New South Wales Vegetation Classification and Assessment: Part 2 Plant communities of the NSW South-western Slopes Bioregion and update of NSW Western Plains plant communities, Version 2 of the NSWVCA database

J.S. Benson

Science and Public Programs, Royal Botanic Gardens and Domain Trust, Sydney, NSW 2000, AUSTRALIA.
Email: john.benson@rbgsyd.nsw.gov.au

Abstract: This third paper in the NSW Vegetation Classification and Assessment series covers the NSW South-western Slopes Bioregion of 8.192 million hectares being 10% of NSW. A total of 135 plant communities, comprising 97 new communities and 38 previously described communities, are classified. Their protected area and threat status is assessed. A full description of the 135 plant communities is provided in a 400 page report, generated from the NSWVCA database, on the CD accompanying this paper. *Eucalyptus*-dominated grassy or shrubby woodlands and open forests are the main types of vegetation in the bioregion. The CD also contains a read-only version of Version 2 of the NSWVCA database that includes updated information on the plant communities previously published in Version 1 of the NSWVCA covering the NSW Western Plains. Six new communities are added to the Western Plains. The vegetation classification and assessment is based on published and unpublished vegetation surveys and map unit descriptions that are listed in the NSWVCA Bibliography on the CD, expert advice and extensive field checking.

Over 80% of the native vegetation in the NSW South-western Slopes Bioregion has been cleared making it the most cleared and fragmented of the 18 IBRA Bioregions in NSW. Exotic plant species dominate the ground cover outside conservation reserves, state forests, roadsides and travelling stock reserves. As of September 2008 about 1.9% of the Bioregion was in 105 protected areas and 28 of the 135 plant communities were assessed to be adequately protected in reserves. Using NSWVCA Threat Criteria, 18 plant communities were assessed as being Critically Endangered, 33 Endangered, 29 Vulnerable, 25 Near Threatened and 30 Least Concern. Current threats include over-grazing, especially during drought, exotic species dominance of the ground cover, impacts of fragmentation on species persistence and genetic diversity and impacts of lower rainfall due to climate change.

To address these threats, linking and enlarging vegetation remnants through revegetation (including regenerating native ground cover) is required. Some progress is being made through re-vegetation schemes driven by the NSW 2003 Natural Resource reforms, however, more incentive funding for landholders would accelerate the re-vegetation program.

Cunninghamia **(2008) 10 (4): 599–673**

Introduction

This is the third paper in the New South Wales Vegetation Classification and Assessment (NSWVCA) project that aims to finely classify and assess the status of plant communities in New South Wales (NSW). The paper and its accompanying CD provide a detailed classification and assessment of the native vegetation in the New South Wales South-western Slopes Bioregion (NSWSWS Bioregion) defined in IBRA Version 6 of Thackway & Cresswell (1995).

Benson (2006) contains a history and description of vegetation classification internationally, in Australian and in NSW; descriptions of the parameters of the NSWVCA project; descriptions of the NSWVCA database fields, reports and software; descriptions of the protected area assessment rules and threat criteria used to assign protected area adequacy and threat categories to the classified plant communities. Benson (2006) includes a number of figures showing planning regions in NSW, including bioregions and catchment management authority areas (CMAs). These figures should be referred to when reading this paper.

© 2008 Botanic Gardens Trust

Benson et al. (2006) contains Version 1 of the NSWVCA database with 213 plant communities classified and described for the eight western-most NSW IBRA bioregions that comprise the semi-arid and arid NSW Western Plains covering 57% of NSW. The completion of the NSWVCA for the NSWSWS Bioregion, reported here, in addition to the NSW Western Plains, means that 53 million hectares or 65% of NSW have been covered by a consistent and detailed vegetation classification and plant community status assessment (Figure 1).

As outlined in Benson (2006), the project builds on the Australian vegetation classification of Beadle (1981) using existing analyses of floristic site data, vegetation map unit descriptions, vegetation reports, expert knowledge and field checking to classify and assess the status of native vegetation. Extensive field surveys were used to check previous classifications and help to gap fill where data were lacking. The hierarchical level of the vegetation classification generally conforms to the "plant association" or sub-association" levels defined in Beadle & Costin (1952) or Levels 5/6 in the National Vegetation Information System (NVIS) (ESCAVI 2003). While the NSWVCA classification is mainly based on floristic variation, abiotic factors such as substrate and soil have been taken into account in defining the plant communities (Benson 2006).

The NSWVCA is assisting environmental site assessment with its classified plant communities progressively being incorporated into the Biometric Tool in the NSW Property Vegetation Planning process (Gibbons et al. 2005). It should be useful for setting priorities in national, state, regional or local planning targets and for setting priorities for new conservation reserves or secure property agreements to fulfil a comprehensive, representative protected area system in NSW. The inputs, products, uses and outcomes of the NSWVCA project are summarised on the flow diagram in Figure 2.

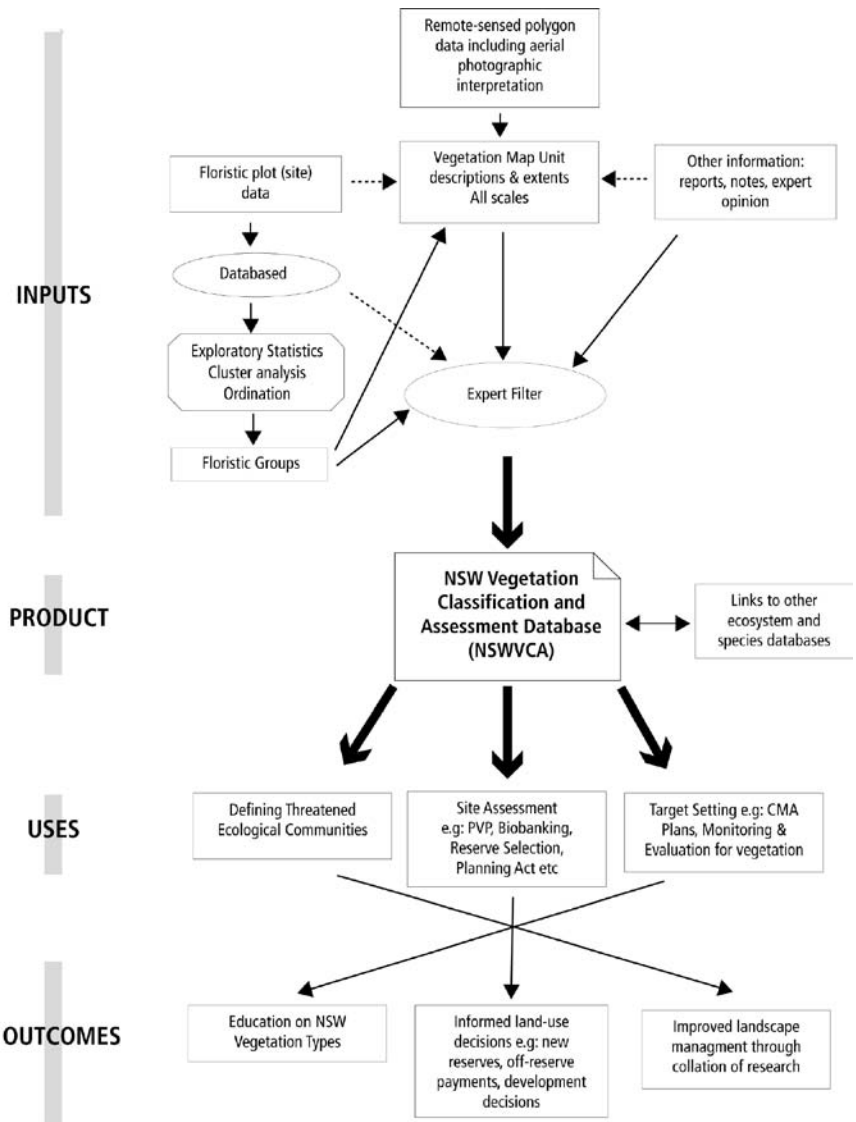

Fig. 2. Flow diagram showing the data and expert inputs to product the NSWVCA product, its uses and prospective outcomes.

The CD accompanying this paper (back pocket of the journal) contains the descriptions of the plant communities in the NSW South-western Slopes Bioregion and updated information on the plant communities previously described for the NSW Western Plains (Benson et al. 2006). The CD also contains a read only version of Version 2 of the NSWVCA database.

The study area: NSW South-western Slopes Bioregion

The NSW South-western Slopes Bioregion includes 8,191,970 hectares, being 10.2% of the area of NSW (Figures 1 & 3). It includes an area from the Victorian border east of Albury in the south to the town of Dundedoo in the north being bounded in the east by the cooler and moister South Eastern Highlands Bioregion and in the west by the drier and hotter NSW Western Plains. From north to south the NSWSWS Bioregion includes the major inland towns of Wellington, Mudgee, Parkes, Forbes, Cowra, West Wyalong, Temora, Boorowa, Cootamundra, Narrandera, Wagga Wagga, Tumut and Albury.

The Bioregion includes the South Western Slopes and most of the Central Western Slopes Botanical Divisions defined in Anderson (1961). Its western boundary abuts the Riverina and Cobar Peneplain Bioregions, its northern boundary abuts the Darling Riverine Plain and Brigalow Belt South Bioregions and its eastern boundary abuts the Sydney Basin and South Eastern Highlands Bioregions.

The NSWSWS Bioregion includes the mid-sections of the Murray, Murrumbidgee, Lachlan and Central West Catchment Management Authority areas (CMAs) that run westwards (inland) from the Great Dividing Range (Figure 3). A total of 25 Local Government Areas (LGAs) are fully or partly within the NSWSWS Bioregion.

A comprehensive summary of abiotic and biotic features in the NSWSWS Bioregion is available in a scoping study report produced by NSW National Parks and Wildlife Service (NPWS)(2001).

Climate

The NSWSWS Bioregion includes two of the nine Australian climate zones defined by Stern (2000) (see Figure 3 in Benson 2006) that cover NSW. These are the Temperate – No Dry Season (hot summer) climate zone that is more or less congruent with the Lower Slopes Sub-region and the Temperate – No Dry Season (warm summer) climate zone that is more or less congruent with the Upper Slopes Sub-region. Mean annual rainfall varies from over 800 mm at Tumut in the east of the Bioregion to 470 mm at Condobolin in the western side of the bioregion (NSW NPWS 2003). Maximum annual average monthly temperatures range from 24° to 33° C and minimum annual average monthly temperatures range from -0.7° to 3.2°C (NSW NPWS 2003). Typical mean daily temperatures of some towns are: 24° at Dubbo, 21° at Albury and 23° at Mudgee.

Physiography

The physical characters of the NSWSWS Bioregion are summarised in NSW NPWS (2003) and NSW NPWS (2001). Moore (1953a) describes the climate, geology and soils of the southern two thirds of the area including the relationships of these abiotic factors with vegetation types. Detailed descriptions and maps of soil landscapes are provided in King (1989) for the Forbes 1:250,000 map sheet and in Chen & McKane (1996) for the Wagga Wagga 1:100,000 map sheet.

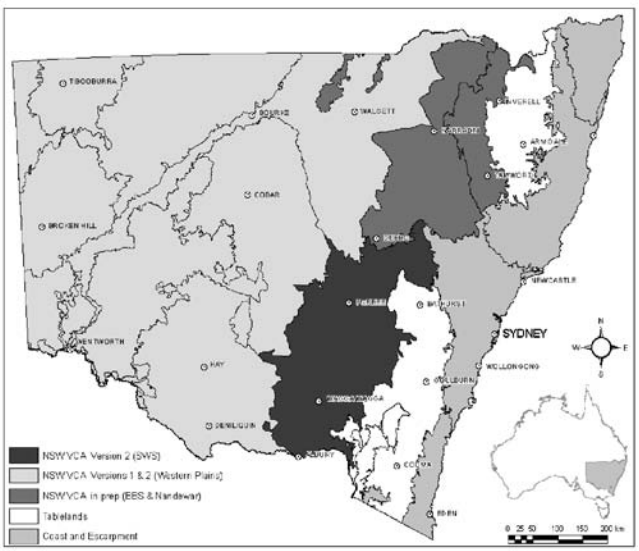

Fig. 1. Progress of the NSWVCA project across New South Wales, Australia. Version 1 (Benson et al. 2006) covered the NSW Western Plains. Version 2 updates the NSWVCA for the NSW Western Plains and includes extra plant communities occurring in the NSW South-western Slopes Bioregion (NSWSWS) (this volume). Version 3 will add the Brigalow Belt South and Nandewar Bioregions to the NSWVCA.

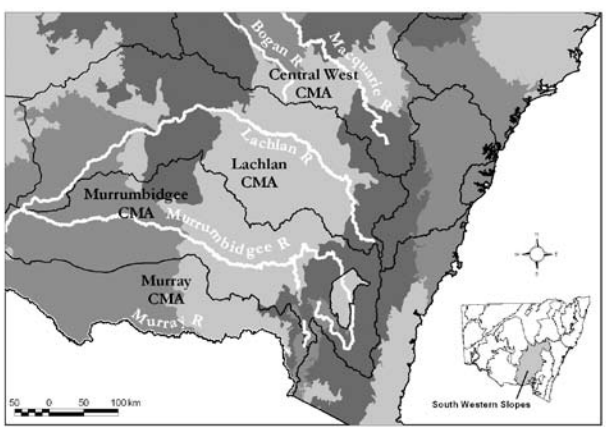

Fig. 3. The 8 million hectare NSW South-western Slopes Bioregion showing major rivers and the location of four Catchment Management Authority areas (CMAs) that intersect the bioregion.

The NSWSWS Bioregion is divided into the Lower Slopes and Upper Slopes Sub-regions (DEC NSW 2004) (Figure 4). These sub-regions contain contrasting substrates, soils and vegetation. The landform patterns in the Lower Slopes sub-region are dominated by flood plains, alluvial plains and terrace plains with some isolated rocky hills. Overall, alluvial deposits cover 33% of the whole NSWSWS Bioregion (NSW NPWS 2001). Typical soils in the Lower Slopes Sub-region include alluvial brown, grey and red clays, clay-loams and red or black earths (loams). Gilgai soils have developed on some low lying plains with heavy clay soils such as at Bullenbong Plain near Lockhart and near Albury.

Aeolian sand to loam soil occurs on rises near major rivers or on sand plains that over-top alluvial sediments. Fine aeolian loam or clay soils (parna) occur from Temora in the north extending to south of Wagga Wagga in the south. Shallow, gravel soils occur on low rises composed of sedimentary sandstones, ironstone or metamorphic rocks. Skeletal sandy lithosol soils occur on rocky hills or ranges composed of siliceous rocky substrates such as sandstone and granite, although this type of terrain is limited in extent in the Lower Slopes Sub-region.

Lakes occur in the Lower Slopes Sub-region west of Forbes (Nerang Cowal, Lake Cowal), to the south of Wagga Wagga near Walla Walla (for example Gum Cowal) and in the far south-west of the bioregion such as Lake Urana. The beds of these lakes contain grey clay soil.

The Upper Slopes Sub-region contains more complex geological and soil compositions influenced by the major geological feature – the Lachlan Fold Belt (Gray 1997). The main landform patterns are hills with small areas of floodplains and alluvial plains along major river valleys. The hills are very steep in places. Substrate includes sedimentary, metamorphic, volcanic rocks, igneous rocks with fine-grained sedimentary rocks including shale and mudstone (NSW Department of Mines 1970). Common metamorphic rocks include slate and phyllite. The siliceous metamorphic rock quartzite commonly outcrops on the crests of hills throughout the Upper Slopes Sub-region.

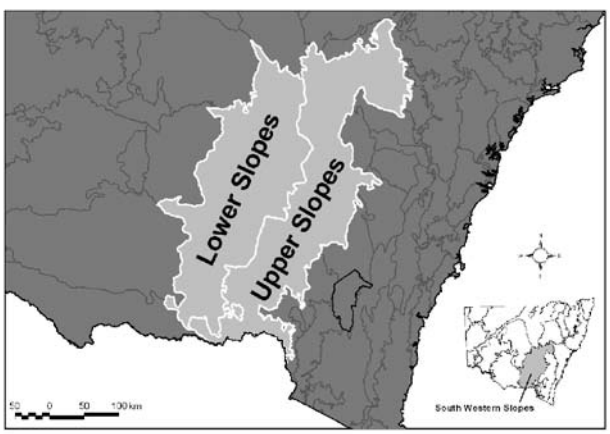

Fig. 4. Lower Slopes and Upper Slopes Sub-regions within the NSW South-western Slopes Bioregion.

North-south orientated strike ridges are primarily composed of sandstone. Some hills are composed of conglomerate, such as near Reefton in the mid-north, Benambra in the south and Mount Arthur near Wellington in the north (pers. obs). Limited outcrops of limestone occur, the most famous being at Wellington Caves (Osborne 1998). Fine-grained sedimentary rocks such as shale and mudstone are common in the upper Macquarie River valley and in the region from Mudgee to Wellington in the far north of the bioregion. Acid volcanic rocks (mainly rhyolite) outcrop on hills north of Boorowa including at Wyangala Dam and on the Hervey and Currumbena Ranges near Peak Hill (including part of Goobang National Park) in the northern part of the bioregion (NSW Department of Mines 1971, 1972).

Various types of granite outcrop on the hills between Albury – Wagga – Tumbarumba in the south, on the Boginderra Hills near Temora and at Eugowra east of Forbes in the north NSW Department of Mines 1971). Granodiorite occurs near Tumbarumba on the south-eastern edge of the bioregion. Quartz-rich adamellite outcrops just north of Tumut (including in Mudjarn Nature Reserve) and near Kyeamba.

The main soil types in the Upper Slopes Sub-region are yellow and red podsolic (texture contrast) soils, red or brown solodic soils derived from sedimentary or acid volcanic (rhyolite) rocks along with yellow earths and red earths (Chen & McKane. 1996). Lithosol soil is common on rocky hills.

Small areas of Tertiary basalt in the Upper Slopes Sub-region form dark (chocolate) loam (or black earth) soils. Quaternary alluvium composed of gravels, sands and loams occur along river valleys. Colluvium occurs on outwashes at the base of hills. Organic or peaty soils have developed in some valleys where sediment has accumulated and water flow has been impaired, sometimes forming swamps. Wetlands occur in old river channels or in depressions on the floodplains of the Murray, Murrumbidgee and Lachlan Rivers.

One of the largest areas of serpentinite rocks in NSW outcrop between Cootamundra – Coolac – Tumut in the south-eastern part of the bioregion (Ashley et al. 1971). The serpentinite-derived soil supports distinctive vegetation exhibiting unusual structure and species composition (Lyons et al. 1974).

Land use and land degradation

The Aboriginal and European occupation history of the NSWSWS Bioregion is summarised in NSW NPWS (2003). Most of the area north of the Murrumbidgee River was occupied by Wiradjuri people. The Yorta Yorta people occupied the Murray River region. By the 1850s Aboriginal culture had been severely disrupted by the impacts of European land settlement, disease and direct confrontation.

John Oxley was the first European explorer to traverse the northern section of the NSWSWS Bioregion in 1817 and Charles Sturt crossed the southern part of the Bioregion in 1827. Shortly after, settlers arrived with livestock and radical changes to the native vegetation of the bioregion commenced. Gold rushes to central NSW during and after the 1850s lead to a rapid growth in the European population and increases in pastoral production. Currently, a large gold mine is in production at Lake Cowal, west of Forbes.

The NSWSWS Bioregion is now one the most intensively farmed regions in Australia with 96% of the area freehold land (NSW NPWS 2001). During the last 50 years large areas of grazing land has been converted to irrigated and dryland cropping. Irrigation for pasture and horticultural crops such as stone fruit and grapes occurs on rich alluvial flats and adjoining hills near to the major rivers. Dryland cropping of wheat, barley and rape seed occupy a high proportion of the Lower Slopes Sub-region and a smaller part of the Upper Slopes Sub-region.

Today, over 80% of the woody cover of native vegetation has been cleared (Figure 5) (Benson 1999, Pressey et al. 2000, Keith & Simpson 2008). Most of the uncleared native vegetation has been heavily grazed and this has impacted on species composition and vegetation structure. Sheet and gully soil erosion is common on steep hills in the Upper Slopes Sub-region, while sheet and wind erosion have impacted the soils of the alluvial plains in the Lower Slopes Sub-region. Salinity affects at least 93,000 ha of land in the bioregion (Littleboy et al. 2001 cited in NSW NPWS 2001).

An expansion of the use of exotic pasture and fertiliser since World War II has lead to a dominance of exotic grasses and forbs in the ground cover over most of the bioregion (Prober 1996). This limits the potential for restoration in these landscapes. Very few large areas of native vegetation remain on high fertile soils in valleys or on alluvial plains. The largest and most intact native vegetation remnants occur on low nutrient soils on steep hills or rocky ranges (NSW NPWS 2001). Smaller patches of grassy woodland remnants occur on travelling stock routes and roadsides. Small areas of forests and woodlands on aeolian sandy-loam soils, containing stands of the valuable timber tree White Cypress Pine (*Callitris glaucophylla*), were protected in forest preserves in the late 19th Century and early 20th Century. Many of these later became State Forests under the NSW Forestry Act 1916 and some have since been transferred to conservation reserves under the NSW National Parks and Wildlife Act 1974.

Less than 2% of the Bioregion is in protected areas including various types of conservation reserves and secure property agreements. In addition to protected areas only about 1.5% of the bioregion is State Forest and less than 1% is held in other public ownership such as travelling stock reserves and road reserves, therefore, only 4 to 5% of the NSWSWS Bioregion is in public ownership. With the exception of the 42,000 ha Goobang National Park near Peak Hill and the 24,000 ha Woomargama National Park near Holbrook, most of the native vegetation remnants and conservation reserves are tiny in size. This is demonstrated in the analysis of native vegetation patch sizes by Gibbons & Boak (2002) for the Holbrook region (just north of Albury) where the vast majority of patches were found to be less than 10 ha in size.

Another impact on native vegetation and natural corridor links has been a large expansion of pulp and timber exotic pine plantations (*Pinus radiata*) in the Tumut to Tumbarumba district in the south-eastern corner of the NSWSWS Bioregion.

Previous botanical studies

Moore (1953a) describes the vegetation of the southern half of the NSWSWS Bioregion (south of the town of Young) in a vegetation classification hierarchy similar to the scheme developed by Beadle & Costin (1952). His coarse-scale (1:500,000) vegetation map depicts the pre-European distribution of 10 broadly classified "alliances". The diagrammatic relationship of the environmental variables soil and climate with vegetation type presented on page 522 in Moore (1953a) remains relevant today. In a complementary paper, Moore (1953b) discussed "disclimax" communities of the region in relation to proposed "original" vegetation.

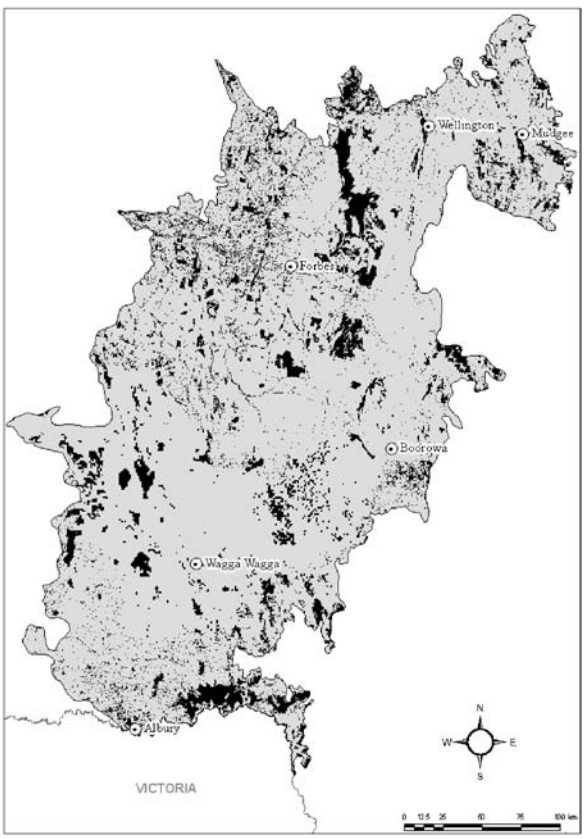

Fig. 5. Map showing cleared areas (light grey) and woody native vegetation remnants (black) in the NSWSWS Bioregion. Source: Keith & Simpson (2008).

After Moore's 1950s contributions, there was a hiatus in botanical survey and vegetation mapping in the NSW SWS Bioregion. However, since 1990 a number of botanical surveys have been undertaken and a number of vegetation maps have been produced. Some of these cover large areas such as a topographical map sheet area or a local government area but most cover smaller areas such as conservation reserves.

One of the first plot based vegetation surveys in the bioregion was the 1:250,000 vegetation mapping of the southern NSW wheatbelt covering the Forbes and Condobolin 1:250,000 map sheet areas by Sivertsen & Metcalfe (1995). This describes and maps major vegetation types in the central-western part of the Bioregion. Bos & Lockwood (1996) provide a floristic classification based on plot sampling of State Forests and some other areas in the southern half of the Upper Slopes Sub-region of the bioregion between Forbes and Albury. Austin et al. (2000) modelled 77 floristic groups across environmental gradients in the central Lachlan River region using over 1000 records of canopy and perennial shrub species. While this provided limited description of the full plant species composition of the vegetation, it provided an insight to the main canopy species groupings in that region.

As part of the NSW Native Vegetation Mapping Program (2000–2005), Lewer et al. (2003) plot sampled and mapped native vegetation over six 1:100,000 scale map sheet areas on the north-western edge of the Bioregion extending into the eastern edge of the adjoining Cobar Peneplain Bioregion. Of these six maps, the Tullamore, Tottenham and Bogan Gate 1:100,000 map sheets are in the NSW SWS Bioregion. This finer scale mapping covered part of the previous 1:250,000 scale mapping in Sivertsen & Metcalfe (1995). Lewer et al. (2003) describe 61 floristic groups (20 of which are non-woody) from analysis of plot data. These groups were lumped into 27 map units. Some of these floristic groups and map units are mainly distributed outside the NSW SWS Bioregion and have previously been collated into the NSWVCA for the NSW Western Plains section (Benson et al. 2006).

Seddon et al. (2002) document the vegetation of the Little River catchment in the Central West CMA in the far northern part of the NSW SWS Bioregion. This includes modelling pre-European extent of vegetation types. To the west of Little River, Porteners (1997) produced a detailed vegetation map and vegetation classification of the extensive Goobang National Park that includes parts of the Hervey and Currumbena Ranges near Peak Hill. A number of distinct vegetation types are confined to that region. Subsequently, Porteners (2001) surveyed and mapped the vegetation in Big Brush, Ingalba and Pucawan Nature Reserves near Temora in the Lower Slopes Sub-region. To the north west of these three reserves, Lilley & Tidemann (1994) documented the vegetation in Buddigower Nature Reserve near West Wyalong. Most recently, Porteners (2007) mapped and described the plant communities in Koorawatha, Dananbilla, Gungewalla and Illunie Nature Reserves between Boorowa and Cowra in the Upper Slopes Sub-region.

East of Goobang NP, the conservation reserves Nangar, Weddin Mountains and Conimbla National Parks were surveyed and mapped by ERM Mitchell McCotter (1996). Lembit & Skelton (1998) mapped and surveyed Barton, Copperhannia and Dapper Nature Reserves on the north-eastern boundary of the NSW SWS Bioregion They also mapped Boginderra Hills Nature Reserve near Temora in the Lower Slopes Sub-region. Hill & Peake (2000) mapped and surveyed the Avisford Nature Reserve, near Mudgee, at the north-eastern tip of the NSW SWS Bioregion. The vegetation in the Mudgee part of the NSW SWS Bioregion intergrades with vegetation types more typical of the Sydney Basin and Brigalow Belt South Bioregions.

Gellie (2005) produced a forest ecosystem classification for the south-east corner of NSW including the southern part of the Upper Slopes Sub-region of the NSWSWS Bioregion. The classification was based on analysis of floristic site data and resulting floristic groups were mapped through modelling. A site specific vegetation survey and on-ground aerial photographic mapping exercise was completed by Gellie & Fanning (2004). This produced a detailed floristic classification and fine-scale vegetation maps of 14 conservation reserves in the NSWSWS Bioregion. The reserves were Benambra National Park (NP), Courabyra Nature Reserve (NR), Downfall NR, Ellerslie NR, Livingstone NP, Livingston State Conservation Area (SCA), Minjary NR, Mudjarn NR, Nest Hill NR, Tabletop NR, Tumblong SCA, Ulandra NR, Wereboldera SCA and Woomargama NP. A supplementary survey by Gellie (EcoGIS 2005) sampled and mapped the vegetation in Bogandyera, Clarkes Hill and Jingellic Nature Reserves in the upper Murray River catchment. The combined survey and mapping in Gellie & Fanning (2004) and EcoGIS (2005) cover the most complex array of vegetation types in the NSWSWS Bioregion – a complexity reflecting the Albury to Yass region's rugged topography, substrate variation and relatively high rainfall.

Unpublished NSW NPWS file notes describe vegetation in some conservation reserves and NSW State Forests has produced Forest Type maps for most of the State Forests in the Bioregion including areas dedicated as Flora Reserve under the Forestry Act 1916. A detailed account of the forest history for three White Cypress Pine (*Callitris glaucophylla*) – dominated State Forests in the Forbes region is provided in Allen (1998).

Priday (2004) produced a fine-scale vegetation map of the Wagga Wagga Shire largely based on substrate. The Boorowa Shire, situated in the Upper Slopes Sub-region, was sampled and mapped into broad vegetation units by NSW NPWS (2002). Priday (incomplete 2006) produced a biolandscape vegetation classification covering the southern half of the NSWSWS Bioregion emphasising substrate in the ecological classification.

To meet some interim planning needs of the Lachlan and Central West Catchment management Authorities, DEC NSW (2006, 2006a) produced 1:250,000 scale maps depicting broadly typed vegetation communities in these two catchment areas. While this mapping did not include plot sampling, it included aerial photographic interpretation of some previously unmapped areas and rapid ground checking of areas lacking existing map or plot data.

Wetlands downstream (westwards) of the Hume Reservoir on the Murray River were classified on hydrological features and mapped by Pressey (1986). The *Eucalyptus camaldulensis* (River Red Gum), *Eucalyptus largiflorens* (Black Box) and other floodplain plant communities on the Murray River west of Albury were mapped by Margules & Partners (1990) and floristically classified by Smith & Smith (1990). Webster & Davidson (2003) have produced an inventory of floodplain wetlands in the upper Murray (east of Albury) and mid-upper Murrumbidgee River floodplains. Webster (2007) subsequently produced a management history of some of the upper Murray River wetlands.

Most conservation reserves in the NSW SWS Bioregion have now been mapped and/or plot sampled. Since these reserves occupy topographically and geologically diverse landscapes in ranges and hills, the more complex mosaics of vegetation types have been sampled and documented. Vegetation mapping and sample plot data outside conservation reserves remains poor. Based on the relationships between vegetation heterogeneity and landscape heterogeneity it is likely that the vegetation in these areas was probably more homogenous due to large areas of similar soil types where grassy box woodlands would have occurred.

Gibbons & Boak (2002) produced a study on isolated trees and patch sizes of different vegetation types in the Holbrook area in the southern part of the NSW SWS Bioregion. Their findings have implications for threat assessment and vegetation management discussed below.

Educational booklets containing detailed notes on vegetation types and their species composition have been produced for the vegetation of the upper Murray / Murrumbidgee River catchments by Stelling (1998) and for the mid-Lachlan River region by the now defunct Mid-Lachlan Regional Vegetation Committee (1999).

In summarising, irrespective of the early vegetation survey and mapping by Moore (1953), the biogeographical approach by Priday (2006), surveys of conservation reserves and some local government areas, there has been no consistent mapping or description of vegetation types across the whole NSWSWS Bioregion. Sound plot data exists for most reserves but are scarce for private land. This mirrors the vegetation data situation in the NSW Western Plains reported in Benson et al. (2006). Therefore, additional plot data sampling all landscapes, data analyses and regional, fine scale vegetation mapping could refine this initial vegetation classification.

The vegetation classification

A discussion on methods used to classify vegetation for the NSWVCA is outlined on pages 341–344 in Benson (2006). These include collation and cross-checking of all available vegetation surveys, vegetation mapping, floristic site data and extensive field checking. All sources, including map unit or floristic group names or numbers used to define each plant community, are cited in the "Authority" field in the NSWVCA database. These references are included in the Reference field of each plant community record in the database and are listed in the NSWVCA Bibliography in a spreadsheet on the CD accompanying this article.

The vegetation classification is based on floristic criteria taking into account physiognomic features. The classification places an emphasis on the numerically classified floristic groups from relevant regional and local vegetation survey projects. Available cluster analysis outputs were examined when deciding on species groups, and individual project authors were contacted to discuss whether to combine or split their floristic groups for a State project. These decisions are documented in the Authority field of the database. As large parts of the NSW SWS Bioregion were found to be deficient in quantitative floristic data, I derived some of the plant communities from map descriptions, species lists, field checking or other qualitative information.

The characteristic species listed in the three Characteristic Species strata fields in the database were mainly based on dominant species derived from plot data analyses or from field observations. Diagnostic species, defined in fidelity analyses (*sensu* Westhoff & Van der Maaral 1980), may also be listed. However, diagnostic species in vegetation classifications cannot necessarily be solely relied on to define boundaries between similar communities (Chytrý et al. 2002). The NSWVCA database does not presently contain a "fidelity" field for registering diagnostic species but such a field could be added.

Confidence ratings in the "Classification confidence level" field in the database reflect the quality of data supporting each plant community definition. A number of the plant communities are registered with a low-medium confidence rating due to a lack of data. This includes plant communities where expert opinion suggested they exist but site data was lacking to improve their definition and description.

Six field trips to ground truth communities were undertaken (April 2002, October 2002, May 2005, April–May 2006, February 2007 and May 2007) (Figure 6). Vegetation was checked at over 300 field stops, made during approximately 10,000 km of road traverse that included most major and minor roads and most conservation reserves. At each field stop dominant plant species and physiographic data were recorded in a notebook and a GPS site recording was taken. Copies of the notebooks are held by the Botanic Gardens Trust, Sydney.

The vegetation in most of the conservation reserves in the bioregion was field-checked. Botanical surveys and large-scale vegetation mapping in these reserves greatly assisted with the NSWVCA classification in the upper Murray and mid-Murrumbidgee River regions in the southern part of the bioregion and around the towns of Peak Hill and Mudgee in the northern part of the bioregion.

Each plant community was assigned a protected area adequacy code based on the threshold rules outlined in field 79 in Appendix A in Benson (2006). Similarly, each community is assigned a threat code based on the threat criteria outlined in Appendix B in Benson (2006). The combined protected area/threat code succinctly summarises the status of each community.

Recognition of NSWVCA plant communities for use in field site or office assessments will largely require comparison of characteristic species including diagnostic species with high fidelity, physiographic features such as soil type and landform pattern and geographical location. A comprehensive discussion on the topic field recognition of vegetation type, is given for the United States National Vegetation Classification in Jennings et al. (2006).

The NSWVCA database contains a query mode and search routine that can be used for listing candidate plant communities for a site assessment. Spatial context is provided through the database report options that allow communities to be listed by IBRA Bioregions, bioregion sub-regions, Local Government Areas and other types of geographical areas. The query mode, which is accessible in the non-read only version of the database, facilitates complex multi-field queries such as listing plant communities from a number of types of geographical areas combined with a number of the other 90 database fields. If in the future links can be constructed between the database and maps of plant communities, the spatial capacity of the NSWVCA will improve. It is proposed that future vegetation mapping in NSW, in regions covered by the NSWVCA, will refer map unit classifications to those in the NSWVCA (pers. comm., DECC NSW Vegetation Information System, in development). A matrix-like key to the plant communities would assist with filtering plant communities in database searches for regional or site assessments. Such a key would likely use database fields such as characteristic species, geographical location, abiotic variables and photographs (see future progress section below).

Estimates of extent

The methods for estimating pre-European extent, current extent and extent in protected areas are outlined in Benson (2006) and Benson et al. (2006). All available vegetation maps were interrogated using geographical information (GIS) software. Accurate estimates (within 10% error) are provided for extent in many of the protected areas. However, because contextual vegetation mapping is lacking for the

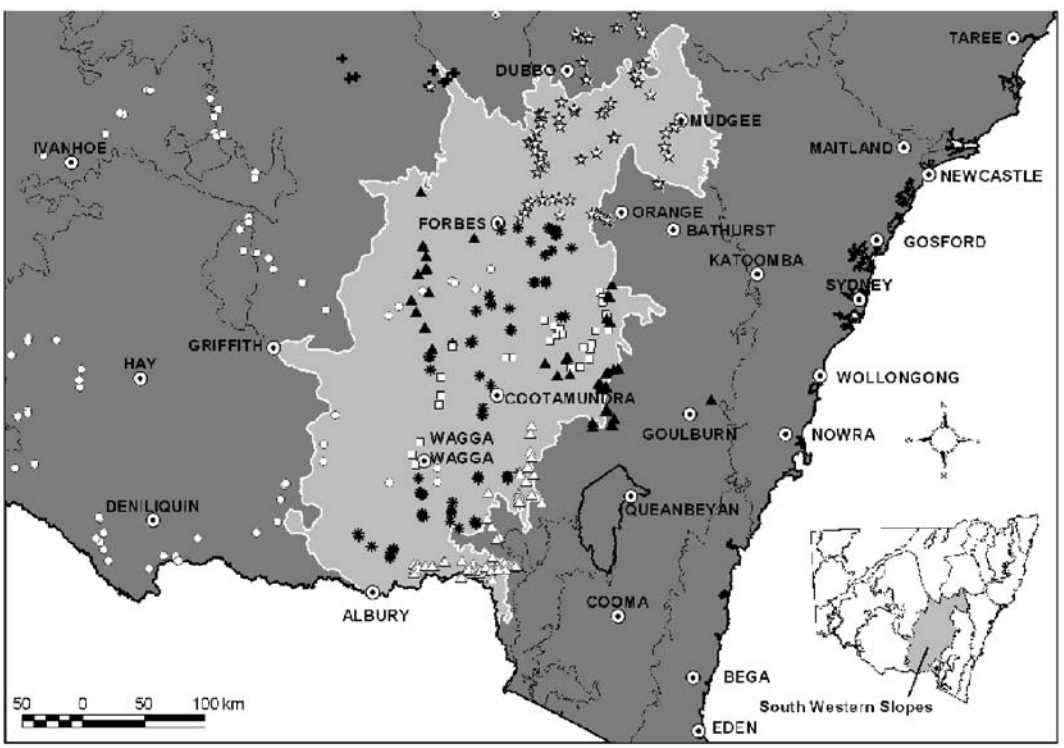

Fig. 6. Locations of field checks undertaken during six field trips between 2002 and 2007 that assisted in classifying the vegetation of the NSW South-western Slopes Bioregion.

bulk of the NSWSWS Bioregion, pre-European and current extent estimates for many plant communities were recorded with a low accuracy. Also, the sum of all pre-European extents for all the plant communities listed in the NSW South-western Slopes Bioregion is greater than the size of the bioregion (8.19 million hectares). This is because the NSWVCA records total extent over the full range of each plant community, not just its area in bioregion. Many NSWSWS plant communities extend into the South Eastern Highlands Bioregion in the east or into the NSW Western Plains Section of NSW to the west.

Plant community nomenclature

Historically, both internationally and in Australia, the naming of plant communities has been inconsistent when compared to the naming of species. No universal protocol for naming plant communities has been developed whereas species nomenclature follows the Latin binomial naming system devised in *Species Plantareum* by Carl Linneas in 1753. A plant community naming system was canvassed nearly 100 years ago at the 3rd International Botanical Conference in Brussels by Flahault & Schroter (1910). Subsequently, a hierarchical classification system of using scientific names of one to a few characteristic plant species was developed by the Zurich-Montpellier School (Braun-Blanquet 1932). This was modified for describing vegetation in Australia by Beadle & Costin (1952) – a system that remains influential today. Since then, numerous naming systems have been applied to vegetation classification and mapping. This deficiency in standardised nomenclature was discussed over 50 years ago by Moore (1953, page 498) in his seminal paper on the vegetation of the NSW south-western Slopes.

Subsequent to the plant community classification and nomenclature used in Beadle & Costin (1952), Carnaham (1990) produced standard names for the major structural vegetation types across Australia with reference to dominant plant genera. At finer levels of vegetation classification, nomenclature has varied widely. For example, regional ecosystems classified in Queensland are identified by a number followed by a description (Sattler & Williams 1999 and web updates). Alternatively, Victorian Ecological Vegetation Classes (see web link http://www.dse.vic.gov.au/DSE/nrence.nsf of the Victorian Department of Sustainability and Environment) contain short names that depict vegetation structure and landform (e.g. Low Rise Woodlands) mostly avoiding using English names of characteristic plant species.

Short structural / life–form nomenclature has also been applied in NSW regional vegetation surveys. For example, Keith & Bedward (1999) apply names such as "Lowland Swamp", "Montane Heath" or "Foothills Dry Scrub Forest" to their map units covering the Eden region of south-eastern NSW. Tozer (2003) uses names such as "Shale Hills Woodland" and "Riparian Forest" in his map units for the Cumberland Plain in western Sydney. However, while these names are easy to use and recall, they are so generic that they could be applied to numerous ecological communities across Australia and throughout the world.

In order to overcome the nomenclature limitations highlighted above, the NSWVCA applies three types of names to each plant community:

A NSWVCA database ID number (e.g. ID285). This will change only if a community is deleted, split or amalgamated;

A "Scientific Name" containing up to 12 binomial Latin names of characteristic species in up to three vegetation layers;

A "Common Name" (in English) that conveys a colloquial description of the vegetation. The Name usually includes one or more dominant / diagnostic plant species, the most prevalent vegetation structural formation (based on Walker & Hopkins 1990), a reference to soil, substrate or climate and a reference to the main geographical occurrence in which a plant community occurs, such as a bioregion or a locality. Some plant communities may be described without a reference to species, e.g. "ID66 Artesian Mound Spring forbland/sedgeland mainly of the Mulga Lands Bioregion". Although the "Common Name" may be more than 10 words long, it has the advantage of specifically describing a vegetation type for any region of Australia, thus avoiding confusion in provincial, national and international vegetation classifications.

The NSWVCA nomenclature is similar to that adopted for use in naming associations and alliances in the United States detailed in Jennings et al. (2006). The NSWVCA nomenclature was adopted for use in the NSW property vegetation planning scheme across New South Wales (Eco Logical Australia Pty Ltd 2006).

Table 1. List of 135 plant communities in the NSW South-western Slopes Bioregion by alphabetical order of formation group acronym showing their ID number; protected area/threat code; common name; pre-European, current and protected areas and ranges based on accuracy estimates; proportion in Catchment Management Authority areas (CMAs); and extent in protected areas with an accuracy code.

Notes: The formation group acronyms are correlated to formation group names in Table 4 in Benson (2006). The Protected Area/Threat code and the protected area extent accuracy codes M, E1-E4 are explained in Benson (2006). Folder 2 on the CD contains a full report (90 fields) and a short report (28 fields) listing all plant communities in the NSW South-western Slopes Bioregion. *indicates communities that occur in protected areas in the NSW Western Plains. # indicates communities that occur in protected areas in the NSW Tablelands or on the north-west slopes.

Formation Group Acronym	Veg ID: Threat/Protected Area Code Plant Community Common Name	ESTIMATED EXTENT: pre-European (range) Current Range (% pre-European) Protected Range (% pre-European)	% of Community in Bioregion	% of Community in CMA	Protected Area Name & Size (ha) (* = also on Western Slopes) (# = also on Tablelands or Northern Slopes)		Veg Area (ha) % Pre-European & Accuracy Code		
ASI	026: CE/5a Weeping Myall open woodland of the Riverina and NSW South-western Slopes Bioregions	1,600,000 (1,200,000 - 2,000,000) ha 120,000 - 200,000 ha (7.5 - 13 %) 740 - 890 ha (91 - 110 %)	<30% CP 30-70% NSS 30-70% RIV	<30% Central West <30% Lachlan <30% Murray 30-70% Murrumbidgee	Lake Urana NR* Oolambeyan NP* DE9905 PA*	302 21,839 663	10 715 88	<0.01 0.04 0.01	E3 M M
ASI	077: E/4a Yarran shrubland on peneplains and alluvial plains of central NSW	30,000 (15,000 - 45,000) ha 3,500 - 10,000 ha (12 - 33 %) 390 - 700 ha (72 - 130 %)	<30% BBS 30-70% CP <30% DRP <30% NSS	<30% Central West 30-70% Lachlan <30% Murray <30% Murrumbidgee <30% Western	Cocoparra NP* Cocoparra NR* Yathong NR*	8,364 4,775 108,768	1 42 500	<0.01 0.14 1.67	M M E2
ASI	317: LC/3b Currawang very tall shrubland on siliceous rocky ridges and cliffs mainly in the NSW South Western Slopes Bioregion	1,500 (1,400 - 1,600) ha 1,200 - 1,400 ha (80 - 93 %) 180 - 330 ha (70 - 130 %)	>70% NSS	<30% Central West <30% Lachlan <30% Murray <30% Murrumbidgee	Tabletop NR Livingstone NP Ulandra NR Dananbilla NR Nangar NP Weddin Mountains NP Benambra NP	102 1,918 3,958 2,436 9,356 8,697 1,400	31 25 89 20 30 20 42	2.07 1.67 5.93 1.33 2.00 1.33 2.80	M M M E4 E3 E3 E2
CCI	054: E/4a Buloke - White Cypress Pine woodland in the NSW South-western Slopes Bioregion	20,000 (10,000 - 30,000) ha 2,000 - 6,000 ha (10 - 30 %) 430 - 790 ha (70 - 130 %)	<30% DRP >70% NSS	<30% Central West 30-70% Lachlan	Goobang NP GE9902 PA# GE9903 PA#	42,347 8 935	600 8 4	3.00 0.04 0.02	M E2 E2

Formation Group Acronym	Veg ID: Threat/Protected Area Code Plant Community Common Name	ESTIMATED EXTENT: pre-European (range) Current Range (% pre-European) Protected Range (% pre-European)	% of Community in Bioregion	% of Community in CMA	Protected Area Name & Size (ha) (* = also on Western Slopes) (# = also on Tablelands or Northern Slopes)		Veg Area (ha) % Pre-European & Accuracy Code		
CCI	055: E/5a Belah woodland on alluvial plains in the central wheatbelt of NSW	450,000 (320,000 - 580,000) ha 49,000 - 91,000 ha (11 - 20 %) 380 - 690 ha (71 - 130 %)	<30% BBS <30% CP 30-70% DRP <30% NSS	<30% Border R/Gwydir <30% Central West <30% Namoi <30% Western <30% Lachlan	Boronga NR*	198	20	<0.01	E2
					Budelah NR*	4,049	1	<0.01	M
					Careunga NR#	492	395	0.09	M
					Kirramingly NR#	1,329	5	<0.01	E2
					Macquarie Marshes NR*	19,465	30	0.01	M
					Wilbertroy FR	136	6	<0.01	M
					Boomi NR*	157	20	<0.01	E2
					Boomi West NR*	148	15	<0.01	E2
					Brigalow Park NR#	251	15	<0.01	M
					VCA0008	400	25	0.01	M
CCI	057: NT/3a Belah/Black Oak - Western Rosewood - Wilga woodland of central NSW including the Cobar Peneplain Bioregion	350,000 (250,000 - 450,000) ha 140,000 - 260,000 ha (40 - 74 %) 14,000 - 25,000 ha (72 - 130 %)	30-70% CP 30-70% MDD <30% NSS	<30% Central West 30-70% Lachlan <30% Murrumbidgee <30% Western	Kajuligah NR*	13,833	6,000	1.71	E3
					Langtree NR*	232	200	0.06	M
					Mount Grenfell HS*	1,365	380	0.11	E3
					Nombinnie NR*	72,128	3,900	1.11	E1
					Nombinnie SCA*	53,258	1,000	0.29	E2
					Oolambeyan NP*	21,839	1	<0.01	M
					Round Hill NR*	13,642	251	0.07	M
					Scrubby Mountain FR*	1,704	500	0.14	E3
					Yathong NR*	108,768	7,200	2.06	E2
CCI	085: NT/4a River Oak forest and woodland of the NSW South-western Slopes and South Eastern Highlands Bioregions	30,000 (15,000 - 45,000) ha 4,000 - 12,000 ha (13 - 40 %) 850 - 1,500 ha (71 - 120 %)	>70% NSS <30% SEH	30-70% Lachlan 30-70% Murrumbidgee <30% ACT	Abercrombie River NP#	18,845	205	0.68	M
					Barton NR#	533	3	0.01	M
					Brindabella NP#	18,141	220	0.73	M
					Copperhannia NR#	3,507	25	0.08	M
					Evans Crown NR#	432	5	0.02	E1
					Girralang NR#	652	50	0.17	E2
					Mullion Range SCA#	1,047	100	0.33	E2
					Narrandera NR	59	1	<0.01	E1
					Tarlo River NP#	8,179	200	0.67	E2
					Turon NP#	3,053	350	1.17	E2
					Wee Jasper NR#	629	4	0.01	M
					Oak Creek NR#	403	5	0.02	E1
					Black Andrew NR#	1,557	37	0.12	E1

Formation Group Acronym	Veg ID: Threat/Protected Area Code Plant Community Common Name	ESTIMATED EXTENT: pre-European (range) Current Range (% pre-European) Protected Range (% pre-European)	% of Community in Bioregion	% of Community in CMA	Protected Area Name & Size (ha) (* = also on Western Slopes) (# = also on Tablelands or Northern Slopes)		Veg Area (ha) % Pre-European & Accuracy Code		
CPW	048: CE/5b White Cypress Pine-Drooping Sheoak grassy open woodland of the Riverine Plain	5,000 (2,500 - 7,500) ha 250 - 750 ha (5 - 15 %) 0 ha	<30% NSS >70% RIV	30-70% Murray <30% Murrumbidgee	Not Protected				
CPW	070: V/5a White Cypress Pine woodland of central NSW	200,000 (100,000 - 300,000) ha 35,000 - 100,000 ha (18 - 50 %) 28 - 52 ha (70 - 130 %)	<30% BBS <30% CP <30% DRP <30% MDD 30-70% NSS	<30% Border R/Gwydir 30-70% Central West 30-70% Lachlan <30% Namoi	Strahorn FR*	72	40	0.02	E2
CPW	309: LC/1a Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South-western Slopes Bioregion	20,000 (14,000 - 26,000) ha 12,000 - 22,000 ha (60 - 110 %) 5,800 - 10,000 ha (70 - 120 %)	30-70% NSS <30% SEH	<30% Murray 30-70% Murrumbidgee <30% Lachlan	Bogandyera NR# Minjary NP Mudjarn NR Ulandra NR Winburndale NR# Conimbla NP Dananbilla NR Livingstone NP Woomargama NP	9,463 1,459 590 3,958 11,047 7,948 2,436 1,918 24,185	123 358 332 270 29 3,340 100 80 3,600	0.62 1.79 1.66 1.35 0.15 16.7 0.50 0.40 18.0	E1 E1 M E4 M E1 E3 E3 E2
EBWP	056: V/5a Poplar Box - Belah woodland on clay-loam soils of the alluvial plains of north-central NSW	450,000 (180,000 - 720,000) ha 70,000 - 130,000 ha (16 - 29 %) 160 - 290 ha (71 - 130 %)	30-70% BBS <30% CP 30-70% DRP <30% NSS	30-70% Border R/Gwydir 30-70% Central West <30% Lachlan <30% Namoi <30% Western	Boronga NR* Macquarie Marshes NR* Boomi NR* Boomi West NR*	198 19,465 157 148	10 200 5 10	<0.01 0.04 <0.01 <0.01	E3 M E3 E2
EBWP	075: E/5a Yellow Box - White Cypress Pine grassy woodland on deep sandy-loam alluvial soils of the eastern Riverina and western NSW South-western Slopes Bioregions	100,000 (50,000 - 150,000) ha 5,600 - 10,000 ha (5.6 - 10 %) 250 - 460 ha (70 - 130 %)	30-70% NSS 30-70% RIV	30-70% Murray 30-70% Murrumbidgee	Lake Urana NR* Wilbertroy FR VCA0117	302 136 3	271 86 3	0.27 0.09 <0.01	M E1 E1

Formation Group Acronym	Veg ID: Threat/Protected Area Code Plant Community Common Name	ESTIMATED EXTENT: pre-European (range) Current Range (% pre-European) Protected Range (% pre-European)	% of Community in Bioregion	% of Community in CMA	Protected Area Name & Size (ha) (* = also on Western Slopes) (# = also on Tablelands or Northern Slopes)		Veg Area (ha) % Pre-European & Accuracy Code		
EBWP	076: CE/5a Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	500,000 (350,000 - 650,000) ha 28,000 - 52,000 ha (5.6 - 10 %) 150 - 270 ha (71 - 130 %)	30-70% NSS <30% RIV	<30% Lachlan <30% Murray <30% Murrumbidgee	Flagstaff Memorial NR Wiesners Swamp NR AL9913 PA HE9901 PA NA9904 PA VCA0108 WW0001 PA#	18 102 16 8 43 4 155	10 20 8 33 38 4 97	<0.01 <0.01 <0.01 0.01 0.01 <0.01 0.02	E2 E1 E1 E2 E2 M E2
EBWP	080: E/5a Inland Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South-western Slopes and Riverina Bioregions	800,000 (560,000 - 1,000,000) ha 98,000 - 180,000 ha (12 - 23 %) 280 - 510 ha (71 - 130 %)	<30% NSS 30-70% RIV	<30% Lachlan <30% Murray <30% Murrumbidgee	Buckingbong FR Gubbata NR* Wilbertroy FR AL9907 PA AL9908 PA AL9909 PA AL9910 PA AL9921 PA	163 151 136 19 125 125 125 125	155 5 22 14 17 30 134 19	0.02 <0.01 <0.01 <0.01 <0.01 <0.01 0.02 <0.01	M E1 E1 E1 E1 M M E1
EBWP	082: E/5a Inland Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion	400,000 (280,000 - 520,000) ha 70,000 - 130,000 ha (18 - 33 %) 320 - 380 ha (92 - 110 %)	30-70% CP <30% MDD <30% NSS	30-70% Central West 30-70% Lachlan <30% Western <30% Murrumbidgee	Cocoparra NP* Cocoparra NR* Strahorn FR* Woggoon NR* CD9910 PA WE9902 PA#	8,364 4,775 72 6,113 36 519	3 64 30 200 36 15	<0.01 0.02 0.01 0.05 0.01 <0.01	E1 E1 E3 E1 E1 E1
EBWP	083: E/5a Yellow Box woodland on sandy loam soils on alluvial plains mainly in the upper Darling Riverine Plain Bioregion	30,000 (15,000 - 45,000) ha 3,000 - 9,000 ha (10 - 30 %) 0 ha	>70% DRP <30% NSS	30-70% Central West <30% Namoi	Not Protected				
EBWP	110: V/5a Inland Grey Box - Cypress Pine shrubby woodland on stony footslopes in the NSW South Western Slopes and Riverina Bioregions	40,000 (20,000 - 60,000) ha 5,000 - 15,000 ha (13 - 38 %) 210 - 370 ha (73 - 130 %)	<30% CP >70% NSS	<30% Lachlan <30% Murray <30% Murrumbidgee	Cocoparra NP* Cocoparra NR* Nangar NP The Rock NR	8,364 4,775 9,356 343	100 41 17 130	0.25 0.10 0.04 0.33	M M M E2
EBWP	201: CE/5a Fuzzy Box - Inland Grey Box on alluvial brown loam soils mainly in the NSW South-western Slopes Bioregion	100,000 (70,000 - 130,000) ha 4,200 - 7,800 ha (4.2 - 7.8 %) 56 - 100 ha (70 - 130 %)	<30% BBS <30% CP >70% NSS	<30% Central West 30-70% Lachlan	Coolbaggie NR# Weddin Mountains NP VCA0008	1,773 8,697 400	50 27 3	0.05 0.03 <0.01	E2 M E4

Formation Group Acronym	Veg ID: Threat/Protected Area Code Plant Community Common Name	ESTIMATED EXTENT: pre-European (range) Current Range (% pre-European) Protected Range (% pre-European)	% of Community in Bioregion	% of Community in CMA	Protected Area Name & Size (ha) (* = also on Western Slopes) (# = also on Tablelands or Northern Slopes)		Veg Area (ha) % Pre-European & Accuracy Code		
EBWP	244: E/5a Poplar Box grassy/shrubby woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).	1,500,000 (1,100,000 - 1,900,000) ha 280,000 - 520,000 ha (19 - 35 %) 170 - 500 ha (51 - 150 %)	<30% BBS 30-70% DRP <30% NSS	30-70% Border R/Gwydir <30% Central West <30% Lachlan <30% Namoi <30% Western	Boomi NR* Boomi West NR* Budelah NR* Midkin NR* Boronga NR* NY9902 PA	157 148 4,049 374 198 20	30 54 22 190 20 20	<0.01 <0.01 <0.01 0.01 <0.01 <0.01	E2 E2 M M E3 M
EBWP	248: E/5a Mixed box eucalypt woodland on low sandy-loam rises on alluvial plains in central western NSW	50,000 (25,000 - 75,000) ha 5,000 - 15,000 ha (10 - 30 %) 0 ha	30-70% CP 30-70% NSS	<30% Central West 30-70% Lachlan	Not Protected				
EBWP	258: NT/5a Gum Coolabah - Mugga ironbark - White Cypress Pine woodland on granite low hills in the eastern Cobar Peneplain Bioregion and central NSW SWS Bioregion	32,000 (23,000 - 41,000) ha 14,000 - 26,000 ha (44 - 81 %) 4 - 7 ha (70 - 130 %)	30-70% CP <30% NSS	>70% Central West <30% Western	Snake Rock AA	61	5	0.02	E2
EBWT	266: CE/5a White Box grassy woodland in the upper slopes sub-region of the NSW South-western Slopes Bioregion	800,000 (560,000 - 1,000,000) ha 35,000 - 65,000 ha (4.4 - 8.1 %) 230 - 420 ha (71 - 130 %)	>70% NSS <30% SEH	<30% Central West <30% Lachlan <30% Murray <30% Murrumbidgee	Flagstaff Memorial NR Barton NR# Minjary NP Tumblong SCA Oak Creek NR# VCA0116 VCA0111 HE9901 PA WT9908 PA	18 533 1,459 745 403 4 3 8 230	6 6 30 106 100 4 3 6 64	<0.01 <0.01 <0.01 0.01 0.01 <0.01 <0.01 <0.01 0.01	E2 M E3 E1 E3 M E1 E2 E2
EBWT	267: E/5a White Box - White Cypress Pine - Inland Grey Box shrub/grass/forb woodland in the NSW South-western Slopes Bioregion	70,000 (35,000 - 100,000) ha 4,000 - 12,000 ha (5.7 - 17 %) 12 - 14 ha (92 - 110 %)	>70% NSS	<30% Central West <30% Lachlan <30% Murray <30% Murrumbidgee	Wiesners Swamp NR VCA0038	102 2	10 3	0.01 <0.01	E1 M

Formation Group Acronym	Veg ID: Threat/Protected Area Code Plant Community Common Name	ESTIMATED EXTENT: pre-European (range) Current Range (% pre-European) Protected Range (% pre-European)	% of Community in Bioregion	% of Community in CMA	Protected Area Name & Size (ha) (* = also on Western Slopes) (# = also on Tablelands or Northern Slopes)		Veg Area (ha) % Pre-European & Accuracy Code		
EBWT	268: V/4a White Box - Blakelys Red Gum - Long-leaved Box - Nortons Box - Red Stringybark grass-shrub woodland on shallow soils on hills in the New South Wales South-western Slopes Bioregion	80,000 (56,000 - 100,000) ha 21,000 - 39,000 ha (26 - 49 %) 1,100 - 1,900 ha (75 - 130 %)	>70% NSS	30-70% Murray 30-70% Murrumbidgee <30% Central West <30% Lachlan	Benambra NP Livingstone NP Livingstone SCA Nest Hill NR Tabletop NR Woomargama NP Tarcutta Hills BHR	,400 1,918 582 758 102 24,185 432	1,029 230 28 60 7 30 80	1.29 0.29 0.04 0.08 0.01 0.04 0.10	M E1 M M M E3 E2
EBWT	269: E/5b White Box - Blakelys Red Gum - Red Box - Red Stringybark shrubby woodland on shallow soils on metamorphic hills in the Albury region of the NSW South-western Slopes Bioregion	4,500 (4,100 - 4,900) ha 900 - 1,100 ha (20 - 24 %) 0 ha	>70% NSS	>70% Murray	Not Protected				
EBWT	270: NT/5a White Box - Tumbledown Gum - Long-leaved Box shrub/grass woodland on fine-grained sediments of the upper Macquarie River gorge, NSW central western slopes	10,000 (5,000 - 15,000) ha 4,200 - 7,800 ha (42 - 78 %) 0 ha	30-70% SEH 30-70% NSS	>70% Central West	Not Protected				
EBWT	272: V/3a White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes	20,000 (10,000 - 30,000) ha 3,500 - 10,000 ha (18 - 50 %) 1,500 - 1,800 ha (91 - 110 %)	>70% NSS	30-70% Central West 30-70% Lachlan	Nangar NP Barton NR# Goobang NP Boginderra Hills NR Weddin Mountains NP Eugowra NR Dananbilla NR Koorawatha NR Gungewalla NR Illunie NR	9,356 533 42,347 798 8,697 115 2,436 1,111 140 732	301 2 310 15 238 16 400 265 10 90	1.51 0.01 1.55 0.08 1.19 0.08 2.00 1.33 0.05 0.45	M M E1 M M E2 E1 E1 E3 E2
EBWT	273: V/4a White Box shrubby open forest on fine grained sediments on steep slopes in the Mudgee region of the of central western slopes of NSW	30,000 (15,000 - 45,000) ha 6,000 - 18,000 ha (20 - 60 %) 280 - 520 ha (70 - 130 %)	>70% NSS	>70% Central West	Avisford NR	2,587	400	1.33	E2

Formation Group Acronym	Veg ID: Threat/Protected Area Code Plant Community Common Name	ESTIMATED EXTENT: pre-European (range) Current Range (% pre-European) Protected Range (% pre-European)	% of Community in Bioregion	% of Community in CMA	Protected Area Name & Size (ha) (* = also on Western Slopes) (# = also on Tablelands or Northern Slopes)		Veg Area (ha) % Pre-European & Accuracy Code		
EBWT	274: E/5b White Box - Rough-barked Apple alluvial woodland of the NSW central western slopes including in the Mudgee region	8,000 (5,600 - 10,000) ha 900 - 1,100 ha (11 - 14 %) 140 - 260 ha (70 - 130 %)	>70% NSS	>70% Central West	Avisford NR	2,587	200	2.50	E2
EBWT	275: E/5b Herbaceous White Box - Apple Box valley woodland of the NSW central western slopes	6,000 (3,000 - 9,000) ha 500 - 1,500 ha (8.3 - 25 %) 32 - 58 ha (71 - 130 %)	30-70% NSS 30-70% SEH	30-70% Central West <30% Lachlan	Barton NR#	533	45	0.75	M
EBWT	276: CE/5a Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South-western Slopes Bioregion	40,000 (20,000 - 60,000) ha 2,000 - 6,000 ha (5 - 15 %) 52 - 94 ha (71 - 130 %)	>70% NSS	<30% Central West <30% Lachlan <30% Murrumbidgee	YO0102 PA WT9910 PA	43 230	43 30	0.11 0.08	E2 E2
EBWT	277: CE/5a Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South-western Slopes Bioregion	500,000 (350,000 - 650,000) ha 21,000 - 39,000 ha (4.2 - 7.8 %) 1,100 - 1,800 ha (77 - 130 %)	<30% SEH >70% NSS	<30% Central West <30% Lachlan <30% Murray <30% Murrumbidgee	Boginderra Hills NR Ulandra NR Woomargama NP Jingellic NR Conimbla NP WW9901 PA# WT9902 PA	798 3,958 24,185 2,140 7,948 18 230	10 758 220 24 90 17 313	<0.01 0.15 0.04 <0.01 0.02 <0.01 0.06	M E1 E1 M E4 E2 E2
EBWT	278: E/3a Riparian Blakelys Red Gum - box - shrub - sedge - grass tall open forest of the central NSW South-western Slopes Bioregion	30,000 (15,000 - 45,000) ha 3,000 - 9,000 ha (10 - 30 %) 1,700 - 5,000 ha (50 - 150 %)	30-70% NSS 30-70% SEH	<30% Central West <30% Lachlan <30% Murrumbidgee	Conimbla NP Goobang NP VCA0081	7,948 42,347 224	353 3,000 21	1.18 10.0 0.07	M E1 E3
EBWT	279: V/4a Blakelys Red Gum - White Cypress Pine woodland on footslopes of hills in central part of the NSW South-western Slopes Bioregion	12,000 (6,000 - 18,000) ha 2,000 - 6,000 ha (17 - 50 %) 480 - 880 ha (70 - 130 %)	>70% NSS	30-70% Lachlan 30-70% Central West	Nangar NP Weddin Mountains NP	9,356 8,697	261 423	2.18 3.53	M M

Formation Group Acronym	Veg ID: Threat/Protected Area Code Plant Community Common Name	ESTIMATED EXTENT: pre-European (range) Current Range (% pre-European) Protected Range (% pre-European)	% of Community in Bioregion	% of Community in CMA	Protected Area Name & Size (ha) (* = also on Western Slopes) (# = also on Tablelands or Northern Slopes)		Veg Area (ha) % Pre-European & Accuracy Code		
EBWT	280: E/4a Blakelys Red Gum - Long-leaved Box - Red Stringybark shrub/grass hill woodland of the NSW South-western Slopes Bioregion	60,000 (30,000 - 90,000) ha 6,000 - 18,000 ha (10 - 30 %) 630 - 1,100 ha (70 - 120 %)	>70% NSS	30-70% Lachlan 30-70% Murrumbidgee <30% Central West	Ulandra NR	3,958	900	1.50	E3
EBWT	281: CE/5a Rough-Barked Apple - Yellow Box - Blakelys Red Gum woodland on valley flats in the NSW western Slopes	25,000 (13,000 - 37,000) ha 1,000 - 3,000 ha (4 - 12 %) 50 - 150 ha (50 - 150 %)	30-70% BBS <30% NAN <30% NSS <30% SB	<30% Central West <30% Namoi <30% Hunter/Central R	Coolbaggie NR#	1,773	100	0.40	E2
EBWT	282: E/4a Blakelys Red Gum - White Box - Yellow Box - Black Cypress Pine box grass/shrub woodland on clay loam soils on undulating hills of central NSW South-western Slopes Bioregion	70,000 (35,000 - 100,000) ha 2,500 - 7,500 ha (3.6 - 11 %) 550 - 1,000 ha (71 - 130 %)	30-70% NSS <30% SEH	<30% Central West <30% Lachlan <30% Murray <30% Murrumbidgee	Mudjarn NR Ulandra NR Minjary NP Dananbilla NR Illunie NR Koorawatha NR Gungewalla NR VCA0036 VCA0037	590 3,958 1,459 2,436 732 1,111 140 4 53	24 105 103 330 110 12 40 4 50	0.03 0.15 0.15 0.47 0.16 0.02 0.06 0.01 0.07	E1 E1 M E1 E1 M E1 E1 E3
EBWT	283: CE/5a Apple Box - Blakelys Red Gum moist valley and footslopes grass-forb open forest of the NSW South-western Slopes Bioregions	35,000 (18,000 - 52,000) ha 2,100 - 3,900 ha (6 - 11 %) 76 - 220 ha (50 - 150 %)	30-70% NSS <30% SEH	<30% ACT <30% Central West <30% Lachlan <30% Murray <30% Murrumbidgee	Ellerslie NR Woomargama NP Bogandyera NR# Livingstone NP	1,879 24,185 9,463 1,918	120 11 10 10	0.34 0.03 0.03 0.03	E1 E1 E4 E3
EBWT	284: V/5b Red Stringybark - Blakelys Red Gum - tea tree herbaceous swampy valley open forest of the Murraguldrie region in the southern NSW South-western Slopes Bioregion	3,000 (2,100 - 3,900) ha 700 - 1,300 ha (23 - 43 %) 110 - 130 ha (92 - 110 %)	>70% NSS	>70% Murrumbidgee <30% Murray	Murraguldrie FR	1,520	120	4.00	E1
EBWT	286: E/4b Red Box - Blakelys Red Gum sedge woodland on colluvial clay drainage lines in the NSW South-western Slopes Bioregion	2,000 (1,400 - 2,600) ha 280 - 520 ha (14 - 26 %) 93 - 110 ha (90 - 110 %)	>70% NSS	>70% Murray	Benambra NP	1,400	103	5.15	M

Formation Group Acronym	Veg ID: Threat/Protected Area Code Plant Community Common Name	ESTIMATED EXTENT: pre-European (range) Current Range (% pre-European) Protected Range (% pre-European)	% of Community in Bioregion	% of Community in CMA	Protected Area Name & Size (ha) (* = also on Western Slopes) (# = also on Tablelands or Northern Slopes)		Veg Area (ha) % Pre-European & Accuracy Code		
EBWT	287: V/4a Long-leaved Box - Red Box - Red Stringybark mixed open forest on hills and hillslopes in the NSW South-western Slopes Bioregion	60,000 (30,000 - 90,000) ha 10,000 - 30,000 ha (17 - 50 %) 2,000 - 3,500 ha (72 - 130 %)	>70% NSS <30% SEH	<30% Murray 30-70% Murrumbidgee <30% Lachlan <30% Central West	Murraguldrie FR Tumblong SCA Ellerslie NR Benambra NP Minjary NP Mudjarn NR Barton NR# Nangar NP Conimbla NP	1,520 745 1,879 1,400 1,459 590 533 9,356 7,948	1,280 8 600 114 42 197 122 200 200	2.13 0.01 1.00 0.19 0.07 0.33 0.20 0.33 0.33	E2 E1 E2 E1 E1 E1 E1 E2 E3
EBWT	293: LC/4c Nortons Box shrubby low woodland on sandstone and conglomerate escarpments in the far southern part of the NSW South Western Slopes	400 (280 - 520) ha 350 - 410 ha (88 - 100 %) 55 - 67 ha (90 - 110 %)	>70% NSS	>70% Murray	Benambra NP Tabletop NR	1,400 102	21 40	5.25 10.0	M E1
EBWT	294: NT/2a Nortons Box - Red Box - White Box tussock grass open forest of the southern section of the NSW South-western Slopes Bioregion	15,000 (11,000 - 19,000) ha 5,600 - 10,000 ha (37 - 67 %) 2,000 - 3,600 ha (71 - 130 %)	>70% NSS <30% SEH	30-70% Murray 30-70% Murrumbidgee	Tumblong SCA Woomargama NP Mullengandra NR Woomargama SCA	745 24,185 150 7,046	344 950 70 1,450	2.29 6.33 0.47 9.67	E1 E1 E3 E1
EBWT	298: E/5b Apple Box - Nortons Box - Blakelys Red Gum valley flat moist grassy tall open forest in the southern NSW South-western Slopes and adjoining South East Highlands Bioregions	5,000 (2,500 - 7,500) ha 350 - 1,000 ha (7 - 20 %) 150 - 270 ha (70 - 130 %)	30-70% SEH 30-70% NSS	30-70% Murrumbidgee 30-70% Murray	Bogandyera NR# Jingellic NR Wereboldera SCA Downfall NR Woomargama NP Woomargama SCA	9,463 2,140 2,255 483 24,185 7,046	30 30 11 12 100 30	0.60 0.60 0.22 0.24 2.00 0.60	E1 M M M E2 E1
EBWT	304: CE/4a Candlebark - Apple Box - Robertson's Peppermint tall open forest on granite in the Tumbarumba region of the South East Highlands and upper NSW South-western Slopes Bioregions	10,000 (7,000 - 13,000) ha 700 - 1,300 ha (7 - 13 %) 250 - 460 ha (70 - 130 %)	30-70% NSS 30-70% SEH	>70% Murray	Bogandyera NR# Clarkes Hill NR#	9,463 2,206	66 291	0.66 2.91	M M

Formation Group Acronym	Veg ID: Threat/Protected Area Code Plant Community Common Name	ESTIMATED EXTENT: pre-European (range) Current Range (% pre-European) Protected Range (% pre-European)	% of Community in Bioregion	% of Community in CMA	Protected Area Name & Size (ha) (* = also on Western Slopes) (# = also on Tablelands or Northern Slopes)		Veg Area (ha) % Pre-European & Accuracy Code		
EBWT	305: NT/2a Apple Box - Broad-leaved Peppermint - Red Stringybark shrubby hill open forest in the upper NSW South-western Slopes Bioregion and adjacent South Eastern Highlands Bioregion	10,000 (5,000 - 15,000) ha 3,000 - 9,000 ha (30 - 90 %) 1,900 - 3,400 ha (71 - 130 %)	30-70% SEH <30% NSS	30-70% Murray 30-70% Murrumbidgee	Bogandyera NR# Clarkes Hill NR# Downfall NR Courabyra NR# Carabost FR# Mundaroo FR#	9,463 2,206 483 240 2,803 1,946	60 1,642 42 39 400 500	0.60 16.4 0.42 0.39 4.00 5.00	E1 E1 E1 E3 E4 E4
EBWT	312: CE/5a Yellow Box grassy tall woodland on valley flats in the upper slopes of the South-western Slopes Bioregion and South Eastern Highlands Bioregion	40,000 (28,000 - 52,000) ha 2,100 - 3,900 ha (5.3 - 9.8 %) 110 - 190 ha (75 - 130 %)	30-70% NSS 30-70% SEH	30-70% Murrumbidgee 30-70% Murray	Bogandyera NR# Woomargama NP	9,463 24,185	97 50	0.24 0.13	M E4
EBWT	314: V/4c Apple Box - Red Stringybark basalt scree open forest in the upper Murray River region	40 (28 - 52) ha 18 - 22 ha (45 - 55 %) 6 - 8 ha (90 - 110 %)	>70% NSS	>70% Murray	Bogandyera NR#	9,463	7	17.5	M
EBWT	315: LC/4c Red Box - Dwyers Red Gum low woodland on shallow red earths on upper hillslopes and hillcrests in the upper Murray River region	400 (360 - 440) ha 270 - 330 ha (68 - 83 %) 49 - 91 ha (70 - 130 %)	>70% NSS	>70% Murray	Jingellic NR	2,140	70	17.5	E1
EBWT	316: V/4b Nortons Box - Red Box - Red Stringybark - Nodding Flax Lily forb-grass open forest - woodland mainly on the Minjary Range north of Tumut	8,000 (5,600 - 10,000) ha 2,100 - 3,900 ha (26 - 49 %) 530 - 970 ha (71 - 130 %)	>70% NSS	>70% Murrumbidgee	Minjary NP	1,459	750	9.38	E2
EBWT	326: V/5b Long-leaved Box - Red Box grass-shrub open forest on hillslopes in the Mudgee Region, NSW central western slopes	8,000 (4,000 - 12,000) ha 1,500 - 4,500 ha (19 - 56 %) 91 - 160 ha (70 - 120 %)	>70% NSS	>70% Central West	Avisford NR	2,587	130	1.63	E2

Formation Group Acronym	Veg ID: Threat/Protected Area Code Plant Community Common Name	ESTIMATED EXTENT: pre-European (range) Current Range (% pre-European) Protected Range (% pre-European)	% of Community in Bioregion	% of Community in CMA	Protected Area Name & Size (ha) (* = also on Western Slopes) (# = also on Tablelands or Northern Slopes)		Veg Area (ha) % Pre-European & Accuracy Code		
EBWT	341: E/4a Blakelys Red Gum - Red Box - Black Cypress Pine grass/shrub woodland on hills in the upper slopes sub-region of the NSW South-western Slopes and western South Eastern Highlands Bioregions	7,000 (4,900 - 9,100) ha 1,100 - 1,900 ha (16 - 27 %) 260 - 260 ha (100 - 100 %)	30-70% NSS 30-70% SEH	30-70% Lachlan 30-70% Murrumbidgee	Illunie NR VCA0033	732 155	210 50	3.00 0.71	E1 E3
EBWT	347: V/3a White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South-western Slopes Bioregion	12,000 (6,000 - 18,000) ha 2,300 - 6,700 ha (19 - 56 %) 660 - 1,200 ha (71 - 130 %)	>70% NSS	30-70% Murrumbidgee <30% Lachlan	Ellerslie NR Tarcutta Hills BHR	1,879 432	800 130	6.67 1.08	E2 E2
EBWT	350: E/5b Candlebark - Blakelys Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South-western Slopes and South-Eastern Highland Bioregions	15,000 (11,000 - 19,000) ha 1,400 - 2,600 ha (9.3 - 17 %) 0 ha	>70% SEH <30% NSS	<30% Murrumbidgee >70% Lachlan	Not Protected				
EBWT	352: E/5a Red Stringybark - Blakelys Red Gum hillslope open forest on meta-sediments in the Yass - Boorowa - Crookwell region of the NSW South-western Slopes and South Eastern Highlands Bioregions	50,000 (35,000 - 65,000) ha 4,900 - 9,100 ha (9.8 - 18 %) 0 ha	30-70% NSS 30-70% SEH	30-70% Lachlan <30% Murrumbidgee	Not Protected				
ECT	295: LC/1a Robertson's Peppermint - Broad-leaved Peppermint - Nortons Box - stringybark shrub-fern open forest of the NSW South Western Slopes and SHE Bioregions	30,000 (15,000 - 45,000) ha 9,000 - 27,000 ha (30 - 90 %) 11,000 - 20,000 ha (71 - 130 %)	>70% NSS <30% SEH	30-70% Murray <30% Murrumbidgee	Woomargama NP Wereboldera SCA Bogandyera NR# Courabyra NR# Kosciuszko NP# Carabost FR# Woomargama SCA Mundaroo FR#	24,185 2,255 9,463 240 689,464 2,803 7,046 1,946	6,240 118 892 50 5,000 900 1,720 500	20.8 0.39 2.97 0.17 16.7 3.00 5.73 1.67	E2 E1 M E3 E3 E4 E1 E4

Formation Group Acronym	Veg ID: Threat/Protected Area Code Plant Community Common Name	ESTIMATED EXTENT: pre-European (range) Current Range (% pre-European) Protected Range (% pre-European)	% of Community in Bioregion	% of Community in CMA	Protected Area Name & Size (ha) (* = also on Western Slopes) (# = also on Tablelands or Northern Slopes)		Veg Area (ha) % Pre-European & Accuracy Code		
ECT	299: NT/4b Riparian Ribbon Gum - Robertsons Peppermint - Apple Box riverine very tall open forest of the NSW South Western Slopes and South East Highlands Bioregions	8,000 (5,600 - 10,000) ha 2,800 - 5,200 ha (35 - 65 %) 370 - 1,100 ha (50 - 150 %)	30-70% NSS 30-70% SEH	>70% Murray <30% Murrumbidgee	Clarkes Hill NR# Bogandyera NR# Jingellic NR Wereboldera SCA Kosciuszko NP#	2,206 9,463 2,140 2,255 689,464	30 195 2 10 500	0.38 2.44 0.03 0.13 6.25	M M M E3 E3
ECT	300: LC/1a Ribbon Gum - Robertson Peppermint montane fern - grass tall open forest on deep clay loam soils in the upper NSW SWS Bioregion and western Kosciuszko escarpment	100,000 (70,000 - 130,000) ha 56,000 - 100,000 ha (56 - 100 %) 49,000 - 90,000 ha (71 - 130 %)	>70% SEH <30% NSS <30% AA	30-70% Murray 30-70% Murrumbidgee	Bogandyera NR# Jingellic NR Kosciuszko NP#	9,463 2,140 689,464	148 100 69,000	0.15 0.10 69.0	E1 E1 E2
ECT	307: NT/4b Eurabbie - Robertson's Peppermint very tall, fern open forest of gullies and sheltered hillslopes in the southern most part of the NSW South-western Slopes Bioregion	4,000 (3,600 - 4,400) ha 2,700 - 3,300 ha (68 - 83 %) 230 - 680 ha (51 - 150 %)	30-70% SEH 30-70% NSS	>70% Murray <30% Murrumbidgee	Woomargama NP Bago FR# Mundaroo FR#	24,185 23 1,946	350 55 50	8.75 1.38 1.25	E3 E1 E3
EIW	002: NT/3a River Red Gum-sedge dominated very tall open forest in frequently flooded sites along major rivers and floodplains in south-western NSW	35,000 (25,000 - 45,000) ha 21,000 - 39,000 ha (60 - 110 %) 2,300 - 4,200 ha (70 - 130 %)	<30% NSS >70% RIV	>70% Murray <30% Murrumbidgee <30% Lachlan	Billabong FR* Moira Lakes FR* Native Dog FR* Pollack FR* Sanddune Pine FR* Snake Island FR* Toupna Creek FR* Yanga NP* Yanga SCA*	309 1,418 3 714 60 36 79 36,438 33,777	50 40 43 100 10 5 2 3,000 30	0.14 0.11 0.12 0.29 0.03 0.01 0.01 8.57 0.09	E3 E3 E3 E3 E3 E3 E3 E3 E4
EIW	005: NT/4a River Red Gum herbaceous-grassy very tall open forest on inner floodplains in the lower slopes sub-region of the NSW South West Slopes Bioregion and the eastern Riverina Bioregion	15,000 (7,500 - 22,000) ha 4,500 - 13,000 ha (30 - 87 %) 200 - 360 ha (71 - 130 %)	30-70% NSS 30-70% RIV	>70% Murray <30% Murrumbidgee <30% Lachlan	Billabong FR* Moira Lakes FR* Narrandera FR* Narrandera NR Snake Island FR* Toupna Creek FR* Wilbertroy FR	309 1,418 14 59 36 79 136	110 50 12 50 30 10 20	0.73 0.33 0.08 0.33 0.20 0.07 0.13	E3 E3 E1 E2 E3 E3 E3

Formation Group Acronym	Veg ID: Threat/Protected Area Code Plant Community Common Name	ESTIMATED EXTENT: pre-European (range) Current Range (% pre-European) Protected Range (% pre-European)	% of Community in Bioregion	% of Community in CMA	Protected Area Name & Size (ha) (* = also on Western Slopes) (# = also on Tablelands or Northern Slopes)		Veg Area (ha) % Pre-European & Accuracy Code		
EIW	009: V/3a River Red Gum - wallaby grass tall woodland on the outer River Red Gum zone mainly in the Riverina Bioregion	35,000 (25,000 - 45,000) ha 8,400 - 15,000 ha (24 - 43 %) 1,600 - 2,800 ha (73 - 130 %)	<30% NSS >70% RIV	>70% Murray <30% Murrumbidgee <30% Lachlan	Billabong FR* Moira Lakes FR* Yanga NP* Yanga SCA*	309 1,418 36,438 33,777	117 30 2,000 30	0.33 0.09 5.71 0.09	E3 E3 E3 E4
EIW	074: E/5a Yellow Box - River Red Gum tall grassy riverine woodland of NSW South West Slopes and Riverina Bioregions	30,000 (21,000 - 39,000) ha 5,600 - 10,000 ha (19 - 33 %) 19 - 35 ha (70 - 130 %)	30-70% NSS 30-70% RIV	<30% Lachlan <30% Murray <30% Murrumbidgee	Narrandera NR Sanddune Pine FR* Toupna Creek FR* DE9906 PA	59 60 79 43	8 3 13 3	0.03 0.01 0.04 0.01	E2 E3 E3 M
EIW	079: V/5a River Red Gum shrub/grass riparian tall woodland or open forest mainly in the upper slopes sub-region of the NSW South Western Slopes bioregion and western South East Highlands Bioregion	35,000 (18,000 - 52,000) ha 6,000 - 18,000 ha (17 - 51 %) 25 - 45 ha (71 - 130 %)	>70% NSS <30% SEH	<30% Lachlan 30-70% Murray 30-70% Murrumbidgee	Hattons Corner NR# Koorawatha NR Flagstaff Memorial NR GE9907 PA# VCA0008 VCA0084	4 1,111 18 62 400 14	1 5 2 10 7 10	<0.01 0.01 0.01 0.03 0.02 0.03	E1 E1 E2 E1 E4 E2
EIW	237: E/5a Riverine Inland Grey Box grassy woodland of the semi-arid (warm) climate zone	15,000 (7,500 - 22,000) ha 2,800 - 5,200 ha (19 - 35 %) 9 - 27 ha (50 - 150 %)	30-70% NSS 30-70% RIV	<30% Lachlan 30-70% Murray <30% Murrumbidgee	Billabong FR* Sanddune Pine FR* Toupna Creek FR*	309 60 79	2 3 13	0.01 0.02 0.09	E3 E3 E3
EIW	249: V/5b River Red Gum grass - swamp woodland to open woodland on cowals (lakes) and associated flood channels in central NSW	6,500 (3,300 - 9,700) ha 1,500 - 4,500 ha (23 - 69 %) 56 - 100 ha (71 - 130 %)	<30% DRP 30-70% NSS <30% RIV	30-70% Central West <30% Lachlan <30% Murrumbidgee <30% Murray	Lake Urana NR* Wiesners Swamp NR	302 102	9 70	0.14 1.08	M E1
EIW	251: E/5a Mixed Eucalypt woodlands of floodplains in the southern-eastern Cobar Peneplain Bioregion	35,000 (18,000 - 52,000) ha 5,000 - 15,000 ha (14 - 43 %) 62 - 110 ha (70 - 130 %)	30-70% CP 30-70% NSS	>70% Lachlan	CD9901 PA	229	88	0.25	E2
EIW	356: V/5c Blakelys Red Gum x Dirty Gum - White Cypress Pine tall woodland lining sandy watercourses in the NSW South-western Slopes Bioregion	1,000 (700 - 1,300) ha 280 - 520 ha (28 - 52 %) 0 ha	>70% NSS	30-70% Lachlan 30-70% Central West	Not Protected				

Formation Group Acronym	Veg ID: Threat/Protected Area Code Plant Community Common Name	ESTIMATED EXTENT: pre-European (range) Current Range (% pre-European) Protected Range (% pre-European)	% of Community in Bioregion	% of Community in CMA	Protected Area Name & Size (ha) (* = also on Western Slopes) (# = also on Tablelands or Northern Slopes)		Veg Area (ha) % Pre-European & Accuracy Code		
EIWI	217: V/3a Mugga Ironbark - Inland Grey Box - cypress pine tall woodland on footslopes of low hills in the NSW South-western Slopes Bioregion	80,000 (40,000 - 120,000) ha 13,000 - 37,000 ha (16 - 46 %) 4,400 - 5,300 ha (91 - 110 %)	>70% NSS <30% RIV	<30% Central West 30-70% Lachlan <30% Murrumbidgee	Big Bush NR Blue Mallee FR Buddigower NR Ingalba NR Pucawan NR The Charcoal Tank NR PA9902 PA VCA0008 PA9903 PA WE9904 PA#	643 66 329 4,179 287 84 248 400 62 519	450 10 120 3,600 225 42 248 31 62 40	0.56 0.01 0.15 4.50 0.28 0.05 0.31 0.04 0.08 0.05	M E3 E2 E M E2 E1 M E2 E2
EIWI	243: NT/4a Mugga Ironbark - White Cypress Pine woodland on low rises mainly in the Cobar Peneplain Bioregion	40,000 (28,000 - 52,000) ha 18,000 - 32,000 ha (45 - 80 %) 280 - 340 ha (90 - 110 %)	30-70% CP 30-70% NSS <30% RIV	30-70% Lachlan <30% Murrumbidgee	CD9907 PA CD9911 PA	343 428	182 128	0.46 0.32	M M
EIWI	289: V/3a Mugga Ironbark - Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South-western Slopes Bioregion	20,000 (10,000 - 30,000) ha 4,000 - 12,000 ha (20 - 60 %) 800 - 1,400 ha (71 - 120 %)	>70% NSS <30% SEH	<30% Murray 30-70% Murrumbidgee <30% Lachlan	Ellerslie NR Tumblong SCA Downfall NR Murraguldrie FR Koorawatha NR Tarcutta Hills BHR	1,879 745 483 1,520 1,111 432	250 280 13 100 320 167	1.25 1.40 0.07 0.50 1.60 0.84	E2 E1 E2 E2 E1 M
EIWI	318: V/4a Mugga Ironbark -Tumbledown Gum - Red Box - Black Cypress Pine open forest on shallow stony soils on hills in the NSW South-western Slopes Bioregion	30,000 (15,000 - 45,000) ha 6,000 - 18,000 ha (20 - 60 %) 120 - 110 ha (100 - 95 %)	>70% NSS	30-70% Murrumbidgee <30% Murray <30% Lachlan	TA9801 PA	116	116	0.39	E2
EIWI	328: LC/1a Red Ironbark - Black Cypress Pine shrubby woodland of the NSW South-western Slopes Bioregion	30,000 (27,000 - 33,000) ha 18,000 - 32,000 ha (60 - 110 %) 8,400 - 15,000 ha (70 - 130 %)	>70% NSS	30-70% Central West 30-70% Lachlan	Goobang NP	42,347	12,000	40.0	E2
EIWI	329: LC/1b Red Ironbark - Red Stringybark - Tumbledown Gum heath low woodland on siliceous ridges of the NSW central western slopes	6,000 (4,200 - 7,800) ha 3,900 - 7,100 ha (65 - 120 %) 2,500 - 4,500 ha (71 - 130 %)	>70% NSS	>70% Lachlan <30% Central West	Goobang NP	42,347	3,500	58.3	E2

Formation Group Acronym	Veg ID: Threat/Protected Area Code Plant Community Common Name	ESTIMATED EXTENT: pre-European (range) Current Range (% pre-European) Protected Range (% pre-European)	% of Community in Bioregion	% of Community in CMA	Protected Area Name & Size (ha) (* = also on Western Slopes) (# = also on Tablelands or Northern Slopes)		Veg Area (ha) % Pre-European & Accuracy Code		
EIWI	330: NT/2a Mugga Ironbark - Black Cypress Pine - Red Stringybark - Blakelys Red Gum - Red Ironbark woodland on hillslopes and in valleys on ranges in the NSW central western slopes	30,000 (21,000 - 39,000) ha 8,400 - 15,000 ha (28 - 50 %) 3,300 - 6,100 ha (70 - 130 %)	>70% NSS	30-70% Central West 30-70% Lachlan	Goobang NP Nangar NP Weddin Mountains NP	42,347 9,356 8,697	3,300 440 970	11.0 1.47 3.23	E2 E1 E1
EIWI	342: V/3a Mugga Ironbark - mixed box woodland on hills in the Cowra - Boorowa - Young region of the NSW South-western Slopes Bioregion	12,000 (8,400 - 15,000) ha 3,500 - 6,500 ha (29 - 54 %) 810 - 980 ha (91 - 110 %)	<30% SEH >70% NSS	<30% Murrumbidgee 30-70% Lachlan	Illunie NR Dananbilla NR Goonawarra NR* Gungewalla NR VCA0044 VCA0033	732 2,436 410 140 46 155	45 700 20 10 20 100	0.38 5.83 0.17 0.08 0.17 0.83	E2 E1 E4 E3 E3 E3
EIWI	343: E/5b Mugga Ironbark - Red Box - Red Stringybark - Inland Grey Box grass/shrub woodland on metamophic substrates in the Tarcutta - Gundagai region, NSW SWS Bioregion	4,000 (2,800 - 5,200) ha 350 - 650 ha (8.8 - 16 %) 0 ha	>70% NSS	>70% Murrumbidgee	Not Protected				
EIWI	358: CE/5b Mugga Ironbark - Red Box - White Box tall woodland on hills composed of fine-grained sediments in the Wellington to Mudgee region in the northern NSW South-western Slopes Bioregion	3,000 (2,100 - 3,900) ha 140 - 260 ha (4.7 - 8.7 %) 0 ha	>70% NSS	>70% Central West	Not Protected				
EMDI	178: E/5c Broombush - Green Mallee - Blue Mallee very tall shrubland on stony rises in the NSW South-western Slopes Bioregion	800 (560 - 1,000) ha 140 - 260 ha (18 - 33 %) 67 - 120 ha (71 - 130 %)	>70% NSS	>70% Lachlan <30% Murrumbidgee	Blue Mallee FR Buddigower NR The Charcoal Tank NR	66 329 84	5 50 40	0.63 6.25 5.00	E3 E1 E1
ESAW	303: CE/5b Black Sally grassy low woodland in valleys in the upper slopes sub-region of the NSW South-western Slopes Bioregion and western South Eastern Highlands Bioregion	5,000 (3,500 - 6,500) ha 210 - 390 ha (4.2 - 7.8 %) 0 ha	30-70% SEH <30% NSS	30-70% Murrumbidgee 30-70% Murray	Not Protected				

Formation Group Acronym	Veg ID: Threat/Protected Area Code Plant Community Common Name	ESTIMATED EXTENT: pre-European (range) Current Range (% pre-European) Protected Range (% pre-European)	% of Community in Bioregion	% of Community in CMA	Protected Area Name & Size (ha) (* = also on Western Slopes) (# = also on Tablelands or Northern Slopes)		Veg Area (ha) % Pre-European & Accuracy Code		
ESCT	285: E/5b Broad-leaved Sally grass - sedge woodland on valley flats and swamps in the NSW South-western Slopes and adjoining South Eastern Highlands Bioregions	8,000 (5,600 - 10,000) ha 1,400 - 2,600 ha (18 - 33 %) 68 - 200 ha (50 - 150 %)	30-70% NSS 30-70% SEH	>70% Murray <30% Murrumbidgee	Bogandyera NR# Murraguldrie FR Woomargama NP Woomargama SCA	9,463 1,520 24,185 7,046	6 10 113 6	0.08 0.13 1.41 0.08	M E3 M E1
ESWWS	288: LC/1b Long-leaved Box - Black Cypress Pine granitic hillcrest shrubby open forest of the upper Murray Valley region, NSW SW Slopes Bioregion	8,000 (5,600 - 10,000) ha 4,200 - 7,800 ha (53 - 98 %) 4,000 - 4,800 ha (92 - 110 %)	>70% NSS	>70% Murray	Woomargama NP Woomargama SCA	24,185 7,046	4,224 140	52.8 1.75	E1 E1
ESWWS	290: NT/3a Red Stringybark - Red Box - Long-leaved Box - Scribbly Gum tussock grass - shrub low open forest on hills in the southern part of the NSW South-western Slopes Bioregion	30,000 (21,000 - 39,000) ha 7,000 - 13,000 ha (23 - 43 %) 1,600 - 2,900 ha (71 - 130 %)	>70% NSS <30% SEH	30-70% Murrumbidgee 30-70% Murray	Ellerslie NR Downfall NR Nest Hill NR Livingstone NP Livingstone SCA Jingellic NR	1,879 483 758 1,918 582 2,140	30 176 678 800 85 487	0.10 0.59 2.26 2.67 0.28 1.62	E2 E1 E2 E1 E1 M
ESWWS	291: NT/4b Scribbly Gum - Black Cypress Pine - Mugga ironbark - Daphne Heath low woodland of the Wagga Wagga region in the southern NSW South-western Slopes Bioregion	6,000 (5,400 - 6,600) ha 3,600 - 4,400 ha (60 - 73 %) 740 - 890 ha (91 - 110 %)	>70% NSS	30-70% Murrumbidgee <30% Murray	Livingstone NP Livingstone SCA	1,918 582	465 350	7.75 5.83	E1 E1
ESWWS	296: NT/2a Brittle Gum - peppermint open forest of the Woomargama to Tumut region, NSW South-western Slopes Bioregion	30,000 (27,000 - 33,000) ha 17,000 - 19,000 ha (57 - 63 %) 5,100 - 9,300 ha (71 - 130 %)	30-70% NSS <30% SEH	30-70% Murrumbidgee 30-70% Murray	Downfall NR Kosciuszko NP# Woomargama NP Wereboldera SCA Bogandyera NR# Mundaroo FR# Carabost FR#	483 689,464 24,185 2,255 9,463 1,946 2,803	96 5,000 335 427 454 400 500	0.32 16.7 1.12 1.42 1.51 1.33 1.67	E1 E3 E1 E1 M E3 E3

Formation Group Acronym	Veg ID: Threat/Protected Area Code Plant Community Common Name	ESTIMATED EXTENT: pre-European (range) Current Range (% pre-European) Protected Range (% pre-European)	% of Community in Bioregion	% of Community in CMA	Protected Area Name & Size (ha) (* = also on Western Slopes) (# = also on Tablelands or Northern Slopes)		Veg Area (ha) % Pre-European & Accuracy Code		
ESWWS	297: NT/1a Broad-leaved Peppermint - Nortons Box - Red Stringybark tall open forest on red clay on hills in the southern part of the NSW South-western Slopes Bioregion	40,000 (28,000 - 52,000) ha 18,000 - 32,000 ha (45 - 80 %) 11,000 - 19,000 ha (75 - 130 %)	>70% NSS	30-70% Murrumbidgee 30-70% Murray	Bogandyera NR# Courabyra NR# Downfall NR Jingellic NR Minjary NP Mullengandra NR Woomargama NP Woomargama SCA	9,463 240 483 2,140 1,459 150 24,185 7,046	3,000 150 157 532 11 80 7,200 3,580	7.50 0.38 0.39 1.33 0.03 0.20 18.0 8.95	E2 E2 M M E1 E3 E2 E1
ESWWS	306: NT/1a Red Box - Red Stringybark - Nortons Box hill heath shrub - tussock grass open forest of the Tumut region	12,000 (8,400 - 15,000) ha 5,600 - 10,000 ha (47 - 83 %) 3,400 - 6,200 ha (71 - 130 %)	30-70% SEH 30-70% NSS	30-70% Murrumbidgee <30% Murray	Wereboldera SCA Kosciuszko NP# Mundaroo FR#	2,255 689,464 1,946	1,691 3,000 96	14.1 25.0 0.80	E1 E4 E4
ESWWS	311: NT/3b Red Stringybark - Broad-leaved Peppermint - Nortons Box heath open forest on in the upper slopes subregion in the NSW SWS Bioregion and adjoining South East Highlands Biorgion	2,000 (1,400 - 2,600) ha 840 - 1,500 ha (42 - 75 %) 460 - 550 ha (92 - 110 %)	30-70% NSS 30-70% SEH	<30% Murrumbidgee >70% Murray	Bogandyera NR# Clarkes Hill NR# Kosciuszko NP#	9,463 2,206 689,464	102 200 200	5.10 10.0 10.0	M E2 E4
ESWWS	313: LC/1c Brittle Gum - Broad-leaved Peppermint open forest with tall dense shrub understorey on riparian coarse grained granitic soils in the South-western Slopes Bioregion	300 (210 - 390) ha 210 - 390 ha (70 - 130 %) 270 - 330 ha (90 - 110 %)	>70% NSS	>70% Murray	Woomargama NP	24,185	300	100	E3
ESWWS	321: NT/3a Red Stringybark - Long-leaved Box - Black Cypress Pine shrub/grass woodland on siliceous sedimentary ranges in the upper NSW South-western Slopes and South Eastern Highlands Bioregions	23,000 (12,000 - 34,000) ha 7,500 - 22,000 ha (33 - 96 %) 2,000 - 2,400 ha (90 - 110 %)	<30% SEH >70% NSS	30-70% Central West 30-70% Lachlan	Barton NR# Conimbla NP Dananbilla NR Gungewalla NR VCA0081	533 7,948 2,436 140 224	340 1,400 200 70 200	1.48 6.09 0.87 0.30 0.87	E1 E2 E1 E1 E2

Formation Group Acronym	Veg ID: Threat/Protected Area Code Plant Community Common Name	ESTIMATED EXTENT: pre-European (range) Current Range (% pre-European) Protected Range (% pre-European)	% of Community in Bioregion	% of Community in CMA	Protected Area Name & Size (ha) (* = also on Western Slopes) (# = also on Tablelands or Northern Slopes)		Veg Area (ha) % Pre-European & Accuracy Code		
ESWWS	322: LC/1a Scribbly Gum - Red Stringybark - Black Cypress Pine hillslope shrub-tussock grass open forest on mainly sandstone ranges in the NSW central western slopes	30,000 (15,000 - 45,000) ha 10,000 - 30,000 ha (33 - 100 %) 8,700 - 16,000 ha (70 - 130 %)	>70% NSS	30-70% Lachlan 30-70% Central West	Conimbla NP Nangar NP Weddin Mountains NP Koorawatha NR Dananbilla NR VCA0044	7,948 9,356 8,697 1,111 2,436 46	1,500 7,300 1,850 500 1,200 12	5.00 24.3 6.17 1.67 4.00 0.04	E2 E2 E1 E3 E3 E3
ESWWS	323: LC/3a Red Stringybark open forest on steep hills in the Mudgee region in the northern section of the NSW South-western Slopes Bioregion	10,000 (5,000 - 15,000) ha 3,500 - 10,000 ha (35 - 100 %) 910 - 1,600 ha (70 - 120 %)	>70% NSS	>70% Central West	Avisford NR	2,587	1,300	13.0	E2
ESWWS	324: LC/4b Scribbly Gum grassy open forest on hills in the Mudgee Region, NSW central western slopes	2,500 (1,800 - 3,200) ha 1,600 - 2,800 ha (64 - 110 %) 210 - 390 ha (70 - 130 %)	>70% NSS	>70% Central West	Avisford NR	2,587	300	12.0	E2
ESWWS	325: LC/3c Blue-leaved Stringybark open forest of the Mudgee region NSW central western slopes	300 (270 - 330) ha 230 - 270 ha (77 - 90 %) 70 - 130 ha (70 - 130 %)	>70% NSS	>70% Central West	Avisford NR	2,587	100	33.3	E2
ESWWS	327: LC/4b Scribbly Gum - Black Cypress Pine - Red Ironbark open forest of the NSW central western slopes	5,000 (3,500 - 6,500) ha 2,800 - 5,200 ha (56 - 100 %) 350 - 650 ha (70 - 130 %)	>70% NSS	30-70% Central West	Goobang NP	42,347	500	10.0	E2
ESWWS	331: LC/1a Red Stringybark woodland on siliceous hillslopes in of the Hervey Range region in the northern part of the NSW South-western Slopes Bioregion	20,000 (14,000 - 26,000) ha 12,000 - 20,000 ha (60 - 100 %) 6,700 - 12,000 ha (71 - 130 %)	>70% NSS	30-70% Central West 30-70% Lachlan	Goobang NP	42,347	9,500	47.5	E2
ESWWS	345: NT/5a Red Box - Tumbledown Gum - Red Stringybark - Long-leaved Box dry woodland on fine-grained metamorphic substrates in the western South Eastern Highlands and upper NSW South-western Slopes Bioregions	5,000 (3,500 - 6,500) ha 2,100 - 3,900 ha (42 - 78 %) 35 - 41 ha (92 - 110 %)	30-70% NSS 30-70% SEH	<30% Central West 30-70% Lachlan	Copperhannia NR#	3,507	38	0.76	M

Formation Group Acronym	Veg ID: Threat/Protected Area Code Plant Community Common Name	ESTIMATED EXTENT: pre-European (range) Current Range (% pre-European) Protected Range (% pre-European)	% of Community in Bioregion	% of Community in CMA	Protected Area Name & Size (ha) (* = also on Western Slopes) (# = also on Tablelands or Northern Slopes)	Veg Area (ha) % Pre-European & Accuracy Code		
ESWWS	346: V/5b White Box - Blakelys Red Gum - White Cypress Pine shrubby woodland on metamorphic hills in the Wagga Wagga region of the NSW South-western Slopes Bioregion	1,500 (750 - 2,200) ha 350 - 1,000 ha (23 - 67 %) 0 ha	>70% NSS	>70% Murrumbidgee	Not Protected			
ESWWS	348: V/4a Red Stringybark - Long-leaved Box - Joycea pallida grassy open forest in the upper Lachlan catchment, NSWSWS and South Eastern Highlands Bioregions	30,000 (21,000 - 39,000) ha 8,400 - 15,000 ha (28 - 50 %) 280 - 520 ha (70 - 130 %)	30-70% NSS 30-70% SEH	>70% Lachlan	Mundoonen NR# 1,476	400	1.33	E2
ESWWS	353: CE/5b Scribbly Gum - Red Stringybark - box - Daviesia latifolia - snow grass open forest on sandy loam soils from acid volcanics in the Boorowa - Young region of the NSW South-western Slopes Bioregion	3,000 (2,100 - 3,900) ha 210 - 390 ha (7 - 13 %) 0 ha	>70% NSS	>70% Lachlan	Not Protected			
ESWWS	354: LC/1a Red Stringybark - Long-leaved Box - Black Cypress Pine - hummock grass - shrubby low woodland on siliceous volcanic and sedimentary ranges in the Peak Hill region, central west NSW	15,000 (11,000 - 19,000) ha 8,400 - 15,000 ha (56 - 100 %) 4,900 - 9,100 ha (70 - 130 %)	>70% NSS	30-70% Central West <30% Lachlan	Goobang NP 42,347	7,000	46.7	E2
EWLFST	310: LC/1a Nortons Box - Red Stringybark grassy tall open forest on sheltered slopes in the Tumbarumba - Murray River region of the NSW South-western Slopes Bioregion	10,000 (7,000 - 13,000) ha 4,200 - 7,800 ha (42 - 78 %) 6,200 - 7,400 ha (91 - 110 %)	30-70% SEH 30-70% NSS	>70% Murray <30% Murrumbidgee	Bogandyera NR# 9,463 Clarkes Hill NR# 2,206 Jingellic NR 2,140 Carabost FR# 2,803 Mundaroo FR# 1,946	4,500 44 860 1,000 400	45.0 0.44 8.60 10.0 4.00	E2 M E1 E3 E4

Formation Group Acronym	Veg ID: Threat/Protected Area Code Plant Community Common Name	ESTIMATED EXTENT: pre-European (range) Current Range (% pre-European) Protected Range (% pre-European)	% of Community in Bioregion	% of Community in CMA	Protected Area Name & Size (ha) (* = also on Western Slopes) (# = also on Tablelands or Northern Slopes)		Veg Area (ha) % Pre-European & Accuracy Code		
EWLFST	344: E/5b Argyle Apple - Acacia mearnsii valley open forest of the Yass - Rye Park region of the South Eastern Highlands and adjoining NSW South Western Slopes Bioregions	4,500 (3,200 - 5,800) ha 910 - 1,600 ha (20 - 36 %) 130 - 220 ha (74 - 130 %)	30-70% SEH <30% NSS	<30% Murrumbidgee >70% Lachlan	Mundoonen NR# Razorback NR# Burrinjuck NR# Oak Creek NR#	1,476 2,640 5,201 403	4 10 150 12	0.09 0.22 3.33 0.27	M E3 E3 E3
EWLFST	349: LC/4a Scribbly Gum - Red Stringybark open forest on hills composed of silicous substrates in the mid-Murrumbidgee and upper Lachlan catchments mainly in the western South Eastern Highlands Bioregion	80,000 (56,000 - 100,000) ha 28,000 - 52,000 ha (35 - 65 %) 2,200 - 4,000 ha (71 - 130 %)	<30% NSS >70% SEH	30-70% Lachlan <30% Murrumbidgee	Mundoonen NR# Razorback NR# Black Andrew NR# Burrinjuck NR# Oak Creek NR#	1,476 2,640 1,557 5,201 403	830 2,000 1 3 255	1.04 2.50 <0.01 <0.01 0.32	E2 E2 M M E1
EWLFST	351: V/4a Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion	50,000 (35,000 - 65,000) ha 14,000 - 26,000 ha (28 - 52 %) 70 - 1,300 ha (10 - 190 %)	>70% SEH <30% NSS	30-70% Lachlan 30-70% Central West	Mundoonen NR# Burrinjuck NR# Black Andrew NR#	1,476 5,201 1,557	1 500 190	<0.01 1.00 0.38	M E3 E2
EWRHI	185: LC/4a Dwyers Red Gum - White Cypress Pine - Currawang shrubby woodland of the NSW South-western Slopes Bioregion	50,000 (35,000 - 65,000) ha 28,000 - 52,000 ha (56 - 100 %) 910 - 1,600 ha (70 - 120 %)	<30% CP >70% NSS	<30% Lachlan <30% Murrumbidgee	Cocoparra NR* Cocoparra NP* Snake Rock AA	4,775 8,364 61	830 460 5	1.66 0.92 0.01	E1 E1 E2

Formation Group Acronym	Veg ID: Threat/Protected Area Code Plant Community Common Name	ESTIMATED EXTENT: pre-European (range) Current Range (% pre-European) Protected Range (% pre-European)	% of Community in Bioregion	of Community in CMA	Protected Area Name & Size (ha) (* = also on Western Slopes) (# = also on Tablelands or Northern Slopes)		Veg Area (ha) % Pre-European & Accuracy Code		
EWRHI	186: LC/1a Dwyers Red Gum - Black Cypress Pine - Currawang shrubby low woodland on rocky hills mainly in the NSW South-western Slopes Bioregion	60,000 (30,000 - 90,000) ha 25,000 - 75,000 ha (42 - 130 %) 15,000 - 27,000 ha (72 - 130 %)	<30% CP >70% NSS	30-70% Lachlan <30% Murray 30-70% Murrumbidgee	Blue Mallee FR Cocoparra NP* Cocoparra NR* Eugowra NR Goobang NP Ingalba NR The Charcoal Tank NR The Rock NR Weddin Mountains NP Livingstone NP Livingstone SCA Boginderra Hills NR Benambra NP Tabletop NR Koorawatha NR Dananbilla NR Woomargama NP Ulandra NR Buddigower NR CO9801 PA VCA0044 WE9904 PA#	66 8,364 4,775 115 42,347 4,179 84 343 8,697 1,918 582 798 1,400 102 1,111 2,436 24,185 3,958 329 525 46 519	10 6,030 3,200 100 500 400 2 193 5,145 300 17 320 30 23 420 1,000 200 2,400 40 525 12 45	0.02 10.1 5.33 0.17 0.83 0.67 <0.01 0.32 8.58 0.50 0.03 0.53 0.05 0.04 0.70 1.67 0.33 4.00 0.07 0.88 0.02 0.08	E3 E1 E1 M E1 E2 E1 E2 E1 E2 E1 E2 E2 E3 E1 E1 E3 E2 E2 M E3 E3
EWRHI	257: NT/5a Dwyers Red Gum - Currawang grassy low woodland of the central western plains of NSW	45,000 (32,000 - 58,000) ha 21,000 - 39,000 ha (47 - 87 %) 330 - 330 ha (100 - 100 %)	30-70% CP 30-70% NSS	30-70% Central West <30% Lachlan <30% Western	Cocoparra NP*	8,364	330	0.73	E2
EWRHI	319: V/5a Tumbledown Gum - White Cypress Pine hill woodland in the southern part of the NSW South-western Slopes Bioregion	20,000 (10,000 - 30,000) ha 4,000 - 12,000 ha (20 - 60 %) 0 ha	>70% NSS	30-70% Murrumbidgee <30% Murray <30% Lachlan	Not Protected				
EWRHI	332: LC/3a Tumbledown Gum - Black Cypress Pine - Red Stringybark woodland on rocky hills in the NSW central western slopes	15,000 (7,500 - 22,000) ha 5,500 - 16,000 ha (37 - 110 %) 890 - 1,600 ha (71 - 130 %)	>70% NSS	30-70% Lachlan <30% Central West	Conimbla NP Nangar NP Boginderra Hills NR	7,948 9,356 798	500 600 160	3.33 4.00 1.07	E3 E2 M

Formation Group Acronym	Veg ID: Threat/Protected Area Code Plant Community Common Name	ESTIMATED EXTENT: pre-European (range) Current Range (% pre-European) Protected Range (% pre-European)	% of Community in Bioregion	% of Community in CMA	Protected Area Name & Size (ha) (* = also on Western Slopes) (# = also on Tablelands or Northern Slopes)		Veg Area (ha) % Pre-European & Accuracy Code		
EWRHI	338: E/5b Blakelys Red Gum - Red Stringybark - Long-leaved Box woodland on Wyangala Granite in the NSW South-western Slopes Bioregion	8,000 (5,600 - 10,000) ha 720 - 880 ha (9 - 11 %) 0 ha	30-70% NSS 30-70% SEH	>70% Lachlan	Not Protected				
EWRHI	339: V/5a Tumbledown Gum - Black Cypress Pine - Red Stringybark - Currawang shrubby low woodland on Wyangala granite and metasediments of the Wyangala Dam region, NSW South-western Slopes Bioregion	20,000 (14,000 - 26,000) ha 8,400 - 15,000 ha (42 - 75 %) 5 - 5 ha (100 - 100 %)	>70% NSS	>70% Lachlan	CW9903 PA#	32	5	0.03	E2
EWRHI	340: NT/5b Red Stringybark - red gum - Black Cypress Pine - Kunzea - tea tree shrubby open forest on granite ranges of the Boorowa - Wyangala region, NSW SW Slopes Bioregion	2,000 (1,400 - 2,600) ha 700 - 1,300 ha (35 - 65 %) 0 ha	>70% NSS	>70% Lachlan	Not Protected				
FWI	053: V/4a Shallow freshwater sedge swamp in depressions on floodplains of inland north-western NSW	150,000 (75,000 - 220,000) ha 25,000 - 75,000 ha (17 - 50 %) 1,800 - 3,200 ha (71 - 130 %)	<30% BBS 30-70% DRP 30-70% MUL <30% RIV <30% NSS	30-70% Border R/Gwydir 30-70% Central West <30% Lachlan <30% Murray <30% Murrumbidgee <30% Namoi <30% Western	Boomi NR* Budelah NR* Kirramingly NR# Macquarie Marshes NR* Nocoleche NR* Boomi West NR* Boronga NR*	157 4,049 1,329 19,465 71,068 148 198	2 17 9 2,000 500 5 3	<0.01 0.01 0.01 1.33 0.33 <0.01 <0.01	E1 E2 M E2 E2 E1 E1
FWI	181: LC/3a Common Reed - Bushy Groundsel aquatic tall grassland of inland river systems	30,000 (15,000 - 45,000) ha 10,000 - 30,000 ha (33 - 100 %) 2,700 - 4,900 ha (71 - 130 %)	<30% CP <30% DRP <30% MUL <30% MDD <30% NSS 30-70% RIV	<30% Border R/Gwydir <30% Central West <30% Lachlan <30% Lower MD 30-70% Murray <30% Murrumbidgee <30% Namoi <30% Western	Macquarie Marshes NR* Yanga NP* Narran Lake NR*#	19,465 36,438 22,338	3,800 5 20	12.7 0.02 0.07	E2 E3 E3

Formation Group Acronym	Veg ID: Threat/Protected Area Code Plant Community Common Name	ESTIMATED EXTENT: pre-European (range) Current Range (% pre-European) Protected Range (% pre-European)	% of Community in Bioregion	% of Community in CMA	Protected Area Name & Size (ha) (* = also on Western Slopes) (# = also on Tablelands or Northern Slopes)		Veg Area (ha) % Pre-European & Accuracy Code		
FWI	182: LC/4a Cumbungi rushland of shallow semi-permanent water bodies of the inland river systems	40,000 (12,000 - 68,000) ha 15,000 - 45,000 ha (38 - 110 %) 200 - 600 ha (50 - 150 %)	<30% DRP <30% MUL <30% MDD <30% NSS 30-70% RIV	<30% Border R/Gwydir <30% Central West <30% Lachlan <30% Lower MD <30% Murray <30% Murrumbidgee <30% Namoi <30% Western	Macquarie Marshes NR*	19,465	400	1.00	E2
FWI	238: NT/5a Permanent and semi-permanent freshwater lakes of the inland slopes and plains	1,000,000 (500,000 - 1,500,000) ha 200,000 - 600,000 ha (20 - 60 %) 710 - 2,100 ha (51 - 150 %)	<30% BBS >70% DRP <30% MUL <30% MDD <30% NSS 30-70% RIV <30% SSD	<30% Border R/Gwydir <30% Central West <30% Lachlan <30% Lower MD <30% Murray <30% Murrumbidgee <30% Namoi <30% Western	Billabong FR* Macquarie Marshes NR* Moira Lakes FR* Morrisons Lake NR* Peacock Creek FR* Pollack FR* Willandra NP* Yanga NP*	309 19,465 1,418 319 110 714 18,835 36,438	19 300 664 180 5 6 100 130	<0.01 0.03 0.07 0.02 <0.01 <0.01 0.01 0.01	E1 E3 E1 E2 E2 E1 E4 E2
FWI	360: CE/5c Gilgai wetland mosaic in the southern NSW South-western Slopes Bioregion	1,000 (500 - 1,500) ha 70 - 130 ha (7 - 13 %) 0 ha	>70% NSS	>70% Murray <30% Murrumbidgee	Not Protected				
FWSS	335: E/5b Tussock grass - sedge - rush - reed valley flat wetlands on organic clay loams in the upper slopes sub-region of the NSW South-western Slopes Bioregion	6,000 (3,000 - 9,000) ha 700 - 1,300 ha (12 - 22 %) 0 ha	30-70% NSS <30% SEH	<30% Lachlan <30% Central West <30% Murrumbidgee <30% Murray	Not Protected				
FWSS	336: NT/5b Rush - Sedge - Common Reed mainly lentic channel wetlands of the Upper Murray and mid-Murrumbidgee River floodplains in the NSW South-western Slopes Bioregion	3,000 (2,100 - 3,900) ha 1,100 - 1,900 ha (37 - 63 %) 4 - 4 ha (90 - 110 %)	>70% NSS <30% RIV <30% SEH	>70% Murray <30% Murrumbidgee	VCA0084	14	4	0.13	E4
GFTI	250: LC/2b Derived tussock grasslands of the central western plains and lower slopes of NSW	1,000 (100 - 1,900) ha 200,000 - 600,000 ha (20000 - 60000 %) 430 - 510 ha (91 - 110 %)	<30% CP 30-70% NSS	30-70% Central West 30-70% Lachlan <30% Murrumbidgee <30% Western	CD9907 PA CD9911 PA VCA0008	343 428 400	122 260 90	12.2 26.0 9.00	M M E1

Formation Group Acronym	Veg ID: Threat/Protected Area Code Plant Community Common Name	ESTIMATED EXTENT: pre-European (range) Current Range (% pre-European) Protected Range (% pre-European)	% of Community in Bioregion	% of Community in CMA	Protected Area Name & Size (ha) (* = also on Western Slopes) (# = also on Tablelands or Northern Slopes)		Veg Area (ha) % Pre-European & Accuracy Code		
GFTI	320: CE/5a Kangaroo Grass - Redleg Grass rich-herb temperate tussock grassland of the northern Monaro, ACT and upper Lachlan River regions of the NSW South Western Slopes and South Eastern Highlands Bioregions	25,000 (18,000 - 32,000) ha 700 - 1,300 ha (2.8 - 5.2 %) 0 ha	<30% NSS >70% SEH	>70% Lachlan	Not Protected				
HSOT	292: LC/2b She oak - Fringe Myrtle heathland on rocky ranges in the NSW South-western Slopes Bioregion	8,000 (5,600 - 10,000) ha 4,200 - 7,800 ha (53 - 98 %) 2,100 - 3,800 ha (71 - 130 %)	>70% NSS	30-70% Lachlan <30% Murrumbidgee <30% Central West	Big Bush NR Pucawan NR Ingalba NR Nangar NP Goobang NP Conimbla NP Dananbilla NR Koorawatha NR Gungewalla NR	643 287 4,179 9,356 42,347 7,948 2,436 1,111 140	170 30 350 36 2,000 360 20 5 2	2.13 0.38 4.38 0.45 25.0 4.50 0.25 0.06 0.03	E1 E1 E1 E1 E2 E1 E3 E3 E3
HSOT	301: E/5b Drooping Sheoke - Ricinocarpus bowmannii - grasstree tall open shrubland of the Coolac - Tumut Serpentinite Belt	8,500 (6,000 - 11,000) ha 1,700 - 3,100 ha (20 - 36 %) 0 ha	>70% NSS <30% SEH	>70% Murrumbidgee	Not Protected				
HSOT	334: LC/3c Tick Bush - Drooping She Oak tall shrubland on granite hills of the NSW central western slopes	800 (720 - 880) ha 630 - 770 ha (79 - 96 %) 200 - 370 ha (70 - 130 %)	>70% NSS	>70% Lachlan	Boginderra Hills NR	798	285	35.6	E2
HSOT	337: CE/5c Apple Box - Silver Banksia - Drooping Sheoak open woodland - tall shrubland in protected gullies of the Coolac - Tumut serpentinite belt, NSW South-western Slopes Bioregion.	300 (210 - 390) ha 27 - 33 ha (9 - 11 %) 0 ha	>70% NSS	>70% Murrumbidgee	Not Protected				

Formation Group Acronym	Veg ID: Threat/Protected Area Code Plant Community Common Name	ESTIMATED EXTENT: pre-European (range) Current Range (% pre-European) Protected Range (% pre-European)	% of Community in Bioregion	% of Community in CMA	Protected Area Name & Size (ha) (* = also on Western Slopes) (# = also on Tablelands or Northern Slopes)		Veg Area (ha) % Pre-European & Accuracy Code		
HSOT	357: LC/5c Beyeria - Mintbush - Tumbledown Gum shrubland - low woodland on conglomerate outcrops in the Wellington region, NSW central western slopes	100 (70 - 130) ha 56 - 100 ha (56 - 100 %) 0 ha	>70% NSS	>70% Central West	Not Protected				
MWSI	173: NT/2a Sandplain mallee of central NSW	700,000 (490,000 - 910,000) ha 250,000 - 450,000 ha (36 - 64 %) 120,000 - 130,000 ha (98 - 110 %)	<30% CP 30-70% MDD <30% NSS	<30% Central West 30-70% Lachlan <30% Murrumbidgee <30% Western	Gubbata NR*	151	146	0.02	E1
					Kajuligah NR*	13,833	4,000	0.57	E3
					Langtree NR*	232	32	<0.01	E1
					Loughnan NR*	390	360	0.05	E1
					Mount Grenfell HS*	1,365	100	0.01	E2
					Nombinnie NR*	72,128	57,590	8.23	E1
					Nombinnie SCA*	53,258	33,830	4.83	E2
					Pulletop NR*	145	135	0.02	E1
					Round Hill NR*	13,642	12,540	1.79	E1
					Scrubby Mountain FR*	1,704	250	0.04	E3
					Yathong NR*	108,768	13,400	1.91	E2
					WE9906 PA#	24	24	<0.01	M
					WE9907 PA#	519	35	0.01	M
MWSI	193: E/3a Red Mallee - White Mallee extremely tall "tree mallee" on silty-loam-clay soils of central south-western NSW	20,000 (10,000 - 30,000) ha 2,500 - 7,500 ha (13 - 38 %) 1,100 - 1,900 ha (73 - 130 %)	<30% CP 30-70% MDD <30% NSS	<30% Central West 30-70% Lachlan <30% Western	Nombinnie NR*	72,128	500	2.50	E1
					Nombinnie SCA*	53,258	1,000	5.00	E1
					Quanda NR*	4,767	10	0.05	E4
MWSI	355: CE/5b Bull Mallee - White Mallee tall mallee woodland on red sandy loam soils in the central western slopes of NSW	2,000 (1,800 - 2,200) ha 90 - 110 ha (4.5 - 5.5 %) 0 ha	>70% NSS	>70% Lachlan	Not Protected				
MWSR	176: LC/3a Green Mallee - White Cypress Pine very tall mallee woodland on gravel rises mainly in the Cobar Peneplain Bioregion	75,000 (53,000 - 97,000) ha 42,000 - 78,000 ha (56 - 100 %) 5,000 - 9,200 ha (70 - 130 %)	>70% CP <30% MDD <30% NSS	30-70% Central West <30% Lachlan 30-70% Western	Nombinnie SCA*	53,258	260	0.35	M
					Yathong NR*	108,768	6,800	9.07	E2
					CD9907 PA	343	2	<0.01	M
					CD9911 PA	428	21	0.03	M
					WE9902 PA#	519	40	0.05	E1

Formation Group Acronym	Veg ID: Threat/Protected Area Code Plant Community Common Name	ESTIMATED EXTENT: pre-European (range) Current Range (% pre-European) Protected Range (% pre-European)	% of Community in Bioregion	% of Community in CMA	Protected Area Name & Size (ha) (* = also on Western Slopes) (# = also on Tablelands or Northern Slopes)		Veg Area (ha) % Pre-European & Accuracy Code		
MWSR	177: E/4a Blue Mallee - Bull Mallee - Green Mallee very tall mallee shrubland of the West Wyalong region, NSW South-western Slopes Bioregion	15,000 (11,000 - 19,000) ha 1,400 - 2,600 ha (9.3 - 17 %) 150 - 170 ha (94 - 110 %)	>70% NSS	>70% Lachlan <30% Murrumbidgee	Big Bush NR Blue Mallee FR Buddigower NR	643 66 329	5 40 115	0.03 0.27 0.77	E3 E2 E2
MWSR	256: LC/5b Green Mallee - Black Cypress Pine tall mallee woodland on rises and low hills in the central western slopes of NSW	7,000 (3,500 - 10,000) ha 2,500 - 7,500 ha (36 - 110 %) 59 - 71 ha (91 - 110 %)	<30% BBS <30% CP 30-70% NSS	>70% Central West <30% Lachlan <30% Western	Big Bush NR Coolbaggie NR#	643 1,773	15 50	0.21 0.71	E3 E2
RIEC	302: V/5b Riparian Blakelys Red Gum - Broad-leaved Sally woodland - tea-tree - bottlebrush - wattle shrubland of the NSW South-western Slopes and South East Highlands Bioregions	5,000 (2,500 - 7,500) ha 1,300 - 3,700 ha (26 - 74 %) 63 - 350 ha (30 - 170 %)	30-70% NSS 30-70% SEH	30-70% Murrumbidgee <30% Murray	Bogandyera NR# Kosciuszko NP#	9,463 689,464	10 200	0.20 4.00	E3 E3
RIEC	333: V/5c Bottlebrush riparian shrubland of the central western slopes and adjoining tablelands of NSW	3,000 (1,500 - 4,500) ha 500 - 1,500 ha (17 - 50 %) 2 - 9 ha (30 - 170 %)	>70% NSS <30% SEH	30-70% Lachlan 30-70% Central West	Nangar NP	9,356	5	0.17	E3

NSWSWS Bioregion plant communities

A total of 135 plant communities have been classified and assessed as being in the NSWSWS Bioregion. Plant community ID number, common name, extent, threat category and protected area occurrences and status are listed in Table 1. A total of 97 of the communities are additions to the plant communities described in Part 1 of the NSWVCA project in Benson et al. (2006). A total of 38 NSWSWS communities also occur in the NSW Western Plains (Table 1). Examples of full reports and short reports of plant communities from the NSWSWS Bioregion in the NSWVCA database are provided in Appendices A–D.

The bulk of the results, i.e. the plant community descriptions, are presented in reports generated from Version 2 of the NSWVCA database. These reports are arranged in folders on the CD accompanying the article. They include full (90 field) and short (28 field) reports covering the 135 plant communities in the NSWSWS Bioregion. The full PDF report on the NSWSWS is nearly 400 pages long. The CD contains a "read only" copy of Version 2 of the NSWVCA database that can be used to generate a range of full or short reports for listing plant communities by various geographical areas or under broad vegetation classes.

The contents of the CD

A **READ ME** file that describes the contents of the CD, the 15 files that comprise the NSWVCA database and explains how to use the database.

Folder 1: Version 2 of the NSWVCA database

A read-only formatted Version 2 of the NSWVCA database and 15 associated files for using the database and the *Images* folder that links to the database. This version of the database includes data entries for the NSWSWS Bioregion along with updated entries for the NSW Western Plains. In total 315 plant communities are recorded 135 or which occur in the NSWSWS Bioregion;

Folder 2: Reports on plant communities in the NSWSWS Bioregion

Full and Short PDF Reports listing the plant communities in the NSWSWS Bioregion;
Full and Short PDF Reports listing the plant communities in the Lower Slopes and Upper Slopes Sub-regions;
Updated Bibliography from Version 2 of the NSWVCA database;
PDF copy of this third NSWVCA paper: Benson, J.S. (2008) New South Wales Vegetation Classification and Assessment: Version 2: NSW South-western Slopes Bioregion and Update of NSW Western Plains. *Cunninghamia* 10(4): 599–673.

Folder 3: Updated reports on plant communities in the NSW Western Plains

This updates reports published on the CD in Benson et al. (2006) and includes:
A spreadsheet listing the changes made to the NSW Western Plains plant communities since Version 1 of the database was published in July 2006;
Full Report (all 90 fields in the database) of 220 plant communities in the NSW Western Plains;
Short Report (28 of the 90 fields) of 220 plant communities in the NSW Western Plains;
A sub-folder containing Full and Short Reports of the plant communities in each of the eight IBRA Bioregions that comprise the NSW Western Plains.

Folder 4: Reports on plant communities in six western NSW CMA areas

Updated Full and Short Reports listing plant communities in the Western CMA and the Lower Murray Darling CMA areas. The NSWVCA covers these areas completely;
Full and Short Reports listing plant communities in the NSW Western Plains and NSW Western Slopes sections of the Murray, Murrumbidgee, Lachlan and Central West CMAs. Note: plant communities in the NSW Tablelands Section (shown in Figures 6 & 8 on pages 335, 336 in Benson 2006) of these four CMA have not yet been classified or assessed in the NSWVCA project, therefore, the vegetation classification of these four CMAs remains incomplete as of 2008.
The plant communities listed in reports for bioregions or CMAs on the CD are arranged in alphabetical order by the names of the NSWVCA Formation Groups listed in Table 4 on page 346 in paper one in the NSWVCA series (Benson 2006).

Range of plant communities

Of the 135 plant communities, 9 are estimated to have had a pre-European extent <1000 ha (rare); 41 between 1000 and 10,000 ha (restricted); and 85 >10,000 ha (Table 2). Therefore, the majority of communities covered large areas before clearing and fragmentation after European settlement.

About one third (21) of the (higher hierarchical) NSWVCA Formation Groups in NSW (Table 4 on page 346 in Benson 2006), occur in the NSW SWS Bioregion (Table 3). The two Formation Groups containing the largest number of plant communities are: "*Eucalyptus* (Mostly Shrubby) Woodlands and Forests on Low Fertility Soils on the Western Slopes" with 20 communities and "*Eucalyptus* (Mostly Grassy) Box Woodlands of the Tablelands and Western Slopes" with 34 communities (Table 3). This reflects the dominance of *Eucalyptus*–dominated forests and woodlands in the NSWSWS Bioregion compared to the range of vegetation formations that occur on the NSW Western Plains where

a high number of plant communities occur in chenopod shrublands, *Acacia* shrublands and grasslands (Benson et al. 2006).

A total of 20 of the 99 Vegetation Classes in defined Keith (2004) occur in the NSWSWS Bioregion (Table 4). Three of these Classes: Western Slopes Dry Sclerophyll Forests, Upper Riverina Dry Sclerophyll Forest and Western Slopes Grassy Woodlands, contain half (71 of 135) of the NSWVCA plant communities defined in the Bioregion. It should be noted that some of the Keith (2004) Vegetation Classes mainly occur outside the NSWSWS Bioregion.

The occurrence of plant communities in the four CMAs that intersect with the NSWSWS Bioregion (Central West, Lachlan, Murrumbidgee and Murray CMAs) are provided in Table 5. This table also includes an updated list of communities recorded in the two far western NSW CMAs being the Lower Murray-Darling and Western CMAs thus updating Table 8 in Version 1 of the NSWVCA presented in Benson et al. (2006).

The main vegetation types in the NSWSWS Bioregion include mallee shrublands, various types of wetlands, *Callitris*-woodlands, *Allocasuarina – Casuarina* woodlands, *Eucalyptus* grassy woodlands on higher nutrient soils, *Eucalyptus* shrubby woodlands and open forests on medium to poor soils on rocky hills and *Eucalyptus* tall open forests with fern-grass-shrub ground covers in regions with higher rainfall. The combination of different climate, substrates and soils is reflected in markedly different vegetation types from both sub-regions. The Upper Slopes Sub-region receives higher rainfall and has lower average temperatures than the Lower Slopes Sub-region.

Plant communities in the Lower Slopes Sub-region

The Lower Slopes Sub-region contains extensive alluvial plains and floodplains that support vegetation types that overlap with those described occurring in the NSW Western Plains described in Benson et al. (2006). The plant communities occurring in this sub-region are listed in Folder 2 on the CD and are summarised below.

Rivers and channels are generally dominated by *Eucalyptus camaldulensis* (River Red Gum) tall forest or tall woodland extending onto the inner floodplains (IDs 2, 5, 9) and onto the fringes or beds of cowals (lakes) or flood channels (ID249)(Figure 7). River Red Gum often mixes with riparian *Eucalyptus microcarpa* (Inland Grey Box) woodland

Table 2. Number of plant communities that are estimated to have been Originally Rare <1000 ha, Originally Restricted 1000 – 10,000 ha and Originally Common >10,000 ha before European settlement.

Estimated pre-European Extent	Community ID Numbers	Number of plant communities
RARE (<1,000 ha)	178, 293, 313, 314, 315, 325, 334, 337, 357	***9***
Restricted (1,000 - <2,000 ha)	250, 317, 346, 356, 360	5
Restricted (2,000 - <5,000 ha)	269, 284, 286, 307, 311, 324, 333, 336, 340, 343, 344, 353, 355, 358	14
Restricted (5,000 - <10,000 ha)	48, 249, 256, 274, 275, 285, 288, 291, 292, 298, 299, 301, 302, 303, 316, 326, 327, 329, 335, 338, 341, 345	22
TOTAL RESTRICTED (1,000 - <10,000 ha)		***41***
Common (10,000 - <20,000 ha)	5, 177, 237, 270, 279, 294, 304, 305, 306, 310, 323, 332, 342, 347, 350, 354	16
Common (20,000 - <50,000 ha)	2, 9, 54, 74, 77, 79, 83, 85, 110, 181, 182, 193, 243, 251, 257, 258, 272, 273, 276, 278, 281, 283, 289, 290, 295, 296, 297, 309, 312, 318, 319, 320, 321, 322, 328, 330, 331, 339, 348	39
Common (50,000 - <100,000 ha)	176, 185, 186, 217, 248, 267, 268, 280, 282, 287, 349, 351, 352	13
Common (100,000 - <200,000 ha)	53, 75, 201, 300	4
Common (200,000 - <500,000 ha)	55, 56, 57, 70, 82	5
Common (>=500,000 ha)	26, 76, 80, 173, 238, 244, 266, 277	8
TOTAL COMMON (>=10,000 ha)		***85***

(ID237). *Eucalyptus melliodora* (Yellow Box) woodland (ID74) also mixes with River Red Gum on floodplains and Yellow Box woodland also occurs on alluvial and aeolian soil flats (ID276) where it has mainly been cleared (Figure 8). Above the floodplains, Inland Grey Box tall grassy or shrub-grass woodlands (IDs 76, 80, 82, 248) (Figure 9) are common on loams and clay soils throughout the western half of the bioregion mixing with *Callitris endlicheri* (Black Cypress Pine) and shrubs on the footslopes of hills (ID110). A restricted and highly threatened Yellow Box – White Cypress Pine woodland occurs on sandy rises between Narrandera and Urana (ID75) (Figure 10). *Eucalyptus populneus* (Poplar Box) woodland (ID56, 244) is restricted to the north-western part of the NSWSWS Bioregion and is more common in bioregions to the north and west (see Benson et al. 2006). *Eucalyptus conica* (Fuzzy Box) woodland (ID201) (Figure 28, pp438 in Benson et al. 2006) occurs on alluvial or colluvial soils on flats often near watercourses in the northern half of the bioregion, often mixing with Yellow Box woodland.

Acacia shrublands include *Acacia pendula* (Weeping Myall) low woodland on alluvial plains (ID26) with small patches of *Acacia homalophylla* (Yarran) tall shrubland (ID77) on aeolian or alluvial sediments (Figure 11). *Acacia doratoxylon* (Currawang) dominated shrublands (ID317) occur on skeletal lithosol soil on rocky ridges. These grade into the more widespread *Eucalyptus dwyeri* (Dwyer's Red Gum)-dominated low woodlands (IDs 185, 186) on rocky siliceous ridges. ID185 may grade into a *Eucalyptus intertexta* (Gum Coolabah) woodland that occurs with *Eucalyptus sideroxylon* (Mugga Ironbark) and *Callitris glaucophylla* (White Cypress

Table 3. Cross reference of 135 plant communities in the NSW South-western Slopes Bioregion with 20 NSWVCA Formation Groups that occur in that bioregion.

Formation Group	Acronym	SWS VCA Veg. ID Numbers	No.
Acacia Woodlands and Shrublands of the Inland Slopes and Plains	ASI	26, 77, 317	3
Casuarina Woodlands of the Inland Slopes and Plains	CCI	54, 55, 57, 85	4
Cypress Pine (Callitris) Woodlands Mainly of the Inland	CPW	48, 70, 309	3
Eremophila, Melaleuca and Dodonaea Shrublands of the Inland	EMDI	178	1
Eucalyptus (Mostly Grassy) Box Woodlands of the Inland Plains	EBWP	56, 75, 76, 80, 82, 83, 110, 201, 244, 248, 258	11
Eucalyptus (Mostly Grassy) Box Woodlands of the Tablelands and Western Slopes	EBWT	266, 267, 268, 269, 270, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 287, 293, 294, 298, 304, 305, 312, 314, 315, 316, 326, 341, 347, 350,	34
Eucalyptus (Mostly Shrubby) Woodlands and Forests on Low Fertility Soils on the Eastern Tablelands	EWLFST	310, 344, 349, 351	4
Eucalyptus (Mostly Shrubby) Woodlands and Forests on Low Fertility Soils on the Western Slopes	ESWWS	288, 290, 291, 296, 297, 306, 311, 313, 321, 322, 323, 324, 325, 327, 331, 345, 346, 348, 353, 354	20
Eucalyptus Communities of Inland Watercourses and Inner Floodplains	EIW	2, 5, 9, 74, 79, 237, 249, 251, 356	9
Eucalyptus Ironbark Woodlands and Forests of the Inland Slopes, Plains and Peneplains	EIWI	217, 243, 289, 318, 328, 329, 330, 342, 343, 358	10
Eucalyptus Subalpine Woodlands and Forests	ESAW	303	1
Eucalyptus Swamp Communities of the Eastern Coast and Tablelands	ESCT	285	1
Eucalyptus Tall Wet Forests of the Eastern Tablelands and Western Slopes	ECT	295, 299, 300, 307	4
Eucalyptus Woodlands on Rocky Hills of the Inland	EWRHI	185, 186, 257, 319, 332, 338, 339, 340	8
Freshwater Wetlands: Coast, Tablelands and Slopes Sedgeland Swamps	FWSS	335, 336	2
Freshwater Wetlands: Inland Aquatic, Swamp and Shrubland Communities	FWI	53, 181, 182, 238, 360	5
Grasslands on Fine Texture Soils on the Inland Slopes and Plains	GFTI	250, 320	2
Heaths and Shrublands on the Tablelands and Western Slopes of South-eastern Australia	HSOT	292, 301, 334, 337, 357	5
Mallee Woodlands and Shrublands of Inland Sandplains and Sand Dunes	MWSI	173, 193, 355	3
Mallee Woodlands and Shrublands on Stony Ridges of the Inland Slopes and Plains	MWSR	176, 177, 256	3
Riparian mostly Myrtaceous Shrublands of the Western Slopes, Tablelands and Coast (non-rainforest)	RIEC	302, 333	2

Pine) at the base on the slopes of granite hills in the Peak Hill to Tullamore region (ID258). A grassy Dwyer's Red Gum woodland (ID257) is present on some hills with richer soils in a few western ranges. Small areas of *Allocasuarina luehmannii* (Buloke) – *Callitris glaucophylla* (White Cypress Pine) woodland (ID54) occur on alkaline outwash soils, such as on the western flank of Goobang National Park. *Casuarina cristata* (Belah) woodlands (ID55, 56) occur on alluvial plains while *Callitris glaucophylla* (White Cypress Pine) (IDs 70 and 48) woodlands occur on alluvial or aeolian sand rises in the north mixing with red gum *Eucalyptus blakelyi* / *E. chloroclada* along sandy watercourses (ID356).

Ironbark woodlands are less common in the Lower Slopes Sub-region than the Upper Slopes Sub-region. Small areas of *Eucalyptus sideroxylon* (Mugga Ironbark) – *Callitris glaucophylla* (White Cypress Pine) with the mallee *Eucalyptus dumosa* (ID243) occur on gravely ridges in the north-western corner of the sub-region being more abundant in the Cobar Peneplain Bioregion. This has some similarity with the Gum Coolabah community on granite ID258 described above. A distinctive Mugga Ironbark – *Eucalyptus macrocarpa* (Inland Grey Box) woodland with a shrubby understorey (ID217) including *Acacia hakeoides*, *Dodonaea viscosa* subsp. *spatulata* and *Santalum acuminatum* is common on stony rises and footslopes of low hills in the Temora to Wyalong region (Figure 12). A good example is in The Charcoal Tank Nature Reserve.

Several mallee shrublands / low woodlands occur near the western edge of the Lower Slopes Sub-region. These include the sandplain mallee of central NSW (ID173), a very tall mallee community on loam to clay soils in central NSW (ID193), a very restricted type of mallee on parna sediment near Wyalong (ID355) (Figure 13) and / low mallee woodland on gravely rises and sediments that is dominated by *Eucalyptus polybractea* (Blue Mallee), *Eucalyptus viridis*

Fig. 7. ID249 *Eucalyptus camaldulensis* (River Red Gum) woodland, Gum Swamp near Walla Walla, (AGD66) 35°49'25' S 147°04'30' E. Photograph, Jaime Plaza, 19/10/2002.

Fig. 8. ID276: An overgrazed *Eucalyptus melliodora* (Yellow Box) alluvial flats woodland on red loam soil, during a drought, north of Junee. Mainly cleared and endangered. Photograph, John Benson, 14/3/2007.

Vegetation Class (Keith 2004)	SWS VCA Veg. ID Numbers	Total
Brigalow Clay Plain Woodlands	55	1
Eastern Riverine Forests	85	1
Floodplain Transition Woodlands	56, 74, 76, 80, 82, 237, 248, 251	8
Inland Floodplain Swamps	53, 181, 182, 238, 335, 336, 360	7
Inland Floodplain Woodlands	83	1
Inland Riverine Forests	2, 5, 9, 79, 249, 356	6
Inland Rocky Hill Woodlands	176, 185, 256, 257, 258, 292, 317, 318, 319, 328, 329, 332, 334, 357	14
North-west Plain Shrublands	77	1
Riverine Plain Woodlands	26	1
Riverine Sandhill Woodlands	48, 75	2
Sand Plain Mallee Woodlands	173, 193, 355	3
Semi-arid Sand Plain Woodlands	57	1
Southern Tableland Dry Sclerophyll Forests	296, 299, 307, 344, 345, 349, 351, 352	8
Southern Tableland Grassy Woodlands	283, 303, 312, 341, 350	5
Southern Tableland Wet Sclerophyll Forests	295, 300	2
Upper Riverina Dry Sclerophyll Forests	269, 285, 288, 289, 290, 293, 294, 297, 298, 302, 304, 305, 306, 310, 311, 313, 314, 315, 338, 339, 340, 342, 353	23
Western Peneplain Woodlands	70, 244	2
Western Slopes Dry Sclerophyll Forests	54, 110, 177, 178, 186, 217, 243, 270, 273, 287, 291, 309, 321, 322, 323, 324, 325, 327, 330, 331, 333, 343, 346, 348,	26
Western Slopes Grasslands	250, 320	2
Western Slopes Grassy Woodlands	201, 266, 267, 268, 272, 274, 275, 276, 277, 278, 279, 280, 281, 282, 284, 286, 301, 316, 326, 337, 347	21

Table 4. Cross reference of the 135 plant communities classified in the NSW South-western Slopes Bioregion in the NSWVCA database with the 20 Vegetation Classes fully or partly mapped in the bioregion by Keith (2004). Other plant communities that occur in other bioregions occur in these Vegetation Classes.

(Green Mallee), *Eucalyptus behriana* (Bull Mallee) with patches of *Melaleuca uncinata* (Broombush) (Figure 14) near West Wyalong (IDs 177 & 178). Very small patches of Green Mallee woodland (ID256) occur on stony rises just within the western edge of the NSWSWS Bioregion.

An *Allocasuarina diminuta* (she oak) – *Calytrix tetragona* (Five Fringe Myrtle) shrubland (ID292) (Figure 15) occurs on rock platforms or stony rises in the central part of the Lower Slopes and Upper Slopes Sub-regions. A very restricted *Kunzea* sp. '*Mt Kaputar'* (tick bush) shrubland (ID334) occurs on granite rock platforms on ridges in the Boginderra Hills near Temora.

Limited areas of sedge / rush swamps dominated by *Eleocharis*, *Carex*, *Juncus* and other water plants (ID53 & ID360) along with Reedland (ID181) and Rushland (ID182) swamps and open water wetlands (ID238) occur throughout the Lower Slopes Sub-region.

Fig. 9. ID76: *Eucalyptus microcarpa* (Inland Grey Box) tall woodland on clay to loam alluvial soils, Bimbi Road TSR South of Grenfell, (AGD66) 34°01'09" S 147°50'13" E. This is mainly cleared and endangered. Photograph, Jaime Plaza, 12/10/2002.

Table 5. Occurrence of plant communities in the eight western NSW Catchment Management Authority areas (CMAs). Notes. This updates the Western and Lower Murray Darling CMA data published in Table 8 in Version 1 of the NSWVCA (Benson et al. 2006). The Lower Murray-Darling and Western CMAs are fully covered by the NSWVCA but the Murray, Murrumbidgee, Lachlan and Central West CMAs do not include plant communities that are restricted to the South East Highlands and Australian Alps Bioregions.

CMA & No. Communities Present	Vegetation Communities Present
Central West 120	24; 26; 27; 35; 36; 37; 39; 40; 43; 45; 49; 50; 53; 54; 55; 56; 57; 70; 77; 78; 81; 82; 83; 84; 87; 88; 98; 103; 104; 105; 106; 108; 109; 112; 125; 134; 141; 144; 145; 146; 153; 158; 160; 163; 168; 173; 174; 175; 176; 180; 181; 182; 184; 187; 188; 193; 195; 201; 202; 204; 206; 208; 211; 212; 214; 217; 227; 228; 238; 241; 242; 244; 247; 248; 249; 250; 255; 256; 257; 258; 266; 267; 268; 270; 271; 272; 273; 274; 275; 276; 277; 278; 279; 280; 281; 282; 283; 287; 292; 317; 321; 322; 323; 324; 325; 326; 327; 328; 329; 330; 331; 332; 333; 335; 345; 351; 354; 356; 357; 358
Lachlan 137	2; 5; 7; 9; 10; 11; 12; 13; 15; 16; 17; 18; 23; 24; 26; 28; 29; 45; 46; 47; 50; 53; 54; 55; 56; 57; 58; 70; 72; 74; 76; 77; 79; 80; 82; 85; 98; 103; 104; 105; 106; 108; 110; 134; 142; 143; 153; 154; 157; 159; 160; 163; 164; 165; 166; 170; 171; 173; 174; 175; 176; 177; 178; 180; 181; 182; 184; 185; 186; 190; 193; 201; 208; 216; 217; 236; 237; 238; 239; 240; 242; 243; 244; 248; 249; 250; 251; 256; 257; 266; 267; 268; 271; 272; 275; 276; 277; 278; 279; 280; 282; 283; 287; 289; 292; 309; 317; 318; 319; 320; 321; 322; 328; 329; 330; 331; 332; 333; 334; 335; 338; 339; 340; 341; 342; 344; 345; 347; 348; 349; 350; 351; 352; 353; 354; 355; 356
Lower Murray/Darling 60	8; 11; 12; 13; 15; 16; 17; 18; 20; 21; 22; 23; 24; 28; 41; 50; 58; 63; 64; 65; 108; 119; 123; 124; 128; 139; 143; 150; 151; 152; 153; 154; 155; 156; 157; 159; 160; 163; 164; 165; 166; 170; 171; 172; 181; 182; 189; 190; 191; 196; 199; 216; 220; 221; 238; 240; 242; 252; 253; 254
Murray 97	2; 5; 7; 8; 9; 10; 11; 12; 13; 15; 16; 17; 18; 19; 20; 21; 22; 23; 24; 26; 28; 44; 45; 46; 47; 48; 50; 53; 58; 63; 74; 75; 76; 77; 79; 80; 86; 110; 157; 159; 160; 163; 164; 166; 170; 171; 181; 182; 186; 216; 237; 238; 240; 242; 249; 266; 267; 268; 269; 277; 282; 283; 284; 285; 286; 287; 288; 289; 290; 291; 293; 294; 295; 296; 297; 298; 299; 300; 302; 303; 304; 305; 306; 307; 309; 310; 311; 312; 313; 314; 315; 317; 318; 319; 335; 336; 360
Murrumbidgee 119	2; 5; 7; 9; 10; 11; 12; 13; 15; 16; 17; 18; 19; 21; 23; 24; 26; 28; 44; 45; 46; 47; 48; 50; 53; 57; 58; 74; 75; 76; 77; 79; 80; 82; 85; 110; 139; 142; 143; 153; 154; 157; 159; 160; 163; 164; 165; 166; 170; 171; 173; 177; 178; 181; 182; 185; 186; 190; 216; 217; 236; 237; 238; 239; 240; 242; 243; 249; 250; 266; 267; 268; 276; 277; 278; 280; 282; 283; 284; 285; 287; 289; 290; 291; 292; 294; 295; 296; 297; 298; 299; 300; 301; 302; 303; 305; 306; 307; 309; 310; 311; 312; 316; 317; 318; 319; 335; 336; 337; 341; 342; 343; 344; 346; 347; 349; 350; 352; 360
Western 153	11; 13; 15; 16; 18; 23; 24; 25; 27; 29; 31; 35; 36; 37; 38; 39; 40; 41; 43; 50; 52; 53; 55; 56; 57; 58; 59; 60; 61; 62; 63; 66; 67; 68; 69; 71; 72; 77; 82; 87; 98; 100; 103; 104; 105; 106; 108; 109; 115; 117; 118; 119; 120; 121; 122; 123; 124; 125; 127; 128; 129; 130; 131; 132; 133; 134; 136; 137; 138; 139; 140; 142; 143; 144; 145; 146; 149; 150; 151; 152; 153; 154; 155; 156; 158; 159; 160; 161; 162; 163; 165; 166; 167; 168; 169; 170; 171; 172; 173; 174; 175; 176; 180; 181; 182; 183; 184; 189; 192; 193; 194; 195; 197; 198; 199; 200; 207; 208; 210; 211; 212; 213; 214; 215; 218; 220; 222; 224; 225; 226; 229; 230; 231; 232; 233; 234; 238; 241; 242; 244; 245; 246; 247; 250; 256; 257; 258; 261; 262; 263; 264; 271; 359

Fig. 10. The mainly cleared and endangered ID75 *Eucalyptus melliodora–Callitris glaucophylla* woodland on a sandy rise in Lake Urana Nature Reserve, (AGD66) 35°16'15.6" S 146°08'54.8" E. Photograph, Jaime Plaza, 9/4/2002.

Fig. 11. ID77 *Acacia homalophylla* (Yarran) shrubland along the Barmedman – Wyalong Road in the NSW southern wheatbelt, (AGD66) 34° 08.360' S 147° 22.689' E. This is mainly cleared and endangered. Photograph, Jaime Plaza, 30/5/2007.

Fig. 12. D217: *Eucalyptus sideroxylon* (Mugga Ironbark) – *Eucalyptus microcarpa* (Inland Grey Box) shrubby woodland on a gravely rises in The Charcoal Tank Nature Reserve, (AGD66) 33°59'05.6" S 147°09'17.7" E. Photograph, Jaime Plaza, 19/4/02.

Fig. 13. Predominantly cleared ID355 *Eucalyptus behriana* (Bull Mallee) – *Eucalyptus socialis* (White Mallee) with *Acacia* spp., *Eremophila* spp. shrubs on red earth soils adjacent to the Wyalong – Barmedman Road and railway easement, (AGD66) 33° 56.355' S 147° 15.448' E. Photograph, Jaime Plaza, 31/5/2007.

Fig. 14. The highly restricted and mainly cleared ID178 *Melaleuca uncinata* (Broombush) – *Eucalyptus dwyeri* (Dwyer's Red Gum) shrubland in The Charcoal Tank Nature Reserve, (AGD66) 33°59'08.0' S 147°09'07.4' E. Photograph, Jaime Plaza 19/4/02.

Fig. 15. ID292 *Allocasuarina diminuta* (She Oak) – *Calytrix tetragona* (Fringe Myrtle) shrubland on a rocky ridge in Goobang National Park, (AGD66) 32°55' 41.8" S 148°23' 46" E. Photograph, Jaime Plaza, 04/05/2005.

Plant communities in the Upper Slopes Sub-region

The Upper Slopes Sub-region contains hill landform patterns with some rocky north-south orientated ranges containing siliceous rocks such as sandstone, conglomerate, granite or rhyolite. Floodplains composed of alluvial soils adjoin larger rivers including the Murray, Murrumbidgee and Lachlan Rivers. Besides the limited areas of alluvial soils, most soils are derived from metamorphic and sedimentary rocks of the Lachlan Fold Belt. Colluvium occurs on footslopes of hills. The most widespread vegetation types in the Upper Slopes Sub-region are those in *Eucalyptus*-dominated grassy woodlands or shrubby open forests.

The plant communities occurring in the Upper Slopes Sub-region are listed in Folder 2 on the CD and are summarised below.

Eucalyptus camaldulensis (River Red Gum) tall open forest (ID79) (Figure 16) dominates the riparian zone of major streams but River Red Gum is replaced by *Eucalyptus blakelyi* (Blakely's Red Gum) at higher altitudes where the latter often overtops *Leptospermum* spp. – *Callistemon sieberi*-dominated shrublands that occupy the banks of streams (IDs 302 & 333) (Figure 17). *Casuarina cunninghamiana* (River Oak) dominated tall open forest (ID85) (Figure 18) occupies the riparian zone in the mid to upper reaches of major rivers and creeks extending into the South Eastern Highlands Bioregion (Southern Tablelands Botanical Division), mixing with River Red Gum in some locations.

On richer, deeper loam to clay soils derived from alluvium on river flats and on soils derived from fine-grained lithology on undulating hills, the ground cover in woodlands is dominated by a rich array of grass and forb species. However, most of the original extent of these grassy woodlands has disappeared through clearing and weed invasion (see discussion below). The two most widespread, but now mainly cleared, grassy woodlands are *Eucalyptus albens* (White Box) grassy woodland (mainly ID266) (Figure 19) and *Eucalyptus blakelyi* (Blakely's Red Gum) – *Eucalyptus melliodora* (Yellow Box) grassy woodland (mainly ID277) (Figure 20). Both occur across a wide range of substrates and soil types as documented in Prober (1996). Both are included in the Grassy Box–Gum woodland Endangered Ecological Community (EEC) listing under Federal and NSW threatened species laws. A Yellow Box dominated tall woodland of restricted extent, occurs in narrow valleys in the upper Murray River catchment (ID312). Similarly, *Eucalyptus bridgesiana* (Apple Box) tall grassy woodland occurs in valley flats throughout the Upper Slopes (ID283) (Figure 21) with a similar type occurring with *Eucalyptus nortonii* (Norton's Box) in valleys near Tumut (ID298). A restricted type of Apple Box dominated woodland occurs on basalt scree in the upper Murray River valley (ID314).

White Box shrubby or shrub-grass woodlands cover a large proportion of the steep hills in the Upper Slopes Sub-region, generally occurring on shallow soils. These include White

Fig. 16. ID79 Upper Slopes form of *Eucalyptus camaldulensis* (River Red Gum) riparian woodland with grassy ground cover, Canowindra-Goologong Rd, south-western slopes, (AGD66) 33°34'27" S 148°29'58" E. Photograph, Jaime Plaza, 11/10/02.

Fig. 17. ID302 Riparian shrubland with *Leptospermum obovatum Callistemon sieberi*, *Acacia kettlewelliae*, *Lomatia myrticoides* with Blackberry and Willow infestation along Tumbarumba Creek, south of Tumbarumba, (AGD66) 35° 52.946' S 148° 03.243' E. Photograph, Jaime Plaza, 5/5/2006.

Fig. 18. ID85 *Casuarina cunninghamiana* (River Oak) tall woodland lining the Macquarie River in the Macquarie Gorge near Hill End, Photograph, Jaime Plaza, 9/5/2005.

Fig. 19. ID266 *Eucalyptus albens* (White Box) grassy woodland, Quamby–Thuddungra TSR south of Grenfell, (AGD66) 34°09'28" S 148°08'39" E. Photograph, Jaime Plaza, 12/10/02.

Fig. 20. ID277 *Eucalyptus melliodora* (Yellow Box) – *Eucalyptus blakelyi* (Blakely's Red Gum) tall woodland, on flats near Forbes (AGD66) 33°24'37" S 148°11'23" E. Photograph, Jaime Plaza, 10/10/02.

Fig. 21. ID283 *Eucalyptus bridgesiana* (Apple Box) – *Acacia dealbata* gully herbaceous woodland in Ellerslie Nature Reserve, 35°14'33" S 147°51'30" E. Photograph, Jaime Plaza, 20/10/02.

Box – White Cypress Pine – Inland Grey Box (ID267) woodland on loams in the western part of the sub-region and White Box – Blakely's Red Gum – White Cypress Pine woodland (ID346) on metamorphic hills in the Wagga Wagga region. To the east, shrubby White Box – *Eucalyptus polyanthemos* (Red Box) – *Eucalyptus macrorhyncha* (Red Stringybark) – Blakely's Red Gum woodland (ID268) occurs on shallow soils on steep hills. A similar White Box – Blakely's Red Gum – Red Box shrubby woodland that contains a high diversity of shrub species is restricted to the metamorphic hills around Albury (ID269) (Figure 22). Another shrubby woodland with White Box – Blakely's Red Gum – Red Stringybark and occasionally *Eucalyptus sideroxylon* (Mugga Ironbark) occurs on hills in the Tarcutta region (ID347). To the north, White Box – Black Cypress Pine – *Eucalyptus dealbata* (Tumbledown Gum) shrubby woodland (ID272) occurs on rocky ranges in central western NSW including in Nangar and Weddin Mountains National Parks. A poorly documented White Box – Tumbledown Gum – *Eucalyptus goniocalyx* (Long-leaved Box) low woodland occurs on steep slopes of shale or mudstone in the Macquarie River gorge (ID270), a White Box – Red Stringybark shrubby open forest (ID273) occurs on mudstone on very steep hills including Avisford Nature Reserve near Mudgee and a White Box – *Angophora floribunda* (Rough-barked Apple) open forest (ID274) occurs on fine – grained sedimentary substrates in valleys in the Mudgee region.

In addition to the widely distributed Blakely's Red Gum – Yellow Box woodland ID277 mentioned above, many other plant communities are dominated by Blakely's Red Gum. A shrub-grass community of Blakely's Red Gum – Apple Box – Yellow Box and occasionally Inland Grey Box (ID278) occurs in valleys in the central western slopes including Goobang National Park. A restricted community of Blakely's Red Gum with White Cypress Pine (ID279) occurs on colluvial soils on footslopes of hills and ranges such as the Weddin Mountains. In the region around Cootamundara, Blakely's Red Gum occurs with Long-leaved Box, Black Pine and a range of shrub species on hills composed of metamorphic substrates (ID280). This includes the naturally rare but otherwise weedy species *Acacia baileyana* (Cootamundra Wattle). On flatter terrain in the Tumut – Forbes – Cowra region, a woodland (ID282) occurs containing Blakely's Red Gum, White Box, Yellow Box and Black Cypress Pine with a grass-shrub ground cover (including the heath shrub *Lissanthe strigosa*) on clay loam soil on gently undulating hills. To the south of ID282 and restricted to the Murraguldrie region, a valley "swamp" Blakely's Red Gum – Red Stringybark open forest (ID284) is present that contains shrubs such as *Leptospermum continentale* and an abundance of *Juncus* and *Carex* in the ground cover. In the upper Lachlan catchment region Blakely's Red Gum occurs with *Eucalyptus polyanthemos* (Red Box) and *Callitris endlicheri* (Black Cypress Pine) (ID341). East of Cowra Blakely's Red Gum occurs with *Eucalyptus macrorhyncha* (Red Stringybark), *Eucalyptus goniocalyx* (Long-leaved Box) and *Brachychiton*

populneus (Kurrajong) on granite hills between Reids Flat and Wyangala Dam (ID338) (Figure 23). In the far northern part of the NSW SWS Bioregion Blakely's Red Gum occurs on valley flats in association with *Angophora floribunda* (Rough-barked Apple) with a grass – forb ground cover (ID281). This community is more common in the Brigalow Belt South and Nandewar Bioregions to the north.

Eucalyptus polyanthemos (Red Box) is a dominant component of several Upper Slopes hill and valley plant communities. In one restricted community, it mixes with Blakely's Red Gum and White Box along drainage lines in Benambra National Park near Albury (ID286). Red Box also occurs in a small area with *Eucalyptus dwyeri* and *Xanthorrhoea glauca* subsp. *angustifolia* in Jingellic Nature Reserve in the upper Murray River region (ID315). The most widespread plant community with Red Box as a dominant species is ID287 (Figure 24) with other tree species including *Eucalyptus goniocalyx* (Long-leaved Box) and Red Stringybark. This open forest is distributed along much of the length of the Upper Slopes Sub-region. On ridges of hills east of Tumut, Red Box occurs with Red Stringybark and Norton's Box with a distinctive heath shrub understorey on a quartz-shale substrate (ID306). Red Box occurs with *Eucalyptus dealbata* (Tumbledown Gum), Red Stringybark and a diverse shrub understorey on acid volcanic substrate in the Wyangala Dam region, east of Cowra (ID345). In the far north of the NSWSWS Bioregion, Long-leaved Box and Red Box dominate the canopy of an open forest on hill slopes in the Mudgee region (ID326). Long-leaved Box and Black Cypress Pine are dominant trees in a low open forest occurring on shallow soils on granite in Woomargama National Park near Albury (ID288).

In the south-eastern corner of the NSWSWS Bioregion in the region from Albury to Tumut, *Eucalyptus nortonii* (Norton's Box) is one of the most common eucalypt species. There are several plant communities where it is the main tree species or a canopy co-dominant. Near to Albury in Benambra National Park and Tabletop Nature Reserve, Norton's Box occurs with Red Stringybark and *Acacia doratoxylon* (Currawang) to form low shrubby woodland on conglomerate and sandstone escarpments (ID293). To the east, Norton's Box mixes with Red Box and White Box to form an open forest with a distinct tussock grass (*Joycea pallida*) ground cover (ID294) on a granite substrate with examples of this in Woomargama National Park. As mentioned above, Norton's Box occurs with Apple Box in valleys near Tumut (ID298) and grows with Red Stringybark in an open forest on hills in this region (ID310). On shallow soils on the steep Minjary Range north of Tumut, Norton's Box occurs with Red Box, Red Stringybark with a dominance of *Stypandra glauca* (Nodding Flax Lily) in the ground cover (ID316) (Figure 25).

Eucalyptus dives (Broad-leaved Peppermint) and *Eucalyptus mannifera* subsp. *mannifera* (Brittle Gum) are common in a number of plant communities at high altitudes in the Upper Slopes Sub-region with both species being more abundant in the adjoining South Eastern Highlands Bioregion. Broad-leaved

Fig. 22. ID269 *Eucalyptus albens – E. macrorhyncha – E. polyanthemos – E. blakelyi* shrub-rich woodland, Nail Can Hill, Albury, (AGD66) 36°03'00" S 146°54'07" E. Photograph, Jaime Plaza, 18/10/02.

Fig. 23. ID338 *Eucalyptus macrorhyncha* (Red Stringybark) – *Eucalyptus blakelyi* (Blakely's Red Gum) – *Eucalyptus goniocalyx* (Long-leaved Box) woodland on granite hills with an exotic species ground cover on the Rugby to Crookwell road west of the Lachlan River, (AGD66) 34° 24.632' S 149° 03.077' E. Photograph, Jaime Plaza, 29/5/2007.

Fig. 24. ID287 *Eucalyptus polyanthemos* (Red Box) – *Eucalyptus goniocalyx* (Long-leaved Box) – *Eucalyptus macrorhyncha* (Red Stringybark) open forest on brown clay derived from phyllite, 10 km south-east of Rye Park, (AGD66) 34° 33.418' S 148° 59.025' E. Photograph, Jaime Plaza, 29/5/2007.

Fig. 25. ID316 *Eucalyptus nortonii – E. macrorhyncha – E. polyanthemos – Stypandra glauca* low woodland on hillcrests in Minjary National Park, (AGD66) 35°14'31" S 148°07'34" E. Photograph, Jaime Plaza, 16/10/02.

Fig. 26. ID296 *Eucalyptus mannifera* (Brittle Gum) – *Eucalyptus dives* (Broad-leaved Peppermint) – *Eucalyptus macrorhyncha* (Red Stringybark) open forest on quartzite ridges in Woomargama National Park, (AGD66) 35° 54.773' S 147° 18.669' E. Photograph, Jaime Plaza, 2/5/2006.

Fig. 27. ID344 *Eucalyptus cinerea* (Argyle Apple) with *Eucalyptus mannifera* (Brittle Gum) and *Eucalyptus goniocalyx* (Long-leaved Box) open forest in a drainage line on hills in the Blackney's Road north of Yass. This community is mainly cleared and is poor reserved. (AGD66) 34° 41.899' S 149° 00.013' E. Photograph, Jaime Plaza, 29/5/2007.

Fig. 28. ID299 *Eucalyptus viminalis* (Ribbon Gum) tall open forest along a creek infested with Blackberry, east of Tumut, (AGD66) 35° 23.443' S 148° 13.920' E. Photograph, Jaime Plaza, 30/4/2006.

Fig. 29. . ID307 *Eucalyptus bicostata* (Eurabbie) and *Eucalyptus robertsonii* (Robertson's Peppermint) very tall open forest on protected slopes in Woomargama National Park has limited extent but is well reserved, (AGD66) 35° 55.625' S 147° 17.891' E. Photograph, Jaime Plaza, 2/5/2006.

Fig. 30. Extensively cleared ID304 *Eucalyptus rubida* (Candlebark) – *Eucalyptus robertsonii* (Robertson's Peppermint) tall open forest on yellow podsol soil on granite, Hume TSR near Mundaroo, (AGD66) 35° 50.756' S 147° 49.637' E. Photographer, Jaime Plaza, 1/5/2006.

Peppermint mixes with Norton's Box and Red Stringybark in an open forest (ID297) that covers extensive areas of ridges and upper hill-slopes in the Tumut to Albury region. In this same region, Broad-leaved Peppermint also occurs in an open forest in association with Brittle Gum and box eucalypt species such as Norton's Box or Long-leaved Box on hills composed of a range of substrates (ID296) (Figure 26). A variant of ID296 that contains a dense understorey of shrub species such as *Mirbelia oxyloboides* and *Acacia melanoxylon* is restricted to Woomargama National Park (ID313). On hills composed of metamorphic and granodiorite substrates in the Tumbarumba region, Broad-leaved Peppermint grows with *Eucalyptus bridgesiana* (Apple Box) and Red Stringybark with a shrubby understorey that includes *Bursaria spinosa* and *Cassinia longifolia* (ID305). A separate Brittle Gum – Broad-leaved Peppermint open forest community (ID351), containing a Fabaceae-rich shrub cover including *Daviesea leptophylla*, *Dillwynia sericea* and *Acacia dunnii*, occurs on poor soils north of Yass on the upper limit of the NSWSWS Bioregion extending and principally occurring in the South Eastern Highlands Bioregion. ID351 often grades into a restricted riparian or lower footslopes open forest dominated by *Eucalyptus cinerea* (Argyle Apple) (ID344) (Figure 27). This community is restricted to creeklines and flats east of Rye Park and is more extensive in the South Eastern Highlands Bioregion.

Very tall shrub-fern open forests occupy high rainfall areas in the south-eastern corner of the Upper Slopes Sub-region from Tumut to Woomargama National Park and bordering the western boundary of Kosciuszko National Park in the South Eastern Highland Bioregion. These forests are similar to tablelands "wet" forests in their structure and species composition. They include the widespread *Eucalyptus robertsonii* (Robertson's Peppermint) – Broad-leaved Peppermint – Nortons Box – *Pterydium esculentum* (Bracken Fern) shrub-fern open forest (ID295), Riparian *Eucalyptus viminalis* (Ribbon Gum) tall forest (ID299) (Figure 28), montane plateau *Eucalyptus viminalis* (Ribbon Gum) – Robertson's Peppermint tall fern forest (ID300) and *Eucalyptus bicostata* (Eurabbie) very tall open forest (ID307) (Figure 29) in gullies and on protected slopes. These forests are well sampled in Woomargama National Park and other reserves in the Tumbarumba to Tumut region.

Tall woodlands containing *Eucalyptus rubida* (Candlebark) are rare in the NSWSWS Bioregion but are common in the adjoining South Eastern Highlands Bioregion. A Candlebark – Apple Box – *Eucalyptus robertsonii* (Robertson's Peppermint) dominated tall woodland occurs yellow soils derived from granite west of Tumbarumba (ID304) (Figure 30). A different Candlebark woodland occurs on river flats and along creeks near Rye Park, north of Yass where Candlebark grows with *Eucalyptus blakelyi* (Blakely's Red Gum) and Long-leaved Box (ID350) with a grassy ground cover. Both of these Candlebark communities are extensively cleared, heavily grazed and are highly threatened.

Although ironbark-dominated woodlands cover less area in the NSWSWS Bioregion compared to the Brigalow Belt South Bioregion to the north, 10 ironbark-dominated woodlands have been classified. Two (ID243 and ID217) are mainly distributed in the Lower Slopes Sub-region and have been mentioned above. Eight communities occur in the Upper Slopes Sub-region. Six of these (IDs 289, 318, 330, 342, 343 and 358) are dominated by Mugga Ironbark (*Eucalyptus sideroxylon*) and two (IDs 328, 329) are dominated by Red Ironbark (*Eucalyptus fibrosa*).

Most ironbark–dominated woodland or forest occurs on hillcrests or hillslopes. ID289 is a widely distributed open forest that occurs on hills at higher altitudes. It contains *Eucalyptus sideroxylon* (Mugga Ironbark) and *Eucalyptus rossii* (Scribbly Gum) often with *Eucalyptus polyanthemos* (Red Box) or *Eucalyptus goniocalyx* (Long-leaved Box). Elsewhere, Mugga Ironbark mixes with a number of other *Eucalyptus* species including *Eucalyptus albens* (White Box) on hills in the Young to Cowra regions (ID342) (Figure 31). A similar community with Mugga Ironbark, Blakley's Red Gum, *Callitris endlicheri* (Black Cypress Pine) and Red Stringybark (ID330) occurs on the central western slopes including in Nangar, Weddin Mountains and Goobang National Parks. To the south in the Tarcutta – Gundagai region, a Mugga Ironbark – Red Box – Red Stringybark with occasional Inland Grey Box woodland occurs on mainly metamorphic substrates (ID343). Mugga Ironbark co-dominates with *Eucalyptus dealbata* (Tumbledown Gum), Black Cypress Pine with a shrubby understorey on acid volcanic and other silica-rich substrates at lower altitudes in the Upper Slopes Sub-region (ID318). On hills in the Wellington to Mudgee region in the north of the sub-region, Mugga Ironbark occurs with Red Box and White Box on fine-grained sedimentary substrates (ID358).

Eucalyptus fibrosa (Red Ironbark) occurs with *Callitris endlicheri* (Black Cypress Pine) in a shrub-rich woodland (ID328) on acidic volcanic and granite ranges in the ranges near Peak Hill including in Goobang National Park. A similar shrubby woodland community in which Red Ironbark mixes with *Eucalyptus macrorhyncha* (Red Stringybark), *Eucalyptus dealbata* (Tumbledown Gum) and *Acacia doratoxylon* (Currawang) occurs on shallow sandy soils derived from sandstone in the Goobang National Park region (ID329) (Figure 32). Red Ironbark is common as a dominant tree in other plant communities the Pilliga Scrub in the Brigalow Belt South Bioregion to the north.

A number of *Eucalyptus dealbata* (Tumbledown Gum) dominated woodlands occur in the NSWSWS Bioregion on rocky hills composed of acid volcanic, granite, sandstone or conglomerate substrates. Tumbledown Gum occurs with White Cypress Pine on clay soils on hills south of Wagga Wagga (ID319), with Black Cypress Pine and Red Stringybark on rocky sandstone outcrops in the central section of the Upper Slopes Sub-region in locations such as Nangar and Conimbla National Parks and Mount Arthur

Fig. 31. ID342 *Eucalyptus sideroxylon* (Mugga Ironbark) – *E. polyanthemos* (Red Box) woodland in Ilunie Nature Reserve south east of Koorawatha, (AGD66) 34° 09.806' S 148° 35.671' E. Photograph, John Benson, 13/2/2007.

Fig. 32. ID329 *Eucalyptus fibrosa* (Red ironbark) – *E. dwyeri* – *Callitris endlicheri* low open forest on acidic rocks in the Hervey Range in Goobang National Park, (AGD66) 32°55' 21.2" S 148°22' 37.7" E. Photograph, Jaime Plaza, 04/05/2005.

Fig. 33. ID332 *Eucalyptus dealbata* (Tumbledown Gum) – *Callitris endlicheri* (Black Cypress Pine) – *E. macrorhyncha* (Red Stringybark) low open forest in the Mt Arthur Reserve near Wellington, (AGD66) 32°33' 5.4" S 148°54' 34" E. Photograph, Jaime Plaza, 08/05/2005.

near Wellington (ID332) (Figure 33), and with Black Cypress Pine, Red Stringybark, *Eucalyptus polyanthemos* (Red Box) and *Allocasuarina verticellata* (Drooping She-oak) on granite near Wyangala Dam east of Cowra (ID339). *Eucalyptus dealbata* is also a major component of the *Eucalyptus sideroxylon* (Mugga Ironbark) open forest (ID318) that occurs on outcrops of rhyolite and other acidic substrates. Tumbledown Gum is a major component of plant communities on acid volcanic outcrops in the Brigalow Belt South and Nandewar Bioregion to the north of the NSWSWS Bioregion.

Eucalyptus macrorhyncha (Red Stringybark) is the most ubiquitous *Eucalyptus* species in the higher altitude eastern parts of the Upper Slopes Sub-region. It is present in most of the woodlands and open forests cited above but there are some areas where it is so dominant that it forms Red Stringybark communities. Red Stringybark is also often co-dominant with *Eucalyptus rossii* (Scribbly Gum). These communities occur along the length of the Upper Slopes Sub-region.

In the south of the bioregion a Red Stringybark – Red Box – Long-leaved Box – Scribbly Gum grassy open forest (ID290) is widespread on clay-loam soils on hillslopes from south of Wagga Wagga to the upper Murray River. A Scribbly Gum-dominated open forest with Black Cypress Pine – Mugga Ironbark and *Brachyloma daphnoides* low shrub layer (ID291) occurs in the Livingston National Park region south of Wagga Wagga. Further east in the upper Murray River region, small patches of Red Stringybark with *Eucalyptus dives* (Broad-leaved Stringybark) and a heath shrub understorey occur on shallow quartz-rich soils (ID311). To the north, a shrubby Red Stringybark low open forest occurs on granite hills in the Boorowa - Wyangala Dam region (ID340) and to the east of this, in the upper Lachlan and Murrumbidgee catchments, Red Stringybark occurs with Blakley's Red Gum on hills composed of red clay derived from metamorphic substrates (ID352). In the Boorowa to Young region, a restricted open forest dominated by Scribbly Gum with Red Stringybark with shrub species including *Daviesia latifolia* occurs on sandy loam soils on broad ridges (ID353). Further north, between the towns of Cowra and Orange, Red Stringybark occurs with Long-leaved Box and Black Cypress Pine on rocky sandstone hills (ID321). In this same region, a Scribbly Gum open forest occurs with Red Stringybark and Black Cypress Pine on hills composed of siliceous substrates, including granite (ID322). To the west, a Scribbly Gum dominated open forest occurs with Black Cypress Pine and *Eucalyptus fibrosa* (Red Ironbark) on sandy soils on ridges in the Hervey and Currumbenya Ranges including in Goobang National Park (ID327). In this same region, Red Stringybark occurs with Red Ironbark, Mugga Ironbark and Black Cypress Pine comprising a woodland mainly on sandstone substrates (ID331). In the same region Red Stringybark occurs with Long-leaved Box and Black Cypress Pine on rhyolite ridges (ID354) sometimes with *Triodia scariosa* (Porcupine Grass) in the ground cover. In the Mudgee region, in north-east corner of the NSWSWS

Bioregion, Red Stringybark dominated (ID323) (Figure 34), *Eucalyptus agglomerata* (Blue-leaved Stringybark) dominated and Scribbly gum dominated (ID324) shrub-tussock grass open forests occur on steep hills, including in the Avisford Nature Reserve. A widespread Scribbly Gum - Red Stringybark open forest (ID349) (Figure 35), with a sparse shrub layer and a mid-dense tussock grass ground cover, occurs from Yass to Orange in the South Eastern Highlands sub-region extending into the higher altitudes of the Upper Slopes Sub-region. Closely allied to this is a Red Stringybark – Long-leaved Box – tussock grass open forest that occupies more protected hillslopes (ID348).

Eucalyptus dwyeri (Dwyer's Red Gum) is probably the most common "hill red gum" in the NSWSWS Bioregion. The ubiquitous and broadly classified *Eucalyptus dwyeri* (Dwyer's Red Gum) – *Acacia doratoxylon* (Currawang) – *Callitris endlicheri* (Black Cypress Pine) low woodland (ID186) (Figure 36) occurs on skeletal lithosol soils on the crests of most of the rocky hills in the bioregion. While the most common rock type is sandstone it also occurs on granite and conglomerate outcrops. While the floristic composition of ID186 ranges a suite of species remains consistent. ID186 grades into areas dominated by *Callitris endlicheri* (Black Cypress Pine) low open forest (ID309) and *Acacia doratoxylon* (Currawang) (ID317) (Figure 37) low woodland. These last two communities also occur on rocky ranges composed of siliceous substrates such as sandstone, granite and adamellite. The best sample of Black Cypress Pine low open forest in the NSWSWS Bioregion (ID317) is on adamellite in Mudjarn Nature Reserve.

As mentioned above, riparian, myrtaceous shrublands (ID302 & ID333) dominated by *Leptospermum* spp. or *Callistemon sieberi* grow on the banks of streams at higher altitudes in the Upper Slopes Sub-region. At lower elevations, a shrubland dominated by *Allocasuarina diminuta* (she oak) – *Calytrix tetragona* (Five Fringe Myrtle) (ID292) (Figure 15) occurs in small patches on rocky (mainly sandstone) hills including in a number of conservation reserves.

One of the most floristically and structurally distinct plant communities in the NSWSWS Bioregion is a very tall shrubland growing on serpentinite outcrops on ridges and steep slopes between the towns of Tumut and Coolac (ID301) (Figure 38). This is dominated by the very tall shrub *Allocasuarina verticillata* (Drooping She-oak), the shrub *Ricinocarpos bowmanii*, the grasstree *Xanthorrhoea glauca* subsp. *angustifolia* and wattles such as *Acacia implexa* and *Acacia decora*. The trees *Eucalyptus nortonii* (Norton's Box) and *Eucalyptus albens* (White Box) are scattered throughout. The regionally depleted tall shrub *Banksia marginata* (Silver Banksia) grows in some gullies and lower slopes on the serpentinite with Drooping She-oak under a woodland canopy of *Eucalyptus bridgesiana* (Apple Box), *Eucalyptus mellidora* (Yellow Box) and *Eucalyptus nortonii* (Norton's Box) (ID337).

Fig. 34. ID323 *Eucalyptus macrorhyncha* (Red Stringybark) open forest on ridges in Avisford Nature Reserve near Mudgee, (AGD66) 32°38' 5.2" S 149°33' 43.5" E. Photograph, Jaime Plaza, 09/05/2005.

Fig. 35. ID349 *Eucalyptus macrorhyncha* (Red Stringybark) – *Eucalyptus rossii* (Scribbly Gum) open forest with *Joycea pallida* tussock grass ground cover on brown clay derived from phyllite east of Rye Park, (AGD66) 34° 33.149' S 148° 59.400' E. Photograph, Jaime Plaza, 29/5/2007.

Fig. 36. ID186 *Eucalyptus dwyeri* Dwyer's Red Gum with *Callitris endlicheri*, and the shrubs *Calytrix tetragona* and *Acacia verniciflua* on rocky outcrops in Woomargama National Park, (AGD66) 35° 51.792' S 147° 23.501' E. Photograph, Jaime Plaza, 2/5/2006.

Fig. 37. ID317 *Acacia doratoxylon* very tall shrubland on sandstone ridge in Nangar National Park, (AGD66) 33°25'30" S 148°31'47" E. Photograph, Jaime Plaza, 10/10/02.

Fig. 38. D301 *Allocasuarina verticillata – Eucalyptus nortonii – Xanthorrhoea glauca* subsp. *angustifolia – Ricinocarpus bowmannii* tall shrubland on Coolac serpentinite on the Honeysuckle Range near Brungle, (AGD66) 35° 07.734' S 148° 17.996' E. Photograph, Jaime Plaza, 7/5/2006.

Fig. 39. ID285 *Eucalyptus camphora* subsp. *humeana* (Broad-leaved Sally) bordering Tarcutta Swamp near Batlow, NSW South East Highlands Bioregion (AGD66) 35° 40.470' S 148° 02.096' E. Photograph, Jaime Plaza, 1/5/2006.

Fig. 40. ID320 *Themeda australis* Kangaroo Grass – *Bothroichloa macra* (Redleg Grass) forb-rich grassland on Tarengo Travelling Stock Reserve near Boorowa, (AGD66) 34° 28.380' S 148° 39.966' E. Photograph, Jaime Plaza, 29/5/2007.

Fig. 41. ID335 *Poa labillardierei – Phragmites australis – Typha – Juncus* swamp on alluvial organic soil in a valley near Walla Walla east of Rye Park in the upper Lachlan River catchment, (AGD66) 34 32 833 S 148 57.007 E. Photograph, Jaime Plaza, 29/5/2007.

Fig. 42. ID335 Disturbed saline watercourse dominated by the weed *Juncus acutus* subsp. *acutus* with *Poa* and *Cynodon* on Salt Water Creek on the Boorowa-Rugby road NSW SW Slopes, (AGD66) 34 23.977 148 45.407. Photograph, John Benson, 13/2/2007.

The tall shrubs *Kunzea ericoides*, *Kunzea parvifolia* and *Leptospermum continentale* form a shrubland on cleared granite or acid volcanic substrates, for example, in Red Stringybark – Tumbledown Gum – Black Cypress Pine shrubby open forest (ID340) in the Wyangala Dam region. In the north of the NSWSWS Bioregion, *Prostanthera nivea* var. *nivea*, *Beyeria viscosa*, *Westringia eremicola* and *Acacia vestita* form a shrubland with an overstorey of *Eucalyptus dealbata* (Tumbledown Gum) (ID357) on conglomerate outcrops in creek gorges and on the lower hill-slopes of the Catombal Range near Wellington.

Valley flat or riparian frost hollow low grassy woodlands, that are common in the cool climes of the NSW tablelands, are rare in the NSWSWS Bioregion. Small areas of *Eucalyptus stellulata* (Black Sally) low grassy woodland occur along creeks west and south of Tumbarumba (ID303). Also, *Eucalyptus camphora* subsp. *humeana* (Broad-leaved Sally) low sedge-grass woodland (ID285) (Figure 39) occurs along creeks, surrounding swamps and on moist flats from Tumut to Woomargama National Park. This community may include shrubs such as *Acacia kettlewelliae* and *Leptospermum continentale*.

Native grasslands are much rarer in the NSWSWS Bioregion than in the NSW Western Plains to the west or in the South Eastern Highlands Bioregion to the east. Small areas of *Themeda – Bothriochloa* dominated native grasslands occur on travelling stock reserves near Boorowa (ID320) (Figure 40) with similar grassland more common in the Canberra region on the tablelands 120 km to the south-east. Areas of *Aristida – Austrodanthonia – Austrostipa* derived native grassland (i.e. where trees have been removed from previous woodlands) remain in the central – north of the NSW SWS Bioregion (ID250). *Bothriochloa macra* (Red-leg Grass) and species of *Austrostipa* (spear grass) are common on some cleared hills in the Albury to Holbrook region. However, overall, most areas have been cleared converted to exotic pasture. Derived native grassland in the NSWSWS Bioregion is comparatively rare compared to its abundance in the NSW Western Plains and in the Brigalow Belt South and Nandewar Bioregions that comprise the NSW north western slopes (Lodge & Whalley 1989).

Wetlands are relatively limited in extent in the Upper Slopes Sub-region compared to the floodplains of western NSW. Hundreds of small Rush – Sedge – *Phragmites australis* (Common Reed) wetlands occur on the floodplains of the upper Murrumbidgee and Murray Rivers (ID336). A restricted ephemeral wetland (ID360) occurs in gilgai depressions on grey clays from Albury to Holbrook and to the west extending into the Lower Slopes Sub-region. Swamps occur along some smaller creeks, where sediment and organic soils have accumulated on valley floors. These are dominated by *Poa labillardierei* (Snow Grass), *Carex appressa* and species of *Juncus* (ID335) (Figure 41). Most of these swamps have been degraded by drainage, clearing and grazing. In highly

Table 6. Number and different types of protected areas in the NSW South-western Slopes Bioregion and for all of NSW, March 2008.

Notes. The figures excludes 163,200 ha of marine parks in coastal waters of NSW, 10,877 ha of land in 10 Crown Reserves managed by DECC in eastern NSW and about 10,000 ha of Kosciuszko National Park from the statistics on the NSWSWS Bioregion. DECC Acquired lands are allocated to reserve types based on advice from DECC Parks and Wildlife Division. The Brigalow Belt South Bioregion Forest Assessment "Community Conservation Areas" Zones 1–3 (CCA) are allocated to National Park, Aboriginal Area or Nature Reserve categories. Data sources are: DECC Estates and Acquired Lands GIS layer 7.4 March 2008; DECC GIS on Voluntary Conservation Agreements, March 2008; NSW State Forests Flora Reserves GIS layer 2008; Property Agreement data from the former NSW Department of Infrastructure, Planning and Natural Resources PANet database and GIS layers, December 2003 – PAs in perpetuity were selected using shape files coded as being remnant vegetation (i.e. excluding cleared land being re-vegetated). *Assumes that VCAs are being made over the 28,906 ha 'Nanya Station' owned by Ballarat University and the 64,653 ha 'Scotia Sanctuary' owned by the Australian Wildlife Conservancy. Calculations were undertaken in ArcView Version 3.3 (ESRI Inc. 1992–2002) in Lamberts projection and AGD66.

Protected Area Type	No. in NSW	Area (ha) in NSW	% of NSW	No. in NSW SWS	Area (ha) in NSW SWS	% of NSW SWS
Aboriginal Areas	19	33,594	0.042	1	61	0.001
Historic Sites	15	3,219	0.004	3	43	0.001
Karst Conservation Reserves	4	4,575	0.006	1	814	0.010
National Parks	212	5,211,889	6.520	9	98,796	1.206
Nature Reserves	400	891,913	1.116	30	34,938	0.426
State Conservation Areas	130	633,913	0.793	5	10,789	0.132
Total all DEC reserves	780	6,779,104	8.480	49	145,441	1.775
Flora Reserves	88	30,177	0.038	7	4,435	0.054
Total all public reserves	**868**	**6,809,280**	**8.518**	**56**	**149,876**	**1.830**
Secure PAs (NVC Act)	55	5,542	0.007	35	2,106	0.026
VCAs (NPW Act)*	229	114,592	0.143	13	936	0.011
Bush Heritage Reserves	5	2,396	0.003	1	432	0.005
Total non-public protected areas	**289**	**122,531**	**0.153**	**49**	**3,474**	**0.042**
Total for all protected areas	***1,157***	***6,931,811***	***8.67***	***105***	***153,350***	***1.87***

saline catchments, such as the Boorowa River in the Lachlan River catchment, the invasive exotic Rush *Juncus acutus* subsp. *acutus* (Figure 42) and the introduced perennial pasture grass *Phalaris aquatica* dominate areas that were previously natural swamps.

Protected areas in the NSW South-western Slopes Bioregion

As of mid-2008 the NSWSWS Bioregion contained a total of 105 protected areas, comprising 56 public conservation reserves and 48 secure property agreements and one private reserve. Most of these areas are shown in Figure 43. The summed area of these protected areas is 153,350 ha or approximately 1.9% of the bioregion (Table 6) (Figure 44). For NSW as a whole, over 500,000 ha of land have been added to the conservation reserve system in NSW between early 2006 and mid-2008 (compare Table 6 here to Table 9 on page 425 in Benson et al. 2006). Most of these new reserves have been dedicated in the Brigalow Belt South Bioregion to the north of the NSWSWS.

If it is assumed that approximately 20% of woody native vegetation remains in the NSWSWS Bioregion (i.e. about 1,600,000 ha), then less than 10% (about 153,000 ha) of this is in protected areas. While the average size of all protected areas is 1,460 ha, most are far smaller in size, with National Parks and Nature Reserves generally being larger than secure property agreements (Figure 44).

As of mid-2008, the protected areas in the NSWSWS Bioregion included nine National Parks, 30 Nature Reserves, five State Conservation Areas, one Aboriginal Area, one Karst Conservation Reserve, seven Flora Reserves under the NSW Forestry Act 1916, three Historic Sites, one Australian Bush Heritage private reserve, 13 Conservation Agreements (VCAs) under the NSW National Parks and Wildlife Act 1974 and at least 35 secure (99 year) property agreements that were entered into under the NSW Native Vegetation Conservation Act 1998 where they contained areas with the management remnant codes: MEV, MNF and MRZ and the "Improve" codes MNR and MRP. It is possible that other secure property agreements in perpetuity have been entered into under the NSW Native Vegetation Act 2003 since 2004.

A number of protected areas that either overlap with or occur near to the eastern or northern boundaries of the NSWSWS Bioregion have not been assessed in Version 2 of the NSWVCA. These include Razorback, Copperhannia, Burrinjuck, Black Andrew, Oak Creek, Wee Jasper Nature Reserves and Hill End Historic Site. Although the western fringe of the 690,000 ha Kosciuszko National Park overlaps with the NSWSWS Bioregion, this area will be covered in the NSWVCA as part of the South Eastern Highlands Bioregion. Munghorn Gap Nature Reserve occurs in the Sydney Basin

Bioregion to the north-east while Dapper Nature Reserve and Goodiman State Conservation Area are mainly in the Brigalow Belt South Bioregion to the north. As the NSWVCA expands to cover more of NSW, plant communities in these reserves will be assessed and the protected area extent statistics in the NSWVCA database will be modified.

The majority of the 135 plant communities in the NSWSWS Bioregion are poorly represented in the protected area system. In fact, 24 (17%) plant communities are not sampled in protected areas; 50 (37%) have < 0.5%, 83 (61%) have <5% and 98 (73%) have <10% of their pre-European extent in protected areas (Table 7) (10% is an IUCN standard, IUCN 1994). If the protected area codes containing 1a, 1b, 1c, 2a, 2b, 2c, 3a, 3b, 3c are considered as moderately to well represented in protected areas (see definitions of these codes in pages 372–373 in Benson 2006), only 40 of the 135 (30%) plant communities fall into these categories (Table 8).

Table 7. NSW South-western Slopes Bioregion plant communities identified by their NSWVCA database ID number listed under a range of proportions of estimated percent of pre-European extent in protected areas.

Note: Includes occurrences of plant communities that extend to the NSW Tablelands and NSW Western Plains sections. Communities considered to be derived are in the 50–100% category because it is considered they either did not exist in 1788 or have expanded.

Protected pre-European Extent	SWS VCA Veg. ID Numbers	No.
0%	48, 83, 248, 269, 270, 301, 303, 319, 320, 335, 337, 338, 340, 343, 346, 350, 352, 353, 355, 356, 357, 358, 360	23
>0 - <0.2%	26, 55, 56, 70, 74, 76, 79, 80, 82, 201, 237, 238, 244, 258, 266, 267, 276, 333, 336, 339	20
0.2 - <0.5%	75, 251, 277, 281, 283, 312, 318	7
0.5 - <1%	110, 243, 256, 257, 275, 345	6
1 - <2%	5, 53, 77, 177, 182, 249, 268, 273, 280, 282, 285, 326, 348, 351	14
2 - <5%	54, 85, 185, 274, 284, 287, 298, 302, 304, 341, 344, 349	12
5 - <10%	2, 9, 57, 176, 193, 217, 272, 279, 286, 289, 290, 299, 316, 321, 332, 342, 347	17
10 - <15%	178, 181, 278, 291, 307, 323, 324, 327	8
15 - <20%	173, 293, 294, 314, 315, 317, 330	7
20 - <50%	186, 250, 292, 296, 297, 305, 306, 309, 311, 322, 325, 328, 331, 334, 354	15
50 - <100%	288, 295, 300, 310, 313, 329	6

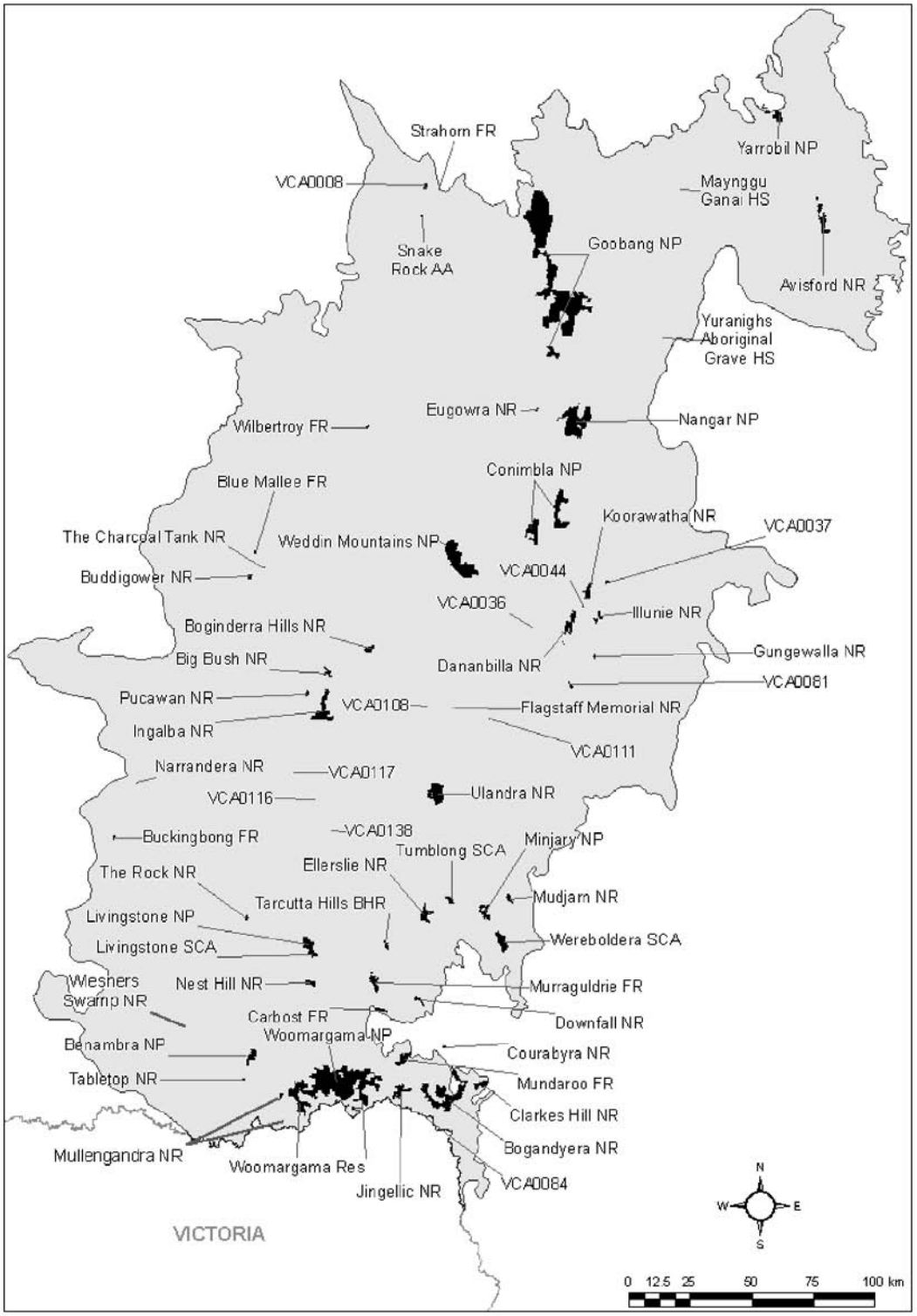

Fig. 43. The location of conservation reserves and conservation agreements under the National Parks and Wildlife Act 1974, Flora Reserves under the NSW Forestry Act 1916 and the Tarcutta Bush Heritage Reserve in the NSW South-western Slopes Bioregion as of March 2008. This excludes the western edge of Kosciuszko National Park and a number of secure property agreements under the Native Vegetation Act 2003.

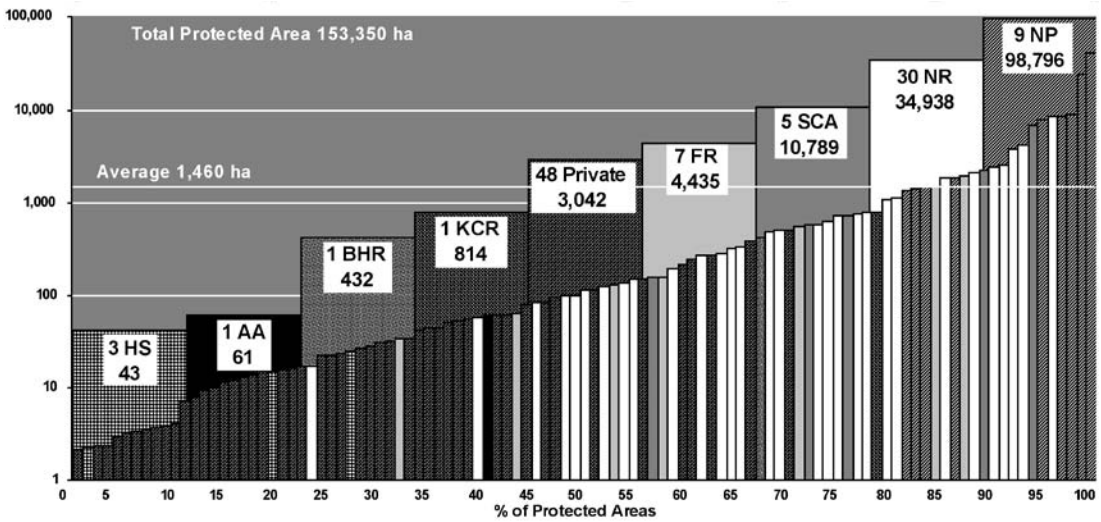

Fig. 44. Size (in hectares) of protected areas in the NSW South-western Slopes Bioregion (as of April 2008 assuming all DECC acquired lands at that time are added to reserves). This includes parts of protected areas that overlap with other bioregions with the exception of Kosicuszko National Park which is excluded. Thin columns in foreground are the areas of individual protected areas. Wide columns in background contain the cumulative area for each type of protected area . The number, type and area of each protected area type are shown in the white boxes. Columns are: HS (diamond-pattern) = Historic Sites, AA (black) = Aboriginal Area, Private (brick pattern) = secure private property agreements (under N P & W Act and Nat. Veg. Act), FR (light grey) = Flora Reserves, , SCA (dark grey) = State Conservation Areas, , NR (white) = Nature Reserves, NP (diagonal stripe) = National Parks.

Table 8. Number of plant communities in threat categories in relation to protected area codes.

Notes: Explanations of the protected area and threat codes are provided in Benson (2006). See Appendix B in Benson (2006) for explanation of the threat categories.

	No. of Extant NSW SWS Plant Communities															
	Protected Area Code															
Threat Category	**1a**	**1b**	**1c**	**2a**	**2b**	**2c**	**3a**	**3b**	**3c**	**4a**	**4b**	**4c**	**5a**	**5b**	**5c**	**Total**
Critically Endangered	-	-	-	-	-	-	-	-	-	1	-	-	10	5	2	18
Endangered	-	-	-	-	-	-	2	-	-	6	1	-	12	11	1	33
Vulnerable	-	-	-	-	-	-	6	-	-	8	1	1	6	5	2	29
Near Threatened	2	-	-	1	-	-	4	1	-	3	3	-	5	2	-	25
Least Concern	9	2	1	-	2	-	4	1	2	3	2	2	-	1	1	30
Total	11	2	1	5	2	-	16	2	2	21	7	3	33	24	6	135

Fig. 45. Most conservation reserves in the NSW SWS Bioregion are situated on hillcrest and rocky ranges that contain the largest patches of remnant native vegetation such as Ulandra Nature Reserve. Photograph, John Benson, 14/10/2002.

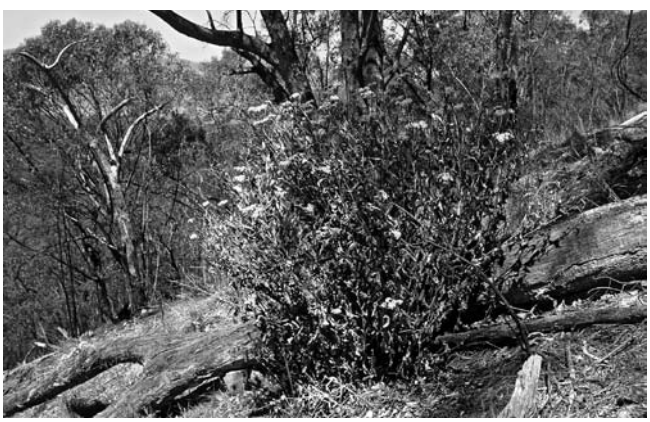

Fig. 46. The rare *Senecio garlandii* in ID293 *Eucalyptus nortonii* – *Dodonaea viscosa* subsp. *cuneata* woodland in Benambra National Park, 35°46'59" S 147°04'50" E. Photograph, Jaime Plaza, 19/10/2002.

Table 9. NSW South-western Slopes Bioregion plant communities that are part of Endangered Ecological Communities listed or nominated under the NSW Threatened Species Conservation Act 1995 and/or the Australian Environmental Protection and Biodiversity Conservation Act 1999 as of March 2008.

Note: The plant communities defined in the NSWVCA do not match directly with the definitions of listed or nominated endangered ecological communities.

ID No	Common Name	TSC Act	EPBC Act
26	Weeping Myall open woodland of the Riverina and NSW South-western Slopes Bioregions	Listed	Listed
54	Buloke – White Cypress Pine woodland in the NSW South-western Slopes Bioregion	Nominated	Listed
76	Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Listed	Nominated
77	Yarran shrubland on peneplains and alluvial plains of central NSW	Nominated	-
80	Inland Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South-western Slopes and Riverina Bioregions	Listed	Nominated
82	Inland Grey Box – Poplar Box – White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion	Listed	Nominated
110	Inland Grey Box – Cypress Pine shrubby woodland on stony footslopes in the NSW South Western Slopes and Riverina Bioregions	Listed	Nominated
177	Blue Mallee – Bull Mallee – Green Mallee very tall mallee shrubland of the West Wyalong region, NSW South-western Slopes Bioregion	Nominated	-
178	Broombush – Green Mallee – Blue Mallee very tall shrubland on stony rises in the NSW South-western Slopes Bioregion	Nominated	-
201	Fuzzy Box – Inland Grey Box on alluvial brown loam soils mainly in the NSW South-western Slopes Bioregion	Listed	-
237	Riverine Inland Grey Box grassy woodland of the semi-arid (warm) climate zone	Listed	-
266	White Box grassy woodland mainly on hills in the Upper Slopes Sub-region of the NSW South-western Slopes Bioregion	Listed	Listed
267	White Box – White Cypress Pine – Inland Grey Box shrub/grass/forb woodland in the NSW South-western Slopes Bioregion	Listed	Listed
274	White Box – Rough-barked Apple alluvial woodland of the NSW central western slopes including in the Mudgee region	Listed	Listed
275	Herbaceous White Box – Apple Box valley woodland of the NSW central western slopes	Listed	Listed
276	Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South-western Slopes Bioregion	Listed	Listed
277	Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South-western Slopes Bioregion	Listed	Listed
278	Riparian Blakely's Red Gum – box – shrub – sedge – grass tall open forest of the central NSW South-western Slopes Bioregion	Listed	Listed
279	Blakely's Red Gum – White Cypress Pine woodland on footslopes of hills in central part of the NSW South-western Slopes Bioregion	Listed	Listed
282	Blakely's Red Gum – White Box – Yellow Box – Black Cypress Pine box grass/shrub woodland on clay loam soils on undulating hills of central NSW South-western Slopes Bioregion	Listed	Listed
303	Black Sally grassy low woodland in valleys in the Upper Slopes Sub-region of the NSW South-western Slopes Bioregion and western South Eastern Highlands Bioregion	Nominated	-
304	Candlebark – Apple Box – Narrow-leaved Peppermint tall open forest on granite in the Tumbarumba region of the South East Highlands and upper NSW South-western Slopes Bioregions	Nominated	-
312	Yellow Box grassy tall woodland on valley flats in the Upper Slopes of the South-western Slopes Bioregion and South Eastern Highlands Bioregion	Listed	Listed
320	Kangaroo Grass – Redleg Grass rich-herb temperate tussock grassland of the northern Monaro, ACT and upper Lachlan River regions of the NSW South Western Slopes and South Eastern Highlands Bioregions	-	Nominated
347	White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the Upper Slopes Sub-region of the NSW South-western Slopes Bioregion	Listed	Listed
350	Candlebark – Blakelys Red Gum – Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South-western Slopes and South-Eastern Highland Bioregions	Nominated	-
355	Bull Mallee – White Mallee tall mallee woodland on red sandy loam soils in the central western slopes of NSW	Nominated	-

A minority of 38 (28%) plant communities have > 10% of their pre-European extent in protected areas and are considered to be adequately represented (Table 7). These mainly occur in reserves on steep hills and north-south strike ranges where the largest areas of native vegetation remain (Figure 45). These hills and ranges contain low nutrient, shallow soils derived from sandstone, granite, adamellite, conglomerate and some metamorphic rocks such as phyllite and quartzite. They support hill red gum, Currawang, Black Cypress Pine, heath, Red Stringybark, Red Box, Scribbly Gum and Ironbark dominated plant communities. Grassy woodlands that occur on high nutrient soils on floodplains, alluvial plains, valley flats and undulating hills landforms are mainly cleared and consequently are very poorly sampled in the protected area system.

A correlation of protected area status with threat categories is presented in Table 8. This shows that very few of the most endangered plant communities are well represented in the protected area system.

Assessment of threats to the vegetation

As mentioned in the Introduction, clearing of over 80% of the NSWSWS Bioregion (Figure 5) has led to severe land degradation and loss of biodiversity (NPWS 2001, Benson 1999). The degree of clearing, combined with heavy grazing and the dominance by exotic ground cover plant species over a large proportion of the bioregion, has lead to a high number of plant communities being categorised as threatened (critically endangered, endangered, vulnerable) in applying the NSWVCA threat criteria (Appendix B in Benson 2006). Applying these threat criteria to the 135 NSWSWS Bioregion plant communities resulted in 18 communities being considered as critically endangered (CE), 33 endangered (E), 29 vulnerable (V), 25 near threatened (NT) and 30 least concern (LC) (Table 8). This implies that 59% of the plant communities fall into the threatened categories (CE, E, or V).

As of April 2008, a total of 18 plant communities were part of endangered ecological community (EEC) listings and a further eight were part of nominated EECs under the NSW *Threatened Species Conservation Act 1995* (Table 9). Concerning the Australian Government *Environmental Protection and Biodiversity Conservation Act 1999*, 17 plant communities were part of its EEC listings and one other was part of an EEC nomination (Table 9). A number of other NSWVCA plant communities recorded in the NSWVCA for the NSWSWS Bioregion warrant nominations and listing as EECs under these laws. These include *Eucalyptus bridgesiana* (Apple Box) grassy valley woodlands (including ID283 & ID298); *Eucalyptus rubida – Eucalyptus robertsonii – Eucalyptus bridgesiana* tall woodland on granite east of Tumbarumba (ID304); *Eucalyptus camphora* subsp. *humilis* (Broad-leaved Sallee) woodland along creeks in the Tumbarumba regions (ID285) and the small gilgai wetlands around Albury and Holbrook (ID360).

A total of 36 plant species in the NSWSWS Bioregion were listed as threatened under the NSW *Threatened Species Conservation Act* in NSW NPWS (2001). Examples of threatened plant species in NSWSWS plant communities are *Senecio garlandii* (Figure 46) occurring in ID293 *Eucalyptus nortonii – Dodonaea viscosa* subsp. *cuneata* woodland in Benambra National Park and in ID186 Dwyer's Red Gum – Currawang low woodland in The Rock Nature Reserve; and *Lepidium aschersonii* in ID355 Bull Mallee – White Mallee mallee woodland near Wyalong. Concerning threatened fauna, 49 species of vertebrates have been recorded from the NSWSWS Bioregion, listed in NSW NPWS (2001).

The number of plant communities in different threat categories in the four CMAs that intersect the NSWSWS Bioregion is presented in Table 10. This excludes plant communities

Fig. 47. Illustration of a sharp boundary of native vegetation to cleared grazing land, southern side of Nest Hill Nature Reserve, north of Holbrook. Photograph, Jaime Plaza, 15/10/2002.

Fig. 48. Sheep grazing of a *Eucalyptus melliodora* (Yellow Box) woodland flat near Jugiong, NSW SWS Bioregion. Over-grazing has lead to extensive loss of ground cover and lack of regeneration of native vegetation. Photograph Jaime Plaza, 29/4/2006.

that are yet to be classified in the NSWVCA that occur on the NSW Tablelands Section in these CMAs. Table 10 also provides an update of the two western CMAs (Western and Lower Murray-Darling) from Version 1 of the NSWVCA (Benson et al. 2006). Most threatened plant communities in the two Western Plains CMAs (Western and Lower-Murray Darling) are located in the eastern (mostly cleared) parts of the CMA areas with some overlapping into the NSWSWS Bioregion. Concerning the four CMAs that transect the NSWSWS Bioregion, threatened plant communities occur throughout the cross-matched areas.

The degree of clearing in the NSWSWS Bioregion has resulted in highly fragmented native vegetation on floodplains, alluvial plains, in valleys, and on gentler sloping low rises or hill landform patterns with high to medium nutrient soils. In one study area near Holbrook, Gibbons & Boak (2002) calculated that over 30% of the total area of woody native vegetation was contained in patches less than one hectare in size (paddock trees) and about 70% was in patches less than 50 ha in size. Gibbons & Boak (2002) calculated that 54% of the woodland dominated by White Box, Yellow Box and Blakely's Red Gum (mainly IDs 266 and 277 in the NSWVCA) were in patches <1 ha. Therefore, paddock trees were found to dominate landscapes with higher nutrient soils and gently undulating terrain. The removal of paddock trees or the ploughing of remnant native ground cover would therefore have substantial impacts on the remaining extent of some types of vegetation such as grassy White Box woodland (ID266).

In contrast, Gibbons & Boak (2002) documented that the largest patches of native vegetation (>50 ha) were found on rocky ranges and steep hills. Clearing to the boundaries of state forests and conservation reserve boundaries (Figure 47) on these hills has led to sharp contrasts in vegetation structure and condition across those boundaries. This fragmentation and isolation of vegetation remnants can lead to reduced genetic diversity of species that comprise major components of plant communities. For example, Prober & Brown (1994) reported that genetic diversity was significantly lower in *Eucalyptus albens* (White Box) populations that contained less than 400–500 trees or about 13 hectares, assuming a tree density of 40 trees per hectare.

Continuous heavy grazing on better soils on alluvial flats (Figure 48) and on shallow soils in hilly country (Figure 49) has led to sheet and gully erosion (Figure 50) and invasion by exotic plant species (Prober & Thiele 1995). Increased fertiliser use since World War II combined with the introduction of exotic pastures caused a shift in ground species composition from perennial native grasses and forbs to annual species (Moore 1953). Typical Upper Slopes Sub-region perennial grass species such as *Themeda australis* and *Poa sieberiana* have been replaced by various species of *Austrostipa* and *Austrodanthonia* and as disturbance continued by exotic grasses such as *Bromus*, *Hordeum* and *Lolium* spp. (Prober & Thiele 1995).

Today, broad-scale clearing of native vegetation has ceased over most of the extent of the NSWSWS Bioregion and some landholders are planting indigenous trees and shrubs or allowing regrowth to occur. The exception to this is the tens of thousands of hectares of scattered native trees and ground cover on former farms being cleared for pine plantations in the Tumut and Tumbarumba regions in the south-eastern corner of the NSWSWS Bioregion (Figure 51). These pine plantations are impeding linkages of native vegetation between the NSWSWS Bioregion and the large biosphere reserve of Kosciuszko National Park to the east in the South Eastern Highlands and Australian Alps Bioregions.

One of the main drivers of changing attitudes among landholder towards native vegetation has been the impact of salinity on farm production (Littleboy et al. 2001). Salinity compounds the primary threats of clearing, fragmentation and weed invasion in valley vegetation remnants. Upper Slopes catchments are particularly affected by salinity with the Boorowa River catchment being particularly saline (Hayman 1996). In the Boorowa Shire, nearly 2000 ha of woody vegetation are impacted by salinity and much of this is concentrated in over-cleared grassy woodland communities such as ID277 *Eucalyptus blakleyi* (Blakely's Red Gum) – *Eucalyptus melliodora* (Yellow Box) woodland that occurs on lower hill-slopes and on river flats (Seddon et al. 2007). Salinity has also affected species composition with exotic species such as the rush *Juncus acutus* (Figure 42) invading valley swamps in the Boorowa to Young regions in the Lachlan catchment.

Too frequent fire or lack of fire may threaten key species in some plant communities. While clearing and fragmentation over the last 100 years has prevented regular widespread wildfires burning large regions, some types of vegetation are susceptible to intense fire. For example, in the summer of 2006 a fire burnt *Eucalyptus camaldulensis* (River Red Gum) lake woodland (ID249) at Nerang Cowal near Forbes possibly killing many of the River Red Gum trees (Figure 52). It is unknown whether this woodland will recover or how long this will take.

The least threatened vegetation types occur on steep, rocky hills mostly in the Upper Slopes Sub-region with some outliers in the Lower Slopes Sub-region. The most common of these communities is ID186 (Figure 36), ID309 and ID317 (Figure 37) dominated by tree species such as *Eucalyptus dwyeri, Eucalyptus dealbata*, *Callitris endlicheri* and *Acacia doratoxylon*. Other non-threatened hill communities include some of the ironbark woodlands, Red Stringybark and Scribbly Gum open forests, Red Box and Long-leaved Box open forests in hills and Eurabbie tall open forest. Some of these communities are well protected in conservation reserves.

Table 10. Number of NSWVCA plant communities with different threat categories in Central West, Lachlan, Murrumbidgee, Murray Catchment Management Authority areas that intersect the NSW south-western Slopes Bioregion and the NSW Western Plains. The two western CMAs* (Western and Lower Murray-Darling) are also included with updated information from Benson et al. (2006).
Notes: Figures in brackets ( ) indicate the number of plant communities (of the total) that are restricted to a single CMA area. This assessment does not represent the entire list of plant communities in the Central West, Lachlan, Murrumbidgee, Murray CMAs because these CMAs extend eastwards into the South Eastern Highlands and the Australian Alps Bioregions. Also, a small part of the Central West CMA lies within the Brigalow Belt South and Nandewar Bioregions. See Appendix B in Benson (2006) for an explanation of the threat categories.

	No. of Extant NSW SWS Plant Communities						
	Catchment Management Authority Areas						
Threat Category Code	Central West	Lachlan	*Lower Murray/Darling	Murray	Murrumbidgee	*Western	Total SWS
Critically Endangered	8 (2)	10 (3)	4	10 (1)	11 (1)	4 (1)	18 (7)
Endangered	15 (2)	24 (2)	3	12 (2)	21 (2)	16 (2)	33 (8)
Vulnerable	14 (2)	22 (2)	10 (3)	13 (1)	17 (2)	15 (1)	29 (7)
Near Threatened	9 (1)	12 (1)	20 (1)	14	18	50 (18)	25 (2)
Least Concern	18 (5)	18 (1)	23 (4)	12 (4)	12	68 (41)	30 (10)
Total	64 (12)	86 (9)	60 (8)	61 (8)	79 (5)	153 (63)	135 (34)

Fig. 49. Over-clearing and over-grazing have lead to gully soil erosion on some soils such as this grey clay on cleared hills south of Ulandra Nature Reserve 34° 54' 24" S 147° 51' 51" E. Photograph, Jaime Plaza, 14/10/2002.

Fig. 51. Pine plantations surrounding a native vegetation remnant in Carobost Flora Reserve, in the southern-eastern corner of the Upper Slopes Sub-region of the NSWSWS Bioregion. Photograph, Jaime Plaza, 17/10/2002.

Fig. 50. Gully and sheet soil erosion with willow (*Salix*) infestation in Milburn Creek east of Cowra during a severe drought. Photograph, John Benson, 12/2/2007.

Fig. 52. Burnt and killed *Eucalyptus camaldulensis* (River Red Gum) (ID249) on Nerang Cowal west of Forbes, (AGD66) 33° 51.999' E 147° 24.973' S. Photograph, Jaime Plaza, 31/5/2007.

Management and conservation priorities

While it should be possible to increase the current 1.9% of the NSW SWS Bioregion in protected areas, the proportion of protection will be constrained by less than 20% of the native vegetation remaining in the Bioregion and much of it being in highly fragmented, small patches. Also, many plant communities have been over-cleared to the extent that less than 10% of their pre-European extent remains. Therefore, for most plant communities it will not be possible to meet the reservation target requirement of 10% of pre-major loss of extent in protected areas that is recommended by IUCN (1994).

As mentioned above, plant communities occurring on rocky ranges or steep hills are relatively intact and many are well sampled in protected areas. In contrast, grassy woodlands such as grassy White Box woodland (ID266) (Figure 19), Blakely's Red Gum – Yellow Box woodland (ID277) (Figure 20), grassy Apple Box valley woodland (Figure 21), Yellow Box flats woodland (ID74, 276) (Figure 8), Inland Grey Box woodland (ID76) (Figure 9) and Fuzzy Box woodland (ID201) are very poorly represented in reserves, infested with exotic ground cover species and are mainly cleared.

The best remaining examples of these grassy woodland communities occur in cemeteries and travelling stock reserves (Prober & Thiele 1995). A concerted effort to influence off-reserve management of grassy box woodland, through, for example, the NSW Grassy Box Woodlands Conservation Management Network (www.gbwcmn.net.au), has raised public awareness and realised a number of secure property agreements over good condition remnants on both private land and public land tenures. The latter include conservation agreements over cemeteries such as Monteagle Cemetery in the Young Shire and Stockinbingal, North Berri Jerri and Marra Cemeteries in the Coolamon Shire. More secure property agreements are required over private land to raise the levels of protection of grassy box woodlands and to form larger patches and native vegetation corridors for long term landscape management.

Preventing the detrimental practice of persistent grazing of high quality remnant grassy woodland is critical to protecting native plant ground and shrub species. On public lands, this could include preventing biologically important travelling stock reserves from being leased or sold off for continuous grazing. Fencing is a key management tool because it usually leads to regeneration of native perennial trees and native grasses and protects the soil from compaction by domestic stock (Spooner & Briggs 2008).

Given the impacts of edge effects on vegetation condition and the implications of small populations of plants in small patches of bushland on genetic diversity, increasing the size of patches should be one of the primary aims of revegetation over the next 50 years. Increasing patch size and connectively of vegetation remnants should help protect woodland bird species as pointed out in Reid (1999) and Freudenberger (1999) who noted that small vegetation remnants of <5 ha fail to support sensitive woodland bird species unless the patches are connected to other remnants. Investment strategies in re-vegetation schemes could focus on enlarging existing remnants and developing naturally vegetated links between remnants, taking into account long term ramifications of climate change on plant and animal species distributions. This may need to include corridors through pine forests in the Tumut to Tumbarumba region to ensure native vegetation links remain from the western plains to the south eastern highlands and minimise impacts of fragmentation on fauna (Lindenmayer et al. 1999).

The clearing of isolated native paddock trees or small remnants should be minimised because it leads to a reduction in plant species associated with native trees (Prober & Thiele 1995). Setting priorities for investing in the regeneration of native vegetation on private land will require site condition assessments using the approaches summarised in Gibbons & Freudenberger (2006). Initiatives such as local landscape biodiversity plans (Davidson 2007) that emphasises recoverability based on ground cover naturalness and connectivity would assist implement ecological restoration at local scales.

Changes to NSW Western Plains NSWVCA Version 1

One of the challenges of the NSWVCA database system is keeping track of new literature and changes in the NSW protected area system. Many minor changes, such as typographical errors or species name changes, have been made to the 213 NSW Western Plains plant communities published in the 2006 Version 1 of the NSWVCA database (Benson et al. 2006). Most of these changes are due to feedback on the 2006 Version 1 publication and changes to boundaries or names of conservation reserves. Key changes are kept in a register spreadsheet on the Royal Botanic Gardens Sydney web site at: http://www.rbgsyd.nsw.gov.au/science/hot_science_topics/vegetation_of_nsw

Six plant communities have been added to the 213 listed in Version 1 of the NSWVCA published in Benson et al. (2006). These are:

ID359 *Tridoia scariosa* (Porcupine Grass) – *Eucalyptus socialis* (Red Mallee) – *Eucalyptus intertexta* (Gum Coolibah) hummock grassland / low sparse woodland on the pre-Cambian metamorphic ranges in the southern Barrier Range sub-region, north of Silverton;

ID363 Swamp Paper-bark sodic scald wetland / shrubland of the Yetman – Yalarbon region;

ID364 Wetlands on sodic soils in the Yetman–Yelarbon region; ID377 Coppurburr low open shrubland on loam - clay flats and playas in the Narran Lake region north of Walgett;

ID375 Budda Pea – Channel Millet ephemeral shrubland / reedland grassland wetland on floodplains in north-western NSW;

ID376 Mixed scrub low open woodland on sand rises on floodplains in the DRP & BBS Bioregions;

ID377 Copperburr low open shrubland on loam – clay flats and playas in the western BBS and northern DRP Bioregions.

Revisions to the distribution of plant communities since Version 1 was published have resulted in 30 plant communities being added to the list of plant communities in the Western CMA (now totalling 153 communities) and two communities have been added to the communities listed in the Lower Murray-Darling CMA (now totalling 60 plant communities) (Table 5). It is important that the PVP Biometric tool is regularly updated with these changes so that CMA property planning decisions are based on the latest NSWVCA version.

A number of western NSW conservation reserve changes have required changes to the statistics on areas of plant communities in reserves. Gundabooka National Park, near Bourke, is now split between Gundabooka National Park and Gundabooka State Conservation Area. Similarly, Yanga National Park near Balranald is split between Yanga National Park, Yanga State Conservation Area and the original Yanga Nature Reserve. Extents and descriptions of some plant communities have changed for reserves that have been subjected to botanical survey and mapping since 2006. This includes plant communities recorded in Budelah, Boomi, Boomi West, Boronga Nature Reserves and additions to Culgoa National Park in the Darling Riverine Plains Bioregion; Narran Lake, Midkin and Careunga Nature Reserves in the Brigalow Belt South Bioregion; additions to Ledknapper Nature Reserve and Paroo-Darling National Park in the Mulga Lands Bioregion. Revised reports from Version 2 of the NSWVCA database for each of the eight bioregions and the two western-most CMAs in the NSW Western Plains Section are provided in Folders 3 and 4 on the CD.

Future progress of and improvements to the NSWVCA

As mentioned in the Introduction, the NSWVCA has covered 9 of the 18 IBRA Bioregions (Thackway & Cresswell 1995, Version 6) in NSW (Figure 1). The vegetation in the Brigalow Belt South and Nandewar Bioregions (NSW North-western Slopes) and the western half of the New England Tableland Bioregion are currently being classified and assessed for Version 3 of the NSWVCA. The three tablelands bioregions (eastern New England Tableland, South Eastern Highlands and Australian Alps) need to be covered by the NSWVCA to yield a complete vegetation classification of the six CMAs that run westwards off the NSW Great Dividing Range and a tablelands coverage of the four coastal CMAs. The biologically complex eastern escarpment and coast vegetation, with about 1000 protected areas, will require teams of experts and several years to complete. However, the east coast could be completed concurrently with the NSW Tablelands Section with the records merged to form a single database vegetation classification covering all of NSW.

It is anticipated that between 1200 and 1400 plant communities would be described if all of NSW was covered by the NSWVCA project. The classification could be expanded to include marine algae and freshwater algae communities if they can be defined.

There are a number of enhancements that could be made to the NSWVCA database including:

Expanding the number of species used in the search routine of Latin species names in the Scientific Name field and English names in the Common Name field. Using more indicative characteristic species in the search routine would reduce the list of candidate plant communities in site assessments;

Developing a matrix key to the plant communities using software such as DELTA (Dallwitz et al. 1993). This would filter information fields such as characteristic species, vegetation structure, soils, substrate, geographical location and photographs to key out plant communities from the NSWVCA database. A key would particularly help people doing site assessments;

Adding a "sample plot reference" field that lists typical plot data that help to define and describe the plant community. This could link directly to the DECC NSW YETI floristic plot (site) data database;

Adding a separate species field that lists species with positive fidelity to a plant community derived through analyses of plot data. This would enhance the vegetation description;

Link the species listed in the NSWVCA database characteristic species fields to the NSW National Herbarium Botanic Gardens Trust species database EMU and its internet derivative BGT Plant Net species information system (http://www.rbgsyd.nsw.gov.au/plant_info/Plant_databases). This would allow access to taxonomic information and images of plant community characteristic plant species;

To increase geo-referencing in the NSWVCA database, citations of vegetation maps entered in the Authority database field could be hot-linked to image or GIS files of relevant vegetation maps. These maps may or may not cover total the total extent of a community or be defined at the same level of classification as the NSWVCA;

Improve visual representation of the landscape position of the plant communities by inserting an extra database field that contains "reference" latitude and longitudes that can automatically link to Google Earth or NSW Government satellite imagery. This would provide a "sky view" of some areas of each plant community via remote sensing technology;

To improve the relationship with the NSW Biometric Tool used in property planning (Gibbons et al. 2005) (http://www.nationalparks.nsw.gov.au/npws.nsf/Content/biometric_tool), the vegetation structure section of the database could expand to include more vegetation strata to cater for the more complex structure of eastern NSW forests. Database fields on other aspects of vegetation structure such as benchmarking number of logs on the ground, average number of tree hollows, average stem density, could also be added.

As mentioned in Benson (2006), memory limits in MS Access software restrict the size of the plant community images that can be linked to the database for generating multi-record PDF reports. Also, the database cannot be web-enabled in its present software. Recent reviews of NSW Department of Environment and Climate Change vegetation information systems have recommended reconstruction of the NSWVCA database in more robust database software to over come these and other deficiencies. It is likely the MS Access NSWVCA database will be upgraded to MS SQL software and web-enabled within two years. This may negate the need to produce regular CD versions of the NSWVCA database as it progresses across NSW. However, a MS Access version may be occasionally published or made available for use on personal computers where internet connection is unavailable or of poor quality.

Acknowledgements

This project was partly supported by a grant from the Natural Heritage Trust Fund (SL 0008 R1 – NAP_NHT). I thank an anonymous referee for constructive comments on the text. Jedda Lemmon helped to collate the literature. Chris Allen helped with some figures and with Excel macros for producing the tables. Sally Waller produced some of the figures. Many people contributed information, reports and advice on vegetation types. Special thanks to Nick Gellie, Steve Priday and Marianne Porteners for providing published and unpublished reports, plot data and plot data analyses for parts of the NSW South-western Slopes Bioregion. Roger Lembit, Michael Mulvany, Ian Davidson, Ric Webster and Michael Doherty provided additional data, vegetation descriptions and advice. I also thank Shawn Capararo, Suzie Jackson, Jo Caldwell, Jamie Molloy and Gavin Newton of DECC Queanbeyan, Tumut, Khancoban and Bathurst Offices respectively, for providing vegetation data and advice on access to conservation reserves. Miranda Kerr and Dave Robson of DECC's Dubbo Office provided vegetation reports for the Lachlan and Central West Catchment Management Areas. Peter Thompson (Western CMA) provided invaluable feedback on the distribution of plant communities in the Western CMA. Special thanks to the Botanic Gardens Trust's photographer Jaime Plaza for his comprehensive photography of the vegetation and his great logistical support during the field work.

References

Note: A bibliography of all references used in the classification and assessment of the vegetation of the eight bioregions that comprise the previously published NSW Western Plains (Benson et al. 2006), the NSW South-western Slopes Bioregion and some areas of the NSW north-western slopes, is presented in the spreadsheet file *NSWVCA Version 2 Bibliography.xls* in Folder 2 on the CD in the back pocket of this journal. The references listed below are those cited in this paper.

Allen, M.R. (1998) Forest history projects for State Forests of New South Wales. Case studies of three cypress pine forests in the Lachlan and Bogan River catchments, Forbes Forestry District on Back Yamma, Euglo South and Strahorn State Forests (State Forests of NSW: Pennant Hills).

Anderson, R.H. (1961) Introduction. Flora series Nos. 1–18: 1–16. *Contributions from the New South Wales National Herbarium* (Royal Botanic Gardens: Sydney).

Ashley, P.M., Chenhall, B.E., Cremer, P.L. & Irving, A.J. (1971) The geology of the Coolac Serpentinite and adjacent rocks east of Tumut, New South Wales. *Journal and Proceedings of the Royal Cociety of New South Wales* 104: 11–29

Austin, M.P., Cawsey, E.M., Baker, B.L., Yialeloglou, M.M., Grice, D.J. & Briggs, S.V. (2000) Predicted vegetation cover in the central Lachlan region. National Heritage Trust Project AA 1368.97 (CSIRO Division of Wildlife and Ecology: Canberra).

Beadle, N.C.W. (1981) *The vegetation of Australia*. (Cambridge University Press: Cambridge).

Beadle, N.C.W. & Costin, A.B. (1952) Ecological classification and nomenclature. *Proceedings of the Linnean Society of New South Wales* 67: 61–82.

Benson, J.S. (2006) New South Wales Vegetation Classification and Assessment: Introduction – the classification, database, assessment of protected areas and threat status of plant communities. *Cunninghamia* 9(3): 331–382.

Benson, J.S. (1999) Setting the scene: the native vegetation of New South Wales. Background Paper Number 1 (Native Vegetation Advisory Council NSW: Sydney).

Benson, J.S., Allen, C., Togher, C. & Lemmon, J. (2006) New South Wales Vegetation Classification and Assessment: Part 1 Plant communities of the NSW Western Plains. *Cunninghamia* 9(3): 383–451.

Bos, D. & Lockwood, M. (1996) Flora, fauna and other features of the south west slopes biogeographic region, NSW. Report No. 59, Johnson Centre of Parks, Recreation and Heritage. (Charles Sturt University: Albury).

Braun-Blanquet, J. (1932) *Plant sociology: the study of plant communities* (McGraw-Hill: New York).

Carnaham, J. (1990) Vegetation. Volume 6 in *Atlas of Australian resources* Third Series (AUSLIG: Canberra).

Chen, X.Y. & McKane, D.J. (1996) Soil landscapes of the Wagga Wagga 1:100,000 sheet. Report (Department of Land and Water Conservation: Sydney).

Chytrý, M., Tichý, L., Holt, J. & Botta-Dukát. Z. (2002) Determination of diagnostic species 1938 with statistical fidelity measures. *Journal of Vegetation Science* 13: 79–90.

Dallwitz, M. J., Paine, T. A., and Zurcher, E. J. (1993 onwards). User's guide to the DELTA System: a general system for processing taxonomic descriptions. 4th Edition. http://delta-intkey.com.

Davidson, I. (2007) Developing a local landscape biodiversity plan in the Woomargama & Jindera local landscapes (Greate Hume Shire). Report to DECC NSW (Regeneration Solutions Ltd: Glenrowan).

Department of Environment and Conservation New South Wales (2004) IBRA sub-regions. Unpublished GIS map (DEC NSW: Sydney).

Department of Environment and Conservation New South Wales (2006) Reconstructed and extant distribution of native vegetation in the Central West Catchment. Unpublished report (NSW Department of Environment and Conservation: Dubbo).

Department of Environment and Conservation New South Wales (2006a) Reconstructed and extant distribution of native vegetation in the Lachlan Catchment. Unpublished report (NSW Department of Environment and Conservation: Dubbo).

EcoGIS (2005) Vegetation of the Upper Murray reserves: Report to NSW Department of Environment and Conservation (DEC Upper Murray Area, Snowy Mountains Region: Khancoban).

Eco Logical Australia Pty Ltd (2006) A review of vegetation types in the PVP–Developer for the border Rivers/Gwydir, Central West, Lachlan, Lower Murray Darling, Namoi and Northern Rivers Catchment Management Authority Areas. Unpublished report to NSW Department of Environment and Conservation, Sydney (Ecological Australia: PO Box 12 Sutherland NSW 1499).

ERM Mitchell McCotter Pty. Ltd. (1996) Bathurst vegetation survey for NSW National Parks and Wildlife Service: Bathurst District covering Winburndale NR, Nangar NP, Conimbla NP and Weddin Mountains NP. (NSW National Parks and Wildlife Service: Bathurst)

Executive Steering Committee for Australian Vegetation Information (ESCAVI) (2003). *Australian Vegetation Attribute Manual: National Vegetation Information System, Version 6.0* (Department of the Environment and Heritage, Canberra, URL: http://www.deh.gov.au/erin/nvis/avam/index.html).

Flauhault, C. & Schroter, C. (1910) *Phytogeographische nomenklature*. Berichte und Vorschliage (3rd International Botanical Congress: Brussels).

Fruedenberger, D. (1999) Guidelines for enhancing grassy woodlands for the vegetation investment project. Report commissioned by Greening Australia ACT & SE NSW Inc. (CSIRO: Wildlife and Ecology: Canberra).

Gellie, N.J.H. (2005) Native vegetation of the Southern Forests: South-east Highlands, Australian Alps, South-west slopes and SE Corner bioregions. *Cunninghamia* 9(2): 219–253.

Gellie, N. & Fanning, M. (2004) Final report of vegetation ecosystems in new and existing conservation reserves, south west slopes region 2002–2004, version 3. Report to NSW Department of Environment and Conservation: Queanbeyan.

Gibbons, P. & Boak, M. (2002) The value of paddock trees for regional conservation in an agricultural landscape. *Ecological Management & Restoration* 3(3): 205–210.

Gibbons, P., Ayers, D., Seddon, J., Doyle, S. and Briggs, S. (2005) BIOMETRIC Version 1.8. A Terrestrial Biodiversity Assessment Tool for the NSW Property Vegetation Plan Developer (NSW Department of Environment and Conservation

c/- CSIRO Sustainable Ecosystems: Canberra), (http://www.nationalparks.nsw.gov.au/PDFs/Biometric_manual_1_8.pdf).

Gibbons, P. & Freudenberger, D. (2006) An overview of methods used to assess vegetation condition at the scale of the site. *Ecological Management & Restoration* 7: S10–S17.

Gray, D.R. 1997. Tectonics of the southeastern Australian Lachlan Fold Belt: structural and thermal aspects, in Burg, J.P. and Ford. M.(eds), *Orogeny Through Time*. Geological Society Special Publication 121: 149–177.

Hayman, G. (1996) Dryland salinity control in the Boorowa catchment. *Australian Journal of Soil and Water Conservation* 9: 23–26.

Hill, L. & Peake, T. (2000) The vegetation of Avisford Nature Reserve. A report to NSW NPWS on vegetation mapping and survey for fire management purposes (Natural Assets environmental Survey and Assessment).

IUCN (1994) *Guidelines for protected area management categories*. Commission on National Parks and Protected Areas with the assistance of the World Conservation Monitoring Centre (IUCN: Gland, Switzerland).

Jennings, M.D., Faber-Langendoen, D., Peet, R.K., Loucks, O.L., Glenn-Lewin, C., Damman, A., Barbour, M.G., Pfister, R., Grossman, D.H., Roberts, D., Tart, D., Walker, M., Talbot, S.S., Walker, J., Hartshorn, G.S., Waggoner, G., Abrams, M.D., Hill, A. & Rejmanek, M. (2006) Description, documentation and evaluation of associations and alliances within the U.S. National Vegetation Classification. Version 4.5 (Ecological Society of America: Washington).

Keith, D.A. (2004) *Ocean shores to desert dunes: the native vegetation of New South Wales and the ACT* (Department of Environment and Conservation NSW: Hurstville).

Keith, D.A. & Bedward, M. (1999) native vegetation of the South East Forests region, Eden, New South Wales. Appendix: Descriptive profiles of floristic assemblages *Cunninghamia* 6(1): 61–218.

Keith, D. & Simpson, C. (2008) A protocol for assessment and integration of vegetation maps, with an application to spatial data sets from south-eastern Australia. *Austral Ecology* 33**:** 761–774.

King, D.P. (1989) Soil landscapes of the Forbes 1:250,000 Sheet (Department of Land and Water Conservation: Sydney).

Lembit, R. & Skelton, N. (1998) Vegetation survey of Copperhannia, Barton, Dapper and Boginderra Hills Nature Reserves. Unpublished report (NSW National Parks and Wildlife Service: Bathurst).

Lewer, S., Ismay, K., Grounds, S., Gibson, R., Harris, M., Armstrong, R., Deluca, S. & Ryan, C. (2003) Native vegetation map report Bogan Gate, Boona Mount, Condobolin, Dandaloo, Tottenham and Tullamore 1:100 000 map sheets. (NSW Department of Infrastructure, Planning and Natural Resources).

Lilley, D.M. & Tidemann, C.R. (1994) Flora and fauna of Buddigower Nature Reserve NSW. Report to NSW National Parks and Wildlife Service. (School of Resources and Environmental Management Aust. National University: Canberra).

Littleboy, M., Piscopo, G., Beecham, R., Barnett, P., Newman, L. & Alwood, N. (2001) Dryland Salinity Extent and Impacts, New South Wales: Technical Report for the National Land and Water Resources Audit, prepared by the Department of Land and Water Conservation for the National Land and Water Resources Audit, Canberra.

Lindenmayer, D.B., Cunningham, R.B., Pope, M. & Donnelly, C.F. (1999) The Tumut fragmentation experiments in south-eastern Australia: the effects of landscape context and fragmentation on arboreal marsupials. *Ecological Applications* 9: 594–611.

Lodge, G.M. & Whalley, R.D.B. (1989) Native and natural pastures on the Northern Slopes and Tablelands of New South Wales. Technical Bulletin No. 35 (NSW Agriculture and Fisheries: Sydney).

Lyons, M.T., Brooks, R.R. and Craig, D.C. (1974) The influence of soil composition on the vegetation of the Coolac Serpentinite Belt in New South Wales. *Journal of the Royal Society of NSW* 107: 67–75.

Margules & Partners (1990) River Murray Riparian Vegetation Study. (Murray-Darling Basin Commission: Canberra).

Mid-Lachlan Regional Vegetation Committee (1999) Plan Draft Mid-Lachlan Regional Vegetation Management Plan for Public Exhibition. (Mid-Lachlan RVC: Forbes).

Moore, C.W.E. (1953a) The vegetation of the south-eastern Riverina, New South Wales 1: the climax communities. *Australian Journal of Botany* 1: 485–547.

Moore, C.W.E. (1953b) The vegetation of the south-eastern Riverina, New South Wales 2: the disclimax communities. *Australian Journal of Botany* 1: 548–567.

NSW Department of Mines (1970) Goulburn 1:250,000 geological series sheet SI 55–12 (NSW Department of Mines: Sydney).

NSW Department of Mines (1972) Dubbo 1:250,000 geological series sheet SI 55–4 (NSW Department of Mines: Sydney).

NSW Department of Mines (1972) Forbes 1:250,000 geological series sheet SI 55–7 (NSW Department of Mines: Sydney).

NSW National Parks and Wildlife Service (2001) New South Wales South West Slopes Bioregion scoping study. NSW Biodiversity Strategy (NSW National Parks and Wildlife Service: Hurstville (http://www.nationalparks.nsw.gov.au/PDFs/sbs_nss_scope.pdf).

NSW National Parks and Wildlife Service (2002) The native vegetation of Boorowa Shire (NSW National Parks and Wildlife Service: Queanbeyan).

NSW National Parks and Wildlife Service (2003) *The bioregions of New South Wales: their diversity, conservation and history* (NSW National Parks and Wildlife Service: Hurstville) (http://www.nationalparks.nsw.gov.au/npws.nsf/Content/bioregions).

Norris, E.H. & Thomas, J. (1991) Vegetation on rocky outcrops and ranges in central and south-western New South Wales. *Cunninghamia* 2(3): 411–442.

Osborne, R.A.L. (1998) Karst geology of Wellington Caves: a review. *Helictite* 37(1): 3–12.

Porteners, M. (1997) Vegetation communities of Goobang National Park and adjoining areas. Unpublished report and vegetation (NSW National Parks and Wildlife Service: Bathurst).

Porteners, M.F. (2001) Vegetation survey of Ingalba, Big Bush and Pucawan Nature Reserves. Report for NSW National Parks and Wildlife Service: Riverina Region.

Porteners, M.P. (2007) Native vegetation of Koorawatha, Dananbilla, Illunie and Gungewalla Nature Reserves. Report to DECC NSW, Southern Office: Queanbeyan.

Pressey, R.L. (1986) Wetlands of the River Murray below Lake Hume. RMC Environmental Report 86/1 (River Murray Commission: Albury).

Pressey, R.L., Hager, T.C., Ryan, K.M., Schwartz, J., Wall, S., Ferrier, S. & Creaser, P.M. (2000) Using abiotic data for conservation assessment over extensive regions: quantitative methods applied across NSW. *Biological Conservation* 96: 55–82.

Prober, S. (1996) Conservation of the grassy White Box woodlands: rangewide floristic variation and implications for reserve design. *Australian Journal of Botany* 44: 57–77.

Prober, S.M. & Brown, A.H.D. (1994) Conservation of the grassy White Box woodlands: population genetics and fragmentation of *Eucalyptus albens*. *Conservation Biology* 8(4): 1003–1013.

Prober, S.M. & Thiele, K.R. (1995) Conservation of the grassy White Box woodlands: relative contributions of size and disturbance to floristic composition and diversity of remnants. *Australian Journal of Botany* 43: 349–366.

Priday, S. (2004) The native vegetation and threatened species of Wagga Wagga Shire. Unpublished report. (NSW National Parks and Wildlife Service, Southern Region: Queanbeyan).

Priday, S. (incomplete 2006) The biolandscapes of the New South Wales South-western Slopes Bioregion (Lachlan, Murrumbidgee and Murray Catchments). Unpublished report to Department of Environment and Conservation, South Branch: Queanbeyan.

Reid, J.R.W. (1999) Threatened and declining birds in the New South Wales sheep-wheat belt. I. Diagnosis, characteristics and management. Consultancy report to NSW National Parks and Wildlife Service (CSIRO Wildlife and Ecology: Canberra).

Sattler, P.S. & Williams, R.D. (1999) (eds.) *The conservation status of Queensland's Bioregional Ecosystems* (Environmental Protection Agency: Brisbane).

Seddon, J., Briggs, S. & Doyle, S. (2002) Little River Catchment biodiversity assessment (NSW National Parks and Wildlife Service c/- CSIRO Sustainable Ecosystems: Canberra).

Sedden, J., Zerger, A., Doyle, S.J. & Briggs, S.V. (2007) The extent of dryland salinity in remnant woodland and forest within and agricultural landscape. *Australian Journal of Botany* 55: 533–540.

Sivertsen, D. & Metcalfe, L. (1995) Natural vegetation of the southern wheat-belt (Forbes and Cargelligo 1:250 000 map sheets). *Cunninghamia* 4(1): 103–128.

Smith, P. & Smith J. Ecological Consultants (1990) Floristic Communities. In River Murray Riparian Vegetation Study. (Murray-Darling Basin Commission: Canberra).

Spooner, P.G. & Briggs, S.V. (2008) Woodlands on farms in southern New South Wales: A longer-term assessment of vegetation changes after fencing. *Ecological Management & Restoration* 9(1): 33–41.

Stelling, F. (Ed.) (1998) South West Slopes Revegetation Guide (Murray Catchment Management Committee and Department of Land & Water Conservation: Albury).

Stern, H., Hoedt, G. & Ernst, J. (2000) Objective classification of Australian climates (Bureau of Meteorology Australia: Melbourne).

Thackway, R. & Cresswell, I. (1995) (eds.) An Interim Biogeographic Regionalisation of Australia. Version 6 (Australian Nature Conservation Agency: Canberra).

Tozer, M. (2003) Native vegetation of the Cumberland Plain, western Sydney: systematic classification and field identification of communities. *Cunninghamia* 8(1): 1–75.

Walker, J. & Hopkins, M.S. (1990) Vegetation. In McDonald, R.C., Isbell, R.F., Speight, J.G., Walker, J. & Hopkins, M.S. (1990) *Australian soil and land survey: field handbook* (Inkata Press: Melbourne).

Webster, R. (2007) Management history of high conservation value wetlands in the upper Murray management unit of the Murray CMA. Report to NSW Murray Wetlands Working Group Inc. (Ecosurveys Pty Ltd: Deniliquin).

Webster, R. & Davidson, I. (2003) inventory of wetlands within the Riverina highlands regional vegetation region. Report to Riverina Highlands Regional Vegetation Committee (Ecosurveys Pty Ltd: Deniliquin).

Westhoff, V. & Van der Maarel, E. (1980) The Braun-Blanquet approach. Pp 289–329 in Whittaker, R.H. *Classification of Plant Communities* Second Edition (W. Junk, the Hague: Netherlands).

Manuscript accepted 15 September 2008

Appendix A. ID266: Full report (90 fields) of a grassy box woodland with an originally large extent and wide distribution that is now mainly cleared, weed invested and is assessed as being Endangered.

Veg. ID No.	266
Common Name	**White Box grassy woodland mainly on hills in the upper slopes sub-region of the NSW South-western Slopes Bioregion**
Scientific Name	*Eucalyptus albens* / *Acacia decora – Acacia implexa – Acacia deanei subsp. paucijuga* / *Themeda australis – Poa sieberiana – Wurmbea dioica – Cymbonotus lawsonianus*
Original Data Entry	J. S. Benson
Original Data Entry Date	10/01/2006
Last Modified By	NA
Last Modified Date	NA
Formation Group	Eucalyptus (Mostly Grassy) Box Woodlands of the Tablelands and Western Slopes
State Veg Map (Keith 2004)	Western Slopes Grassy Woodlands;
State Landscapes (Mitchell 2002)	Not correlated
NVIS Major Veg Sub-Groups	Eucalyptus woodlands with a grassy understorey;
Forest Type (RN 17)	175 – White Box (P);
Characteristic Trees	*Eucalyptus albens; Eucalyptus bridgesiana; Brachychiton populneus subsp. populneus;*
Characteristic Shrubs/Vines/ Epiphytes	*Acacia decora; Acacia implexa; Acacia deanei subsp. paucijuga; Acacia genistifolia; Acacia penninervis var. longiracemosa; Acacia buxifolia subsp. buxifolia; Acacia paradoxa; Dodonaea viscosa subsp. cuneata; Bursaria spinosa subsp. spinosa; Cassinia aculeata; Hibbertia riparia*
Characteristic Groundcover	*Themeda australis; Poa sieberiana; Wurmbea dioica; Cymbonotus lawsonianus; Aristida behriana; Panicum effusum; Austrodanthonia auriculata; Austrodanthonia caespitosa; Microlaena stipoides; Austrostipa bigeniculata; Bothriochloa macra; Elymus scaber var. scaber; Aristida ramosa; Enteropogon acicularis; Austrostipa aristiglumis; Austrodanthonia monticola; Gonocarpus elatior; Oxalis perennans; Lomandra filiformis subsp. coriacea; Lomandra multiflora; Dianella longifoila; Tricoryne elatior; Desmodium varians; Hydrocotyle laxiflora; Asperula conferta; Leptorhynchos squamatus sens. lat.; Craspedia variabilis; Podolepis jaceoides; Stackhousia monogyna; Dichopogon strictus; Velleia paradoxa; Diuris dendrobioides; Microtis uniflora; Cheilanthes sieberi subsp. sieberi; Acaena novae-zelandiae; Acaena ovina; Ajuga australis; Xerochrysum viscosa; Vittadinea cuneata; Wahlenbergia luteola; Solenogyne dominii; Scutellaria humilis; Ranunculus lappaceus; Rumex brownii; Plantago varia; Hypericum gramineum; Chrysocephalum apiculatum; Chloris truncata; Calotis cuneata var. cuneata; Glycine clandestina; Calotis lappulacea; Microseris lanceolata; Geranium retrorsum; Goodenia pinnatifida; Microseris lanceolata; Eryngium ovinum; Prasophyllum odoratum; Diuris dendrobioides*
Characteristic Weed Species	*Hypochaeris radicata; Bromus hordeaceus; Vulpia muralis; Vulpia myuros; Avena fatua; Echium plantagineum; Trifolium campestre; Trifolium arvense; Plantago lanceolata; Phalaris aquatica; Carthamus lanatus; Lolium perenne; Dactylis glomerata; Anagallis arvensis; Briza minor*
Weediness	Very high (>30%) with >30% cover (average)
Threatened Plants	*Microseris lanceolata (depleted);*
Threatened Fauna	*Superb Parrot; Swift Parrot; Brown Treecreeper; Diamond Firetail; Pale-headed Snake; Striped Legless Lizard;*
Mean Native Species Richness	In good sites over 40 spp. in 20 X 20 m plots but such sites are rare.
Characteristic Qualifiers	Combination of Quantitative Data and Qualitiative Estimate
Authority(s)	Includes most of the White Box association in Moore (1953a). Includes Vegetation Group 31 in Gellie & Fanning (2004) and Vegetation Group 117 in Gellie (2005). Community 3 in Priday (2004) for Wagga Wagga Shire. Part of Biolandsapes BulS24 and SouV24 in Priday (2006). White Box woodland in Boorowa Shire (NSWNPWS 2002a). Community 74 (E. albens) in Austin (2001) for mid-Lachlan region. Probably most of the White Box woodland in Sedden et al. (2002) for the Little River Catchment. Much of the White Box community in Prober (1996) and Prober & Thiele (1995) Includes BVT78 in DEC (2006, 2006a). . A sub-formation that could be sub-divided with plot data analysis.
Authority Qualifiers	(Combination of Expert Opinion and Quantitative Data)
Interstate Equivalent(s)	Victoria: part of EVC 175–62 Rainshadow Grassy Woodland
Class. Confidence Level	High
Level of Classification	Sub-formation
Rainforest Structure (Webb)	Not applicable

Structure (WH)	Woodland;
Height Class (WH)	Tall;
Vegetation Description	Tall woodland with trees to 25 m high dominated by White Box (Eucalyptus albens) often as the only tree species. Kurrajong (Brachychiton populneus subsp. populneus) is often present, particularly on limestone or rocky ground. The shrub layer is usually sparse or absent depending on grazing history or soil type. Wattles are the most common shrubs including Acacia decora, Acacia implexa, Acacia pycnantha, Acacia deanei subsp. paucijuga, Acacia genistifolia, Acacia penninervis var. longiracemosa, Acacia buxifolia subsp. buxifolia and Acacia paradoxa. Other shrubs include Dodonaea viscosa subsp. cuneata, Bursaria spinosa subsp. spinosa and Cassinia spp. The ground cover is usually mid-dense to dense except during drought and may be very diverse in grass and forb species. Very few areas contain a native ground cover with a rich flora but where this occurs it typically contains grasses such as Themeda australis, Poa sieberiana, Elymus scaber var. scaber and a range of Austrodanthonia species including Monachather paradoxus and Austrodanthonia auriculata. Forbs in such sites include Wurmbea dioica, Gonocarpus elatior, Microseris lanceolata, Leptorhynchos squamatus sens. lat., Craspedia variabilis, Podolepis jaceoides, Hypericum gramineum, Stackhousia monogyna, Ranunculus lappaceous, Dichopogon strictus, Velleia paradoxa and Diuris dendrobioides. In heavily grazed sites fewer native species are present and the sites are dominated by Austrostipa spp, Aristida spp. and Austrodanthonia spp. Grasses with some hardy forbs such as Calotis spp, Xerochrysum viscosa, Vittadinea cuneata, Wahlenbergia luteola, Solenogyne dominii, Scutellaria humilis and Oxalis perennans. In sites exposed to continuous grazing, soil disturbance and fertilizer application, exotic species dominate the ground cover including Bromus spp., Vulpia spp., Avena fatua, Echium plantagineum, Trifolium spp. and Plantago lanceolata. Floristic composition varies from north to south and on different aspects and soil types. Occurs between 300 – 600 m altitude in the 500 – 700 mm rainfall zone, most of which falls in winter. The soils are mainly red-brown earths, red or yellow podsols with some brown and black earths. The soils are derived from a variety of lithologies including shale, limestone, fine grained metamorhic rocks, granite and basalt. Species composition appears not to vary greatly across these lithologies. Mainly occurs on hillslopes in low hill or hill landform patterns in the NSW South-western Slopes Bioregion overlapping into the South Eastern Highlands Bioregion. Most of this community has been cleared and most of the extent of ground cover has been replaced by exotic annual plant species. Sheet erosion has lead to top soil loss on heavily grazed slopes. Small areas with an "intact" ground cover remain in cemetries, roadsides and travelling stock reserves. While this community is poorly sampled in public reserves, some progress is being made in protecting remnants in non-reserve conservation measures. A highly threatened plant community due to ground cover change and clearing.
Mapped/Modelled	Current extent partly mapped
Mapping Info	Full range not mapped as of 2007. Mapped by Priday (2004) in Wagga Wagga Shire. Mapped in the Boorowa and Yass Shires and in some reserves. Difficult to discern a native understorey from an exotic understorey using aerial photos.
Adequacy Of Plot Sampling	Inadequate
Climate Zone	Temperate: no dry season (warm summer); Temperate: no dry season (hot summer);
IBRA Bioregion (v6)	NSW South-western Slopes (>70%); South Eastern Highlands (1–30%);
IBRA Sub-Region	Bondo (1–30%); Crookwell (1–30%); Lower Slopes (1–30%); Orange (1–30%); Upper Slopes (30–70%);
Botanical Division	Central Western Slopes (CWS) (30–70%); South Western Slopes (SWS) (30–70%);
Local Govt. Areas	Albury (1–30%); Bland (1–30%); Boorowa (1–30%); Cabonne (1–30%); Coolamon (1–30%); Cootamundra (1–30%); Cowra (1–30%); Forbes (1–30%); Greater Hume (1–30%); Gundagai (1–30%); Harden (1–30%); Junee (1–30%); Parkes (1–30%); Temora (1–30%); Wagga Wagga (1–30%); Weddin (1–30%); Wellington (1–30%); Young (1–30%);
CMAs	Central West (1–30%); Lachlan (1–30%); Murray (1–30%); Murrumbidgee (1–30%);
MD Basin	Yes
Substrate Mass	Igneous rocks; Metamorphic rocks; Sedimentary rocks; Volcanic rocks;
Lithology	Basalt; Calcareous mudstone; Claystone; Granite; Hornfels; Jasper; Limestone; Mudstone; Phyllite; Schist; Shale; Slate;
Great Soil Group	Black earth; Chocolate soil; Red podzolic soil; Red-brown earth;
Soil Texture	Clay loam; Light clay; Light medium clay; Medium clay;
Landform Patterns	Hills; Low hills;
Landform Elements	Hillcrest; Hillslope; Valley flat;
Land Use	Cropping and Horticulture; Grazing;
Impacts of Euro. Settlement	Major alteration of species composition; Major reduction (>70%) in extent and /or range;
Pre-European Extent (ha)	800000
Pre-European Accuracy (%)	30
Pre-European Qualifiers	Estimated from pre-European map: part range

Pre-European Comments	Moore (1953a) mapped 1.1 million ha of pre-European White Box woodland from Young to Albury on the NSW south western slopes but this broad map includes several types of White Box woodland. However, this did not cover the northern extent of this community. The most widespread plant community in the NSW SWS Bioregion.
Current Extent (ha)	50000
Current Extent Accuracy (%)	30
Current Extent Qualifiers	Estimated from mapped extant vegetation: part range
Current Extent Information	Miniscule White Box woodland remains with a native ground cover but White Box paddock trees are common mostly with a weedy ground cover. The current extent estimate depends on whether one is recording "intactness of ground cover" or tree patch cover. Prober & Thiele (1993) state that only 0.01% of White Box woodland south of Molong remains relatively unmodified. NSWNPWS map 5584 of a predicted 30511 ha (18%)of White Box woodland in Boorowa Shire but this includes paddock patches. Seddon et al. (2002) estimate only 3% remains in the Little River Catchment.
Percent Remaining	6
Percent Remaining Accuracy (%)	±50
Degree of Fragmentation	Human induced highly fragmented small stands with <30% extent remaining and high edge to area ratio
Recoverability	Very poor health as structure and/or composition severely altered. Insufficient biota remain for natural regeneration except some ruderal species.
Threatening Processes	Highly fragmented due to past clearing. High nitrogen levels are common due to fertilizer use, coinciding with the intoduction of exotic pasture weeds replacing perennial native grasses and forbs. Few remnants contain a natural shrub or ground cover plant species composition.
Threat Process List	Age class of woody vegetation; Clearing for agriculture;Dryland cropping; Herbicides, pesticides or other chemical pollution; Nutrient changes through fertilizers or runoff; Salinity; Soil erosion, water: sheet erosion; Soil erosion, wind; Unsustainable grazing and trampling by stock; Weed (exotic) invasion;
Variation and Natural Disturbance	Occurs over a large range on many lithologies and a number of soil types. Floristic composition varies but Prober (1996) describes consistency in ground cover species composition with a gradual latitudinal change from south to northern NSW.
Adjoining Communities	Grades into and shares many ground species with Blakely's Red Gum – Yellow Box woodland (ID277) on lower hill-slopes and flats; into Fuzzy Box (Eucalyptus conica) woodland (ID201) on colluvial lower hill-slopes and flats; to the west into Inland Grey Box (Eucalyptus microcarpa) woodland (ID76 or ID80) on brown loams and clays and into shrubby White Box or Tumbledown Gum – Mugga Ironbark – Red Stringybark communities on rocky ridges.
Fire Regime	Aboriginal burning of grassy woodlands favoured grasses such as Themeda australis and native yam (Microseris lanceolata). An appropriate fire regime may be 3–15 years. Fire is rare due to fragmentation and lack of ground cover due to grazing. The prevalence of an exotic, annual ground flora has changed the fire regimes. Burning could decrease exotic annual species by flushing soil nitrogen.
Conservation Reserves	Flagstaff Memorial NR 6 (E2); Barton NR 6 (M); Minjary NP 30 (E3); Tumblong SCA 106 (E1); Oak Creek NR 100 (E3);
Total Area in Reserves (ha)	248
No. of Reps in Reserves	5
Explanation of Protected Areas	Flagstaff Memorial NR from Brickhill (1978a). Barton NR from White Box woodland in Lembit & Skelton (1998). VCA116 and VCA111 from DEC file notes. Tumblong SCA, Oak Creek NR and Minjary NR and from vegetation group 31 in Gellie & Fanning (2004). HE9901 and WT9902 from DNR database.
Secure Property Agreements	VCA116 Marra Cemetry VCA 4 (M); VCA111 Wallendbeen Cemetry VCA 3 (E1); HE9901 PA 6 (E2); WT9908 PA 64 (E2);
Total Area in Secure PAs	77
No. of Reps in Secure PAs	4
Total Area Protected (ha)	325
Area Protected Accuracy (%)	30
Protected Pre-Euro. Extent (%)	0.04
Protected Current Extent (%)	0.65
Total Reps in Protected Area	9
Common (>10000 ha in 1750)	5a: <1% in protected areas
Common Qualifiers	Inadequately across distribution
Key Sites for Protection	Some travelling stock routes, cemetries and roadsides contain good condition grassy White Box woodland. These include Guise's Hill TSR and Mangoplah Landcare site in Wagga Shire (Priday 2004), Warraderry Range in the Lachlan Catchment, Hovell's Creek and Bennet Springs TSRs in Boorowa Shire.

Threat Category	Critically Endangered
Threat/Protected Area Code	CE/5a
Threat Criteria	1; 4;
Planning and Management	Management advice is provided in the Grassy White Box Woodlands Information Kit (Lambert & Elix 2002). Prevent travelling stock routes from being sold off or overgrazed. Protect key sites in public conservation reserves. Off-reserve measures such as the Grassy Woodlands Conservation Management Network can protect sites in good condition on private land. Management of remnants may require regular burning or mowing to remove nutrients and annual species and stimulate reproduction of native forbs and grasses.
Listed Under Legislation	Listed TSCA (NSW Threatened Species Conservation Act); Nominated EPBCA (Com. Environmental Protection and Biodiversity Conservation Act);
Recovery Plan	Required
Photo1	ID266a_PC178-22.jpg

Photo Caption 1	ID266 *Eucalyptus albens* grassy woodland, Quamby-Thuddungra TSR south of Grenfell, (AGD66) 34°09'28" S 148°08'39" E, 12/10/02, J.Plaza;
Photo 2	ID266b_PC172-12.jpg

Photo Caption 2	ID266 *Eucalyptus albens – Themeda australis* grassy woodland, Canowindra Cemetery, (AGD66) 33°32'59" S 148°40'17" E, 10/10/02, J.Plaza;

Photo 3 ID266c_PC193-12.jpg

Photo Caption 3 ID266 *Eucalyptus albens* grassy woodland, Minjary National Park, (AGD66) 35°13'18" S 148°07'20" E, 16/10/02, J.Plaza;

Reference List 183; 166; 336; 316; 338; 276; 338; 343; 301; 179; 340; 348; 340; 356; 353; 372; 373;

References

Austin, M.P., Cawsey, E.M., Baker, B.L., Yialeloglou, M.M., Grice, D.J. & Briggs, S.V. (2000) Predicted vegetation cover in the central Lachlan region. National Heritage Trust Project AA 1368.97. (CSIRO Division of Wildlife and Ecology: Canberra); Moore, C.W.E. (1953a) The vegetation of the south-eastern Riverina, New South Wales 1: the climax communities. Aust. J. Botany 1: 485–547; NSW National Parks and Wildlife Service (2002a) The native vegetation of Boorowa Shire (NSW National Parks and Wildlife Service: Hurstville); Priday, S. (2004) The native vegetation and threatened species of the City of Wagga Wagga. Unpublished report. (NSW National Parks and Wildlife Service, Southern Region: Queanbeyan); Prober, S. (1996) Conservation of the grassy White Box woodlands: rangewide floristic variation and implications for reserve design. Aust. J. Botany 44: 57–77; Seddon, J., Briggs, S. & Doyle, S. (2002) Little River Catchment biodiversity assessment. Report. (NSW National Parks and Wildlife Service c/- CSIRO Sustainable Ecosystems: Canberra); Prober, S. (1996) Conservation of the grassy White Box woodlands: rangewide floristic variation and implications for reserve design. Aust. J. Botany 44: 57–77; Prober, S.M. & Thiele, K.R. (1995) Conservation of the grassy White Box woodlands: relative contributions of size and disturbance to floristic composition and diversity of remnants. Aust. J. Bot. 43: 349–366; Brickhill, J. (1978a) Information sheet on Flagstaff Memorial Nature Reserve. RN 39. (NSW National Parks and Wildlife Service: Griffith); Lembit, R. & Skelton, N. (1998) Vegetation survey of Copperhannia, Barton, Dapper and Boginderra Hills Nature Reserves. Report to the NSW National Parks and Wildlife Service: Central West; Gellie, N. & Fanning, M. (2004) Final report of vegetation ecosystems in new and existing conservation reserves, south west slopes region 2002–2004, version 3. Report to NSW Department of Environment and Conservation: Queanbeyan; Lambert, J. & Elix, J. (2002) Grassy White Box woodlands information kit (Community Solutions: Sydney); Gellie, N. & Fanning, M. (2004) Final report of vegetation ecosystems in new and existing conservation reserves, south west slopes region 2002–2004, version 3. Report to NSW Department of Environment and Conservation: Queanbeyan; Priday, S. (in prep. 2006) The native vegetation of the New South Wales South-western Slopes Bioregion (Lachlan, Murrumbidgee and Murray Catchments). Unpublished report to DEC Southern Office Queanbeyan; Gellie, N.J.H. (2005) Native vegetation of the Southern Forests: South-east Highlands, Australian Alps, South-west Slopes and SE Corner bioregions. Cunninghamia 9(2): 219–254; DEC (2006) Reconstructed and extant distribution of native vegetation in the Central West Catchment. Unpublished report (NSW Department of Environment and Conservation: Dubbo); DEC (2006a) Reconstructed and extant distribution of native vegetation in the Lachlan Catchment. Unpublished report (NSW Department of Environment and Conservation: Dubbo);

Appendix B. ID285. Full report of a swampy woodland that is restricted in its extent, mostly cleared and has an Endangered threat status.

Veg. Comm. ID No.	285
Common Name	**Broad-leaved Sally grass – sedge woodland on valley flats and swamps in the NSW South-western Slopes and adjoining South Eastern Highlands Bioregions**
Scientific Name	*Eucalyptus camphora subsp. humeana – Eucalyptus stellulata / Acacia melanoxylon – Acacia dealbata – Acacia kettlewelliae – Leptospermum continentale / Carex appressa – Poa labillardierei var. labillardierei – Juncus holoschoenus – Acaena novae-zelandiae*
Original Data Entry	J.S. Benson
Original Data Entry Date	1/02/2006
Formation Group	Eucalyptus Swamp Communities of the Eastern Coast and Tablelands
State Veg Map (Keith 2004)	Upper Riverina Dry Sclerophyll Forests;
State Landscapes (Mitchell 2002)	
NVIS Major Veg Sub-Groups	Eucalyptus low open woodlands with a grassy understorey;
Forest Type (RN 17)	143 – Swamp Gum/Black Gum/Broadleaved Sallee (P);
Characteristic Trees	*Eucalyptus camphora subsp. humeana; Eucalyptus stellulata; Eucalyptus robertsonii subsp. robertsonii; Eucalyptus bridgesiana*
Characteristic Shrubs/Vines/ Epiphytes	*Acacia dealbata; Acacia melanoxylon; Acacia kettlewelliae; Leptospermum continentale; Mirbelia oxylobioides; Hibbertia obtusifolia; Hovea linearis; Dicksonia antarctica; Cassinia aculeata; Epacris breviflora; Bossiaea foliosa*
Characteristic Groundcover	*Carex appressa; Poa labillardierei var. labillardierei; Juncus holoschoenus; Acaena novae-zelandiae; Senecio hispidulus var. dissectus; Microlaena stipoides var. stipoides; Geranium solanderi var. solanderi; Stellaria pungens; Phragmites australis; Themeda australis; Echinopogon ovatus; Hydrocotyle laxiflora; Ranunculus lappaceus; Geranium neglectum; Rubus parvifolius; Senecio minimus; Senecio diaschides; Calochlaena dubia; Blechnum nudum; Eleocharis sphacelata; Carex fascicularis; Juncus sarophorus; Dichondra repens; Persicaria decipiens; Gonocarpus tetragynus; Euchiton gymnocephalus; Mentha diemenica; Asperula conferta; Clematis aristata; Lomandra confertifolia subsp. rubiginosa; Lomandra longifolia; Lepidosperma laterale; Adiantum aethiopicum; Pteridium esculentum; Urtica incisa*
Characteristic Weed Species	*Rubus discolor; Hypericum perforatum; Aira elegantissima; Taraxacum officinale; Briza minor; Hypochaeris radicata; Holcus lanatus; Acetosella vulgaris; Rosa rubiginosa; Centaurium erythraea; Cirsium vulgare; Plantago lanceolata; Phalaris aquatica*
Weediness	Very high (>30%) with 10–30% cover
Threatened Plants	*Eucalyptus camphora subsp. humeana (restricted)*
Threatened Fauna	*Not assessed*
Mean Native Species Richness	40 +/- 10 spp in 20 X 20 m plot (Gellie & Fanning 2004)
Characteristic Qualifiers	(Quantitative Data)
Authority(s)	South West Slopes Swamp Gum Forest map unit in Gellie & Fanning (2004) and Vegetation Group 14 in EcoGIS (2005) for Upper Murray Valley reserves. Listed as a vegetation profile for Upper Tarcutta and Greenhills and Paddys river – Burra Valley land units in Stelling (1998). Noted as occurring in small patches south-east parts of Wagga Wagga Shire (Priday 2004). Grades into Tea Tree Shrubland riparian Broad-leaved Sally community ID302.
Authority Qualifiers	(Quantitative Data)
Interstate Equivalent(s)	Victoria: EEC 83: Swamp Riparian Woodland
Class. Confidence Level	High
Level of Classification	Association
Rainforest Structure (Webb)	Not applicable
Structure (WH)	Woodland;
Height Class (WH)	Mid-High;

Vegetation Description	Mid-high woodland dominated by Broad-leaved Sally (Eucalyptus camphora subsp. humeana) sometimes with Black Sally (Eucalyptus stellulata) grading into open forest dominated by Robertson's Peppermint (Eucalyptus robertsonii subsp. robertsonii), Blakely's Red Gum (Eucalyptus blakelyi) or Apple Box (Eucalyptus bridgesiana). The shrub layer is usually sparse and includes the tall shrubs Acacia dealbata, Acacia melanoxylon, Acacia kettlewelliae, Leptospermum continentale and the low shrubs Mirbelia oxylobioides, Hibbertia obtusifolia, Hovea linearis, Cassinia aculeata, Epacris breviflora and rarely Bossiaea foliosa. The tall tree fern Dicksonia antarctica occurs in some narrow creeks and Bracken Fern (Pteridium esculentum) may occur. The ground cover is usually dense being dominated by grasses such as Poa labillardierei var. labillardierei, Microlaena stipoides var. stipoides and Echinopogon ovatus. The sedges Carex appressa is most often present and in some wetter sites Eleocharis sphacelata and Carex fascicularis occur, along with the Common Reed (Phragmites australis). Rushes, including Juncus holoshchoenus and Juncus sarophorus, also occur at wet sites. Forbs include Senecio hispidulus var. dissectus, Hydrocotyle laxiflora, Ranunculus lappaceus, Geranium neglectum and Acaena novae-zelandie. Occurs on alluvial or colluvial organic grey to brown podsolic clay loam soils, on poorly drained valley flats, surrounding swamps or lining creeks in hill or mountain landscapes generally above 600 m altitude in the southern section of the NSW South Western Slopes and adjoining South Eastern Highlands Bioregions. The underlying lithology is mainly granite or granodorite. This community is substantially cleared on private land but small patches ocurr in state forests and conservation reserves such as at Tin Mines Camping Area in Woomargama National Park. This community is restricted in extent and most areas on private land and some on public land are infested with weeds, particuarly Blackberry (Rubus discolor). Another riparian shrubland community (ID302) in this region contains Broad-leaved Sally as an emergent tree.
Mapped/Modelled	Current extent partly mapped
Mapping Info	Mapped and sampled in some reserves. Relatively easy to map from aerial photographs due to its canopy signature and occurrence along creeks or on flats but only small patches occur and these are best mapped at scales > 1:25000.
Adequacy Of Plot Sampling	Inadequate
Climate Zone	Montane: no dry season (mild summer); Temperate: no dry season (warm summer);
IBRA Bioregion (v6)	NSW South-western Slopes (30–70%); South Eastern Highlands (30–70%);
IBRA Sub-Region	Bondo (30–70%); Upper Slopes (30–70%);
Botanical Division	South Western Slopes (SWS) (>70%);
Local Govt. Areas	Greater Hume (1–30%); Tumbarumba (1–30%); Tumut (1–30%);
CMAs	Murray (>70%); Murrumbidgee (1–30%);
MD Basin	Yes
Substrate Mass	Alluvium; Igneous rocks;
Lithology	Alluvial loams and clays; Granite;
Great Soil Group	Gleyed podzolic soil; Humic gley; Peaty podzol;
Soil Texture	Clay loam;
Landform Patterns	Hills; Mountains;
Landform Elements	Swamp; Terrace flat; Valley flat;
Land Use	Grazing; Nature Conservation;
Impacts of Euro. Settlement	Major alteration of species composition;
Pre-European Extent (ha)	8000
Pre-European Accuracy (%)	30
Pre-European Qualifiers	Estimated from extant vegetation maps: part range
Pre-European Comments	Priginally would have been present on the edges of low lying poorly drained swamps, along drainage lines and on some river flats in the Upper Slopes Sub-region of the NSW SW Slopes and western side of South East Highlands Bioregion from just north of Tumut to Victoria.
Current Extent (ha)	2000
Current Extent Accuracy (%)	30
Current Extent Qualifiers	Estimated from mapped extant vegetation: part range
Current Extent Information	Remnants occur along drainage lines and on the edges of swamps in the Tumut to Tumbarumba region but many areas have been cleared for agriculture or pine plantations. Some small stands occur in reserves.
Percent Remaining	25

Percent Remaining Accuracy (%)	±50
Degree of Fragmentation	Naturally fragmented stands of variable patch sizes with <50% extent remaining
Recoverability	Moderate health as structure and/or composition altered. Likely to recover considerably if causal factors and secondary impacts removed.
Threatening Processes	Considered to tbe a threatened community because of its limited extent mainly on private land, weed invasion – particularly by Blackberry (Rubus discolor) and hydrological changes along rivers and creeks. Many areas have been cleared and clearing for pine plantations continues as of 2007.
Threat Process List	Clearing for agriculture; Herbicides, pesticides or other chemical pollution; Hydrology: disruption of natural flooding regimes; Nutrient changes through fertilizers or runoff; Weed (exotic) invasion;
Variation and Natural Disturbance	Species composition varies with altitude and degree of water-logging. Some areas are sedge-dominated, others contain more shrubs and grasses.
Adjoining Communities	Grades into open forests dominated by Eucalpytus robertsonii (ID295) and woodlands dominated by Apple Box (Eucalyptus bridgesiana) (ID283) or Blakely's Red Gum (Eucalyptus blakelyi). Broad-leaved Sally also occurs in ID302 that is dominated by woody Myrtaceous shrub species along major rivers.
Fire Regime	Occasionally burnt by wildfire. Perhaps a 30–60 year variable fire frequency. Some areas on private land may be burnt more often by landholders.
Conservation Reserves	Bogandyera NR 6 (M); Murraguldrie FR 10 (E3); Woomargama NP 113 (M); Woomargama SCA 6 (E1);
Total Area in Reserves (ha)	135
No. of Reps in Reserves	4
Explanation of Protected Areas	Woomargama NP and SCA areas from Vegetation Group 20 in Gellie & Fanning (2004). Murrugulderie Flora Reserve estimate from text in Priday (2002). Mapped in Boganderya NR on the western side of Mount Ikes by EcoGIS (2005). A similar community is present in north-western Kosciuszko National Park.
Secure Property Agreements	
Total Area in Secure PAs	0
No. of Reps in Secure PAs	0
Total Area Protected (ha)	135
Area Protected Accuracy (%)	50
Protected Pre-Euro. Extent (%)	1.68
Protected Current Extent (%)	6.75
Total Reps in Protected Area	4
Restricted (>1000<10000 ha in 1750)	5b: <5% in protected areas
Restricted Qualifiers	Inadequately across distribution
Key Sites for Protection	Some sites on private land may be worth protection through conservation agreements. Good stands surround Tarcutta Swamp near Courabyra and on public land on Mount Garland Track 5 km south of Tumbarumba. Areas occur along Paddy's River south-east of Tumbarumba and along other creeks in the Tumbarumba region.
Threat Category	Endangered
Threat/Protected Area Code	E/5b
Threat Criteria	4; 2;
Planning and Management	Avoid clearing, over-grazing and draining flats that support this community. Fence off and maintain riparian vegetation. Avoid grading roads and soil disturbance in this community. Controlling weeds, including Blackberry, is an imperative for enhancing the condition of this community.
Listed Under Legislation	
Recovery Plan	Required
Photo1	ID285a_DX28027.jpg

Photo Caption 1 ID285 Broad-leaved Sallee (*Eucalyptus camphora* subsp. *humeana*) bordering Tarcutta Swamp near Batlow, NSW South East Highlands Bioregion (AGD66) 35° 40.470' S 148° 02.096' E, 1/5/2006, J. Plaza;

Photo 2 ID285b_DX28285.jpg

Photo Caption 2 ID285 Broad-leaved Sallee *(Eucalyptus camphora* subsp. *humeana*) with a sedgeland wetland at Tin Mines Camping Area Woomargama National Park east of Albury NSW south western slopes, (AGD66) 35° 51.665' S 147° 28 503' E, 3/5/2006, J. Plaza;

Photo 3 ID285c_DX28231.jpg

Photo Caption 3 ID285 Broad-leaved Sallee (*Eucalyptus camphora* subsp. *humeana*) with the tall sedge *Carex fasicularis* lining a narrow creek in Woomargama National Park east of Albury NSW, (AGD66) 35° 52.683' S 147° 19 820' E, 2/5/2006, J. Plaza;

Reference List 340; 341; 316; 350;

References

Gellie, N. & Fanning, M. (2004) Final report of vegetation ecosystems in new and existing conservation reserves, south west slopes region 2002–2004, version 3. Report to NSW Department of Environment and Conservation: Queanbeyan; Stelling, F. (Ed.) (1998) South West Slopes Revegetation Guide (Murray Catchement Management Committee and Department of Land & Water Conservation: Albury); Priday, S. (2004) The native vegetation and threatened species of the City of Wagga Wagga. Unpublished report. (NSW National Parks and Wildlife Service, Southern Region: Queanbeyan); EcoGIS (2005) Vegetation of the Upper Murray reserves: Report to NSW Department of Environment and Conservation (DEC Upper Murray Area, Snowy Mountains Region: Khancoban);

Appendix C. ID186: Short report (28 fields) of a broadly classified, widely distributed, shrubby low woodland on rocky hillcrests that is well represented in the protected area system and has a Least Concern threat status.

Veg. ID No	186
Common Name	**Dwyer's Mallee – Black Cypress Pine – Currawang shrubby low woodland on rocky hills mainly in the NSW South-western Slopes Bioregion**
Scientific Name	*Eucalyptus dwyeri – Callitris endlicheri – Acacia doratoxylon / Calytrix tetragona – Dodonaea viscosa subsp. spatulata – Grevillea floribunda – Brachyloma daphnoides subsp. daphnoides / Gonocarpus elatus – Lepidosperma laterale – Chrysocephalum semipapposum – Austrostipa densiflora*
Characteristic Trees	*Eucalyptus dwyeri; Callitris endlicheri; Acacia doratoxylon; Eucalyptus dealbata; Eucalyptus sideroxylon; Allocasuarina verticillata; Eucalyptus goniocalyx; Eucalyptus macrorhyncha*
Characteristic Shrubs/Vines/ Epiphytes	*Calytrix tetragona; Dodonaea viscosa subsp. spatulata; Grevillea floribunda; Brachyloma daphnoides subsp. daphnoides; Cassinia laevis; Acacia linearifolia; Acacia verniciflua; Platysace lanceolata; Dodonaea viscosa subsp. mucronata; Hibbertia obtusifolia; Acacia paradoxa; Acacia deanei subsp. deanei; Acacia buxifolia subsp. buxifolia; Exocarpos cupressiformis; Micromyrtus ciliata; Phebalium obcordatum; Melichrus urceolatus; Persoonia curvifolia; Kunzea ambigua; Senecio garlandii; Leptospermum divaricatum; Phylotheca difformis subsp. difformis; Philotheca salsolifolia subsp. salsolifolia; Phyllanthus hirtellus; Allocasuarina diminuta subsp. diminuta; Acacia lineata; Santalum acuminatum; Leptospermum multicaule; Lissanthe strigosa subsp. strigosa; Acacia verniciflua; Correa reflexa var. reflexa; Pomaderris prunifolia var. prunifolia; Pultenaea procumbens*
Characteristic Groundcover	*Gonocarpus elatus; Lepidosperma laterale; Chrysocephalum semipapposum; Austrostipa densiflora; Austrodanthonia eriantha, Austrodanthonia pilosa; Austrodanthonia caespitosa; Austrostipa scabra subsp. scabra; Aristida ramosa, Stypandra glauca; Cheilanthes distans; Cheilanthes sieberi subsp. sieberi; Cheilanthes austrotenuifolia; Austrostipa mollis; Goodenia ovata; Dampiera lanceolata subsp. lanceolata; Amphipogon caricinus var. caricinus; Calotis cuneifolia; Poa sieberiana var. sieberiana; Themeda australis; Thyridolepis mitchelliana; Hybanthus monopetalus; Astroloma humifusum; Stuartina muelleri; Aristida jerichoensis var. jerichoensis; Lomandra filiformis subsp. coriacea; Arthropodium minus; Einadia nutans subsp. nutans; Xerochrysum viscosa; Goodenia hederacea subsp. hederacea; Laxmannia gracilis; Wahlenbergia stricta subsp. stricta; Gonocarpus tetragynus*
Structure	Open Mallee Woodland; Open Mallee Shrubland; Woodland; Mallee Woodland;
Vegetation Description	Woodland or mallee shrubland dominated by Dwyer's Red Gum (Eucalyptus dwyeri), Black Cypress Pine (Callitris endlicheri) with Currawang (Acacia doratoxylon) often present. Drooping She-oak (Allocasuarina verticillata) may be present in areas infrequently burnt. Mugga Ironbark (Eucalyptus sideroxylon) may be present on mid-lower hill-slopes. Tumbledown Gum (Eucalyptus dealbata) may occur in eastern occurrences. The understorey contains a mid-dense to sparse shrub layer that includes Calytrix tetragona, Cassinia laevis, Grevillea floribunda, Acacia linearifolia, Dodonaea viscosa subsp. spatulata, Dodonaea viscosa subsp. mucronata, Acacia paradoxa, Correa reflexa, Acacia lineata and in some eastern locations patches of Kunzea ambigua. The ground cover is sparse and can be very sparse on rocky areas and rocks may compose 60% of a site. Small shrubs such as Melichrus urceolatus, Astroloma humifusum, Platysace lanceolata, Brachyloma daphnoides and Hibbertia obtusifolia may be present along with grasses such as Austrodanthonia spp., Austrostipa densiflora, Austrostipa scabra, Austrostipa mollis, Aristida ramosa and Themeda australis. The sedge Lepidosperma laterale is often abundant. Forbs include Gonocarpus elatus, Calotis cuneifolia, Stuartina muelleri and Chrysocephalum semipapposum. Rock Ferns (Cheilanthes spp.) are usually common. The rare plant Senecio garlandii occurs at several sites including The Rock Nature Reserve south of Wagga Wagga. The ground cover may form rock forblands in some areas and on a different scale this could be described as a community in itself. Occurs on skeletal or shallow lithosol soils derived from sandstones, granites or other siliceous substrates including quartzite and psammite. Generally present on steep upper hill-slopes, ridgelines or steep gullies on rocky hills mainly in the NSW South-western Slopes Bioregion but extending into the south-eastern edge of the Cobar Peneplain Bioregion. Due to its location on rocky ridges most of this community remains uncleared but grazing by stock or feral animals may threaten some locations. A broadly classified community that could be divided with floristic analyses.
IBRA Bioregion (v6)	Cobar Peneplain (1–30%); NSW South-western Slopes (>70%);
CMAs	Lachlan (30–70%); Murray (1–30%); Murrumbidgee (30–70%);
Pre-European Extent (ha)	60000
Current Extent (ha)	50000
Percent Remaining (%)	83
Pre-European Accuracy (%)	50
Current Extent Accuracy (%)	50
Percent Remaining Accuracy (%)	80

Conservation Reserves	Blue Mallee FR 10 (E3); Cocoparra NP 6030 (E1); Cocoparra NR 3200 (E1); Eugowra NR 100 (M); Goobang NP 500 (E1); Ingalba NR 400 (E2); The Charcoal Tank NR 2 (E1); The Rock NR 193 (E2); Weddin Mountains NP 5145 (E1); Livingstone NP 300 (E2); Livingstone SCA 17 (E1); Boginderra Hills NR 320 (E2); Benambra NP 30 (E2); Tabletop NR 23 (E3); Koorawatha NR 420 (E1); Dananbilla NR 1000 (E1); Woomargama NP 200 (E3); Ulandra NR 2400 (E2); Buddigower NR 40 (E2);
Total Area in Reserves (ha)	20330
Secure Property Agreements	CO9801 PA 525 (M); VCA044 VCA 12 (E3); WE9904 PA 45 (E3);
Total Area in Sec. PAs	582
Total Area Protected (ha)	20912
Total Area Protected Accuracy (%)	30
Threat Category	Least Concern
Threat Criteria	1; 4;
Threat/Protected Area Code	LC/1a
Photo	ID186a_PC185-20.jpg

Photo Caption	ID186 *Eucalyptus dwyeri – Acacia doratoxylon – Callitris endlicheri* low woodland, Ulandra Nature Reserve, (AGD66) 34°46'30" S 147°53'54" E, 14/10/02, J.Plaza;
Reference List	183; 177; 263; 152; 24; 154; 153; 69; 180; 34; 46; 143; 316; 340; 179; 372; 373; 150; 379;

Appendix D. ID335: Short report of a valley tussock grass – sedge wetland that is restricted in extent and Endangered.

Veg. Comm.ID No	335
Common Name	**Tussock grass – sedge – rush – reed valley flat wetlands on organic clay loams in the Upper Slopes Sub-region of the NSW South-western Slopes Bioregion**
Scientific Name	*Phragmites australis – Typha domingensis / Poa labillardierei var. labillardierei – Carex appressa – Juncus homalocaulis – Rumex brownii*
Characteristic Trees	*Eucalyptus blakelyi; Eucalyptus melliodora*
Characteristic Shrubs/Vines/ Epiphytes	*Phragmites australis; Typha domingensis; Acacia dealbata; Babingtonia densifolia;*
Characteristic Groundcover	*Poa labillardierei var. labillardierei; Carex appressa; Juncus homalocaulis; Rumex brownii; Juncus fockei; Juncus holoschoenus; Acaena ovina; Cynodon dactylon; Microlaena stipoides var. stipoides; Aristida ramosa var. ramosa; Geranium neglectum; Geranium retrorsum; Dichopogon fimbriatus; Caesia parviflora var. parviflora; Xerochrysum viscosa; Arthropodium milleflorum; Microtis unifolia*
Structure	Sedgeland; Open Sedgeland
Vegetation Description	Tall tussock grassland to mid-high sedgeland to rushland or reedland dominated by tussock snow grass Poa labillardierei var. labillardierei, sedges including Carex appressa, rushes such as Juncus homalocaulis and Juncus fockei. In wetter areas a taller layer of waterplants including the Common Reed (Phragmites australis) and bulrush (Typha domingensis) may be present. Other grass species include Microlaena stipoides var. stipoides and Cynodon dactylon. Forbs species include Rumex brownii, Acaena ovina, Geranium neglectum, Geranium retrorsum, Dichopogon fimbriatus, Caesia parviflora var. parviflora, Xerochrysum viscosa and Arthropodium milleflorum. Shrubs are sparse but Acacia dealbata or Acacia mearnsii species may be present along with Babbingtonia densiflora and Leptospermum spp.. The trees Blakely's Red Gum (Eucalyptus blakelyi) or Yellow Box (Eucalyptus melliodora) may border the swamp or overhang small swamps that line narrow creeks. Degraded areas of this community are often dominated by exotic weed species such as Sharp Rush (Juncus acutus), Willow (Salix spp.) and Phalaris spp. These weed-infested areas are common in the Boorowa – Young districts often on saline soils. It is difficult to discern the original composition of these valley flat wetlands but they may have been wetter and dominated by reeds and rushes. Occurs on silty or peaty clay loam with high levels of organic material on alluviums derived from a range of substrates along watercourse where sediment has accumulated to form valley flats or where springs may feed valley soaks in the Upper Slopes Sub-region of the NSW SW Slopes Bioregion and adjoining parts of the South Eastern Highlands Bioregion. Grades into ID79 River Red Gum woodland along watercourses to the west and into Blakely's Red Gum and box woodland upslope from the watercourses. Some floristic affiliation to to bogs at higher altitude on the tablelands. Most of the sites dominated by Carex appressa are highly degraded due to heavy stock grazing and now contain a limited species composition. Very few sites are in near-natural condition. As of 2007, this community requires more sampling to improve its definition and description. Due to threats and loss of extent is is an endangered plant community.
IBRA Bioregion (v6)	NSW South-western Slopes (30–70%); South Eastern Highlands (1–30%);
CMAs	Lachlan (1–30%); Central West (1–30%); Murrumbidgee (1–30%); Murray (1–30%);
Pre-European Extent (ha)	6000
Current Extent (ha)	1000
Percent Remaining (%)	17
Conservation Reserves	
Total Area in Reserves (ha)	0
Secure Property Agreements	
Total Area in Sec. PAs	0
Total Area Protected (ha)	0
Threat Category	Endangered
Threat/Protected Area Code	E/5b

Pre-European Accuracy (%)	50
Current Extent Accuracy (%)	30
Percent Remaining Accuracy (%)	±50
Total Area Protected Accuracy (%)	
Threat Criteria	4; 5; 1;

Photo ID335a_SWS0507160.jpg

Photo Caption ID335 *Poa labillardierei – Phragmites australis – Typha – Juncus* swamp on alluvial organic soil in a valley near Walla Walla east of Rye Park in the upper Lachlan River catchment, (AGD66) 34 32 833 S 148 57.007 E, 29/5/2007, Jaime Plaza;

Reference List 353; 308; 353;