woodland were generally restricted to southern areas. These include *Gonocarpus elatus, Austrostipa blackii, Aristida behriana, Bracteantha viscosa, Austrodanthonia auriculata* and *Austrostipa nodosa* (Prober 1996).

6. White Box Yellow Box Blakely's Red Gum Woodland includes vegetation described as *Eucalyptus albens* alliance and *E. melliodora / E. blakelyi* alliance in Beadle (1981), the *Eucalyptus albens* alliance in Moore (1953a,b), the grassy white box woodlands of Prober and Thiele (1993,1995) and Prober (1996) and the Grassy white box woodland of the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999. In the southern tablelands and parts of the southwest slopes, White Box Yellow Box Blakely's Red Gum Woodland are described in Thomas et al. (2000).

7. Related communities are the *Eucalyptus microcarpa, Eucalyptus pilligaensis* Grey Box/ *Eucalyptus populnea* Poplar Box communities of the western slopes and plains and the *Eucalyptus moluccana*, Grey Box, communities of the Clarence, lower Hunter Valley and Western Sydney. These are not covered by this Determination. Similarly the natural temperate grasslands and the *Eucalyptus pauciflora* grassy woodlands of the cooler parts of the southern tablelands are not covered by this Determination.

8. White Box Yellow Box Blakely's Red Gum Woodland has been drastically reduced in area and highly fragmented because of clearance for cropping and pasture improvement. **Austin et al. (2000) found the community had been reduced to less than 1% of its pre-European extent in the Central Lachlan region. Comparable degrees of reduction have been documented for NSW south western slopes and southern Tablelands (estimated <4% remaining, Thomas et. al. 2000), and for the Holbrook area (estimated <7% remaining, Gibbons and Boak (2000).** Gibbons and Boak (2000) found remnants of woodlands dominated by *Eucalyptus albens, E. melliodora* and *E. blakelyi* were severely fragmented. Further remnants of the community are degraded as a consequence of their disturbance history. **Some remnants of these communities survive with the trees partly of wholly removed by post European activities, and conversely, often remnants of these communities survive with these tree species largely intact but with the shrub or ground layers degraded to varying degrees through grazing or pasture modification.** Remnants are subject to varying degrees of threat that jeopardise their viability. These threats include: further clearing (for cropping, pasture improvement or other development); deterioration of remnant condition (caused by firewood cutting, increased livestock grazing, weed invasion, inappropriate fire regimes, soil disturbance and increased nutrient loads); degradation of the landscape in which remnants occur (including soil acidification, salinity, and loss of connectivity between remnants).

9. **The understorey may be highly modified by grazing history and disturbance.** A number of native species appear not to tolerate grazing by domestic stock and are confined to the least disturbed remnants (*Dianella revoluta, Diuris dendrobioides, Microseris lanceolata, Pimelea curviflora, Templetonia stenophylla* (Prober & Thiele 1995). Dominant pasture species typically change from *Themeda australis, Austrostipa aristiglumis* and *Poa* spp. to *Austrostipa falcata, Austrodanthonia* spp. and *Bothriochla macra* as grazing intensity increases (Moore 1953a). This may reflect differences in palatability of these species and their ability to tolerate grazing pressure. Light grazing and burning may also be a problem and lead to *Aristida ramosa* dominance (Lodge & Whalley 1989).

10. **The condition of remnants ranges from relatively good to highly degraded, such as paddock remnants with weedy understories and only a few hardy natives left.** A number of less degraded remnants have survived in Travelling Stock Routes, cemeteries and reserves, although because of past and present management practices understorey species composition may differ between the two land uses. **Some remnants of the community may consist of only an intact overstorey or an intact understorey, but may still have high conservation value due to the flora and fauna they support. Other sites may be important faunal habitat, have significant occurrences of particular species, form part of corridors or have the potential for recovery. The conservation value of remnants may be independent of remnant size.**

11. **Disturbed remnants are still considered to form part of the community including remnants where the vegetation, either understorey, 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.**

12. The community is poorly represented in conservation reserves. There are small occurrences of White Box Yellow Box Blakely's Red Gum Woodland in Border Ranges National Park, Goobang National Park, Goulburn River National Park, Manobalai Nature Reserve, Mt Kaputar National Park, Oxley Wild Rivers National Park, Queanbeyan Nature Reserve, Towari National Park, Warrumbungle National Park, Wingen Maid Nature Reserve and Wollemi National Park. The community also occurs in the following State Conservation Areas, Copeton State Conservation Area, Lake Glenbawn State Conservation Area and Lake Keepit State Conservation Area.

13. Fauna species of conservation significance found in some stands of White Box Yellow Box Blakely's Red Gum Woodland include,

- *Aprasia parapulchella* - Pink-tailed Legless Lizard
- *Burhinus grallarius* - Bush Stone-curlew
- *Cacatua leadbeateri* - Major Mitchell's Cockatoo
- *Climacteris picumnus victoriae* - Brown Treecreeper
- *Dasyurus maculatus* - Spotted-tailed Quoll
- *Delma impar* - Striped Legless Lizard
- *Grantiella picta* - Painted Honeyeater
- *Hoplocephalus bitorquatus* - Pale-headed Snake
- *Lathamus discolor* - Swift Parrot
- *Lophoictinia isura* - Square-tailed Kite
- *Melanodryas cucullata cucullata* - Hooded Robin
- *Melithreptus gularis gularis* - Black-chinned Honeyeater

- *Neophema pulchella* - Turquoise Parrot
- *Ninox connivens* - Barking Owl
- *Petaurus norfolcensis* - Squirrel Glider
- *Phascolarctos cinereus* - Koala
- *Polytelis swainsonii* - Superb Parrot
- *Pomatostomus temporalis temporalis* - Grey-crowned Babbler
- *Pyrrholaemus sagittata* - Speckled Warbler
- *Saccolaimus flaviventris* - Yellow-bellied Sheathtail-bat
- *Stagonopleura guttata* - Diamond Firetail
- *Synemon plana* - Golden Sun Moth
- *Tyto novaehollandiae* - Masked Owl
- *Varanus rosenbergi* - Rosenberg's Goanna
- *Xanthomyza phrygia* - Regent Honeyeater

A number of plant species of conservation significance are likely to occur in White Box Yellow Box Blakely's Red Gum Woodland

- *Ammobium craspedioides*
- *Bothriochloa biloba*
- *Dichanthium setosum*
- *Discaria pubescens*
- *Diuris* spp.
- *Prasophyllum petilum*
- *Pterostylis* spp.
- *Rutidosis leptorhynchoides*
- *Swainsona* spp.

A number of key threatening processes also occur in White Box Yellow Box Blakely's Red Gum Woodland. These include: Clearing of native vegetation, Predation by the European Red Fox *Vulpes vulpes*, Predation by the Feral Cat, *Felis catus*.

14. In view of the small size of existing remnants, and the threat of further clearing, disturbance and degradation, the Scientific Committee is of the opinion that White Box Yellow Box Blakely's Red Gum Woodland is likely to become extinct in nature in New South Wales unless the circumstances and factors threatening its survival or evolutionary development cease to operate and that listing as an endangered ecological community is warranted.

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Exhibition period: 15/03/02 – 19/04/02

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Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions - endangered ecological community listing

http://www.environment.nsw.gov.au/determinations/EucalyptusMicrocarpaEndCom.htm

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions as an ENDANGERED ECOLOGICAL COMMUNITY in Part 3 of Schedule 1 of the Act. The listing of Endangered Ecological Communities is provided for by Part 2 of the Act.

The Scientific Committee has found that:

1. Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions is the name given to the ecological community found on relatively fertile soils of the western slopes and plains of NSW in which *Eucalyptus microcarpa* (Inland Grey Box) is the most characteristic species. The community generally occurs where average rainfall is 375-800 mm pa (Moore 1953, Beadle 1981, Botanic Gardens Trust 2005) and the mean maximum annual temperature is 22-26°C (Botanic Gardens Trust 2005). In NSW the community principally occurs within the Riverina and South West Slopes Bioregions and is also found in portions of the Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions.

2. Inland Grey Box Woodland includes those woodlands in which the most characteristic tree species - *Eucalyptus microcarpa* - is often found in association with *Eucalyptus populnea* subsp. *bimbil* (Bimbil Box), *Callitris glaucophylla* (White Cypress-pine), *Brachychiton populneus* (Kurrajong), *Allocasuarina luehmannii* (Buloke) or *Eucalyptus melliodora* (Yellow Box), and sometimes with *Eucalyptus 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 (Prober and Thiele 2004). 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. Beadle (1948) commented that in its pristine state the overstorey density of this community was sometimes high, approaching a forest structure in southern portions of its range.

3. Inland Grey Box Woodland is characterised by the following assemblage of species:

Abutilon otocarpum
Acacia hakeoides
Alectryon oleifolius
Angophora floribunda
Austrodanthonia auriculata
Austrodanthonia setacea
Brachychiton populneus
Callitris endlicheri

Calotis cuneifolia
Cassinia arcuata
Casuarina pauper
Chloris truncata
Dodonea viscosa subsp*. cuneata*

Acacia buxifolia
Acacia homalophylla
Allocasuarina luehmannii
Atriplex semibaccata
Austrodanthonia caespitosa
Austrostipa scabra* subsp*. falcata
Bursaria spinosa

Callitris glaucophylla

Carex inversa
Casuarina cristata
Chamaesyce drummondii
Crassula sieberiana

Einadia nutans

Enteropogon acicularis

Enchylaena tomentosa

Eremophila debilis

Eremophila deserti
Eucalyptus camaldulensis

Eucalyptus albens

Eucalyptus conica
Eucalyptus melliodora

Eucalyptus largiflorens

Eucalyptus microcarpa

Eucalyptus pilligaensis
Geijera parviflora
Goodenia pinnatifida
Hibbertia obtusifolia
Jacksonia scoparia
Maireana enchylaenoides
Microlaena stipoides
Myoporum montanum
Oxalis perennans
Pittosporum angustifolium
Podolepis jaceoides
Ptilotus obovatus
Sclerolaena birchii
Senna aciphylla
Sida corrugata
Tricoryne elatior
Vittadinia gracilis
Wahlenbergia luteola
Xerochrysum viscosa

Eucalyptus populnea subsp*. bimbil*
Glycine clandestina
Hardenbergia violacea
Indigofera australis
Lomandra filiformis
Maireana microphylla
Microseris lanceolata
Myoporum platycarpum
Paspalidium jubiflorum
Plantago debilis
Pterostylis longifolia
Rumex brownii
Sclerolaena muricata
Senna artemisioides
Solanum parvifolium
Vittadinia dissecta
Wahlenbergia communis
Walwhalleya subxerophilum
Zieria cytisoides

4. The total species list of the community is considerably larger than that given above, with many species present in only one or two sites or in very low abundance. The species composition of a site will be influenced by the size of the site, recent rainfall or drought conditions and by its disturbance history. The number of species, and the above-ground relative abundance of species will change with time since fire, and may also change in response to fire intensity and frequency. At any one time, above-ground individuals of some species may be absent, but the species may be represented below ground in the soil seed banks or as dormant structures such as bulbs, corms, rhizomes, rootstocks or lignotubers. The list of species given above is of vascular plant species; the community also includes micro-organisms, fungi, cryptogamic plants and a diverse fauna, both vertebrate and invertebrate. Further examples are provided below, but the full complement of species in the community is incompletely documented.

5. Inland Grey Box Woodland may be found in the local government areas of Albury, Berrigan, Bland, Blayney, Boorowa, Cabonne, Carrathool, Conargo, Coolamon, Cootamundra, Corowa, Cowra, Deniliquin, Dubbo, Forbes, Gilgandra, Greater Hume, Griffith, Gundagai, Gunnedah, Gwyder, Inverell, Jerilderie, Junee, Lachlan, Leeton, Liverpool Plains, Lockhart, Mid-western Regional, Murray, Murrumbidgee, Narrabri, Narrandera, Narromine, Parkes, Temora, Upper Lachlan, Urana, **Wagga Wagga**, Wakool, Warrumbungle, Weddin, Wellington and Young. Inland Grey Box Woodland may occur elsewhere in the nominated bioregions. Bioregions are defined in Thackway and Creswell (1995).

6. In their detailed assessment of grassy box woodlands in central NSW, Prober and Thiele (2004) identified a **correlation between *Eucalyptus microcarpa* communities and "soils of Tertiary and Quaternary alluvial (or occasionally colluvial or eluvial) origin, largely corresponding with the Red Brown Earths** as described in Beadle (1948) and Moore (1953)." **This ecological attribute helps distinguish between Inland Grey Box Woodlands and the White Box Yellow Box Blakely's Red Gum Woodland which is listed as an Endangered Ecological Community. The latter community generally occurs further east and typically occupies a wide variety of alluvial and non-alluvial soils (Prober and Thiele 2004).**

7. Gradients in floristic diversity found across Inland Grey Box Woodland are also related to climatic differences as rainfall declines to the west and temperature increases to the west and north. **Inland Grey Box Woodland can, in some regions, be differentiated from *Eucalyptus albens-E. melliodora* communities by grass species. *Themeda australis* and *Poa sieberiana* characterise the latter community whereas *Austrostipa scabra*, *Austrodanthonia* spp. and *Enteropogon* spp. are more typically associated with *Eucalyptus microcarpa*, although disturbance weakens this correlation** (Prober and Thiele 2004). Chenopods and other shrubs are more common in the western than eastern portions of Inland Grey Box Woodland, and diversity of canopy species decreases with latitude (Keith 2004)

8. Inland Grey Box Woodland includes several closely related associations. Both Beadle (1948) and Moore (1953) included the *Eucalyptus microcarpa* community within their 'Tall Woodland *Eucalyptus woollsiana*' associations. Specht *et al*. (1995) identified 'T362: *Eucalyptus microcarpa*' on western slopes of southern NSW which represents part of the nominated community. In the Riverina the community was identified by Porteners (1993) as 'Map Unit 24: Grey Box Woodland', and this name was continued in Todd (2003). White *et al*. (2002) identified a somewhat broader vegetation unit in the Riverina, typically dominated by *Eucalyptus microcarpa,* as 'Temperate Plains Grassy Woodland'. Seddon *et al.* (2002) described 'Community B: Grey Box-White Cypress-pine Woodland' in the Little River Catchment. In the Forbes-Lake Cargelligo area, Sivertsen and Metcalfe (1995) described three 'Box Woodlands' (P3, P4 and F3) in which *Eucalyptus microcarpa* was a characteristic species along with *E. populnea* and *Callitris glaucophylla.* They later distinguished 'P13 Grey Box Woodlands' from two 'Poplar Box Woodlands' (P4 and P16) in their assessments north of the Lachlan River (Metcalfe *et al*. 2003). In the vicinity of Dubbo, Kerr *et al.* (2003) described the broad vegetation class of 'Grey Box/Pilliga Box/Poplar Box woodland on undulating rises and flats,' with *Eucalyptus microcarpa* becoming less prevalent to the north. On a statewide scale, Benson *et al.* (2006) described six communities as fitting within the definition of Inland Grey Box Woodland (ID76, ID80, ID81, ID82, ID110 and ID237). The nominated community belongs to 'Floodplain Transition Woodlands' vegetation class of Keith (2004) which also includes the *Eucalyptus conica* (Fuzzy Box) and *E. pilligaensis* (Pilliga Box) woodland communities where *E. microcarpa* rarely occurs.

9. **Two woodland communities that are listed as Endangered Ecological Communities under the Threatened Species Conservation Act adjoin and intergrade with Inland Grey Box Woodland:**

- **Fuzzy Box on alluvials of the NSW South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions**
- **White Box Yellow Box Blakely's Red Gum Woodland**

Woodlands of *Eucalyptus pilligaensis* and *E. populnea*, and those of *E. moluccana* (Coastal Grey Box) in the Sydney Basin Bioregion are also related. Inland Grey Box Woodland can grade into inland riverine forests of *Eucalyptus camaldulensis* (River Red Gum) and *E. largiflorens* (Black Box) along inland rivers and floodplains. These later communities are not covered by this Determination.

10. Fauna species found in some stands of Inland Grey Box Woodland that are listed under the Threatened Species Conservation Act include:

- *Aprasia parapulchella* - Pink-tailed Legless Lizard
- *Burhinus grallarius* - Bush Stone-curlew
- *Lathamus discolor* - Swift Parrot
- *Melithreptus gularis gularis* - Black-chinned Honeyeater
- *Neophema pulchella* - Turquoise Parrot
- *Ninox connivens* - Barking Owl
- *Petaurus norfolcensis* - Squirrel Glider

- *Phascogale tapoatafa* - Brush-tailed Phascogale
- *Polytelis swainsonii* - Superb Parrot
- *Pomatostomus temporalis temporalis* - Grey-crowned Babbler
- *Pyrrholaemus sagittata* - Speckled Warbler
- *Stagonopleura guttata* - Diamond Firetail
- *Vespadelus troughtoni* - Eastern Cave Bat

Flora species found in some stands of Inland Grey Box Woodland that are listed under the Threatened Species Conservation Act include:

- *Austrostipa wakoolica* - A spear-grass
- *Dichanthium setosum* - A bluegrass
- *Diuris tricolor* (syn. *D. sheaffiana*) - Pine Donkey Orchid
- *Swainsona sericea* - Silky Swainson-pea

11. Grassy box woodlands of NSW were rapidly targeted for agriculture development and extensively cleared or degraded (Benson 1991) so that by 1948 few remnants existed and those were often degraded by grazing (Beadle 1948). **Inland Grey Box Woodland has been greatly reduced in area, highly fragmented and greatly disturbed by clearing, cropping, grazing, introduction of exotic species and addition of fertiliser**. Areal reductions of Inland Grey Box Woodland have been independently documented by several authors for regional portions of this community. For example, Austin *et al.* (2000) found the community had been **reduced to 3% of its original extent in the central Lachlan region**. Kerr *et al.* (2003) estimated that of 116 000 ha of a broader community (including some *Eucalyptus pilligaensis* and *E. populnea* woodland) in the vicinity of Dubbo, only 16% remains. In the Riverina and Cobar Peneplain Bioregions, Todd (2003) reported that 762 000 ha of Inland Grey Box Woodland has been reduced by 97% to 20 000 ha of remnants. Of the estimated 9600 ha of Grey Box-White Cypress-pine Woodland in the Little River Catchment, less than 250 ha (2%) remains (Seddon *et al*. 2002). On the basis of regional estimates, 67-92% of the pre-European extent of Inland Grey Box sub-communities have been cleared (Benson *et al*. 2006). **A cumulative assessment of these regional values indicates an overall decline of 85% from 1 532 000 ha to 236 000 ha**. The various regional values and the cumulative estimate indicate a **reduction of a least 70% in the geographic distribution**. This large reduction of the community has occurred in the past 150 years and clearing continues to affect areas of the community. 'Clearing of native vegetation' is listed as a Key Threatening Process under the Threatened Species Conservation Act.

12. Some remnants of the community survive with trees partly or wholly removed. Conversely, **often the remnants of the community survive with trees largely intact but with the shrub or ground layers degraded to varying degrees through grazing or pasture modification**. Some species that are part of the community appear intolerant to heavy grazing by domestic stock and are confined to the least disturbed remnants (Prober and Thiele 2004). Remnants are subject to various processes of degradation that have led to a large reduction in ecological function including:

- Continuing small scale clearing for cropping, pasture improvement or other developments;
- Firewood cutting, increased livestock grazing, stubble burning, weed invasion, inappropriate fire regimes, soil disturbance and increased nutrient loads;
- Degradation of the landscape in which remnants occur including soil acidification, salinisation, extensive erosion scalding and loss of connectivity.

A number of Key Threatening Processes listed under the Threatened Species Conservation Act adversely affect areas of Inland Grey Box Woodland. These include:

- Removal of dead wood and dead trees
- Invasion of native plant communities by exotic perennial grasses
- Predation by the European Red Fox, *Vulpes vulpes*
- Predation by the Feral Cat, *Felis catus*
- Competition from feral honey bees, *Apis mellifera*
- Competition and grazing by the feral European Rabbit, *Oryctolagus cuniculus*

13. Some remnants are highly degraded, with weedy understoreys and only a few hardy natives remaining. A number of less degraded remnants have survived in Travelling Stock Routes, cemeteries and reserves. Understorey species composition may differ markedly between these sites because of past and present management practices. In some instances intentional introduction of non-indigenous species has occurred in these reserves. **Some remnants of the community that consist of only an intact overstorey or an intact understorey still have high conservation value due to the flora and fauna they support.** Other sites may be important examples of specific faunal habitat, have significant occurrences of particular species, comprise portions of vegetation corridors or have the potential for rehabilitation. **The conservation value of remnants may be independent of remnant size. Disturbed remnants are considered to form part of the community including remnants where the understorey, overstorey or both would, under appropriate management, respond to assisted natural regeneration from the soil seed bank.**

14. The community is **poorly represented in conservation reserves and, even then, is almost invariably found in small patches left after surrounding fertile land has been cleared for agriculture**. Examples of Inland Grey Box Woodland are found in Buckingbong Flora Reserve (FR), Cocopara National Park (NP), Cocopara Nature Reserve (NR), Coolbaggie NR, Gubbata NR, Nangar NP, Pucawan NR, Round Hill NR, Strahorn FR, The Rock NR, Warrumbungle NP, Weddin Mountains NP, Wiesners Swamp NR, Wilbertroy FR, Woggoon NR and Wongarbon NR.

15. Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions is eligible to be listed as an endangered ecological community as, in the opinion of the Scientific Committee, it is facing a very high risk of extinction in New South Wales in the near future, as determined in accordance with the following criteria as prescribed by the Threatened Species Conservation Regulation 2002:

Clause 25

The ecological community has undergone, is observed, estimated, inferred or reasonably suspected to have undergone, or is likely to undergo within a time span appropriate to the life cycle and habitat characteristics of its component species:

(b) a large reduction in geographic distribution.

Clause 27

The ecological community has undergone, is observed, estimated, inferred or reasonably suspected to have undergone, or is likely to undergo within a time span appropriate to the life cycle and habitat characteristics of its component species:

(b) a large reduction in ecological function,

as indicated by any of the following:

(d) change in community structure
(e) change in species composition
(f) disruption of ecological processes

(g) invasion and establishment of exotic species
(h) degradation of habitat
(i) fragmentation of habitat

Associate Professor Lesley Hughes

Chairperson

Scientific Committee

Proposed Gazettal date: 27/4/07

Exhibition period: 27/4/07 - 22/6/07

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'Inland grey box woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South bioregions as an endangered ecological community' - overview

April 2007

http://www.environment.nsw.gov.au/threatenedspecies/InlandGreyBoxWoodlandFactsheet.htm

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On 27 April 2007, the NSW Scientific Committee published notice of its final determination to list 'Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions' as an endangered ecological community. The ecological community has subsequently been placed on the schedules of the NSW *Threatened Species Conservation Act 1995* (TSC Act).

Is the final determination suggesting that Inland Grey Box (*Eucalyptus microcarpa*) is an endangered species?

The decision of the Scientific Committee to list this endangered ecological community does not result in Inland Grey Box (*Eucalyptus microcarpa*), or any other individual species, being declared as an endangered species. The decision relates to an assemblage of species that forms a woodland community in the bioregions of the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South. The community is characterised by 74 plant species of which Inland Grey Box is one.

What are the implications of 'Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions' being listed as an endangered ecological community?

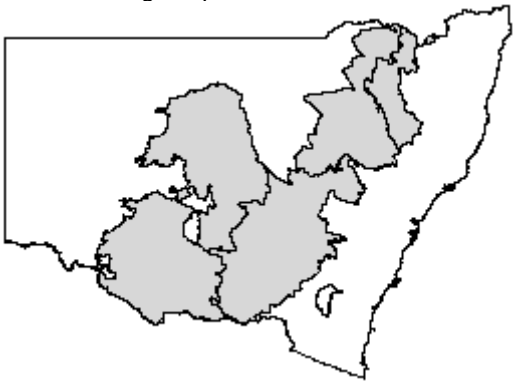
The vegetation types that make up this endangered ecological community are classed as **over 70% cleared vegetation types** in the PVP Biometric tool. Therefore, the broadscale clearing of moderate to good condition stands of the community is prohibited under the *Native Vegetation Act 2003*, irrespective of its status under the TSC Act.

The decision of the Scientific Committee to list this endangered ecological community has the following implications:

- Landholders are able to continue to carry out sustainable grazing without approval under *Native Vegetation Act 2003* or the *Threatened Species Conservation Act 1995*;
- Landholders are able to clear the ecological community without approval under the *Native Vegetation Act 2003* or the *Threatened Species Conservation Act 1995* if the clearing constitutes permitted clearing or permitted activities (which include routine agricultural management activities);
- Other actions that may impact on the community may trigger the development consent/activity approval provisions of the *Environment Planning and Assessment Act 1974*, the licensing requirements of the TSC Act or require an approval under the *Rural Fires Act 1997*. In these cases, the relevant approval authority (usually either a local council, the Department of Environment and Climate Change (DECC) or the Rural Fires Service) must consider the impact of the proposed action on the community; and
- DECC is required to develop strategies for promoting the recovery of the ecological community to a position of viability in nature.

Where are the bioregions in which the endangered ecological community occurs?

The bioregions in which this endangered ecological community occurs are shaded grey in the following map.



DECC 2007 based on IBRA Bioregions V 4

Developing recovery strategies

DECC will work in close collaboration with landholders, catchment management authorities and government agencies to develop recovery strategies for this endangered ecological community that are practical and effective.

These recovery strategies might include measures to:

- control grazing by feral rabbits;
- re-instate appropriate fire regimes;
- manage weed invasion; and

- assist the regeneration of the community through the continuation and/or adoption of sustainable grazing practices.

The listing of this endangered ecological community may assist landholders in acquiring grant funds to carry out conservation activities on their land.

Inland Grey Box Woodland - profile

http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=20072

Scientific name: *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions*
Conservation status in NSW: 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 *Eucalyptus populnea* subsp. *bimbil*, *Callitris glaucophylla*, *Brachychiton populneus*, *Allocasuarina luehmannii* or *Eucalyptus melliodora*, and sometimes with *Eucalyptus albens*. 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.

Location and habitat

Distribution

In NSW the community principally occurs within the Riverina and South West Slopes Bioregions and is also found in portions of the Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions. Inland Grey Box Woodland may occur elsewhere in the nominated bioregions.

Habitat and ecology

- 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.
- There is a correlation between the distribution of *Eucalyptus microcarpa* communities and soils of Tertiary and Quaternary alluvial origin, largely corresponding with the Red Brown Earths.
- 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. Some species that are part of the community appear intolerant to heavy grazing by domestic stock and are confined to the least disturbed remnants.

Regional information
This species is found in the following catchment management authority regions. Click on a region name to see more details about the distribution, vegetation types and habitat preference of the species in that region.

- Border Rivers/Gwydir
- Central West
- Lachlan
- Murray
- Murrumbidgee
- Namoi

Threats

- Small scale clearing for cropping, pasture improvement or other developments.
- Firewood cutting, increased livestock grazing, stubble burning, weed invasion, inappropriate fire regimes, soil disturbance and increased nutrient loads.
- Degradation of the landscape in which remnants occur including soil acidification, salinisation, extensive erosion scalding and loss of connectivity.
- Grazing by introduced European Rabbits and fauna predation by feral cats.
- Poor representation in isolated conservation reserves.

Recovery strategies

Priority actions are the specific, practical things that must be done to recover a threatened species, population or ecological community. The Department of Environment and Conservation has identified **8 priority actions** to help recover the Inland Grey Box Woodland in New South Wales.

What needs to be done to recover this species?

- Assist the regeneration of the community through the continuation and/or adoption of sustainable grazing practices.
- Re-instate appropriate fire regimes.
- Control grazing by feral rabbits and undertake programs to reduce feral cat populations.
- Manage and reduce weed invasion.
- Reduce firewood cutting and stop small scale clearing.
- Address widespread environmental issues such as salinity.

References

- 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.

Appendix 5 - Fauna Species List

Scientific Name	Common Name	Status
BIRDS		
ARDEIDAE		
Ergretta novaehollandiae	White Faced Heron	
RALLLIDAE		
Chenonetta jubata	Australian Wooduck	
ACCIPITRIDAE		
Accipiter fasciatus	Brown Goshawk	
Hieraaetus morphnoides	Little Eagle	
FALCONIDAE		
Falco berigora	Brown Falcon	
CHARADRIIDAE		
Vanellus miles	Masked Lapwing	
COLUMBIDAE		
Ocyphaps lophotes	Crested Pigeon	
Phaps chalcoptera	Common Bronzewing	
Geopelia placida	Peaceful Dove	
Streptopelia chinensis	Spotted Turtle Dove	Introduced
CACATUIDAE		
Eolophus roseicapillus	Galah	
Cacatua galerita	Sulphur Crested Cockatoo	
PSITTACIDAE		
Polytelis swainsonii	Superb Parrot	TSC - Vulnerable
PLATYCERCINAE		
Platycercus eximius	Eastern Rosella	
Platycercus elegans	Yellow Rosella	
Psephotus haematonotus	Red Rumped Parrot	
HALYCYONIDAE		
Dacelo novaeguineae	Laughing Kookaburra	
HIRUNDINIDAE		
Cheramoeca leucosternus	White Backed Swallow	
Hirundo neoxena	Welcome Swallow	
CAMPEPHAGIDAE		
Coracina novaehollandiae	Black Faced Cuckoo Shrike	
PETROICIDAE		
Petroica goodenovii	Red Capped Robin	
Eopsaltria australis	Eastern Yellow Robin	
Microeca fascinans	Jacky Winter	
PACHYCEPHALIDAE		
Pachycephala rufiventris	Rufous Whistler	
Colluricincla harmonica	Grey Shrike Thrush	
DICRURIDAE		
Grallina cyanoleuca	Magpie Lark	
Rhipidura albiscapa	Grey Fantail	
Rhipidura leucophrys	Willie Wagtail	
MELIPHAGIDAE		
Anthochaera carunculata	Red Wattlebird	
Entomyzon cyanotis	Blue Faced Honeyeater	

Manorina melan	Noisy Miner	
Philemon corniculatus	Noisy Friarbird	
Melithreptus lunatus	White Naped Honeyeater	
Lichenostomus penicillatus	White Plumed Honeyeater	
POMATOSTOMIDAE		
Pomatostomus temporalis	Grey Crowned Babbler	TSC - Vulnerable
MALURIDAE		
Malurus cyaneus	Superb Fairy Wren	
ACANTHIZIDAE		
Pyrrholaemus sagittatus	Speckled Warbler	TSC - Vulnerable
Acanthiza nana	Yellow Thornbill	
Smicrornis brevirostris	Weebil	
PARDALOTIDAE		
Pardalotus punctatus	Spotted Pardalote	
Pardalotus striatus	Striated Pardalote	
ARTAMIDAE		
Strepera graculina	Pied Currawong	
CORVIDAE		
Corvus coronoides	Australian Raven	
ESTRILDIDAE		
Teaniopygia bichenovii	Double Barred Finch	
ZOSTEROPIDAE		
Zosterops lateralis	Silvereye	
STURNIDAE		
Sturnus vulgaris	Common Starling	Introduced
Turdus merula	Common Blackbird	Introduced
CORCORACIDAE		
Corcorax melanorhamphos	White Winged Chough	
MAMMALS		
Macropus gigantus	Eastern Grey Kangaroo	
	Echidna	
	Brush Tailed Possum	
	European Rabbit	Introduced
	Common Hare	Introduced
REPTILES		
SCINCIDAE		
Morethia boulengeri	Boulenger's Skink	
Eulamprus sp.	Skink	

Appendix 6 – Recorded Hollow Bearing Trees Data during Field Investigations

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Recorded Hollow BEaring trees during field investigations

No.	Waypoint	D.B.H	Small	Medium	Large	Total	Species	Easting	Northing	Lat	Long
1	55	70	1			1	Eucalyptus melliodora	532544.15	6120400.05	-35.0586	147.3569
2	56	100			1	1	Eucalyptus melliodora	532552.53	6120410.62	-35.0585	147.3570
3	57	130	2	1	1	4	Eucalyptus melliodora	532496.56	6120383.03	-35.0588	147.3564
4	58	90	4	2	1	7	Eucalyptus melliodora	532505.33	6120322.01	-35.0593	147.3565
5	59	80		1		1	Dead	532552.89	6120196.05	-35.0604	147.3570
6	60	90	1	1		2	Eucalyptus melliodora	532516.89	6120166.45	-35.0607	147.3566
7	61	80	2			2	Eucalyptus melliodora	532509.38	6120184.23	-35.0605	147.3565
8	62	60	3			3	Eucalyptus melliodora	532499.30	6120201.27	-35.0604	147.3564
9	63	90	1		1	2	Eucalyptus blakelyi	532467.63	6120245.48	-35.0600	147.3561
10	64	110	2	3		5	Eucalyptus melliodora	532469.96	6120227.20	-35.0602	147.3561
11	65	100	5	3	2	10	Eucalyptus melliodora	532432.12	6120211.78	-35.0603	147.3557
12	66	100	2			2	Eucalyptus blakelyi	532423.38	6120195.55	-35.0604	147.3556
13	67	200	3			3	Eucalyptus melliodora	532396.53	6120199.11	-35.0604	147.3553
14	68	50	1	2		3	Dead	532364.52	6120178.02	-35.0606	147.3549
15	69	90	2	1	1	4	Eucalyptus blakelyi	532352.53	6120183.37	-35.0606	147.3548
16	70	100	2			2	Eucalyptus melliodora	532353.31	6120214.68	-35.0603	147.3548
17	71	90	1		1	2	Eucalyptus blakelyi	532392.49	6120230.52	-35.0601	147.3552
18	72	80			2	2	Eucalyptus blakelyi	532223.68	6120278.51	-35.0597	147.3534
19	73	40		2		2	Dead Stump	532228.08	6120279.27	-35.0597	147.3534
20	74	40	4			4	Dead	532159.24	6120273.19	-35.0598	147.3527
21	75	70	2	2		4	Dead	532146.37	6120277.19	-35.0597	147.3525
22	76	60	4			4	Eucalyptus blakelyi	532105.11	6120266.82	-35.0598	147.3521
23	77	40			1	1	Dead	532102.46	6120261.77	-35.0599	147.3521
24	78	50	2			2	Eucalyptus blakelyi	532030.22	6120281.52	-35.0597	147.3513
25	79	70	2		1	3	Dead	532060.01	6120295.12	-35.0596	147.3516
26	80	80	2	1	1	4	Eucalyptus melliodora	532052.22	6120306.74	-35.0595	147.3515
27	81	90	1	3		4	Eucalyptus melliodora	532044.86	6120327.79	-35.0593	147.3514
28	82	80	5	2		7	Eucalyptus melliodora	532024.83	6120316.08	-35.0594	147.3512
29	83	90	3			3	Eucalyptus melliodora	532017.00	6120312.37	-35.0594	147.3511
30	84	100	6	2		8	Eucalyptus melliodora	531996.32	6120269.18	-35.0598	147.3509
31	85	90	2		2	4	Eucalyptus melliodora	531941.91	6120166.03	-35.0607	147.3503
32	86	100	1	1		2	Eucalyptus melliodora	531921.77	6120158.96	-35.0608	147.3501

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33	87	90	3	2		5	Eucalyptus melliodora	531901.51	6120160.80	-35.0608	147.3499
34	88	100	2			2	Eucalyptus melliodora	531903.74	6120168.03	-35.0607	147.3499
35	89	100	2			2	Eucalyptus melliodora	531898.65	6120175.37	-35.0606	147.3498
36	90	80	3			3	Eucalyptus melliodora	531902.99	6120155.48	-35.0608	147.3499
37	91	120	2	1	2	5	Eucalyptus melliodora	531910.24	6120127.27	-35.0611	147.3500
38	92	100	3		2	5	Eucalyptus melliodora	531920.22	6120068.41	-35.0616	147.3501
39	93	110	2			2	Eucalyptus melliodora	531930.60	6120048.52	-35.0618	147.3502
40	94	90		2	2	4	Eucalyptus albens	531924.00	6120015.44	-35.0621	147.3501
41	95	110	2	2	1	5	Dead	531922.22	6119988.56	-35.0623	147.3501
42	96	110	3		1	4	Eucalyptus albens	531939.81	6119985.45	-35.0624	147.3503
43	97	50	1	1	1	3	Dead	532012.58	6119874.27	-35.0634	147.3511
44	98	70	1	1	1	3	Dead	532031.70	6119878.60	-35.0633	147.3513
45	99	90	2			2	Eucalyptus albens	531975.24	6119796.90	-35.0641	147.3507
46	100	N/A			2	2	Large log	532044.13	6119834.17	-35.0637	147.3514
47	101	130	5	1		6	Eucalyptus albens	532051.03	6119754.80	-35.0644	147.3515
48	102	130	1	1		2	Eucalyptus albens	532420.21	6119668.36	-35.0652	147.3556
49	103	100		2	1	3	Eucalyptus melliodora	532598.75	6120563.69	-35.0571	147.3575
50	104	100	2	1		3	Eucalyptus blakelyi	532569.69	6120584.86	-35.0569	147.3572
51	105	110	3	3	2	8	Eucalyptus albens	532710.02	6119649.31	-35.0654	147.3587
52	106	100	4	2		6	Eucalyptus albens	532733.39	6119641.93	-35.0654	147.3590
53	107	110	2	1	2	5	Eucalyptus albens	532743.46	6119644.52	-35.0654	147.3591
54	108	120		2	2	4	Eucalyptus blakelyi	532779.19	6119528.67	-35.0665	147.3595
55	109	90	3	2	1	6	Dead	532339.60	6120369.36	-35.0589	147.3547
56	110	50			1	1	Dead	532334.25	6120368.97	-35.0589	147.3546
57	111	80	2	3		5	Felled Dead Tree	532332.24	6120370.51	-35.0589	147.3546
58	112	100			1	1	Eucalyptus blakelyi	532333.34	6120387.63	-35.0587	147.3546
59	113	100	5	2	1	8	Eucalyptus blakelyi	532334.92	6120398.32	-35.0586	147.3546
60	114	90	3			3	Eucalyptus blakelyi	532356.77	6120393.30	-35.0587	147.3548
61	115	110		2		2	Eucalyptus melliodora	532432.20	6120381.89	-35.0588	147.3557
62	116	90	3			3	Eucalyptus melliodora	532397.88	6120400.27	-35.0586	147.3553
63	117	100	3	5		8	Eucalyptus blakelyi	532386.90	6120433.20	-35.0583	147.3552
64	118	100	2			2	Eucalyptus melliodora	532423.76	6120479.98	-35.0579	147.3556
65	119	120	3	2		5	Eucalyptus melliodora	532411.19	6120489.70	-35.0578	147.3554

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66	120	110	3			3	Eucalyptus melliodora	532382.96	6120485.66	-35.0578	147.3551
67	121	90	3			3	Eucalyptus melliodora	532373.26	6120502.25	-35.0577	147.3550
68	122	120		3		3	Eucalyptus melliodora	532384.07	6120534.83	-35.0574	147.3551
69	123	90	3			3	Eucalyptus melliodora	532382.21	6120529.24	-35.0574	147.3551
70	124	100	4			4	Eucalyptus melliodora	532387.57	6120557.59	-35.0572	147.3552
71	125	100			1	1	Eucalyptus melliodora	532379.33	6120553.70	-35.0572	147.3551
72	126	80	3			3	Eucalyptus melliodora	532386.93	6120575.11	-35.0570	147.3552
73	127	100	2			2	Eucalyptus melliodora	532373.67	6120615.16	-35.0567	147.3550
74	128	110	4			4	Eucalyptus melliodora	532387.44	6120628.81	-35.0565	147.3552
75	129	120	2		2	4	Eucalyptus melliodora	532431.47	6120695.66	-35.0559	147.3556
76	130	100	3	1		4	Eucalyptus melliodora	532418.00	6120727.69	-35.0557	147.3555
77	131	100		2		2	Eucalyptus melliodora	532400.09	6120765.77	-35.0553	147.3553
78	132	130		2	1	3	Eucalyptus melliodora	532384.06	6120757.05	-35.0554	147.3551
79	133	120	2	1	3	6	Eucalyptus melliodora	532351.58	6120779.94	-35.0552	147.3548
80	134	150	3			3	Eucalyptus melliodora	532332.76	6120760.07	-35.0554	147.3546
81	135	110	2	1		3	Eucalyptus melliodora	532272.42	6120789.60	-35.0551	147.3539
82	136	100	3			3	Eucalyptus melliodora	532261.84	6120769.75	-35.0553	147.3538
83	137	100	2		1	3	Eucalyptus melliodora	532268.94	6120772.42	-35.0553	147.3539
84	138	110	2	1		3	Eucalyptus melliodora	532266.91	6120764.48	-35.0553	147.3538
85	139	110	3	2		5	Eucalyptus melliodora	532315.59	6120697.14	-35.0559	147.3544
86	140	100	5	2		7	Eucalyptus melliodora	532371.88	6120714.96	-35.0558	147.3550
87	141	100	5	3		8	Eucalyptus melliodora	532376.18	6120713.79	-35.0558	147.3550
88	142	110	5		2	7	Eucalyptus melliodora	532382.75	6120710.36	-35.0558	147.3551
89	143	90		1	1	2	Eucalyptus melliodora	532360.46	6120674.99	-35.0561	147.3549
90	144	90	2			2	Eucalyptus melliodora	532350.06	6120645.18	-35.0564	147.3548
91	145	110	3			3	Eucalyptus melliodora	532332.93	6120614.80	-35.0567	147.3546
92	146	120	3	3	1	7	Eucalyptus melliodora	532332.01	6120617.89	-35.0566	147.3546
93	147	80	3	2	1	6	Eucalyptus melliodora	532288.02	6120637.20	-35.0565	147.3541
94	148	90			2	2	Eucalyptus melliodora	532283.20	6120633.26	-35.0565	147.3540
95	149	90	2			2	Eucalyptus melliodora	532248.10	6120651.05	-35.0563	147.3536
96	150	110	3			3	Eucalyptus melliodora	532242.28	6120660.46	-35.0563	147.3536
97	151	100	3			3	Eucalyptus melliodora	532230.03	6120626.03	-35.0566	147.3534
98	152	90		2		2	Eucalyptus melliodora	532233.81	6120611.99	-35.0567	147.3535

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99	153	110	2	2	2	6	Eucalyptus melliodora	532245.20	6120599.15	-35.0568	147.3536
100	154	100		2		2	Eucalyptus blakelyi	532226.66	6120585.64	-35.0569	147.3534
101	155	110	2	3	3	8	Eucalyptus melliodora	532226.63	6120569.75	-35.0571	147.3534
102	156	90			1	1	Eucalyptus blakelyi	532220.15	6120565.42	-35.0571	147.3533
103	157	110	3	2	1	6	Eucalyptus albens	532289.09	6120562.49	-35.0571	147.3541
104	158	110	1	2	1	4	Eucalyptus albens	532261.89	6120542.30	-35.0573	147.3538
105	159	110	5	3	1	9	Eucalyptus melliodora	532239.72	6120508.88	-35.0576	147.3536
106	160	90		4		4	Eucalyptus melliodora	532198.88	6120495.09	-35.0578	147.3531
107	161	120	1	2		3	Eucalyptus melliodora	532182.34	6120500.12	-35.0577	147.3529
108	162	120	2			2	Eucalyptus melliodora	532197.53	6120501.23	-35.0577	147.3531
109	163	120		2	1	3	Eucalyptus melliodora	532189.37	6120467.97	-35.0580	147.3530
110	164	100	2	1		3	Eucalyptus blakelyi	532187.04	6120465.22	-35.0580	147.3530
111	165	90	2			2	Eucalyptus blakelyi	532204.23	6120446.60	-35.0582	147.3532
112	166	70	2	1		3	Eucalyptus blakelyi	532187.10	6120427.71	-35.0584	147.3530
113	167	80	2			2	Eucalyptus blakelyi	532192.01	6120423.95	-35.0584	147.3530
114	168	80	2	2		4	Dead	532226.51	6120383.84	-35.0588	147.3534
115	169	90	5			5	Dead	532261.02	6120439.57	-35.0583	147.3538
116	170	70	4			4	Dead	532297.99	6120462.52	-35.0580	147.3542
117	171	100	2	5		7	Dead	532322.83	6120439.42	-35.0583	147.3545
118	172	90	1	2	1	4	Eucalyptus melliodora	532342.63	6120468.61	-35.0580	147.3547
119	173	90	2			2	Eucalyptus melliodora	532348.62	6120465.28	-35.0580	147.3547
120	174	90	2	1		3	Eucalyptus melliodora	532350.55	6120464.77	-35.0580	147.3548
121	175	100	2	1		3	Eucalyptus melliodora	532360.07	6120411.54	-35.0585	147.3549
122	176	90	3	3		6	Eucalyptus melliodora	532346.05	6120388.49	-35.0587	147.3547
123	177	100	3			3	Eucalyptus melliodora	532333.67	6120407.28	-35.0585	147.3546
124	178	120	2			2	Eucalyptus melliodora	532289.91	6120408.53	-35.0585	147.3541
125	179	80		2		2	Eucalyptus blakelyi	532350.22	6120330.77	-35.0592	147.3548
126	180	90	2			2	Eucalyptus melliodora	532488.88	6120418.27	-35.0584	147.3563
127	181	100	2			2	Eucalyptus melliodora	532506.63	6120490.85	-35.0578	147.3565
128	182	110	3			3	Eucalyptus melliodora	532504.96	6120519.98	-35.0575	147.3565
129	183	130	3	1	3	7	Eucalyptus melliodora	532493.24	6120660.11	-35.0563	147.3563
130	184	130	1	3		4	Eucalyptus melliodora	532484.15	6120646.10	-35.0564	147.3562
131	185	90	3	1		4	Eucalyptus melliodora	532445.95	6120625.72	-35.0566	147.3558

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132	186	120	3	3		6	Eucalyptus melliodora	532479.63	6120637.64	-35.0565	147.3562
133	187	90	5			5	Eucalyptus melliodora	532479.82	6120636.44	-35.0565	147.3562
134	188	110	2	1	1	4	Eucalyptus melliodora	532468.63	6120667.09	-35.0562	147.3561
135	189	90	5			5	Dead	532756.23	6120549.43	-35.0572	147.3592
136	190	110	4			4	Eucalyptus melliodora	532247.14	6120875.36	-35.0543	147.3536
137	191	120	2	2		4	Eucalyptus melliodora	532260.86	6120901.29	-35.0541	147.3538
138	192	100	4			4	Eucalyptus melliodora	532280.31	6120908.14	-35.0540	147.3540
139	193	120	3			3	Eucalyptus melliodora	532317.86	6120938.05	-35.0538	147.3544
140	194	90	1		3	4	Eucalyptus blakelyi	532143.19	6120763.71	-35.0553	147.3525
141	195	90		3		3	Eucalyptus melliodora	532180.52	6120750.71	-35.0555	147.3529
142	196	150	2		4	6	Eucalyptus melliodora	532076.45	6120611.03	-35.0567	147.3518
143	197	80	3			3	Eucalyptus microcarpa	532056.02	6120611.54	-35.0567	147.3515
144	198	100			1	1	Eucalyptus microcarpa	532081.29	6120558.69	-35.0572	147.3518
145	199	90	2			2	Eucalyptus melliodora	532021.34	6120586.77	-35.0569	147.3512
146	200	100	2			2	brittle gum ?????	531821.26	6120670.39	-35.0562	147.3490
147	201	110	2			2	Eucalyptus melliodora	531632.72	6120326.94	-35.0593	147.3469
148	202	90	5	2		7	Eucalyptus blakelyi	531634.89	6119560.29	-35.0662	147.3470
149	203	90	3			3	Eucalyptus melliodora	531630.24	6119540.11	-35.0664	147.3469
150	204	70			2	2	Dead	531623.84	6119495.13	-35.0668	147.3468
151	205	80	3			3	Eucalyptus melliodora	531727.86	6119439.25	-35.0673	147.3480
152	206	130	3	2	1	6	Eucalyptus microcarpa	529957.89	6119314.04	-35.0685	147.3286
153	207	100	2		1	3	Eucalyptus microcarpa	529981.64	6119405.62	-35.0676	147.3288
154	208	120		2	3	5	Eucalyptus microcarpa	529946.17	6119433.84	-35.0674	147.3284
155	209	150	2		3	5	Eucalyptus microcarpa	530017.39	6119347.79	-35.0682	147.3292
156	210	90	3			3	Eucalyptus microcarpa	530137.77	6119366.43	-35.0680	147.3305
157	211	80	2			2	Eucalyptus microcarpa	530162.55	6119365.62	-35.0680	147.3308
158	212	90	2	1		3	Eucalyptus microcarpa	530016.63	6119547.70	-35.0664	147.3292
159	213	80	1	2		3	Dead	530042.82	6119599.83	-35.0659	147.3295
160	214	100	5	2	2	9	Dead	530075.85	6119681.24	-35.0652	147.3299
161	215	90	2			2	Eucalyptus albens	530164.01	6119628.57	-35.0656	147.3308
162	216	90	4	2		6	Dead	530174.09	6119614.88	-35.0658	147.3309
163	217	120	9	3		12	Eucalyptus microcarpa	530237.47	6119641.40	-35.0655	147.3316
164	218	100	3		1	4	Eucalyptus melliodora	530308.70	6119603.00	-35.0659	147.3324

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165	219	80	3	3		6	Eucalyptus blakelyi	530327.49	6119598.43	-35.0659	147.3326
166	220	60	2			2	Dead	530324.74	6119577.81	-35.0661	147.3326
167	221	90	5			5	Dead	529954.27	6119712.25	-35.0649	147.3285
168	222	120	2	1	1	4	Eucalyptus microcarpa	529796.23	6119710.50	-35.0649	147.3268
169	223	130	3	2	3	8	Eucalyptus microcarpa	529628.51	6119603.24	-35.0659	147.3250
170	224	100	2			2	Eucalyptus microcarpa	529627.88	6119560.99	-35.0663	147.3249
171	225	90	2	2	3	7	Eucalyptus microcarpa	529651.79	6119564.72	-35.0662	147.3252
172	226	90	2	1		3	Eucalyptus microcarpa	529651.34	6119539.23	-35.0665	147.3252
173	227	80	2	1		3	Eucalyptus microcarpa	529642.36	6119517.73	-35.0666	147.3251
174	228	90	2			2	Eucalyptus microcarpa	529644.10	6119522.87	-35.0666	147.3251
175	229	100	3	2	1	6	Eucalyptus microcarpa	529670.06	6119510.19	-35.0667	147.3254
176	230	90	2			2	Eucalyptus microcarpa	529604.65	6119454.51	-35.0672	147.3247
177	231	150	5	3	2	10	Eucalyptus microcarpa	529564.69	6119440.66	-35.0673	147.3243
178	232	110	3	2		5	Eucalyptus microcarpa	529521.24	6119466.08	-35.0671	147.3238
179	233	130	1	1	1	3	Eucalyptus microcarpa	529647.71	6119391.56	-35.0678	147.3252
180	234	130			1	1	Eucalyptus microcarpa	529675.41	6119390.58	-35.0678	147.3255
181	235	120	5	1	1	7	Dead	529694.45	6119381.13	-35.0679	147.3257
182	236	90	3			3	Dead	529720.81	6119380.17	-35.0679	147.3260
183	237	90	3	2		5	Dead	529803.28	6119434.75	-35.0674	147.3269
184	238	100	2	1	1	4	Dead	529811.51	6119387.00	-35.0678	147.3270
185	239	90	2	2		4	Eucalyptus albens	529805.53	6119367.12	-35.0680	147.3269
186	240	120	5	2	1	8	Eucalyptus albens	529823.88	6119355.65	-35.0681	147.3271
187	241	110	3	2		5	Eucalyptus albens	529847.52	6119332.32	-35.0683	147.3274
188	242	90	2			2	Dead	529914.12	6119483.08	-35.0670	147.3281
190	244	110	2		1	3	Dead	529794.83	6119464.29	-35.0671	147.3268
191	245	90	3	3		6	Dead	529732.71	6119611.91	-35.0658	147.3261
192	246	90	3	2		5	Eucalyptus microcarpa	529753.83	6119584.49	-35.0660	147.3263
193	247	5	2			7	Eucalyptus microcarpa	529740.80	6119537.25	-35.0665	147.3262
194	248	90	3			3	Eucalyptus microcarpa	529943.77	6119305.55	-35.0686	147.3284
195	249	120	5	2		7	Eucalyptus microcarpa	526718.63	6123866.43	-35.0275	147.2929
196	250	120	1			1	Eucalyptus melliodora	526710.74	6123852.42	-35.0276	147.2928
197	251	90	2			2	Eucalyptus melliodora	526692.68	6123808.41	-35.0280	147.2926
198	252	90	5	3		8	Eucalyptus albens	526581.07	6123155.41	-35.0339	147.2914

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199	253	100	2			2	Eucalyptus albens	526904.94	6123004.55	-35.0353	147.2950
200	254	110	5	1	1	7	Eucalyptus albens	526459.72	6121446.64	-35.0493	147.2901
201	255	90	3		2	5	Eucalyptus albens	526435.89	6121280.34	-35.0508	147.2899
202	256	180	7	2	3	12	Eucalyptus albens	526437.91	6121007.24	-35.0533	147.2899
203	257	120	3		2	5	Eucalyptus albens	526487.04	6120975.83	-35.0536	147.2905
204	258	100	2	2		4	Eucalyptus microcarpa	527298.14	6123007.98	-35.0352	147.2993
205	259	70	1			1	Eucalyptus microcarpa	527395.00	6122994.70	-35.0354	147.3003
206	260	90	5			5	Eucalyptus microcarpa	527413.69	6122988.19	-35.0354	147.3005
207	261	130	2	1		3	Eucalyptus microcarpa	527519.89	6122973.51	-35.0355	147.3017
208	262	90	2	2		4	Eucalyptus microcarpa	527840.41	6122924.71	-35.0360	147.3052
209	263	90	2			2	Eucalyptus microcarpa	527927.59	6122906.17	-35.0361	147.3062
210	264	100	5	1	2	8	Eucalyptus microcarpa	528250.90	6122673.65	-35.0382	147.3097
211	265	110	4			4	Eucalyptus microcarpa	528129.62	6122648.98	-35.0385	147.3084
212	266	120	5	4	2	11	Eucalyptus microcarpa	528087.99	6122657.79	-35.0384	147.3080
213	267	80	5	2		7	Dead	528088.25	6122657.69	-35.0384	147.3080
214	268	120	3			3	Dead	528089.83	6122656.49	-35.0384	147.3080
215	269	120	2			2	Eucalyptus melliodora	528286.39	6122526.55	-35.0396	147.3101
216	270	100	2	4		6	Dead	528287.29	6122523.36	-35.0396	147.3101
217	271	100	5			5	Dead	528288.96	6122514.96	-35.0397	147.3102
218	272	130	2		3	5	Dead	528134.14	6122307.40	-35.0415	147.3085
219	273	90	3			3	Eucalyptus melliodora	529464.65	6120389.80	-35.0588	147.3231
220	274	100	3			3	Eucalyptus melliodora	529447.56	6120372.39	-35.0589	147.3229
221	275	100	2	1	1	4	Eucalyptus melliodora	529437.38	6120389.34	-35.0588	147.3228
222	276	120	2	2		4	Eucalyptus microcarpa	529426.47	6120382.57	-35.0589	147.3227
223	277	80	5			5	Eucalyptus microcarpa	529457.09	6120327.86	-35.0593	147.3230
224	278	100	1	1		2	Eucalyptus microcarpa	529445.98	6120273.84	-35.0598	147.3229
225	279	90	2	2		4	Eucalyptus microcarpa	529445.96	6120273.64	-35.0598	147.3229
226	280	110	2	2		4	Eucalyptus microcarpa	529454.52	6120279.50	-35.0598	147.3230
227	281	90	3	1	1	5	Eucalyptus microcarpa	529414.93	6120257.75	-35.0600	147.3226
228	282	80	1	1	2	4	Eucalyptus microcarpa	529405.12	6120259.14	-35.0600	147.3225
229	283	90			2	2	Dead	529400.80	6120275.37	-35.0598	147.3224
230	284	110	3		2	5	Dead	529419.19	6120219.23	-35.0603	147.3226
231	285	90	2	1	2	5	Dead	529418.71	6120213.45	-35.0604	147.3226

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232	286	120	3		2	5	Dead	529391.62	6120123.74	-35.0612	147.3223
233	287	120	2	5		7	Eucalyptus melliodora	529373.98	6120116.57	-35.0613	147.3221
234	288	100	3	1	1	5	Eucalyptus melliodora	529366.91	6120119.76	-35.0612	147.3221
235	289	90			3	3	Dead	529359.02	6120121.50	-35.0612	147.3220
236	290	100	5	2		7	Eucalyptus microcarpa	529365.44	6120013.89	-35.0622	147.3221
237	291	100	3		5	8	Eucalyptus microcarpa	529362.56	6119981.19	-35.0625	147.3220
238	292	80	3	4		7	Eucalyptus melliodora	529348.22	6119999.99	-35.0623	147.3219
239	293	60	2			2	Eucalyptus microcarpa	529310.79	6119896.81	-35.0632	147.3215
240	294	120	5	2	1	8	Eucalyptus microcarpa	529311.54	6119896.41	-35.0632	147.3215
241	295	100	5		2	7	Eucalyptus microcarpa	529289.72	6119820.75	-35.0639	147.3212
242	296	110	5		2	7	Eucalyptus microcarpa	529304.99	6119812.60	-35.0640	147.3214
243	297	110	3	3	1	7	Eucalyptus melliodora	529283.29	6119787.19	-35.0642	147.3212
244	298	110	3		4	7	Eucalyptus blakelyi	529275.89	6119746.31	-35.0646	147.3211
245	299	160	3	2	1	6	Eucalyptus melliodora	529247.92	6119690.60	-35.0651	147.3208