The vegetation of Peery Lake area, Paroo-Darling National Park, western New South Wales

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Abstract: The vegetation of Peery Lake area, Paroo-Darling National Park (32°18'–32°40'S, 142°10'–142°25'E) in north western New South Wales was assessed using intensive quadrat sampling and mapped using extensive ground truthing and interpretation of aerial photograph and Landsat Thematic Mapper satellite images. 378 species of vascular plants were recorded from this survey from 66 families. Species recorded from previous studies but not noted in the present study have been added to give a total of 424 vascular plant species for the Park including 55 (13%) exotic species. Twenty vegetation communities were identified and mapped, the most widespread being *Acacia aneura* tall shrubland/tall open-shrubland, *Eremophila*/*Dodonaea*/*Acacia* open shrubland and *Maireana pyramidata* low open shrubland. One hundred and fifty years of pastoral use has impacted on many of these communities.

Cunninghamia **(2003) 8(1): 111–128**

Introduction

Peery Lake area of Paroo–Darling National Park (32°18'–32°40'S, 142°10'–142°25'E) is located in north western New South Wales (NSW) 110 km north east of Broken Hill (Figure 1). It covers an area of approximately 96 000 ha. Major features are Peery Lake, a part of the Paroo overflow, and the rugged sandstone hills to the west of the lake. The Park was created in September 2000 from three pastoral stations: Peery, Mandalay and Arrow Bar. An intensive vegetation survey was undertaken in October 2001.

History of the area

Prior to European settlement nomadic Aboriginal tribes who were able to travel away from permanent soaks, waterholes and native wells inhabited the area after favourable rains. The Paakantji Aboriginal people travelled the length of the Darling River from Wilcannia through Menindee towards Wentworth. The large number of middens and stone relics encountered today evidences their strong ties to the river (H. Johnston, NSW National Parks and Wildlife Service, Buronga, pers. comm.). The first Europeans to travel through the area were Sturt and his party who followed the Darling to Menindee and then travelled west to the Barrier Range and north into Queensland (Stanley 1991). Soon after, others followed the Darling River in search of pasture for sheep. Robert Gow explored the area in 1861 in search of suitable pastures (Jervis 1947) but Vincent Dowling, who had established a cattle station close to the mouth of the Warrego River, had explored the Paroo to the north-west in 1860 and applied for grazing rights (Heathcote 1965). The township of Wilcannia was surveyed in 1865 and soon thrived (Hardy 1969). Previously there was just a woolshed and a few huts at Mount Murchison Station. Soon after, 38 runs were taken up as *Momba*, which absorbed the existing Mount Murchison lease, with a total area of 848 000 ha (Pickard 1990). Smith, Elder and Waite held the *Momba* pastoral lease from early 1870 (Heathcote 1965). In 1889 it was reported that Momba was overrun by kangaroos (Heathcote 1965). About this time a party of shooters found opal in the sandstone hills and by the 1890s White Cliffs township was established (Hardy 1969). With the development of pastoral leases in the 1850s, Aboriginal people were moved from their traditional homes to government missions at Menindee, Ivanhoe and Lake Cargelligo.

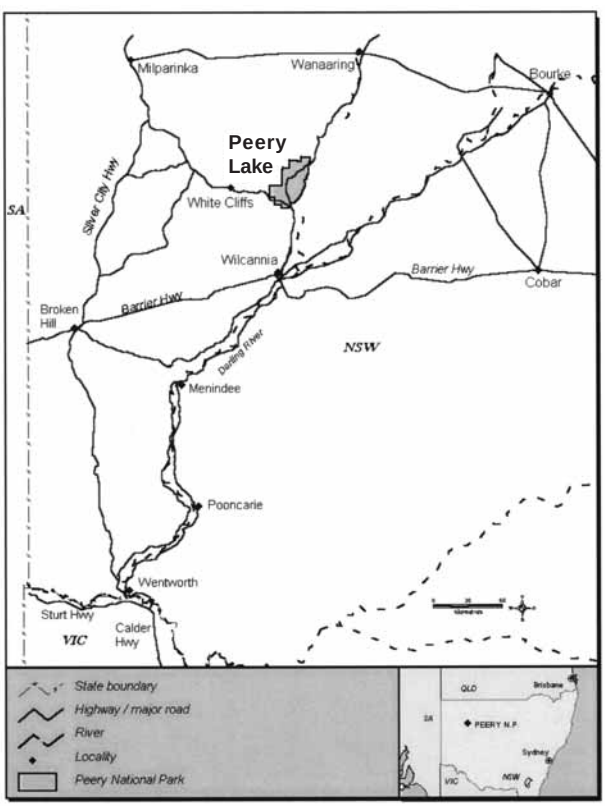

Fig. 1. Location of Peery Lake area, Paroo–Darling National Park

The combination of drought and overstocking made the normal recurrence of drought a major disaster. Whereas the land returned rapidly from 'desert' to 'vital glory' after the 1865–70 drought, this was no longer the case by the end of the century. By 1901 there was a catastrophic decline in productivity in the West Darling area. Sheep numbers went from less than 2 million prior to 1880 to a peak of nearly 8 million by 1894 but had declined to less than 3 million again by 1901. From 1902, *Momba* was successively subdivided until around 1950 when the residue was divided into ten leases which included Peery, Mandalay and Arrow Bar (Pickard 1990). Peery Lake part of Paroo-Darling National Park, based on Peery Station was established in 2000 to protect the cultural and biological features of land systems associated with the Paroo overflow. It was extended by the addition of Mandalay and Arrow Bar Stations in 2001.

Climate

The climate is described as arid with low and unreliable rainfall (Edwards 1979). Temperatures are high in summer and mild in winter with average daily maximum of 35°C in January and 17°C in July and average daily minimum of 21°C in January and 4°C in July. The mean annual rainfall is approximately 250 mm and annual potential evaporation is 2738 mm. There is a slight summer bias to rainfall and annual variation is high (Clewett et al. 1994). The survey was undertaken following heavy rain in September, four weeks previously and thus produced ideal conditions for survey.

Geology and geomorphology

Three physiographic regions (Abraham 1991) occur within the Park. The Paroo plains of the eastern sector are separated from the Stony Tablelands and Plains by the Mount Pleasant sandstone hills (Morton 1991). The twelve land systems present (Milthorpe et al. 1991) are summarised in Table 1.

Previous studies

The most complete study of the vegetation of Far Western New South Wales is that by Beadle (1945, 1948) who included the study area as *Acacia aneura* association with claypans and swamps associated with the channels of the Paroo. The area is included in the erosion survey of the Paroo–Upper Darling (James 1960) who mapped the vegetation of the Paroo–Upper Darling Region including the Peery Lake area: Mulga in the west, Belah–Acacia in the north east and claypan and canegrass in the south east. Milthorpe (1991) gave an account of the vegetation of the north west corner of NSW, which included Peery Lake. Pickard (1993) gave an account of the vegetation of the area occupied by the original Momba Station which also included land now in the Park and Pickard & Norris (1994) produced a map of the natural vegetation of north-western NSW at 1:1 000 000 scale. The mound springs on Peery Lake were included in a report on artesian springs in the Western Division of NSW (Pickard 1992). Parts of the area now included in Peery Lake Paroo–Darling National Park were included in studies undertaken for the Wilderness Society (Lembit 1992, Knight 1994). The former study was conducted during drought conditions with limited ground cover present (Lembit 1992). A detailed survey and vegetation map for Kinchega National Park to the southwest (Westbrooke et al. 2001) has also been published. No systematic survey of the vegetation of Peery Lake area has been undertaken prior to this study.

Table 1. Land systems present in the area (Milthorpe et al. 1991)

Relief	Land system	Characteristics & occurrence
Playas & basins	Cobham	Saltlakes with fringing dunes around Peery Lake
Sandplains & dunefields	Gumbalara	Sandplains with claypans & scattered swamps in lower reaches of Pine & Mirriappa Creeks
Sandplains & dunefields	Klondyke	Dunefields with calcareous swales east of Peery Lake
Alluvial plains	Yapunyah	Broad floodplains of creeks flowing into Peery Lake
Alluvial plains	Fowlers	Frontages of Pine & Mirriapa Creeks
Rolling downs & lowlands	Euramurtie	Sandy areas associated on the footslopes of the sandstone hills west of Peery Lake
Rolling downs & lowlands	Katalpa	Stony plains on the footslopes of hills. Upper reaches of Pine and Mirriappa Creeks
Rolling downs & lowlands	Glenhope	Stony plains, largely obscured by sand around Pine & Mirriappa Creeks
Rolling downs & lowlands	Oakvale	Stony plains between Wannara & Mirriapa Creeks
Hills & footslopes	Pulchra	Stony plains with low rock rises northwest of Peery Lake
Tablelands	Questa Park	Stony plateaux in north of Peery Lake
Ranges	Mount Pleasant	Rounded sandstone hills west of Peery Lake

Methods

Following preliminary survey, 125 × 0.09 ha (30 m × 30 m) quadrats were sampled (Figure 2). All vascular plant species occurring in each quadrat were recorded, as was a cover abundance value, modified from Braun-Blanquet (1928) for each species. Quadrats were subjectively located following the method of Gullan (1978). This ensured that all communities were sampled and provided data on floristic variability within them. Communities were generally sampled in proportion to the area they covered but to enable characterisation of communities, those of limited distribution may have been relatively over-sampled. Sampling was undertaken in October and November 2001 following good spring rains, which resulted in good growth of the ground layer. Data from the quadrats were entered into a database and analysed using PATN (Belbin 1993) to determine the communities present. A species list was compiled incorporating all vascular plant species recorded from quadrats and additional species recorded opportunistically. Further restricted and/or interesting communities recorded

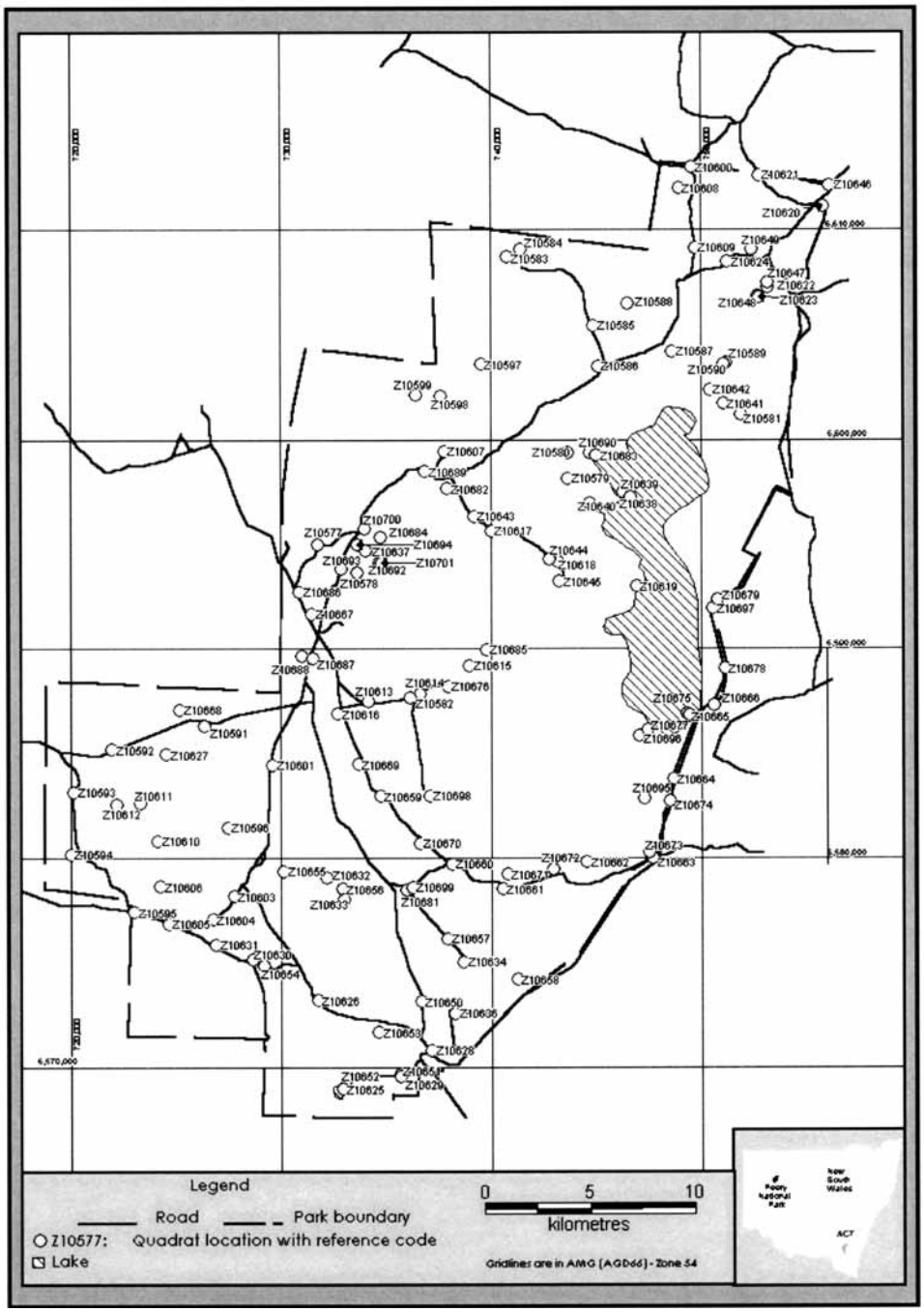

Fig. 2. Peery Lake area, quadrat locations

during the field work but not evident from the numeric classification were added to the final classification to provide twenty vegetation communities. For each community, mean species richness, total species richness and mean numbers of exotic species per quadrat were calculated (Table 2).

During surveys, ground truthing was undertaken by driven and walked transects. Information from these was used in conjunction with study of colour aerial photographs (Central Mapping Authority 1995) and Landsat Thematic Mapper satellite imagery (Scene 95–81) to produce a vegetation map at 1:100 000 scale. The mapped vegetation communities were defined by floristic and structural characteristics (Specht 1970). Sixteen communities identified from the vegetation classification were mapped at this scale. Because of the close association of *Eragrostis australasica h*ummock grassland and *Muehlenbeckia florulenta* open shrubland and the difficulty of separation, these two communities have been combined on the map. Additional vegetation types of restricted occurrence e.g. *Hakea tephrosperma* tall open shrubland and

Halosarcia low open shrubland were located as points on the map. The classified image as transferred to the MapInfo Geographic Information System (MapInfo Corporation, Troy, New York) for final production of the vegetation map (Figure 3).

Table 2. Area, sampling intensity, species richness and weediness of plant communities of Peery National Park.

M: Mean species richness; **T:** Total species richness
Ex.: Mean exotic species; **Q:** Number of quadrats

Community	Approx area (%)	M	T	Ex.	Q
Eucalyptus camaldulensis open woodland (lake)	<1	35	41	3	4
Eucalyptus camaldulensis open woodland (creek)	2.5	27	155	8	7
Eucalyptus largiflorens open woodland	1.2	25	131	3	10
Eucalyptus ochrophloia open woodland	<1	30	33	16	1
Eucalyptus intertexta open woodland	2.8	35	72	3	3
Eucalyptus populnea open woodland	<1	26	129	7	8
Casuarina pauper/ Alectryon oleifolius low open woodland	2.4	23	106	1	11
Flindersia maculosa low open woodland	2.9	19	41	1	4
Acacia aneura/ Acacia tetragonophylla tall open shrubland	4.6	33	116	2	9
Acacia aneura tall shrubland	33	26	132	1	14
Hakea tephrosperma tall open shrubland	<1	31	55	2	2
Muehlenbeckia florulenta open shrubland	2	16	18	2	2
Eremophila/Dodonaea/ Acacia open shrubland	14.2	29	167	2	17
Atriplex nummularia open shrubland	<1	15	18	3	1
Maireana pyramidata low open shrubland	13	22	78	2	6
Halosarcia low open shrubland	<1	17	17	1	1
Eragrostis australasica hummock grassland	1	15	53	1	5
Lakebed herbland	6.2	11	33	1	6
Mixed herbland	10.7	18	98	1	5
Mound springs community	<1	9	9	0	1*
Highly Disturbed sites	<1	35	140	11	7

* data from Pickard (1992).

Results

Vegetation

The vegetation of the study area consists predominantly of woodlands variously dominated by *Acacia aneura, Flindersia maculata, Casuarina pauper, Atalaya hemiglauca* and *Grevillea striata*. Many of these are degraded as a result of past clearing for pasture improvement. In the south west, around the channels of Wannara and Mirriapa Creeks are extensive mixed herblands dominated variously by *Sclerolaena* and *Atriplex* species or grasses, depending on the season. Along creeklines and around Peery and Poloko lakes gallery woodlands variously dominated by *Eucalyptus camaldulensis, Eucalyptus largiflorens, Eucalyptus populnea* subsp. *bimbil, Eucalyptus ochrophloia* and *Acacia stenophylla* occur. Twenty communities were recognised (Table 2). While several of these are of limited distribution they add significantly to the conservation values of the area. The approximate area occupied by each community, the sampling intensity, mean species richness, total species richness and mean weediness of these communities are given (Table 2). All vegetation communities identified are described below, grouped according to structural attributes. The distribution of vegetation types is shown on the vegetation map (Figure 3).

Woodlands

1. *Eucalyptus camaldulensis* open-woodland (lake fringe)

Eucalyptus camaldulensis open woodland (10 m tall) occurs in a generally narrow band around sections of the Paroo overflow Lakes Peery and Poloko. Common associated trees and tall shrubs include *Eucalyptus largiflorens, Acacia stenophylla* and *Myoporum montanum.* Understorey shrubs and tussock species frequently associated include *Atriplex* species, *Einadia nutans, Chenopodium curvispicatum, Enchylaena tomentosa, Muehlenbeckia florulenta* and *Cyperus gymnocaulos.* The ground layer is dominated by the natives *Heliotropium curassavicum, Halosarcia pergranulata, Daucus glochidiatus, Malacocera tricornis, Nicotiana velutina, Osteocarpum acropterum, Pterocaulon sphacelatum, Salsola kali* var. *kali, Sclerolaena intricata, Senecio lautus* subsp. *dissectifolius, Stemodia florulenta, Sporobolus mitchellii* and the exotic herbs *Sisymbrium erysimoides* and *Spergularia rubra.*

2. *Eucalyptus camaldulensis* open-woodland (creek bed)

A narrow band of *Eucalyptus camaldulensis* open woodland (10 metres tall) also occurs along larger creeks. Common associated trees and tall shrubs include *E. largiflorens, Acacia aneura, A. stenophylla, A. victoriae,* and *Myoporum montanum.* Understorey shrubs and tussock species frequently associated include *Eremophila longifolia, Senna artemisioides* noth. *artemisioides, Einadia nutans, Chenopodium curvispicatum, Enchylaena tomentosa* and the exotic *Lycium ferrocissimum.* The ground layer is dominated by the natives *Daucus glochidiatus, Nicotiana velutina, Pterocaulon sphacelatum, Ptilotus atriplicifolius* subsp. *atriplicifolius, Rhodanthe floribunda, Rutidosis floribunda, Salsola kali* var. *kali, Malvastrum americanum, Mentha australis, Senecio cunninghamii, Tetragonia eremaea, Themeda australis, Vittadinia triloba, Wahlenbergia stricta, Brachyscome ciliaris, Bracteantha bracteata, Calotis pumulifera, Abutilon leucocephalum, Aristida ramosa* var. *ramosa, Eragrostis dielsii, Euphorbia drummondii, Gnephosis arachnoidea,*

A narrow band of *Eucalyptus camaldulensis* woodland occurs along major creeks.

Solanum esuriale, S. ellipticum, O*xalis corniculata,* and the exotic herbs *Sisymbrium erysimoides, Solanum nigrum, Sonchus oleraceus, Centaurea melitensis, Anagallis arvensis, Salvia verbenaca, Schismus barbatus, Malva parviflora, Medicago polymorpha, Echium plantagineum* and *Lactuca serriola.*

3. *Eucalyptus largiflorens* open-woodland

This open woodland (10 m tall) occurs on heavy soils around Peery and Poloko Lakes, an unnamed lake near the southern boundary, and along some creeklines. The tall shrub *Acacia stenophylla* is frequently associated. Understorey shrubs and tussock species frequently associated include *Einadia nutans, Enchylaena tomentosa, Muehlenbeckia florulenta* and *Cyperus gymnocaulos.* Common components of the ground layer include the natives *Atriplex* spec*ies, Heliotropium curassavicum, Malacocera tricornis, Nicotiana velutina, Osteocarpum acropterum, Myriocephalus stuartii, Gnephosis arachnoidea, Pterocaulon sphacelatum, Salsola kali* var. *kali, Rutidosis helichrysoides, Sclerolaena intricata, Senecio lautus* subsp. *dissectifolius, Senecio runcinifolius, Sporobolus mitchellii, Teucrium racemosum,* and the exotic herbs *Solanum nigrum* and *Centaurea melitensis.*

4. *Eucalyptus ochrophloia* open-woodland

Open-woodland dominated by *Eucalyptus ochrophloia* with *Eucalyptus largiflorens* associated occurs along the channels of the Paroo overflow, south of Peery Lake. Except where *Muehlenbeckia florulenta* occurs in lower sites the shrub layer is restricted to low chenopods such as *Einadia nutans* and *Sclerolaena* spec*ies*. The ground layer includes *Atriplex leptocarpa, Acacia lindleyi, Chamaesyce drummondii, Malacocera tricornis, Osteocarpum acropterum, Halosarcia pergranulata, Salsola kali* var. *kali, Tetragonia eremaea* and the exotics *Centaurea melitensis* and *Schismus barbatus.*

5. *Eucalyptus intertexta* open-woodland

This open woodland (10 m tall) occurs on the sandy lower slopes of the rocky hills west of Peery Lake. The tall shrubs *Acacia aneura, Alectryon oleifolius* and *Eremophila longifolia* are frequently associated. Understorey shrubs and tussock species frequently associated include *Chenopodium curvispicatum, C. desertorum, Einadia nutans, Enchylaena tomentosa, Eremophila sturtii, Maireana triptera, Sclerolaena diacantha* and *Senna artemisioides* noth. *artemisioides.* The ground layer is dominated by the natives *Eragrostis dielsii, Boerhavia dominii, Brachyscome lineariloba, Chenopodium cristatum, Convolvulus erubescens, Cynoglossum australe, Solanum ellipticum, Stenopetalum lineare* and *Tetragonia eremaea* and the exotics *Schismus barbatus* and *Sisymbrium erysimoides*.

6. *Eucalyptus populnea* open-woodland

This open woodland (10 m tall) dominated by *Eucalyptus populnea* subsp. *bimbil* is associated with drainage lines and creeks. Understorey shrubs and tussock species frequently associated include *Acacia victoriae, Chenopodium curvispicatum, Maireana brevifolia, Rhagodia spinescens* and *Myoporum montanum*. The ground layer is dominated by the natives *Atriplex stipitata, Bracteantha bracteata, Calotis* species, *Eragrostis laniflora, Oxalis corniculata, Harmsiodoxa blennodioides, Rhodanthe floribunda, Rutidosis helichrysoides, Tetragonia eremaea* and *Wahlenbergia stricta* and the exotics *Centaurea melitensis, Anagallis arvensis, Schismus barbatus, Sisymbrium erysimoides* and *Sonchus oleraceus.*

Eucalyptus populnea open woodland occurs along creeks and shallow drainage lines.

7. *Casuarina pauper/Alectryon oleifolius* woodland/open-woodland

Casuarina pauper woodland/open-woodland growing to 10–12 metres tall is widespread on undulating sandplains. Most commonly associated understorey shrubs are *Enchylaena tomentosa, Maireana pyramidata, M. triptera, Rhagodia spinescens, Chenopodium curvispicatum* and *Myoporum montanum*. Common ground layer species include *Rhodanthe floribunda, Tetragonia eremaea, Salsola kali* var. *kali, Gnephosis arachnoidea, Enteropogon acicularis,*

Atriplex holocarpa, *A. stipitata*, *Sclerolaena intricata*, *S. obliquicuspis*, *Senecio lautus* subsp. d*issectifolius* and *Brachyscome ciliaris* var. *lanuginosa*.

Casuarina pauper/Alectryon oleifolius low open woodland is widespread on undulating sandplains.

8. *Flindersia maculosa* low open-woodland

Low open woodland dominated by *Flindersia maculosa* occurs on scattered localities on low hills and sandplains. *Acacia aneura* and *Alectryon oleifolius* are frequently associated. Associated shrubs include *Enchylaena tomentosa*, *Eremophila duttonii*, *Eremophila sturtii*, *Chenopodium desertorum*, *Maireana pyramidata*, *M. triptera*, and *Atriplex stipitata*. Commonly associated herbs and sub-shrubs include *Sclerolaena intricata*, *Einadia nutans*, *Rhodanthe floribunda*, *Stenopetalum lineare*, *Gnephosis arachnoidea*, *Salsola kali* var. *kali*, *Tetragonia eremaea*, *Goodenia pinnatifida* and *Calotis pumulifera*.

Shrublands/tall shrublands

9. *Acacia aneura/A. tetragonophylla* tall open-shrubland

Tall open shrubland dominated by *Acacia aneura*, frequently associated with *Grevillea striata* occurs on the rocky hills to the west of Peery Lake. Associated shrubs include *Enchylaena tomentosa, Maireana triptera, Eremophila duttonii, Eremophila longifolia, Eremophila sturtii, Eremophila serrulata, Senna artemisioides* noth. *artemisioides, Prostanthera striatiflora, Indigofera australis, Acacia brachystachya and Acacia tetragonophylla.* A very diverse ground layer includes *Sclerolaena convexula, Convolvulus erubescens, Oxalis corniculata, Sida corrugata, Sida cunninghamii, Einadia nutans, Tetragonia eremaea, Calotis pumulifera, Calotis cuneifolia, Canthium odoratum, Solanum ellipticum, Euphorbia drummondii, Boerhavia dominii, Stenopetalum lineare, Brachyscome linearis, Wahlenbergia stricta, Daucus glochidiatus, Cheilanthes austrotenuifolia, Cheilanthes lasiophylla* and *Austrostipa scabra.*

Acacia aneura tall shrubland is the most extensive community, occurring on undulating sandplains and low hills.

10. *Acacia aneura* tall shrubland

Tall open shrubland dominated by *Acacia aneura*, frequently associated with *Flindersia maculosa* and *Grevillea striata* occurs on undulating sandplains and low hills. Associated shrubs include *Enchylaena tomentosa, Maireana triptera, Eremophila duttonii, E. longifolia, E. sturtii,* and *Acacia tetragonophylla.* Common low shrubs and herbs include *Sclerolaena bicornis* subsp. *bicornis, S. diacantha, S. intricata, Atriplex limbata, A. stipitata, Convolvulus erubescens, Oxalis corniculata, Rhodanthe floribunda, Rutidosis helichrysoides, Stenopetalum lineare, Gnephosis arachnoidea, Harmsiodoxa blennodioides, Sida corrugata, Einadia nutans, Salsola kali* var. *kali, Chenopodium cristatum* and *Tetragonia eremaea.* Exotic species occurring in this community include *Centaurea melitensis, Sisymbrium erysimoides* and *Sonchus oleraceus.*

11. *Hakea tephrosperma* tall open-shrubland

Small patches of tall open-shrubland dominated by *Hakea tephrosperma* occur to the south of Mandalay sheering shed. Tall shrub associates included *Acacia aneura, Dodonaea viscosa* subsp. *angustissima* and *Eremophila sturtii*. Low shrubs and herbs in the ground layer include *Solanum ellipticum, Tetragonia eremaea, Rhodanthe floribunda, Gnephosis arachnoidea, Austrostipa scabra* and *Maireana triptera.*

Small areas of *Hakea tephrosperma* tall open shrubland occur south and east of the old Mandalay shearing shed.

Low open-shrublands

12. *Muehlenbeckia florulenta* open-shrubland

Low open shrubland dominated by *Muehlenbeckia florulenta* occurs in low-lying areas around Peery and Poloko Lakes. *Eragrostis australasica* is frequently associated and the community may grade into one dominated by that species. Frequently associated low shrubs and herbs include *Sclerolaena divaricata, Sclerolaena stelligera, Sclerolaena intricata, Chamaesyce drummondii, Osteocarpum acropterum, Rutidosis helichrysoides, Tetragonia eremaea, Epaltes cunninghamii* and *Brachyscome lineariloba.*

13. *Dodonaea viscosa* subsp. *angustissima/Senna artemisioides/ Eremophila* species shrubland

Associated with *Casuarina pauper/Alectryon oleifolius* woodland/open-woodland and *Acacia aneura* low open woodland are areas of mixed species shrubland in which *Dodonaea viscosa* subsp. *angustissima, Acacia victoriae, Senna artemisioides* subsp. *filiformis* and *Eremophila sturtii* are prominent. *Acacia aneura* may provide a sparse overstorey. Other associated shrubs include *Enchylaena tomentosa, Maireana pentatropis* and *Chenopodium curvispicatum.* Common low shrubs and herbs include *Sclerolaena bicornis* subsp. *bicornis, Sclerolaena diacantha, Einadia nutans, Atriplex limbata, Atriplex stipitata, Daucus glochidiatus, Convolvulus erubescens, Oxalis corniculata, Rhodanthe floribunda, Rutidosis helichrysoides, Stenopetalum lineare, Solanum esuriale, Brachyscome lineariloba, Gnephosis arachnoidea, Harmsiodoxa blennodioides, Calotis plumulifera, Enneapogon avenaceus, Austrostipa scabra and Wahlenbergia stricta.*

An *Eremophila/Dodonaea/Acacia* mixed shrubland may be the result of past disturbance of woodland communities.

14. *Atriplex nummularia* open-shrubland

An open shrub community dominated by *Atriplex nummularia* occurs to the east of Peery Lake. Associated species include *Maireana pyramidata, Sclerolaena intricata, Sida intricata, Daucus glochidiatus, Myriocephalus stuartii, Rhodanthe moschata, Salsola kali* var. *kali, Tetragonia eremaea* and the exotics *Brassica tournefortii* and *Cucumis myriocarpus.*

15. *Maireana pyramidata* low open-shrubland

A low open shrubland dominated by *Maireana pyramidata* occurs on broad drainage lines and on lower slopes of rises, largely in the north east of the Park. Commonly associated low shrubs and herbs include *Atriplex stipitata, Stenopetalum lineare, Tetragonia eremaea, Rhodanthe floribunda, Gnephosis arachnoidea, Daucus glochidiatus, Einadia nutans, Chamaesyce drummondii, Sclerolaena intricata, Enneapogon avenaceus* and *Sida intricata* along with the exotic *Schismus barbatus.*

Maireana pyramidata low open shrubland is widespread in the north of the park on broad drainage lines and lower slopes.

16. *Halosarcia* low open-shrubland

A low open shrubland dominated by *Halosarcia pergranulata* subsp. *pergranulata* occurs in low-lying sites adjacent to Peery and Poloko Lakes and an unnamed lake near the southern boundary. Associated species include *Teucrium racemosum, Senecio lautus* subsp. *dissectifolius, Sclerolaena divaricata, Plantago drummondii, Gnephosis arachnoidea, Osteocarpum acropterum, Eragrostis dielsii, Centipeda cunninghamii, Atriplex holocarpa and Atriplex lindleyi.*

Grasslands/Herblands

17. *Eragrostis australasica* grassland

Areas of *Eragrostis australasica* grassland occur around Peery and Poloko Lakes. *Muehlenbeckia florulenta* may be associated and the community may grade into a shrubland dominated by that species. Frequently associated low shrubs and herbs include *Sclerolaena intricata, Epaltes cunninghamii, Brachyscome lineariloba, Gnephosis arachnoidea, Atriplex holocarpa/Eragrostis setifolia, Pycnosorus globosus* and *Halosarcia pergranulata* subsp. *pergranulata.*

Eragrostis australasica grassland often associated with *Muehlenbeckia florulenta* shrubland occurs on low-lying areas around Peery Lake.

18. Lakebed herbland

As the lakes dry out after flooding an annual herbland develops. This is dominated by *Atriplex holocarpa, Sporobolus mitchellii, Spergularia rubra, Teucrium racemosum, Senecio lautus* subsp. *dissectifolius, Osteocarpum acropterum, Heliotropium curassavicum* and *Halosarcia pergranulata* subsp. *pergranulata*. Towards the lake edge scattered shrubs of *Muehlenbeckia florulenta* may occur.

19. Mixed herblands

A variety of herbland communities occur within the Park generally on low-lying areas, many of which may be subject to inundation particularly in the area to the east of Arrow Bar Homestead. Common dominants include *Atriplex lindleyi, A. holocarpa, Sclerolaena bicornis, Sclerolaena brachyptera, Sclerolaena intricata and Sclerolaena ventricosa.* Frequently associated small shrubs and herbs include *Maireana aphylla, Maireana coronata, Maireana turbinata, Swainsona campylantha, Swainsona affinis, Tetragonia eremaea, Plantago drummondii, Rhodanthe floribunda, Euphorbia drummondii, Eragrostis setifolia, Brachyscome ciliaris* and *Brachyscome lineariloba*. It is likely that the species composition of these areas is variable and dependant on seasonality of rainfall events, with grasses becoming more prominent following good summer rainfall. These herblands warrant a more detailed study through several seasons.

20. Mound Springs community

Active mound springs located along the eastern shore of Peery Lake carry a sedgeland community dominated by *Cyperus gymnocaulos* and *Cyperus laevigatus.* These springs have been documented by Pickard (1992). Of high significance is the presence of *Eriocaulon carsonii* and *Utricularia dichotoma*.

21. Disturbed sites

A number of quadrats were sampled at sites which had been subject to significant disturbance through the pastoral history of the properties, including homestead sites, earth tanks and yards. These had a high species richness and predictably, relatively high weediness.

Plant species

A total of 378 vascular plant species from 66 families were recorded during this study. A further 46 species have been recorded in previous surveys.

Occurrence of exotic species

Of the 424 species recorded from the Park, 55 (13%) were exotics. Mean percentage occurrence of exotic species ranged from 53% in the *E. ochrophloia* open woodland community to less than 1% in *Casuarina pauper/Alectryon oleifolius* low open woodland and *Acacia aneura* tall shrubland (Table 2). The highest levels of occurrence of exotic species were in communities subject to the greatest influence from water i.e. the open woodlands and herblands associated with the lakebeds and major creeks. This is in accord with Westbrooke (1990) who found a high negative correlation between occurrence of exotic species and distance from water in studies at Mallee Cliffs National Park and Nanya Station. A number of exotic species are winter rainfall stimulated and thus may not have been recorded during this survey. *Melia azedarach*, recorded as an artificial planting, although not naturalised, is of historic and cultural significance.

Discussion

Mapping communities

There are a number of inherent problems in vegetation mapping: vegetation mapping assumes discontinuities between communities which may not exist; the constraints of cartography determine the minimum area that can clearly be distinguished; it is generally not feasible to ground truth the whole of an area and thus parts of the map assume a consistent relationship between the vegetation and other features such as soil type and topography. Beadle's (1948) map of western NSW at approximately 1:1 000 000 scale includes two units for the area. James's (1960) map of the Paroo–Upper Darling shows three vegetation units and Milthorpe's 1:500 000 map of north western NSW shows five units. Pickard and Norris's (1994) map of north-western NSW shows nine vegetation units. In the attached map, sixteen units are mapped and a further four indicated by point location. The map nonetheless suffers from the limitations noted above. The smallest area that could be mapped was 100 m in width, but in the interest of clarity some vegetation types occurring in very narrow bands were exaggerated to this width. Similarly some areas remote from tracks may include small patches of another vegetation unit from that mapped. With the current technology of mapping enabling changes to be readily incorporated, it is hoped that the map will be refined with following botanical visits.

Distribution of communities

The distribution and species composition of vegetation communities within the Peery Lake area is largely determined by variation in topography, landform position and soil type. *Eucalyptus* species open woodlands are associated with

texture contrast soils of the major creeklines and on clays around the overflow lakes. Shrubland dominated by *Acacia brachystachya* and *A. aneura* occurs on the lithosols of the sandstone hills with *Eucalyptus intertexta* woodland on the red earths that occur on the footslopes. Woodlands variously dominated by *Casuarina pauper, A. aneura* and *Flindersia maculosa* occur on desert loams and mixed herblands occur on the clays associated with the floodplains of Wannara Creek. *Maireana pyramidata* low open shrubland occurs on the east-west dunefields to the east of Peery Lake. Other factors, notably past grazing history, have also played a role in determining the present distribution and floristic composition of the communities present.

Conservation status of plant communities

The communities mapped do not directly correspond to those listed by Benson (1989) but nonetheless, based on his analysis, three communities, *Casuarina pauper/Alectryon oleifolius* woodland, *Muehlenbeckia florulenta* low shrubland and *Eragrostis australasica* hummock grassland should be regarded as vulnerable; the remaining communities are inadequately reserved.

The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin' is listed as endangered in Australia under the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act), and those occurring in New South Wales are also listed as endangered in the State under the *Threatened Species Conservation Act* 1995 (TSC Act). The listings include springs that are the natural surface discharge points of aquifers in the Triassic, Jurassic and Cretaceous sedimentary sequence of the Great Artesian Basin. The community comprises a variable range of native species that depend on the natural discharge of groundwater from the Great Artesian Basin for their existence. Those in north-western New South Wales often consist of sedges or similar vegetation as well as trees and shrubs which may occur near the springs. Major threats to this community are trampling and grazing by stock and feral animals, alteration of flow or unsustainable extraction of water from artesian bores reducing flows to the mound springs. The springs within Peery Lake are the only Artesian Springs reserved in NSW (NPWS 2001).

Plant species

Three hundred and seventy eight species of vascular plants were recorded during this study. Whilst this survey was undertaken in optimum conditions following good rains, a survey in one season only will not record all species present. Lembit (1993) in a survey during drought conditions recorded only 104 species. Of the 200 species previously recorded from the Park, 46 were not recorded during the present study. The total of 424 species reflects the diversity of environments and vegetation communities. Highest representation of species was from the Chenopodiaceae (65), Poaceae (60) and Asteraceae (52). Apart from communities associated with major disturbance, overall weediness of communities was low.

Rare, threatened or restricted species

Eucalyptus ochrophloia is restricted to a few watercourses and floodplains in southwest Queensland and north western NSW along the Paroo River (Brooker & Kleinig 1990). Three species are listed by Pressey et al. (1990) as having restricted distribution in western New South Wales. *Eriocaulon carsonii*, listed as endangered under the NSW *TSC Act*, occurs on a mound spring on the western edge of Peery Lake, this being the only known site for this species in NSW (Pickard 1992). *Utricularia dichotoma* previously described, also occurring on these mound springs, is now thought to be a new previously undescribed species (John Benson, Royal Botanic Gardens, pers. comm.). *Swainsona oligophylla* occurs in woodlands and herbfields on the edge of Peery Lake. *Cheilanthes lasiophylla* occurs in *Acacia aneura* tall open shrubland in sheltered situations on the rocky hills.

Acknowledgements

This work was carried out under Licences A393 and A2820 of the NSW National Parks and Wildlife Service. We acknowledge the assistance of staff of the Broken Hill District NSW National Parks and Wildlife Service, in particular Cameron Caffey for assistance throughout this project. Thanks also to Roger Lembit and John Pickard for provision of data from past studies.

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Manuscript accepted 16 June 2003

Appendix 1. Plant species of Peery Lake area with frequency (%) of occurrence in communities

Vascular plant species recorded from Peery Lake area. Nomenclature is according to Harden (1990–1993).

*denotes exotic species ? denotes species recorded in that community but not quadrats.

# denotes species previously recorded for the Park but not during this study

Plant communities

1 *Eucalyptus camaldulensis* open woodland (lake)
2 *Eucalyptus camaldulensis* open woodland (creek)
3 *Eucalyptus largiflorens* open woodland
4 *Eucalyptus ochrophloia* open woodland
5 *Eucalyptus intertexta* open woodland
6 *Eucalyptus populnea* open woodland
7 *Casuarina pauper/Alectryon oleifolius* low open woodland
8 *Flindersia maculosa* low open woodland
9 *Acacia aneura/A. tetragonophylla* tall open shrubland
10 *Acacia aneura* tall shrubland
11 *Hakea tephrosperma* tall open shrubland
12 *Muehlenbeckia florulenta* open shrubland
13 *Eremophila/Dodonaea/Acacia* open shrubland
14 *Atriplex nummularia* open shrubland
15 *Maireana pyramidata* low open shrubland
16 *Halosarcia* low open shrubland
17 *Eragrostis australasica* hummock grassland
18 Lakebed herbland
19 Mixed herbland**.**
20 Mound springs community
21 Highly disturbed sites.

	Plant communities																				
Taxon family & name	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**
Number of quadrats	4	7	10	1	3	8	11	4	9	14	2	2	17	1	6	6	5	4	5	1	8
FERNS																					
Adiantaceae																					
Cheilanthes austrotenuifolia					33				56	14											
Cheilanthes lasiophylla									44												
Marsileaceae																					
Marsilea drummondii		14				38							12		17	17	20		20		25
MONOCOTYLEDONS																					
Amaryllidaceae																					
Crinum flaccidum		14	10																		
Anthericaceae																					
Thysanotus baueri					33				22	7			12		17				20		
Asphodelaceae																					
Bulbine alata		14							22	7			18						20		
Cyperaceae																					
Cyperus alterniflorus		?	?	?																	
Cyperus gymnocaulos	100		40															25			13
Cyperus laevigatus	?																				100
#Cyperus squarrosus																					
Cyperus victoriensis	?	?	?																		
Eleocharis acuta																					13
Eleocharis pallens			?														?				
Eriocaulaceae																					
Eriocaulon carsonii																				100	
Juncaceae																					
Juncus aridicola																		?			
Phormiaceae																					
Dianella longifolia var. *longifolia*						13															
Poaceae																					
Agrostis avenacea var. *avenacea*																					
Aristida calycina var. *praealta*					33																
Aristida contorta										14			12		17						13
Aristida holathera var. *holathera*						13							6								
Aristida jerichoensis									11	7											
Aristida jerichoensis var. *jerichoensis*									11	7											
Aristida jerichoensis var. *subspinulifera*													6								
Aristida nitidula			10																		
Aristida ramosa		29				13															13
Astrebla lappacea							?	?		?											
Austrostipa nitida																					
Austrostipa scabra		14							11	7	50		6		17						25
# Bothriochloa sp.																					
Brachyachne ciliaris		29	20			25		25					18		33	67	20		60		25
**Bromus cartharticus*						13															
#Bothriochloa sp.																					
Chloris truncata							9			7			6				20				13
Cymbopogon ambiguus		14	10			13															

Taxon family & name	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**
Number of quadrats	4	7	10	1	3	8	11	4	9	14	2	2	17	1	6	6	5	4	5	1	8
Cymbopogon obtectus		14								7			12								
# Cynodon dactylon																					
Dichanthium sericeum							9						6		17	17					
Digitaria brownii						?				?											
Digitaria coenicola										?											
Enneapogon avenaceus					?	?	?														
Enneapogon cylindricus										?							?				
Enneapogon polyphyllus						?				?											
Enteropogon acicularis							45		11	7											13
Enteropogon ramosus					?	?	?	?		?			?								
Eragrostis australasica			10			25						100					100	25			13
# Eragrostis desertorum																					
Eragrostis dielsii	25	29	10				9			7			12		50					100	25
Eragrostis eriopoda																17					
Eragrostis lacunaria									11												
Eragrostis laniflora					67					14											
Eragrostis leptocarpa	?	?										?									
Eragrostis setifolia												?			17	17					
Eriachne helmsii										?											
Eriachne mucronata									?												
# Eriachne pulchella subsp. *pulchella*																					
# Eulalia aurea																					
**Hordeum leporinum*																					13
Leptochloa digitata	?	?	?				?														
Monachather paradoxa					33				22	21	50										
# Neurachne munroi																					
Panicum simile													?								
Paspalidium constrictum																			?		
Paspalidium jubiflorum						13															
**Polypogon monspeliensis*																			?		
**Rostraria pumila*							9														
**Schismus barbatus*		43	10	100	100	25	18		11	14	50		24	100	67	17			20	100	50
Sporobolus actinocladus			?		?	?				?				?							
Sporobolus caroli							?							?							
Sporobolus mitchellii	50		40				9					50					40	100			
Themeda australis		43							56				12								
# Themeda avenacea																					
Thyridolepis mitchelliana						?				?											
Tragus australianus										7											
Tripogon loliiformis					?					?			?								
Triraphis mollis						?				?											
Typhaceae																					
**Typha domingensis*																		?			?
Xanthorrhoeaceae																					
Lomandra leucocephala subsp. *leucocephala*						?															
DICOTYLEDONS																					
Acanthaceae																					
Rostellularia adscendens subsp. *adscendens*		14	10			13															
Aizoaceae																					
# Disphyma crassifolium subsp. *clavellatum*																					
Gunniopsis septifraga	25																				
Tetragonia eremaea	25	57	60	100	67	88	100	100	44	64	100		76	100	83	83			40		75
Tetragonia tetragonoides		14				13				7											
Amaranthaceae																					
Alternanthera denticulata			10			13			22								20				
Alternanthera nodiflora			10																		
Ptilotus atriplicifolius var. *atriplicifolius*		29	10				18		56				6								
Ptilotus exaltatus var. *exaltatus*																					13
# Ptilotus gaudichaudii var. *gaudichaudii*																					
# Ptilotus macrocephalus																					
Ptilotus obovatus var. *obovatus*					33					14											13
Ptilotus polystachyus var. *polystachyus*					33	13				14			12								
Ptilotus spathulatus f. *spathulatus*					?	?	?	?	?												
Apiaceae																					
# Cyclospermum leptophyllum																					
Daucus glochidiatus		57	10		33	13	9		67		50		29	100	50	83			40	100	75
# Eryngium plantagineum																					

Taxon family & name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Number of quadrats	4	7	10	1	3	8	11	4	9	14	2	2	17	1	6	6	5	4	5	1	8
Hydrocotyle trachycarpa									11												
Trachymene ochracea	25				33				11	7											
Apocynaceae																					
# Parsonia eucalyptophylla																					
Asclepiadaceae																					
Marsdenia australis					33					7											
Rhyncharrhena linearis										7			6								
Asteraceae																					
#Agianthus burkittii																					
# Arctotheca calendula*																					
Brachyscome ciliaris var. *lanuginosa*	25	29	20		33	13	36			14			12		17				20		13
Brachyscome lineariloba	50	14	20	100	33	38	27		33	21		50	47		67	17	60	25	80		50
Bracteantha bracteata		29			67	13			44	50	50		12								
Calotis cuneifolia		14	10		67	25	9		78	29	50		6								
# Calotis erinacea																					
Calotis hispidula			10		67	13	27	25	22	21	50		12								25
Calotis plumulifera		29	20		67	25		50	33	57			53		50						38
**Carthamus lanatus*		14	10			13	9						12								
**Centaurea melitensis*	25	86	30	100	33	50	9		22	7	50		24		33			25			75
Centipeda cunninghamii			40			13							6					25		100	50
Centipeda thespidioides			10			13							6						20		
Chrysocephalum semicalvum subsp. *semicalvum*									11												
Epaltes australis			20																		13
Epaltes cunninghamii			10			13						100					40				
# Erioclamys behrii																					
Gnephosis arachnoidea	25	57	50	100	67	25	55	50	67	86	100	50	76		67	67	40		40	100	100
Gnephosis eriocarpa			10							7											
**Hedypnois rhagadioloides* subsp. *cretica*		29	10													17					13
Helichrysum semifertile			10																		
**Hypochaeris glabra*						13			22												
Isoetopsis graminifolia					?								?								
# Ixiolaena brevicompta																					
# Lactuca saligna*																					
**Lactuca serriola*	25	29				13															
# Millotia perpusilla																					
Minuria cunninghamii				100			9						18		33	17			20		
Myriocephalus stuartii	25	14	40			13			11				12	100	33		20				13
Podolepis capillaris			10																	100	
Pseudognaphalium luteoalbum			10						11												38
Pterocaulon sphacelatum	50	29	30			25				7			6								13
Pycnosorus chrysanthus			20										6				20				
Pycnosorus globosus		14	10														20	25			
Pycnosorus pleiocephalus			10								50		6								
Rhodanthe corymbiflora	25																				
Rhodanthe floribunda		71	40	100	100	63	55	50	67	71	100		88		100	67			80		75
Rhodanthe moschata		14	20		67				22				6	100							
Rhodanthe pygmaea			?	?	?	?															
Rutidosis helichrysoides		29	30		33	50			33	36		50	35		17		20	25			25
Senecio cunninghamii		29	10			13									17						
Senecio lautus subsp. *dissectifolius*	75	14	50	100		13	27			7			18	100	33	17	20	50		100	13
Senecio magnificus	25																				
Senecio quadridentatus						13	9											25			
Senecio runcinifolius			40																		25
**Silybum marianum*		14																			
**Sonchus oleraceus*		71	20			63	18	25	33	7			18		17	67					75
# Vittadinia cuneata																					
Vittadinia hispidula										7											
Vittadinia triloba		43	10						11	7											13
**Xanthium occidentale*																					25
**Xanthium spinosum*		14				13															
Boraginaceae																					
Cynoglossum australe		14			67																
**Echium plantagineum*		43	10		33	13			11				12								63
Heliotropium asperrimum			10																		
# Heliotropium brachygyne*																					
Heliotropium curassavicum	50		50															50			
Omphalolappula concava									11					100		17					
Plagiobothrys plurisepalus															17						
Trichodesma zeylanicum			10																		

Taxon family & name	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**
Number of quadrats	4	7	10	1	3	8	11	4	9	14	2	2	17	1	6	6	5	4	5	1	8
Brassicaceae																					
**Alyssum linifolium*													6			17			20		
Arabidella eremigena			?			?				?											
Arabidella trisecta													12			17					
# Brassica rapae*																					
**Brassica tournefortii*						13							6	100							13
**Carrichtera annua*													12		17	17					25
Harmsiodoxa blennodioides					67	38			67	36	50		47		17				20		25
**Lepidium bonariense*		14																			
Lepidium oxytrichum									11												13
Lepidium papillosum						?								?							
Lepidium pseudohyssopifolium						?															
**Sisymbrium erysimoides*	50	100	20	100	67	100	9		11	21			29			33					88
**Sisymbrium irio*																	20				13
**Sisymbrium orientale*																					13
Stenopetalum lineare		14	10		67		27	50	33	43	50		65		33	17					13
Stenopetalum nutans										7											
Caesalpiniaceae																					
Petalostylis labicheoides var. *labicheoides*					?				?	?											
Senna artemisioides noth *artemisioides*		29			67	13			78	14			12			17					
Senna artemisioides noth *coriaceae*			10						11	7			12								
Senna artemisioides noth *sturtii*		14	10						11	14											
Senna artemisioides subsp. *filifolia*			10			13				14			41						20		13
Senna artemisioides subsp. *helmsii*										7											
Senna artemisioides subsp. *oligophylla*										14			6								
Senna artemisioides subsp. *petiolaris*		14					9			21	50		24			17	20				
Senna artemisioides subsp. *zygophylla*										7											
Campanulaceae																					
Isotoma petraea									33												
Wahlenbergia communis				100		13			11												
Wahlenbergia gracilis						13							6								
Wahlenbergia stricta	25	71	20		33	50	27		67	7			29		17		20				25
Caryophyllaceae																					
**Polycarpon tetraphyllum*		14	10			13															13
Scleranthus pungens									?												
**Spergularia rubra*	50		20														40	50			38
Casuarinaceae																					
Casuarina pauper							91			14											
Chenopodiaceae																					
Atriplex acutibractea subsp. *acutibractea*					?																
Atriplex angulata	25		10				9									17					
Atriplex conduplicata			10															25			
Atriplex eardleyae	25	43				25	27						18		17				20		25
Atriplex holocarpa	75		50			13	36					100				50	60	75	80	100	50
Atriplex leptocarpa	25		20	100														25			
Atriplex limbata			20			13	9	25					53		17						13
Atriplex lindleyi	25		30	100			18								17	50	40	25	60	100	25
# Atriplex lobativalvis																					
# Atriplex nessorhina																					
Atriplex nummularia	25													100			20				
Atriplex stipitata	50	29	30			25	36	100		64	50		71		33	50					38
Atriplex suberecta	50		30																		
# Atriplex turbinata																					
# Chenopodium album*																					
Chenopodium cristatum		29	10		33	38	18	25	33	21			12						40		25
Chenopodium curvispicatum	25	71	10		100	38	73		22	36			41		50						50
Chenopodium desertorum					67	13	9	50			50		6								13
Chenopodium melanocarpum																					?
**Chenopodium murale*	25																				25
#Chenopodium pumilio																					
# Dissocarpus biflorus var. *biflorus*																					
# Dissocarpus biflorus var. *cephalocarpus*																					
Dissocarpus paradoxus		14	10			25	9	25		14	50		18				20				25
Einadia nutans	100	100	50	100	100	75	27	50	44	50	50		65		67		20		20	100	63
Enchylaena tomentosa	75	29	50		67	50	100	100	67	86	50		47			17					100
Halosarcia pergranulata subsp. *pergranulata*	50		30	100			9										40	75		100	
Maireana aphylla							18												40		
Maireana appressa													6					25			

Taxon family & name	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**
Number of quadrats	4	7	10	1	3	8	11	4	9	14	2	2	17	1	6	6	5	4	5	1	8
Maireana brevifolia			10			38							6								25
Maireana coronata						13	9	25					12			17			40		
# Maireana eriocladа																					
Maireana georgei			10							21			6		17						13
Maireana integra													6								
Maireana pentatropis						13	18			7											13
Maireana pyramidata	25		10	100		13	73	50		29			29	100	100	17			20		50
Maireana sclerolaenoides			10				18									17					
Maireana sedifolia							18								17						
Maireana triptera		14	20		67		45	100	56	64	100		12		17						50
Maireana turbinata								25													
Malacocera tricornis	50			100			27								17	33	20		40		
Neobassia proceriflora			10																		
Osteocarpum acropterum	100		50	100			9					50	6				20	50		100	25
Rhagodia spinescens		14	10			50	36	25	11	29			47			17					25
**Salsola kali* var. *kali*	50	43	50	100	33	38	73	75	11	50	50		53	100		17	20	25			63
**Salsola kali* var. *strobilifera*					33					7	50		6		17	17					25
Sclerolaena articulata													6								
Sclerolaena bicornis var. *bicornis*							18			7	50		29			17	20		40		13
Sclerolaena blackiana													6								
Sclerolaena brachyptera			10				9												40		
Sclerolaena convexula		14			33				89	7	50		6								
Sclerolaena decurrens			10										6		17						
Sclerolaena diacantha		14	20		67	13	36	25	11	21	50		65		17				20		38
Sclerolaena divaricata			10				18				50	50	6		33	33	20	25		100	13
Sclerolaena eriacantha			10				9			7											
Sclerolaena intricata	100		50	100		38	73	100		57	50	50	71	100	67	100	60	25	80		75
Sclerolaena johnsonii													6								
Sclerolaena lanicuspis									11				29								25
Sclerolaena longicuspis																17					
Sclerolaena muricata																	20				13
Sclerolaena obliquicuspis		14	10			25	27			7			18		17	17					25
Sclerolaena oppositicuspis				100									6								
Sclerolaena parallelicuspis							?	?		?					?						
Sclerolaena patenticuspis							?								?						
Sclerolaena stelligera												50					20				
Sclerolaena tricuspis							9			7			12				20		40		
Sclerolaena ventricosa	25			100											17			25	20		
Convolvulaceae																					
Convolvulus erubescens	25	29	20		100	38			44	36	50		65		83	50			20		63
Crassulaceae																					
Crassula sieberiana									22												
Cucurbitaceae																					
**Citrullus lanatus* var. *lanatus*						13									17						
**Cucumis myriocarpus*			10										6	100							
Euphorbiaceae																					
Chamaesyce australis																	20				
Chamaesyce drummondii	25			100					11							17					13
Euphorbia drummondii		14	10		33	13			44	21		50	18		50		20		40		
Euphorbia eremophila									22	7					33						
Euphorbia stevenii													6		17						
# Phyllanthus involatus																					
Phyllanthus lacunarius									11				6		17						25
Fabaceae																					
Cullen cinereum			10																		25
Cullen parvum										7											
Glycine clandestina		43	10							7											
Glycyrrhiza acanthocarpa			10										6								
Indigofera australis									33												
Lotus australis			10																		
Lotus cruentus	25												12		33		20				
Lysiphyllum carronii																					13
**Medicago laciniata*								25	11												
**Medicago minima*		14				25							12								
**Medicago polymorpha*		29				13											20				
** Medicago truncatula*																			?		?
Muelleranthus trifoliolatus			10																		
Swainsona affinis				100	33				11	21						17	40	25	40		
Swainsona campylantha						13	18						29		17	17			80		13

Taxon family & name	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**
Number of quadrats	4	7	10	1	3	8	11	4	9	14	2	2	17	1	6	6	5	4	5	1	8
Swainsona greyana															17						
Swainsona microphylla													6								
Swainsona oligophylla	25																	50			
#Swainsona phacoides																					
**Trifolium cernuum*								25		7											
Frankeniaceae																					
Frankenia species																?		?	?		
Gentianaceae																					
**Centaurium spicatum*			10																		50
**Centaurium tenuiflorum*									11									25			
Geraniaceae																					
**Erodium cicutarium*						13				7											
Erodium crinitum									11	7	50										
Goodeniaceae																					
Goodenia fascicularis															17	17					13
Goodenia glauca	?	?	?		?																
Goodenia heterophylla subsp. *heterophylla*																					
Goodenia lunata									11												
Goodenia pinnatifida										7											
Scaevola spinescens			10				9			7							20				
Haloragaceae																					
Haloragis aspera			10			13															25
# Haloragis glauca																					
Haloragis odontocarpa									11				6								
Myriophyllum verrucosum																					13
Lamiaceae																					
Mentha australis		29																			13
Prostanthera striatiflora									56												
**Salvia verbenaca*		29				25	9		11	7	50										13
Teucrium racemosum	25	29	40	100		25	9					100	18				60	50		100	25
Lentibulariaceae																					
Utricularia dichotoma																				100	
Linaceae																					
Linum marginale		?				?															
Loranthaceae																					
Amyema lucasii										14											
Amyema maidenii subsp. *maidenii*					33				44	7			6								
Amyema miraculosum subsp. *boormanii*		?			?			?	?				?								
# Ameyema quandong																					
Lysiana exocarpi							9						6								
Lysiana murrayi									33				6								
Malvaceae																					
Abutilon fraseri									11				6								
Abutilon leucopetalum		29	20		33			25	22	14			12		17						13
# Abutilon otocarpum																					
Hibiscus brachysiphonius			10				9		22						17	33			40		13
Hibiscus sturtii var. *grandiflorus*									11												
# Hibiscus sturtii var. *sturtii*																					
Lavatera plebeia	25	14				25															
**Malva parviflora*	25	29	20			38						50	6				20				63
**Malvastrum americanum*	25	71	20	100		38	9			7	50		12		17				40		75
Sida ammophila									?	?				?	?						
Sida corrugata	25					25	9		33	36	50		12								25
Sida cunninghamii			10			13	9		44	29			6		17	17					25
Sida fibulifera		14																			
Sida intricata		29		100		13	9			7	50		41	100	50		20		20		50
Sida petrophila		29	20		33		9		22	14			6								
# Sida rhombifolia																					
Meliaceae																					
**Melia azedarach*																					13
Owenia acidula																17					
Mimosaceae																					
Acacia aneura		29			100	25	27	75	78	71	50		35								13
Acacia brachystachya									44												
# Acacia hakeoides																					
Acacia ligulata		29								7			6								

Taxon family & name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Number of quadrats	4	7	10	1	3	8	11	4	9	14	2	2	17	1	6	6	5	4	5	1	8
# Acacia loderi																					
Acacia oswaldii						13	18			21	50										38
# Acacia salicina																					
Acacia stenophylla	50		60			13											40				
Acacia tetragonophylla		14			33	25	9	25	67	43			18								13
Acacia victoriae		57	20			50	9			14	50		59		17				20		63
Myoporaceae																					
Eremophila bignoniiflora							9														13
Eremophila deserti											50		6								
Eremophila duttonii			10		33		9	50	33	43			6								13
Eremophila gilesii										?											
Eremophila latrobei						13			11	7											
Eremophila longifolia		29	10	100	67	25			33	64	50		24								25
Eremophila maculata													12				20				13
Eremophila polyclada							9														
Eremophila serrulata									33	7											
Eremophila sturtii		14	10			38	18	75		29	100		29		17	17					13
Myoporum montanum	100	86	20			63	45			7	50		24					25			88
Myoporum platycarpum													6								
Myrtaceae																					
Eucalyptus camaldulensis	75	100	10			13														100	38
Eucalyptus coolabah subsp. *coolabah*			?																		
Eucalyptus intertexta					100	13			11	7											
Eucalyptus largiflorens	50		80																		
Eucalyptus ochrophloia				100																	
Eucalyptus populnea subsp. *bimbil*		43				100															
Nyctaginaceae																					
Boerhavia dominii		14	10	100	33	38			33	14			18						20		13
Oleaceae																					
Jasminum lineare		14							11		50										13
Onagraceae																					
Epilobium hirtigerum			10																		
Oxalidaceae																					
Oxalis corniculata		57	10		67	50	9		78	36	50		41			17					38
Oxalis perennans													6								
** Oxalis pes-caprae*																					?
Papaveraceae																					
**Argemone ochroleuca* subsp. *ochroleuca*						13															
**Glaucium corniculatum*																					13
Pittosporaceae																					
Pittosporum phylliraeoides			10			13															38
Plantaginaceae																					
Plantago cunninghamii									11												
Plantago drummondii		14			33	25	9		56	7	50		24		33	33		25	80	100	25
Plantago turrifera											50										
Plumbaginaceae																					
***** *Limonium lobatum*																					?
Polygonaceae																					
Acetosa vesicaria		14																			
**Emex australis*		14				13							6								13
Muehlenbeckia florulenta	75		70	100								100			17	17	80	50			13
Persicaria lapathifolia						13															13
Persicaria prostrata	?	?		?																	
**Polygonum aviculare*																					13
Rumex brownii			10																		
**Rumex crispus*		14																			
Portulacaceae																					
Calandrinia eremaea							9			14											
# Calandrinia ptychosperma																					
# Portulacca intraterranea																					
Portulaca oleracea			10			13	18	25	11	7			18		17	17	40		20		50
Primulaceae																					
**Anagallis arvensis*	25	57				50	9		22				12				20				63

Taxon family & name	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**
Number of quadrats	4	7	10	1	3	8	11	4	9	14	2	2	17	1	6	6	5	4	5	1	8
Proteaceae																					
Grevillea striata		14			67	13		50	44	29			18								
Hakea leucoptera															17						
Hakea tephrosperma					33						100										
Ranunculaceae																					
# *Clematis microphylla* var. *microphylla*																					
Rubiaceae																					
Canthium odoratum									33												
Canthium oleifolium					?		?		?	?											
Rutaceae																					
Eriostemon linearis									22												
Flindersia maculosa		14				13	18	100		36			18								
Geijera parviflora						?	?														
Santalaceae																					
Santalum lanceolatum			10						22				6								
Sapindaceae																					
Alectryon oleifolius		14			33	13	45	50		21			6								13
Atalaya hemiglauca		14	10						11	7											50
Dodonaea viscosa subsp. *angustissima*		14							11	21	100		18		33						
Scrophulariaceae																					
Mimulus repens	25																				
Stemodia florulenta	50		10														20				
Solanaceae																					
Datura leichhardtii																					?
Lycium australe																					13
**Lycium ferocissimum*		57			33	25	9			7											38
**Nicotiana glauca*	25		20																		
Nicotiana suaveolens	25																				
Nicotiana velutina	100	29	60		33	25	9		22				12	100	17						25
Solanum ellipticum		43	10	100	100	25	27		78	64	100		18			33					25
Solanum esuriale		29			33	25			11	14	50		41		17	17			40		25
Solanum ferocissimum								25	11	7	50										
**Solanum nigrum*		43	30			25	9		11				6								50
Thymelaeaceae																					
Pimelea microcephala subsp. *microcephala*		14			67		9						6								
Pimelea trichostachya			10						11	7					17						
Verbenaceae																					
**Verbena officinalis*			10																		13
**Verbena supina*			20																		25
Violaceae																					
Hybanthus monopetalus					?																
Zygophyllaceae																					
Zygophyllum ammophilum	14		10			33		25						7					12		
Zygophyllum eremaeum																	6				
Zygophyllum humillimum														?							
Zygophyllum iodocarpum														7					6		
Zygophyllum ovatum						13															