Biodiversity in the southern rangelands: variation in biota over time and space on the Black Range and Lake Mason stations, Murchison Bioregion, Western Australia

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ABSTRACT

This biodiversity survey examined the terrestrial vertebrate fauna, avifauna and vascular flora of two adjoining, ex-pastoral stations in the Murchison Bioregion of Western Australia. A diverse native biota was identified with at least 58 reptiles, 18 terrestrial mammals, 73 birds and 385 vascular plants documented. Few rare species were recorded and most species were typical of the Eremaean Botanical Province. Assemblage structure was assessed for 24 stratified sampling sites for reptiles, mammals and vascular flora. Significant indicator species were resolved for the various assemblage groups. Species accumulation data at the site and landscape scale and for each assemblage group, gained by sampling over two years and several seasons, were used to determine sampling adequacy for reptiles and mammals. By the end of the five survey periods, between 90–95% of trappable reptile species and 97–100% of mammal species had been recorded. Analysis of assemblage groups showed that three sampling periods for reptiles and four for mammals were adequate to determine the species assemblages of these two groups across all survey sites. Trapping efficiency for reptiles and mammals was compared between 20 L buckets and narrow diameter but deeper PVC pipes. Mean maximum temperature had both positive and negative effects on reptile capture rates, which varied with reptile family. Agamids had a strong negative capture association with the number of times the sites had been surveyed. This study provides the first detailed baseline of biota in the Murchison Bioregion and indicates that relying on fauna trapping over only two sampling periods in arid environments is not adequate to identify the full assemblage of species at the site scale.

Keywords: biodiversity, flora, land systems, Murchison, sampling design, vertebrates

INTRODUCTION

A comprehensive knowledge of biodiversity values relating to species patterning, composition and abundance is an essential component for effective reserve management. This information is used as the basis of monitoring programs that provide improved understanding of the consequences of management actions, inactions, stochastic processes and the implications of conflicting land uses, such as pastoral grazing and mining activities. More broadly, biodiversity surveys contribute to biogeographic and taxonomic knowledge of the flora and fauna and can elucidate aspects of species' natural history (for example Burbidge et al. 2000; George et al. 2015).

Within the arid zone of Western Australia, we have only superficial understanding of distributions for many vertebrate taxa and much of the vascular flora. In addition, very little information about species associations, natural history and specific habitat requirements is known. There is almost no knowledge about their individual and collective roles in maintaining landscape-scale processes.

There are few data relating to biodiversity survey published for any part of the Murchison Bioregion (Cowan 2003). The only systematic assessment has been in the southern portion of the bioregion where several

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sites were examined during the Eastern Goldfields Biological Survey, coordinated by the Western Australian Biological Surveys Committee from 1978 to 1982 (Biological Surveys Committee 1984). However, even then sampling was sparse and only covered wide-spread surface types. An analysis by How and Cowan (2006) using data from Western Australian Museum vertebrate collections to assess sampling intensity across the state showed much of the Murchison Bioregion to have been poorly sampled. Descriptions of vegetation associations have been documented at the scale of 1:1,000,000 (Beard 1976) for the Murchison, including this study area, however this is broad and provides insufficient detail at fine scales.

Black Range and Lake Mason Stations are ex-pastoral stations situated just north of the community of Sandstone in the central Murchison Bioregion, and no detailed formal biological survey has been undertaken previously. The Western Australian Museum database shows records for only seven species of reptiles, two terrestrial mammals, four birds and no frogs (Western Australian Museum 2010) for either property. The Western Australian Herbarium database contained records of 82 individual plants representing 17 families, 34 genera and 52 species (Western Australian Herbarium 1998–). Prior to this survey, the closest detailed biodiversity assessment surveys in the vicinity were on Wanjarri Nature Reserve some 150 km to the east (Hall et al. 1994) and on Yuinmery Station around 100 km to the south (Dell et al. 1992). After this survey floristic work was undertaken on local banded ironstone and greenstones formations of Lake Mason (Thompson & Sheehy 2010).

The primary aim of the current study was to identify the terrestrial mammals and reptiles, particularly those with specific conservation values, and their habitat associations at Black Range and Lake Mason ex-pastoral stations. An assessment of vascular flora and avifauna was also undertaken. Our focus was a thorough documentation of the biodiversity values of this significant area in the Murchison Bioregion in order to provide a baseline against which changes in land use and climate can be assessed, and to provide management guidelines for reclaimed pastoral land. In addition to this, we aimed to identify the most critical aspects of performing detailed biodiversity assessment including effort, timing, seasonality and the utility of land systems as the basis for sampling stratification.

During this biodiversity assessment, a secondary aim was to examine the efficiency and sampling adequacy of two commonly used trap types across a broad gradient of habitats in an arid environment. An area of continuing debate amongst survey zoologists is the efficiency of different trap types. Vertebrate surveys often use two trap types, the narrow and deep PVC pipe and the wider but shallower 20 L buckets. Previous work by Rolfe and McKenzie (2000) indicated that the PVC pipe trap was more effective. However, Thompson and Thompson (2007) suggested that the 20 L bucket was more effective.

An essential part of any survey is maximising efficiency and ensuring data collected are adequate in quality and quantity for the desired purpose. Methodological sampling issues exist for all biota, but they are especially problematic for fauna, principally because of species mobility, variable activity driven by immediate and seasonal climatic conditions and overall abundance being affected by longer term climatic trends (Environmental Protection Authority and Department of Environment and Conservation 2010). Further complicating these issues are the methods used for sampling, such as trap type, trap arrangements, sampling duration and timing. Consequently, in this survey, the repetitive sampling design enabled some assessment of sampling adequacy through the use of species accumulation data, examining changes in assemblage structure with multiple sampling and examining temperature changes on the activity of different vertebrate families.

STUDY AREA

Lake Mason and Black Range stations in the Murchison Bioregion

Lake Mason and Black Range Stations are ex-pastoral stations that were purchased for the purpose of nature conservation by the then Department of Conservation and Land Management (CALM; now the Department of Parks and Wildlife) in 2000 under the Gascoyne–Murchison Strategy (Laurance 1996). They are situated centrally in the Murchison Bioregion (Thackway & Cresswell 1995), just north of the community of Sandstone (Fig. 1). They share a common longitudinal boundary and can be considered as a single land-management unit totalling approximately 228,647 ha. While these properties are not currently part of the state's formal reserve system they are managed as such under a memorandum of understanding between Parks and Wildlife and the Western Australian Department of Land Administration (DOLA).

Lake Mason Station was established as part of a pastoral enterprise shortly after 1900 by HGB Mason (Senior 1995). Early stocking was mostly cattle, as was the case for many pastoral stations at that time, but by 1926 this was changed to sheep. Stocking rates appear to have been relatively stable for much of the station's history with around 13,000 head of sheep being run in 1926 and between 8000–10,000 sheep being shorn annually by 1978. Black Range Station was established as a pastoral lease around 1920 but there is little information of stocking rates throughout its history other than an indication through much of the southern area that overgrazing has been quite severe. The Agricultural Department reported in 1998 that for the land that had moderate to high grazing potential (14,168 ha), the vegetation on approximately 43.3% (6,139 ha) was in poor condition. For Lake Mason Station this figure was 37.2% (32,357 ha of a total of 86,956 ha; Van Vreeswyk et al. 1998).

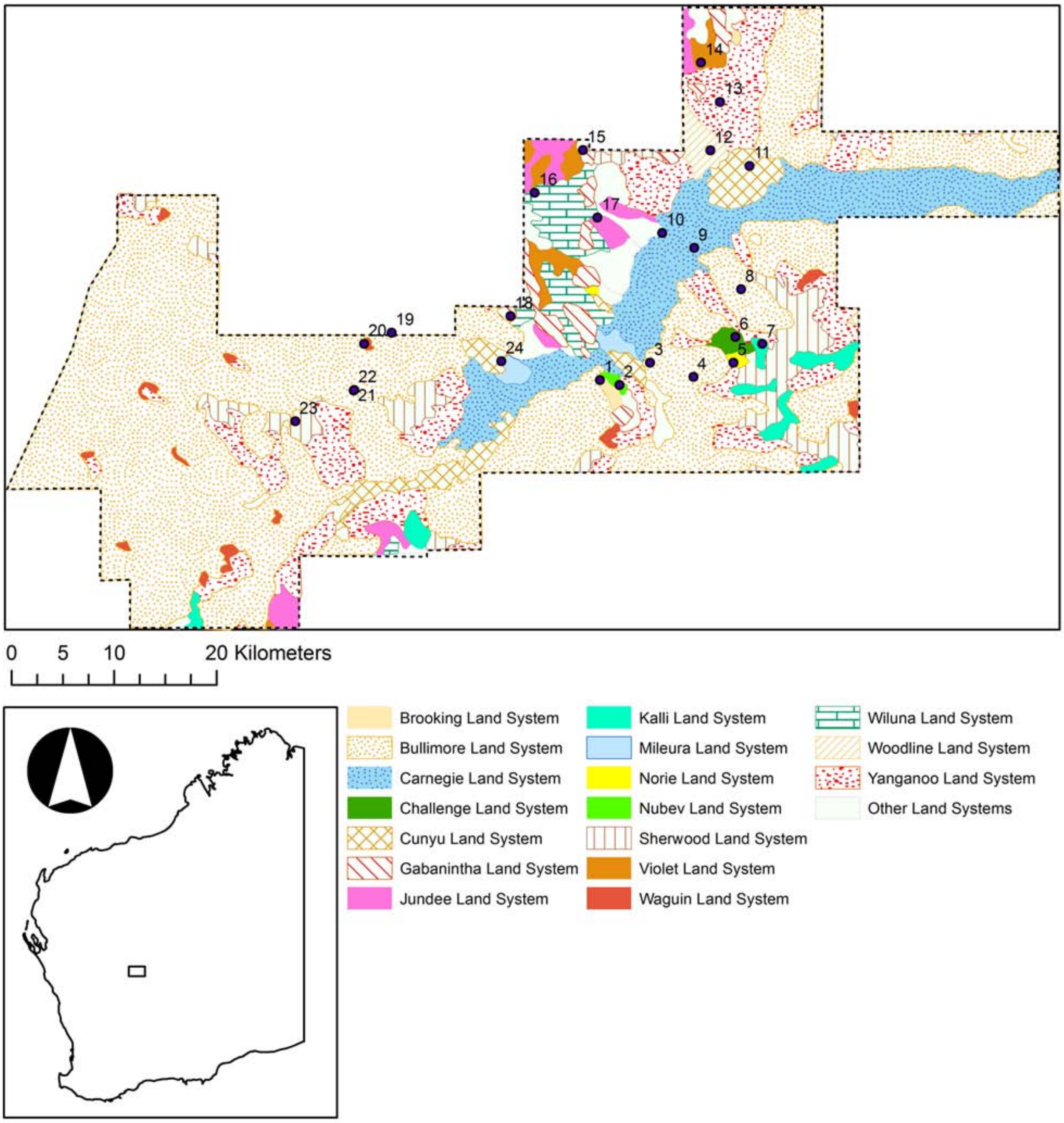


Figure 1. Maps showing location of Lake Mason and Black Range Stations in Western Australia and the location of survey sites in relation to land systems. The dashed line shows the station boundaries while triangles indicate the location of survey sites numbered 1 to 24.

Climate

The climatic regime for the region is that of desert (Payne 1997) with long hot, dry summers and cool winters. Evaporation exceeds mean annual precipitation by a factor of >10, with limited rainfall occurring in both summer and winter. The closest weather station is at Sandstone, approximately 35 km south of the study area. Records for rainfall date from 1904 to 2010 while temperature records are available from 1906 to 2010. The mean maximum temperature is 38 °C (range 35.8–38) and occurs in January while the mean minimum temperature is 3.6 °C (range 3.6–5.1) and occurs in July. Mean annual rainfall is 242 mm and February is the wettest month.

Mean temperature across all five of our surveys was 32.3 °C (SD = 4.0) while the mean minimum temperature was 15.3 °C (SD = 6.4). Average maximum and minimum temperatures were cooler in the September sampling periods (max 28.2 °C, SD = 2.8; min 8.4 °C, SD=1.8) than they were in the November and March periods (max 35.0 °C, SD = 0.2; min 19.8 °C, SD = 0.8). In the months leading up to the first survey in September 2004, Sandstone recorded 323 mm of rainfall. The total rainfall for that year was 349 mm. By late November 2005 a further 163 mm was recorded. There were only two days when any rain fell during a survey period and these were both in November 2004, with a total of 7 mm. In summary, 2004 was an above average rainfall year while 2005 was below average and trapping periods were warm to hot and comparatively dry.

Geology and vegetation

The study area is situated in the central-northern part of the Southern Cross Granite –Greenstone Terrane of the Yilgarn Craton (Chen 2005), which is covered by the Sandstone 1:100,000 and 1:250,000 geological series map sheets. Relief is subdued and ranges from 480–590 m above sea level, but the localised variation is considerably less. Granitic rocks occupy or underlie much of the area but are generally poorly exposed. The most significant outcrops are close to and below breakaway escarpments, a common feature throughout the study area. Large exposures of rounded granite dome surfaces are present, particularly in the south-east. Greenstone formations comprising metamorphosed amphibolites, basalts and fine grained sediments, along with banded iron formations, occur in a broad band almost at the centre of the study area and are part of a larger north-westerly trending system known as the Gum Creek greenstone belt (Wyche et al. 2004). Surface expression of these formations generally take the form of undulating hills but with differing amounts of bedrock exposed (Tingey 1985), although at the southern end of this band there is a low narrow banded ironstone range, the Jasper Hills.

Taking up the central area of the former Lake Mason pastoral lease is Lake Mason itself, a large playa lake that from its southern end trends north-easterly before taking an entirely easterly direction. Its usually dry bed spans around 45 km in length and is close to 2 km at its widest.

Spinifex (*Triodia* spp.) sandplain makes up around 81.8% of the former Blake Range Station. This may include species such as *Eucalyptus kingsmillii*, *E. gongylocarpa* and *Acacia aneura* (mulga), with mulga-dominated plains contributing 11% and breakaways and stony plains 4.5% (Van Vreeswyk et al. 1998). Proportional areas of spinifex are considerably less on Lake Mason (36%) although it is still the dominant vegetation type. Mulga plains make up 15.8%, lake areas 16.5%, with acacia dominated hills, breakaways and stony plains, and calcreted drainage systems contributing 7.7%, 6.7% and 5.8%, respectively. The lower plains and alluvial tracts are dominated by *Acacia* woodlands with *A. aneura* the most abundant species. Understoreys often contain a shrub layer consisting of species of *Eremophila* and *Senna*, along with a variety of grasses. Acacias, including *A. aneura* and *A. quadrimarginea*, are also found scattered around the margins and along drainage lines of granite outcrops and amongst stony hills and ranges. Lake beds are dominated by samphires while the marginal areas and saline drainage tracts often support a variety of chenopods including *Maireana* spp. and *Atriplex* spp. Stands of *Casuarina pauper* with shrubby *Acacia* spp. and chenopod understoreys are found on the calcreted surfaces.

METHODS

Sampling methods

Twenty-four survey locations (sites) were selected to represent the major diversity in land systems, land units and habitat types within the study area on Lake Mason and Black Range stations. Land systems were selected as the primary stratification method as they are mapped at a useful scale (1:250,000) and represent recurring patterns of topography, vegetation and soils across the landscape (Mabbutt 1968). Empirical data support the stratification of components of biodiversity across different land systems (Oliver et al. 2004).

Survey sites were located on 17 of the 28 systems mapped across the study area: these 17 land systems accounted for 96.5% of the total study area. Land system descriptions, their aerial extent, and land unit and habitat descriptions for each of the 24 survey sites are summarised in Appendix 1.

To sample small vertebrates, two pitfall trap-drift fence lines were constructed at each site and positioned approximately 80–100 m apart. Each line consisted of a 60 m long and 0.3 m high aluminium flywire fence with the bottom few centimetres buried in the substrate. At 5 m from each end, and then at 10 m intervals along each fence, a pitfall trap was positioned with its opening centrally located under the fence and flush to the ground. The pitfall traps used were 250 mm wide by 400 mm deep plastic buckets (20 L) alternating with 150 mm wide by 600 mm deep PVC pipes. Thus each line had three plastic buckets and three PVC pipes, and each site had a total of 12 pitfall traps. Insulating material made from cut egg cartons or small polystyrene packing trays, along with small amounts of soil and leaf litter, were placed in the bottom of buckets to provide protection from both weather and predation.

Six medium sized Elliott traps (type A) were set at approximately 15 m intervals starting from the end of each pit-trap line. These were baited with 'universal bait', a combination of oats and peanut butter, and this was replaced every few days.

Traps were checked and cleared each morning between sunrise and 10 am. All captures were identified to species level. Body mass, sex and reproductive status were recorded. For reptiles, snout–vent length was also recorded with a plastic ruler, while for mammals cranium and pes length were measured with a set of vernier callipers. All specimens were either processed on site and immediately released, or brought back to a central location for processing and returned to their original location for release prior to the end of the day. To calculate within-session recapture rates, a small mark from a paint pen (xylene free) was applied to the outside of one ear for mammals and to the abdomen for reptiles. Vouchers for all species caught were lodged with the Western Australian Museum for confirmation of identification and to provide a permanent and reliable record of species caught in this study.

Trap lines at all sites were opened and operated simultaneously for seven consecutive nights over each of the following five periods: from 15–21 September 2004; 25 November to 1 December 2004; 16–22 March 2005; 14–20 September 2005; and 16–22 November 2005. Elliott traps were used for the first two survey periods in 2004, however, as only two mammal individuals were caught from 4032 trap nights, their continued use seemed unlikely to provide useful additional information and therefore they were discontinued.

Floristic survey quadrats were established at each of the 24 sites. These consisted of a 30 × 30 m quadrat marked in the corners with galvanised fence droppers. They were positioned so as to be representative of the typical vegetation community present at each site and were surveyed once only in September 2004. Species presence data was recorded from each site and voucher specimens of most species were lodged with the Western Australian Herbarium.

Visual bird censuses were undertaken over seven days in both September 2004 and September 2005. All sites were surveyed within a 200 m radius of the pitfall trap lines for at least 30 mins on two different mornings or late afternoons during each survey, except for sites 4, 12, 15, 19, 21, 22 and 24, which were surveyed once only for a period of approximately 30 mins each in 2004, while sites 4, 12, 15, 19 and 24 were surveyed once only for a period of approximately 30 mins each in 2005. Additional opportunistic bird sightings were recorded during the course of the surveys.

Nomenclature for all taxa referred to follow that of the Western Australian Museum for fauna and the Western Australian Herbarium for flora from the most current lists as of March 2017.

Statistical analyses

Permutated species accumulation curves were produced in PRIMER for observed data as well as for the Chao 1, Jackknife 1 and Bootstrap species richness estimators using pitfall captures. These estimators were used as they are considered to give a meaningful view of species diversity in an assemblage where abundance data is available (Magurran 2004), although in situations where rare species represent a significant proportion of the total sample Bootstrapping is considered superior (Poulin 1998). Estimations of total species richness with Chao 1(bias corrected) and Jackknife1 at each site was undertaken with the program SPADE (Chao & Shen 2003). While Bootstrapping estimates were acquired from PRIMER.

Assemblage analysis for vertebrate pitfall captures and floristic quadrat data was undertaken using the Bray–Curtis association measure in PRIMER v6. When applied to presence/absence data, as was the case with the floristic data, this index is then the equivalent of a Sorensen index (Legendre & Legendre 1998). From a community analysis perspective species that were too large to be captured and sampled reliably by pit trapping, but had been occasionally captured or observed in the study area, were excluded from subsequent quantitative multivariate analysis. These exclusions were the larger varanids and snakes (*Varanus giganteus, V. gouldii, V. panoptes, V. tristis, Pseudonaja mengdeni, P. modesta, Pseudechis australis/butleri*), mammals (*Tachyglossus aculeatus, Macropus robustus, M. rufus*) and frogs (*Neobatrachus wilsmorei, Pseudophryne occidentalis*). Similarity analysis of floristic data was undertaken with the removal of all species having only a single site occurrence (although a full list of all species is provided in Appendix 4). Data were clustered using Unweighted Pair Group Method with Arithmetic Mean (UPGMA) and structures between samples were determined using the similarity profiling routine (SIMPROF; Clarke & Gorley 2006). SIMPROF tests for evidence of structure in a set of samples and can be used to objectively define meaningful groups within a dendrogram. Indicator species analysis (Dufrene & Legendre 1997) using the PC-ORD Package (Mccune & Mefford 1999) was used to identify species with high fidelity within the SIMPROF defined groups and also as a secondary assessment to confirm ecologically appropriate cut point for the dendrograms (McCune et al. 2002). Multi-Dimensional Scaling (MDS) in PRIMER was used to graphically represent sample associations. Similarity derived from the dendrograms at the 30% level for flora and reptiles and 45% level for mammals were overlain on the MDS plots. Comparison between multiple resemblance matrices was undertaken using 2nd stage MDS in PRIMER whereby a single correlation matrix of p values (Spearman rank correlations) is produced defining overall similarity of the matrices with each other. This was undertaken to test for association between the site patterns for reptiles, mammals and vascular flora.

An assessment of overall sampling adequacy for the purpose of differentiating assemblage structure was also undertaken using 2nd Stage MDS. Here results from each sampling period were combined so data from sampling period one was compared with the cumulated data from sampling periods one and two and then these were compared against the cumulated data for sampling periods one, two and three, etc. The statistical package GENSTAT (VSN International) was used for comparative analysis of the effectiveness of the two pit trap types used in this survey.

RESULTS

Reptiles and mammals

Species richness

We conducted 10,080 pit-trap days over five separate surveys between September 2004 and November 2005. Seventy-two species of native fauna were recorded from captures of 2028 individuals over the 35 nights of trapping (Appendix 2). For reptiles there were 18 skinks species, 15 geckos, 9 dragons, 8 snakes, 6 varanids, 2 pygopods and 2 amphibians. For the mammals there were 9 dasyurids and 3 rodents. Additional native species that were not included in trapping data but were observed include two macropods, three bats and the echidna.

The most abundantly trapped species were *Gehyra variegata* ($\bar{x}$ = 32.6 captures per survey, SD = 22.05), *Rhynchoedura ornata* ($\bar{x}$ = 25.8, SD = 12.68), *Sminthopsis macroura* ($\bar{x}$ = 25.2 , SD = 11.12), *Lucasium squarrosum* ($\bar{x}$ = 21 , SD = 15.52), *Strophurus elderi* ($\bar{x}$ = 19, SD = 18.19), *Diplodactylus pulcher* ($\bar{x}$ = 19 , SD = 17.59) and *Heteronotia binoei* ($\bar{x}$ = 18.4, SD = 9.61). Each of these species had >90 captures over the course of the survey and was detected in every survey period, although abundance was highly variable across survey periods. All of these species were detected on at least 50% of sites except for *Strophurus elderi,* which was confined to the five sites with spinifex (Bullimore land system). All the other species occurred across a range of habitats that generally excluded spinifex.

Other wide-spread but less abundant taxa included *Lerista timida* ($\bar{x}$ = 16.0, SD = 11.6), *Sminthopsis ooldea* ($\bar{x}$ = 15.2, SD = 5.45), *Menetia greyii* ($\bar{x}$ = 14.4, SD = 6.58), and *Pseudomys hermannsburgensis* ($\bar{x}$ = 5.4, SD = 1.14), with all occurring on at least 50% of surveyed sites and all detected every survey period.

Species that were even less abundant but were detected on each of the five survey periods were *Cryptoblepharus buchananii, Ctenophorus caudicinctus, C. nuchalis, Ctenotus leonhardii, C. pantherinus, C.* aff. *quattuordecimlineatus, C. schomburgkii, Delma butleri, Egernia depressa, Mus musculus, Ningaui ridei, Notomys alexis, Sminthopsis crassicaudata, S. hirtipes, S. longicaudata, Strophurus wellingtonae, S. strophurus* and *Varanus caudolineatus.*

Several species that are only intermittently caught when pitfall traps are used were recorded during this survey. This included the brush-tailed mulgara (*Dasycercus blythi*), which was recorded at sites 8 and 19, both in the Bullimore land system dominated by spinifex sandplain.

The long-tailed dunnart (*Sminthopsis longicaudata*) was captured 29 times from seven sites. This is currently listed as a Priority 4 species. Captures were reliable on each survey with a mean capture rate of 5.8 (SD = 1.3) individuals per survey period. The majority of these occurred in the breakaways (site 23), on the Gabanintha land system (site 18) or the Jasper Hills (site 1). However, individuals were detected at other sites with the common environmental attribute being a stony substrate with sparse vegetation.

Although not formally considered rare or endangered the kultarr (*Antechinomys laninger*) is a species that is infrequently encountered. There were two records of this species from this survey, both from site 20 within the Waguin land system which consists of a stony substrate with halophytic vegetation and a mulga over storey.

A number of vertebrate species that were difficult to detect and document were captured on only one of the five survey periods and were generally represented by only one individual. These were *Ctenophorus salinarum, Ctenotus severus, Ctenotus uber, Nephrurus laevissimus, Pygopus nigriceps, Suta fasciata, Tiliqua occipitalis, Lucasium stenodactylum* and *Pseudomys desertor*. Other species trapped on only two occasions and in low abundance were *Liopholis inornata, Brachyurophis semifasciata, Simoselaps bertholdi* and *Ctenotus grandis*.

Five introduced species of vertebrate were recorded during the survey: the fox (*Vulpes vulpes*), feral cat (*Felis catus*), rabbit (*Oryctolagus cuniculus*), goat (*Capra hircus*) and the house mouse (*Mus musculus*). Most of these were in low numbers and infrequently seen, apart from rabbits which were most abundant around the lake system, and the house mouse which is considered naturalised and was caught on nine of the trapping grids. Past evidence of goats was particularly high around the breakaways, banded ironstone ranges and exposed granites, although their numbers have reduced to a point where they no longer appear to be an ongoing problem. Evidence of grazing by domestic stock was also particularly apparent at sites 12 and 13 where grasses, herbs and small shrubs were almost entirely absent from the sites and there was evidence of loss of surface soil.

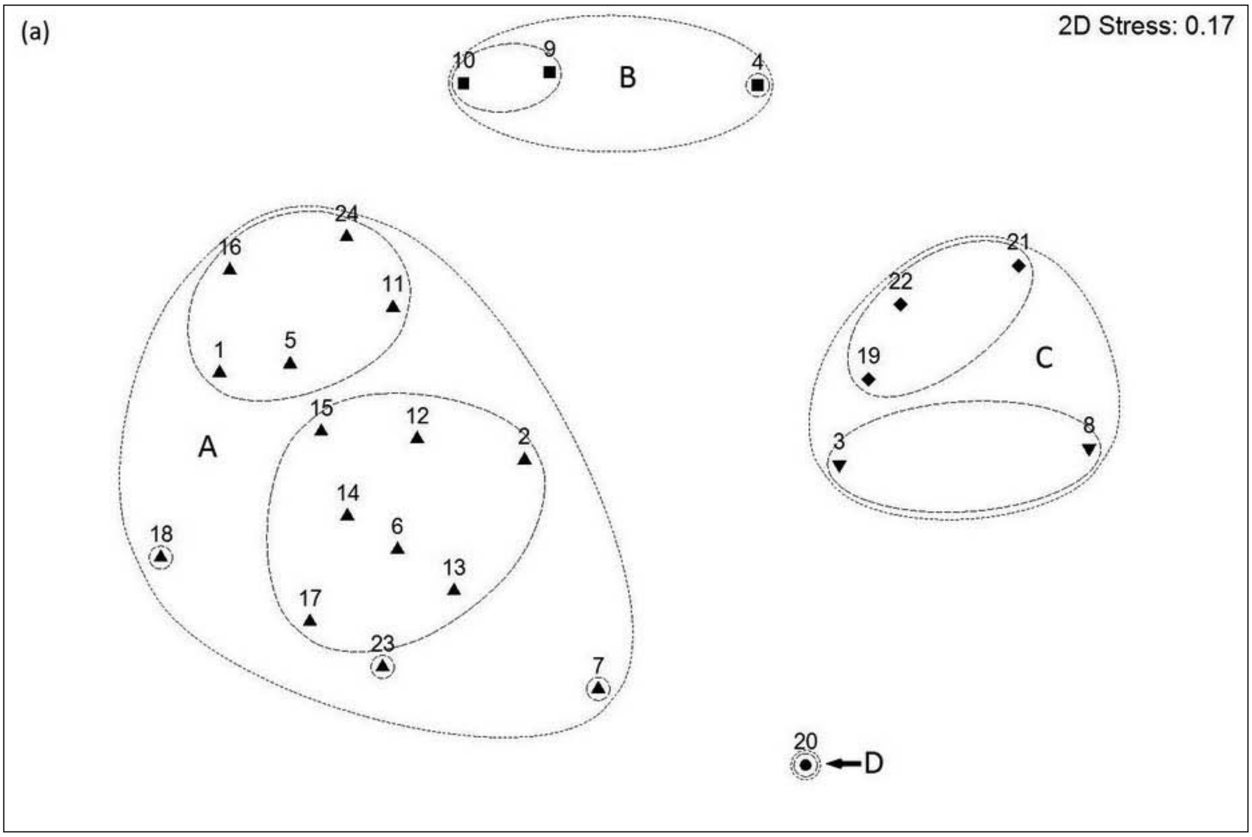
Fifty-one reptile species (1538 individuals) were caught, with a mean trap efficiency across all survey periods of 0.1526 (SD = 0.0774; range 0.0565–0.2311) captures per pit trap night. We captured thirteen mammal species (470 individuals), with a mean trap efficiency across all survey periods of 0.0466 (SD = 0.0105; range 0.0317–0.0565) captures per pit trap night.

Community assemblages

For reptiles, approximately 50% of the total number of species had been caught after 62 individuals and 75% had been caught after 224 individuals (Fig. 3a). The Chao 1, Jackknife 1 and Bootstrap estimators are in close agreement on the total number of reptile species at the end of the survey with 56.9, 56.9 and 53.8, respectively (Fig. 3a). This would indicate that by the end of the survey between 90–95% of trappable species had been caught.

For mammals, 50% of species (6.5) had been caught after 13 individuals and 75% (9.75) after 44 individuals. Chao 1, Jackknife 1 and Bootstrap estimators were 13, 13 and 13.4 respectively, suggesting that 97–100% of mammal species had been sampled by the end of the survey period (Fig. 3b).

The grouping in the MDS plot for the reptiles (Fig. 2a) is defined by 30% similarity from Bray–Curtis abundance data and UPGAMA clustering. This level was used as it closely approximated the split defined by the more objective SIMPROF routine (Clarke & Gorley 2006) and using indicator species analysis (Mccune et al. 2002). The latter method identified four distinct



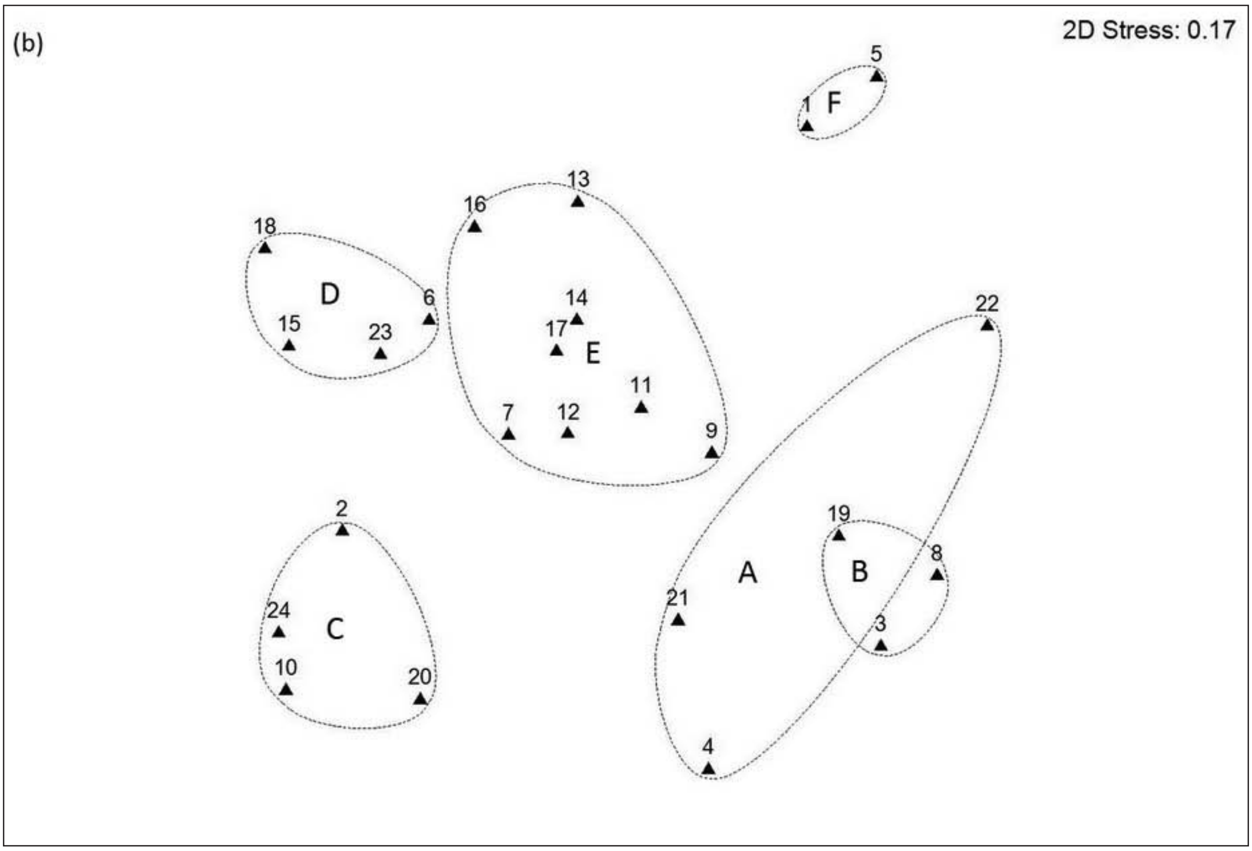


Figure 2. An MDS ordination of the sites for (a) reptiles and (b) mammals. Symbol groups are defined by SIMPROF and clusters enclosed with the dashed lines are at the 30% (outer) and 45% (inner) similarity level for reptiles and 45% similarity for mammals. Note that the use of SIMPROF did not resolve any significant structure for sites in relation to mammals and therefore there is only a single symbol.

assemblages while the SIMPROF routine identified a fifth (Table 1). Adequacy of sampling for each of the four groups was determined by comparing the mean number of observed species at each site within a group to the mean number of predicted species from the Chao 1, Jackknife 1 and Bootstrap estimators. For Group A the observed species richness compared to the estimators indicated that between 78% and 88% of

Table 1

Site groupings defined by reptile assemblages and the significant indicator species for the groupings. Sampling adequacy for each of the groups is assessed through examination of the observed species and the various species estimators.

	A	B	C	D
Sites	1, 2, 5, 6, 7, 11 12, 13, 14, 15, 16, 17, 18, 23 and 24	4, 9 and 10	3, 8, 19, 21 and 22	20
Description	Stony and/or hardpan plains with acacia shrublands	Fringing lake sites (sites 9 and 10) and recently burnt spinifex sandplain site (site 4)	Spinifex sites: SIMPROF analysis split sites 3 and 8 (Mulga overstorey) from the others	Open alluvial plain incorporating chenopod shrubs
Indicator species and IV value	*Diplodactylus pulcher* (59.1%)* *Lerista timida* (65.9)*	*Ctenophorus nuchalis* (93.4%)** *Ctenotus leonhardii* (56.3%)* *Lerista desertorum* (60.3%)* *Strophurus strophurus* (62.9%)*	*Ctenotus pantherinus* (80.0%)* *Ctenotus* aff. *quattuordecimlineatus* (87.3%)** *Delma butleri* 100.0%)** *Strophurus elderi* (100.0%)**	No indicator values but contained highest captures for *Diplodactylus pulcher* (33 individuals) and *D. conspicillatus* (11 individuals)
Species observed	11.4 (SD=2.7)	12.3 (SD=4.2)	15.8 (SD=3.1)	15
Chao 1	13.5 (SD=4.4)	15.4 (SD=5.2)	23.6 (SD=13.3)	17.1
Jackknife 1	14.5 (SD=3.8)	16.6 (SD=5.1)	21.9 (SD=5.3)	20.9
Bootstrap	12.9 (SD=3.2)	14.2 (SD=4.5)	18.6 (SD=3.7)	18

* P < 0.05; ** P < 0.01

Table 2

Site groupings defined by mammal assemblages and the significant indicator species for the groupings. Sampling adequacy for each of the groups is assessed through examination of the observed species and the various species estimators.

	A	B	C	D	E	F
Sites	4, 21 and 22	3, 8 and 19	2, 10, 20 and 24	6, 15, 18 and 23	7, 9, 11, 12, 13, 14, 16 and 17	1 and 5
Description	Spinifex including recently burnt site as well as dune crest and base site	Unburnt spinifex	Alluvial plains and calcreted drainage plains with halophytic shrublands	Breakaway, green-stone hills and undulating plain all dominated by acacia shrublands	Sandy sites and wash plains on hardpan, generally incorporating tall acacias. Large areas of bare ground.	Ironstone screes and exfoliating granitic domes dominated with acacia shrubland
Indicator species and IV value	*Sminthopsis hirtipes* (87.7%)**	*Ningaui ridei* (80.5%)** *Dasycercus blythi* (66.7%)*	*Sminthopsis crassicaudata* (67.2%)** *Mus musculus* (61.1%)*	*Sminthopsis longicaudata* (60.5%)* *S. macroura* (59.7%)***	No significant indicator species	*Pseudantechinus woolleyae* (100.0%)**
Species observed	5.0 (SD=2.6)	5.7 (SD=1.5)	4.5 (SD=1.9)	3.5 (SD=0.6)	3.8 (SD=1.9)	3.0 (SD=1.4)
Chao 1	5.5 (SD=3.5)	7.2 (SD=3.3)	5.0 (SD=2.4)	4.1 (SD=1.4)	4.5 (SD=2.3)	3.0 (SD=1.4)
Jackknife 1	6.6 (SD=3.8)	8.2 (SD=4.0)	5.4 (SD=2.9)	4.9 (SD=0.8)	4.7 (SD=2.2)	3.0 (SD=1.4)
Bootstrap	5.7 (SD=3.3)	6.7 (SD=2.4)	5.0 (SD=2.5)	4.1 (SD=0.5)	4.2 (SD=1.7)	3.1 (SD=1.6)

* P < 0.05; ** P < 0.01; *** P < 0.001

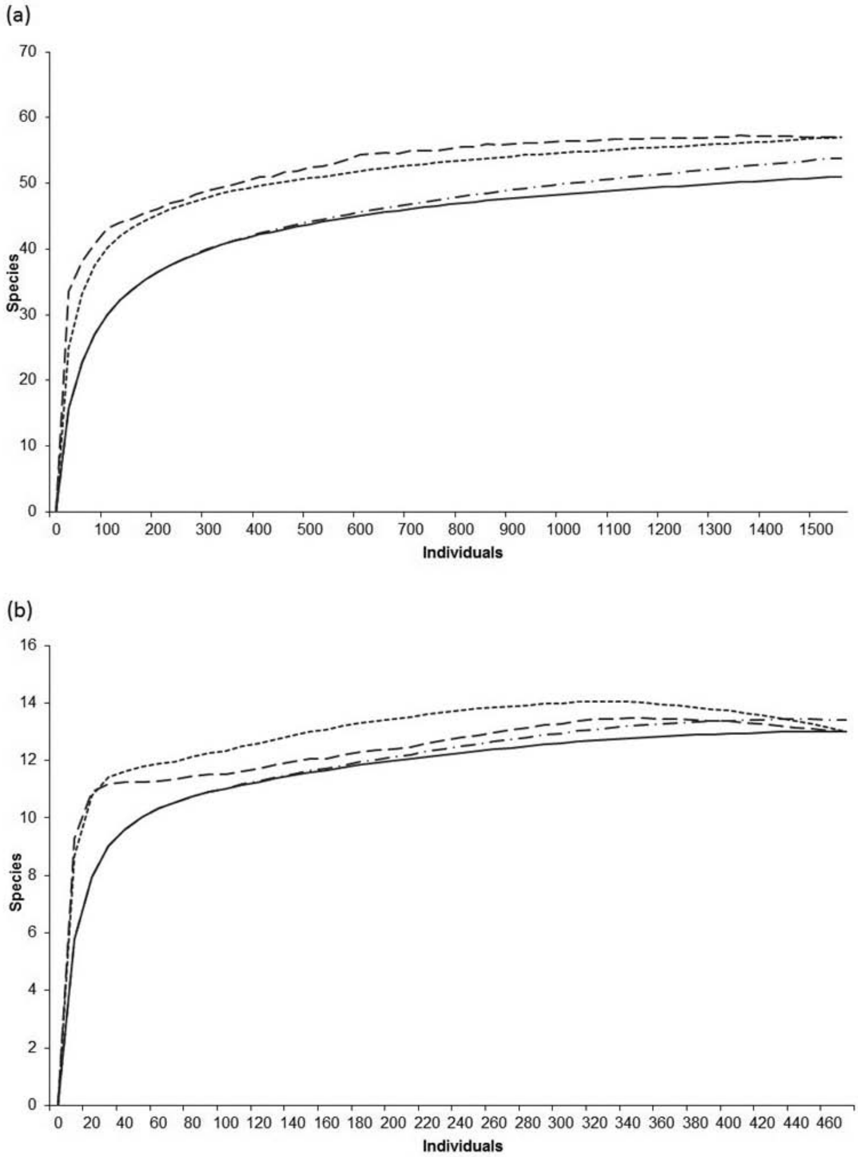


Figure 3. Permutated species accumulation curves for (a) pit-trapped reptiles and (b) pit-trapped mammals. Solid lines represent observations; dashed lines represent Chao 1 estimates; dotted lines represent Jackknife 1 estimate; and dashes and dots represent Bootstrap estimates.

species had been sampled. For Group B it was estimated that 74–87% of species were sampled; Group C, 67–84% of species and Group D, with a single site, 72–88% of species. In almost all cases Bootstrapping had the most conservative estimations.

As Chao 1 uses rarity to predict species, the regular occurrence of single representatives of a number of taxa will result in high predictions. Isolated climatic events that stimulate animal activity over short durations (e.g. a single evening of rainfall or high humidity and temperature) can also have a considerable impact here as can proximity of a site to other habitat types. Mammal groups were not readily distinguishable in the dendrogram through the SIMPROF routine (Fig. 2b) so a cut point was determined using indicator species analysis (Dufrene & Legendre 1997; Mccune et al. 2002). This identified six groups at the 47% similarity level and eight significant indicator species (Table 2).The mean for species observed within each group was compared against the range of values provided by each of the estimators for the same data to determine the level of sampling adequacy for each of the groups. For Group A this indicated that 76–91% of species were sampled; Group B, 70–90%; Group C, 83–90%; Group D, 71–85%; Group E, 80–90%; and Group F, 96–100%.

From the Spearman Rank correlation matrix comparing the combined different resemblance matrices with each other (Table 3), it was possible to determine how many sampling periods were required before additional sampling contributed little change to the assemblage groups. After three sampling periods (r^2 = 0.97), additional sampling of reptiles would not have resulted in a significant difference in the overall reptile assemblage grouping. For the mammals, four sampling

Table 3

Spearman Rank correlation matrix for cumulative trapping data for reptiles and mammals.

	Trip 1	Trip 2	Trip 3	Trip 4
Reptiles				
Trip 2	0.82			
Trip 3	0.79	0.97		
Trip 4	0.80	0.96	0.98	
Trip 5	0.79	0.92	0.95	0.97
Mammals				
Trip 2	0.67			
Trip 3	0.50	0.71		
Trip 4	0.59	0.74	0.98	
Trip 5	0.54	0.76	0.92	0.92

periods were required before a close correlation with further sampling was achieved ($r^2 = 0.98$).

Comparison of trap types

Buckets caught1364 individuals or 64.3% of all captures and this higher capture rate resulted in a significant chi squared statistic ($\chi^2 = 219.21$, $p < 0.0001$). However, 10 species were caught in the buckets but not in the PVC pipe while PVC pipes caught nine species not caught in the buckets. Where species were caught in both trap types, there were more individuals in the buckets, with the exception of *Notomys alexis*, *Varanus panoptes*, *Tympanocryptis pseudopsephos*, *Sminthopsis macroura*, *S. longicaudata*, *S. hirtipes*, *S. crassicaudata*, *Pseudantechinus woolleyae*, *Nephrurus vertebralis* and *Egernia depressa,* but even for these there was only a statistically significant difference for *N. alexis* ($\chi^2 = 20.22$, $p < 0.0001$). A comparison of the entire data set of species abundances in each of the trap types using Wilcoxins matched-pairs test further supports the difference between the two trap types with a test statistic of 503.5 ($p < 0.001$) .

Climatic conditions are thought to influence sampling effectiveness. Spearman Rank correlations corrected for ties showed that three families had significant associations with the mean maximum temperature. These were the Carphodactylidae ($r^2 = 0.87$, $p < 0.08$), the Gekkonidae ($r^2 = 0.90$, $p < 0.02$) and the Elapidae ($r^2 = 0.78$, $p < 0.08$). Conversely, the Pygopodidae had a negative correlation with mean maximum temperature ($r^2 = -0.87$, $p < 0.08$). For Agamids there was a significant correlation with survey sequence ($r^2 = -1.0$, $p < 0.001$).

Birds

Sixty-seven of the 73 species of birds from 29 families recorded during the survey were recorded from within the quadrats (Appendix 3). While the avifauna was surveyed on at least two days, on and immediately around each of the 24 survey site locations, these data were not considered robust enough to be analysed to the same extent as that of the small ground-dwelling vertebrates and no statistical analyses were undertaken.

There were two species of particular conservation interest: the hooded robin (*Melanodryas cucullata*) and the peregrine falcon (*Falco peregrinus*). The hooded robin, while not listed as threatened, has declined in both range and abundance in south-eastern and south-western Australia (Barrett et al. 2003). We recorded this species on five sites (Appendix 3) with all of these sites containing a single floristic assemblage (Group D) as defined by our analysis (Fig. 4). The specially protected peregrine falcon was also only recorded once, from site 23.

A species of conservation significance that was not recorded on quadrats but was seen on several occasions during the survey was the malleefowl (*Leipoa ocellata*), which is listed as Vulnerable.

Only eight species were observed on more than half of the survey sites: yellow-throated miner (*Manorina flavigula*, 23 sites); singing honeyeater *(Lichenostomus virescens*, 21 sites); pied butcherbird (*Cracticus nigrogularis*, 17 sites); grey butcherbird (*Cracticus torquatus*, 23 sites); crested bellbird (*Oreoica gutturalis*, 20 sites); rufous whistler (*Pachycephala rufiventris*, 13 sites); Australian ringneck (*Platycercus zonarius*, 13 sites); and grey-crowned babbler (*Pomatostomus temporalis*, 13 sites). Almost 21% (14 species) of the recorded species were only observed on a single site. The majority of sites had fewer than 20 species recorded although sites 23, 20, 17, 15, 14 and 9 were the exceptions with 46, 34, 28, 21, 23 and 20 species respectively.

Vascular plants

The 301 taxa recorded from the quadrats (Appendix 4) represented 44 families and 138 genera with the dominant families being the Asteracea (34 taxa), Fabaceae (32 taxa), Chenopodiaceae (29 taxa) and Scrophulariaceae (28 taxa). No taxa listed as rare or endangered were recorded during the surveys. We recorded four priority-listed taxa from four families: *Labichea eremaea* (P1, Fabaceae), *Baeckea* sp. Sandstone (P3, Myrtaceae), *Grevillea inconspicua* (P4, Proteaceae) and *Eremophila arachnoides arachnoides* (P3, Scrophulariaceae).

Twelve plant taxa from six families could not be identified with taxonomic certainty, primarily because the plants were sterile and a confirmed identification was not possible. These were: Chenopodiaceae (3 species), Fabaceae (1 species) Malvaceae (4 species), Poaceae (1 species), Portulacaceae (2 species) and Zygophyllum (1 species). A further four taxa are awaiting formal descriptions and are currently only attributed manuscript names: Fabaceae (2 species), Myrtaceae (1 species) and Portulacaceae (1 species).

As we only collected presence data for plant taxa, we used frequency of occurrence as an indicator of how common each taxa was across our sites. Only six taxa were recorded in more than half of the sites sampled. These were *Acacia aneura* and *A. tetragonophylla* (large shrubs or trees); *Ptilotus obovatus* and *Solanum lasiophyllum* (low shrubs); and *Erodium cygnorum* and *Brachyscome ciliaris* (annual or perennial herbs). Just over half of the taxa recorded (149) were present in only one of the 24 quadrats.

Using the Chao 2 estimator, which examines the ratios of single occurrence to double occurrence as a proportion of overall richness to predict the sampling effectiveness, only 64% of taxa were predicted to have been sampled, with the forecast total number being 467. The Western Australian Herbarium has vouchered material for 413 native and 11 alien taxa from the broader study site area. Richness for individual quadrats ranged from 11–53 taxa, with the spinifex-dominated sites generally the poorest and fringing lake sites, drainage sites and rocky habitats the richest.

Nine taxa from nine families recorded from quadrats were introduced, with a further two introduced taxa known from the study area. Sites 24, 17 and 10 had the highest richness of introduced taxa, with five (*Sonchus oleraceus, Sisymbrium orientale, Cuscuta epithymum, Erodium aureum* and *Solanum nigrum*) , three (*Rostraria pumila, Rumex hypogaeus* and *Lysimachia arvensis*) and three (*S. oleraceus, R. hypogaeus* and *L. arvensis*) taxa respectively, while site 14 had two taxa (*C. epithymum* and *Portulaca oleracea*) and sites 9 (*P. oleracea*) and 23 (*S. nigrum*) one taxa. Site 24 has had considerable disturbance from grazing and is adjacent to an historic town site. Site 17 is a shaded mulga patch on a drainage channel and site 10 is on the lake fringe, both areas that were probably favoured by grazing stock.

Floristic groupings in the dendrogram were well supported at the 20% cut point with four groups identified using 41 significant indicator species (Table 4; Appendix 5), although SIMPROF analysis differentiated one additional group by splitting site 4 from sites 21 and 22 (Fig. 4.) Only the four groups identified through indicator analysis were examined further in the assemblage comparisons.

Assemblage comparisons

The Spearman rank correlation matrix (r^2 values) between the groups exhibited weak correlations with a reptile–mammal comparison of 0.41, reptile–flora of 0.53, mammal–flora of 0.35, avifauna–flora of 0.44, avifauna–reptiles of 0.39, and avifauna–mammals of 0.16. A resemblance matrix of soil chemistry was also tested against each of the biotic groups using 2nd MDS but the resultant values were so low (<0.11 for each group) they did not warrant further examination.

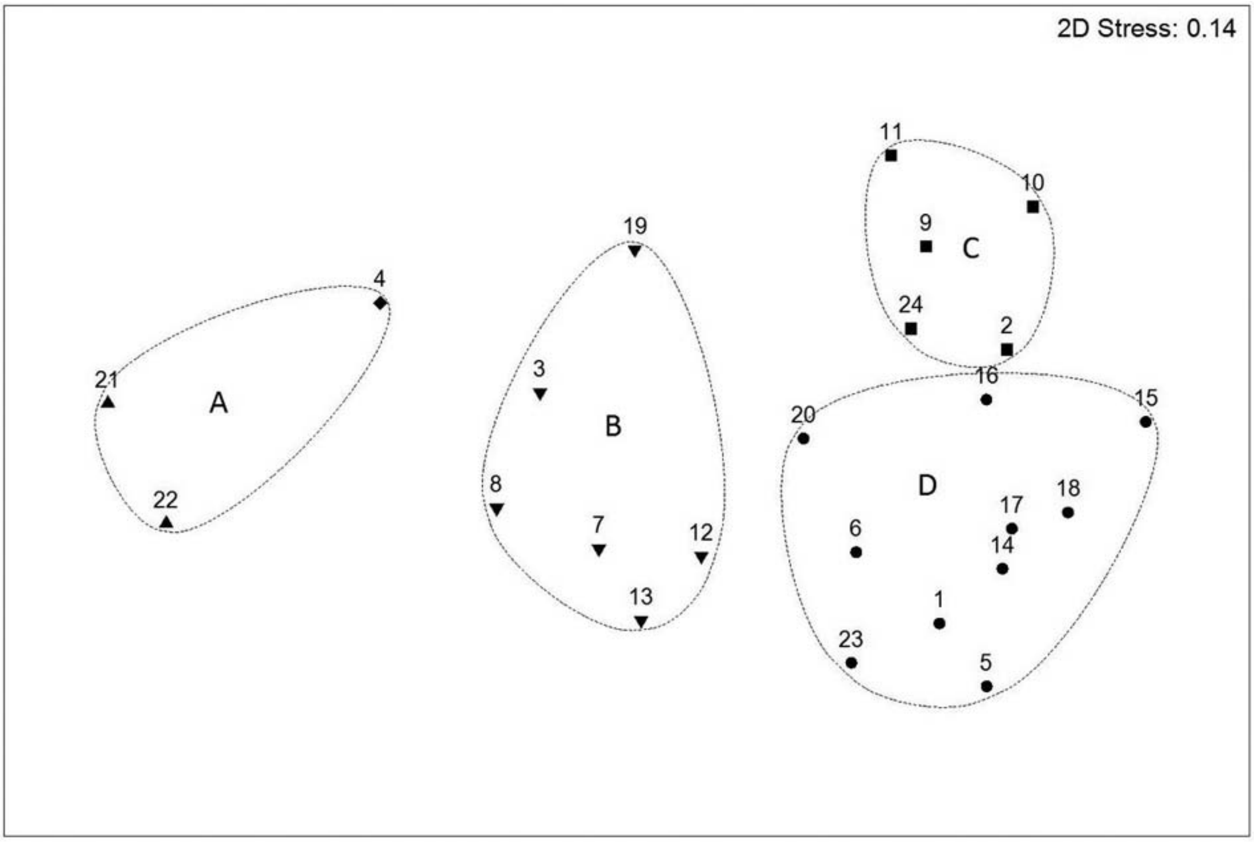


Figure 4. An MDS ordination of sites from floristic data (symbol groups defined by SIMPROF and clusters enclosed with dashed line are at the 30% similarity level). Species with a single occurrence were not included in the analysis.

Table 4
Site groupings defined by flora assemblages and the significant indicator species for the groupings.

	A	B	C	D
Sites	4, 21 and 22	3, 7, 8, 12, 13, 19,	2, 9, 10, 11 and 24	1, 5, 6, 14, 15, 16, 17 18, 20 and 23
Description	Spinifex including recently burnt site as well as dune crest and base site	Spinifex shrubland/ sandplain sites along with sandy wash plains supporting Acacia species	Sites located around the periphery of the lake and or supporting halophytic vegetation	Dominated by rock (break-aways, iron stone ranges and granitic hills) or have a high proportion of broken rock with shallow soils.
Indicator species and IV value	*Daucus glochidiatus* (100%)*** *Podolepis* sp. (85%)**	*Homalocalyx thryptomenoides* (50%)* *Glischrocaryon flavescens* (48%)*	*Marsdenia australis* (85%)*** *Cuscuta epithymum* (IV=64%)*	*Erymophyllum ramosum* (70%)** *Chrysocephalum eremaeum* (70%)***

* P < 0.05; ** P < 0.01; *** P < 0.001

DISCUSSION

Fauna and flora

The overall number of species within the various families is similar to that of other surveys we have conducted using similar methods at Goongarrie Station and Matuwa (ex-Lorna Glen Station) , located at the southern and northern extent, respectively, of the Murchison Bioregion. The 58 reptile species recorded from this study, along with the predicted vertebrate richness of an additional seven reptile species, indicates the overall reptile assemblage is likely to be about 65 species. This figure is at the upper end of the range for landscape-scale surveys reported in Australia (Thompson et al. 2003; How & Dell 2004). While similar comparisons for mammal surveys have not been undertaken, the 15 terrestrial native mammal species recorded here is only four fewer than the number of terrestrial mammal species considered extant for the entire Murchison Bioregion (Burbidge et al. 2008). Only two species of frog, from six potential species, were recorded. This is not surprising, however, as the conditions throughout most of the survey remained warm to hot, and predominantly dry. The majority of semi-arid zone frogs form a 'cocoon' and aestivate, buried some distance below the soil surface under these conditions (Lee & Mercer 1967). We recorded 73 species of bird with 67 of these present within the quadrats. There are a further 49 species known from the survey area that we did not record (Appendix 3). Many of these are water birds, and given that conditions remained dry throughout our survey their absence was not unexpected. Two species of conservation significance for which records exist in the area are the rainbow bee-eater (*Merops ornatus*) and the greater egret (*Ardea modesta*). Both species are listed under international treaties for migratory birds and while the greater egret would be only a very infrequent visitor coinciding with inundation of the lake, the rainbow bee-eater is likely to be more frequently encountered.

These results are comparable to those recorded within the Sandstone – Sir Samuel, Laverton–Leonora and Youanmi–Leonora study areas of the Eastern Goldfields surveys, in which recorded 54 reptile species, 10 small mammals and three larger mammals, three frogs and 63 birds from surveyed quadrats (McKenzie et al. 1994). Reptile species that were not encountered but would be expected to occur in the area include elapid snakes such as *Pseudechis australis* and *Demansia psammophis,* as well as smaller fossorial species. These larger and more mobile species are more likely to be encountered through visual observation or with the use of funnel traps. The four mammal species known from the Murchison Bioregion but not caught (*Pseudomys bolami, Ningaui yvonneae, Sminthopsis dolichura and Macropus fuliginosus*), are unlikely to occur within the study area. *P. bolami, N. yvonneae* and *M. fuliginosus* have distributions only just incorporating the southern edge of the Murchison Bioregion (Menkhorst & Knight 2004; Van Dyck & Strahan 2008; Western Australian Museum 2010–), while the study area is just outside the north-eastern extent of the known range of *S. dolichura*.

Most of the species surveyed are comparatively common and widespread across suitable habitat and are generally typical of the Eremaean Botanical Province (Menkhorst & Knight 2004; Storr et al. 1983, 1990, 1999, 2002; Tyler & Doughty 2009; Van Dyck & Strahan 2008). However, three mammal species we only recorded twice and these were *Antechinomys laniger, Dasycercus blythi* and *Pseudomys desertor*. All but one of the captures, for *P. desertor,* were in PVC pipe, as the 600 mm depth means that these species cannot escape easily, as they can from the shallower buckets. Each of these species frequently remains undetected or in low numbers for long periods and have what appears to be cyclical peaks of abundance in the landscape. Populations of the rodent *P. desertor* have been reported to fluctuate in response to rainfall over the preceding six months (Masters 1993; Dickman et al. 1999) while Haythornthwaite (2006) recorded temporal variability for the detection of *Dasycercus cristicauda* which, after a recent taxonomic revision (Woolley 2005), is now considered to be *D. blythi*. A study of *D. blythi* at Mt Keith Station east of Sandstone recorded sharp temporal variation in abundances (D. Pearson pers. comm.). A targeted survey undertaken by BHP's Leinster Nickel operation (approximately 130 km east of Lake Mason) recorded 15 *Antechinomys laniger* from just 40 Elliott traps set for five nights in a sampled area of <1 ha (Hughes 2003). However, when a survey with more than seven times this effort was conducted in the same area and season two years later only one individual was caught. For mammal taxa that have highly dynamic populations correlated with seasonal or even longer temporal scales associated with rainfall, absence or rarity cannot necessarily be inferred from non-detection or low abundance. This is particularly the case with short-term sampling over a 15-month period as with this study.

While a number of reptile species were also captured infrequently, none of these are considered rare and the low capture rates can be attributed to one or more of the following: limited sampling within suitable habitat (e.g. *Ctenophorus salinarum*); species towards the limits of their range (e.g. *Ctenotus severus*); climatic conditions not amenable to activity during the surveys (e.g. *Brachyurophis semifasciata* and *Simoselaps bertholdi* and all frog species); and species known to have low abundances (e.g. *Tiliqua occipitalis* and *Liopholis inornata*).

Only two species of ground vertebrates recorded are listed as Priority species, the brush-tailed mulgara (*Dasycercus blythi*) and the long-tailed dunnart (*Sminthopsis longicaudata*). *D. blythi* was caught only on two occasions. Pit trapping is not an efficient method for detecting *D. blythi* due to its size, but given that its preferred habitat of spinifex sandplain is widespread and extensive across the study area, it is likely that this species is more widespread and abundant than can be concluded from this study. The preferred habitat of *S. longicaudata* is sparsely vegetated stony substrates, including gibber fields, breakaways and rocky ranges. This study has greatly increased our understanding of the habitat preferences and variation in the species. It was detected on almost all survey sites (Appendices 1 and 2) with these substrate features and is likely to be found in additional areas where these habitat features are present.

A number of species recorded were towards the geographic limit of their known distribution. Species converging on their north, east or north-eastern limit include *Ctenophorus salinarum, Ctenotus severus, Tiliqua occipitalis, Lerista macropisthopus, Neobatrachus wilsmorei, Pseudophryne occidentalis, Anilios waitii, Morethia butleri* and *Strophurus assimilis*. Species close to the south, west or south-western extent of their ranges include *Ctenotus quatturodecimlineatus, Lerista desertorum, Varanus eremius, Diplodactylus conspicillatus, Ningaui ridei, Sminthopsis longicaudata, Strophurus elderi* and *Sminthopsis ooldea*.

At least one reptile species in the study area is taxonomically unresolved. Recent phylogenetic analysis has indicated that the species currently identified as *Ctenotus quatturodecimlineatus* at our study area is likely to be a cryptic species *Ctenotus* aff. *quatturodecimlineatus* (Rabosky et al. 2009). The current known distribution *Ctenotus* aff. *quatturodecimlineatus* is confined to the study area although no systematic survey has been conducted in immediately adjacent areas. All collection records have been from spinifex sand plain and sand dunes (Bullimore land system sites 3, 4, 8, 19, 21, 22) with the exception of site 20 (Waguin land system), which supports halophytic shrubs and mulga on a small stony plain. This relatively insular sampling site is restricted in extent and surrounded by Bullimore, thus the possibility of this individual being non-resident in this habitat is high.

Within the dasyurids there are potential identification problems with *Sminthopsis ooldea*, partially because there is frequently some level of confusion in the field between the identity of this species and that of *S. dolichura*, and the full extent of its geographic range is unclear. There remains a question as to whether or not the WA population of *S. ooldea* fits the type description which comes from specimens collected from Ooldea Siding on the trans Australian Railway in South Australia (N Cooper & L Umbrello pers. comm.). Current investigations suggest that *S. macroura* may be a complex of at least three taxa (Blacket et al. 2001) but these are yet to be formally described. Blacket et al. (2001) examined limited material from WA, with none from central or southern parts of the known distribution, and suggested that WA populations require further analysis.

We recorded 385 taxa of vascular native flora (301 taxa within the quadrats) and lodged 379 of these with the Western Australian Herbarium. The known taxa for the study area now stands at 467. The figure from the quadrats is considerably less than either the currently known flora for the stations (Western Australian Herbarium 1998–) or the predicted species richness from accumulation data. This arises from the single sampling of the quadrats in combination with the absence of a variety of ephemeral or annual taxa due to the dry conditions. Six species of priority plant from four families are known from the study area but not recorded in this study and these are: Lamiaceae - *Pityrodia canaliculata* (P1), Fabaceae - *Acacia burrowsiana* (P3) *and Bossiaea eremaea* (P3), Goodeniaceae - *Dampiera plumosa* (P1) and the Myrtaceae - *Euryomyrtus inflata* (P3) *and E. patrickiae* (P3). An increase in recorded taxa would be expected through repetitive sampling following good winter rain and by sampling additional land systems and other minor landscape features.

The survey of the Sandstone – Sir Samuel area of the Eastern Goldfields, which was approximately 70 km east of Lake Mason and on Wanjarri Nature Reserve, described the flora and vegetation of the area as having affinity with the Great Victoria Desert, particularly in respect to the sandplain communities (Keighery et al. 1994). This is conspicuously the case here with the presence of species such as *Eucalyptus gongylocarpa* and *Xanthorrhoea thorntonii,* both occurring close to their western extent on the sandplains of Black Range Station, although *X. thorntonii* was not present in any quadrats. The richest floristic communities were those associated with drainage tracts, run-on areas and fringing lake environments, primarily as a result of the higher ephemeral or annual taxa counts than those obtained at other sites. This was particularly the case at site 10, a sandy bank adjacent to Lake Mason, where the taxa incorporated elements of both the lake community as well as taxa from the surrounding broad valley. The spinifex dominated sites had comparatively low overall taxa richness, although the taxa associated with the dune system, sites 21 and 22, varied considerably from those of other sites except site 4. This appears to be driven by fire successional species that have greater prevalence on the dune complexes than they do on the long-unburnt spinifex sand plains as at each of these sites there was evidence of fire within the last several years. It was evident that a number of sites dominated by tall acacia (7, 12 and 13) had a long history of grazing and this was reflected in the reduction or near absence of any perennial understorey and consequently the lowest species richness values.

Community composition

In their survey of Sandstone – Sir Samuel and Laverton–Leonora study areas, Mckenzie et al. (1994) recorded strong relationships between species composition and surface lithology. Their sites were located along topographic gradients across the landscape associated with geomorphic sequences. We found similar relationships between species composition and environmental factors, but not across all sites. For example, the sites that clustered together in Group A were located across a range of landscape positions and on different geological substrates but tended to have stony or hard surfaces with sparse vegetation cover. These sites supported a comparatively low richness of habitat generalist species of reptiles (Pianka 1969) such as *Diplodactylus pulcher, Lerista timida, Rhynchoedura ornata, Menetia greyii* and *Ctenotus schomburgkii.* Sites that clustered together in Group C had a sandy substrate with spinifex cover and this environment has the highest overall species richness. It supports a number of habitat specific species such as *Strophurus elderi, Delma butleri, Ctenotus pantherinus* and *Ctenotus* aff.*quattuordecimlineatus.* While all these sandy spinifex sites were mapped as Bullimore land system, there was variation in the community structure that correlated with differences in overstorey vegetation and topographic features between the sites. This variability within spinifex communities has been reported by ecologists for many years (Pianka 1986; James 1994) but is infrequently considered in management, particularly in relation to fire. The clustering of sites adjacent to lake areas with site 4 to form group C is somewhat surprising, however there are similarities in that substrate material is sand or sandy loam with no rocky elements and structurally sparse shrubs are present with little ground cover. Almost no species show any site fidelity other than the burrowing agamid *Ctenophorus nuchalis,* and to a lesser extent an arboreal gecko, *Strophurus strophurus* with the latter present on most sites other than those with hard surfaces. As vegetation recovers on site 4 post fire the assemblage structure is likely to show greater resemblance with that of the other spinifex sites within the Bullimore land system. The numeric prevalence of *D. conspicillatus* and *D. pulcher,* both species that occupy spider burrows (Pianka & Pianka 1976), is what defines site 20 (Group D), an alluvial plain with chenopod shrubs. As cover is quite limited in this environment the capacity to either burrow or use the burrows of other species is likely to be important.

The overall patterning of mammals groups was also similar to that documented by (Mckenzie et al. 1994) and, as for reptiles, there was separation amongst the spinifex sites. The burnt spinifex site was more strongly associated with the sites located on the crest and at the base of a dune than with other spinifex sites. This was largely owing to the association of *Sminthopsis hirtipes* with sandy sites having relatively open spinifex cover found within group A and *Ningaui ridei* with sandy sites comprising relatively mature dense spinifex found within B sites. While there were fewer mammal than reptile species, their high fidelity to a particular habitat meant that there was greater differentiation between the sites for mammal assemblages. The exception to this was Group E, which included sites that are structurally simple and generally contain large areas of bare ground or pebbles with little understorey. This simplified habitat provides limited cover and would appear to primarily provide opportunity for generalist species such as *Sminthopsis macroura, S. ooldea* and, to a lesser degree, *Pseudomys hermannsburgensis*.

The four primary floristic groups identified here were broadly related to surface geology. Sites on aeolian sands derived from the weathering of granitic rocks supported spinifex communities. Sites with aeolian sands that also include mixed alluvial and colluvial surfaces where the material has also been derived from granitic breakaways and exposed bedrock supported spinifex shrubland and *Acacia* spp. Sites dominated by valley calcretes which are associated with central channels of former main drainage lines and also occur where drainage lines enter the lake system (Tingey 1985) supported halophytic vegetation. These sites may also consist of clay, gravel and gypsiferous alluvial deposits. Exposed granitic rock and associated colluvial material, metabasalts and banded ironstone formations tend to have shallow soils with a high proportion of exposed bedrock and support only sparse vegetation cover.

The correlation data between the assemblages resolved for the plants, birds, reptiles and mammals showed no significant relationships with each other and, consequently, in this ex-pastoral landscape no one group is a reasonable or reliable indicator of any other group.

Methodological considerations

Accumulation analysis of fauna

There has been much debate about how much sampling is enough to derive meaningful assemblage structures or to determine predicted species lists. While overall species accumulation curves for a study area may go some way in demonstrating comprehensiveness of assemblages at coarse scales, reduced effort at the site scale, particularly in short-term or brief studies, means that the data are usually inadequate to identify assemblages. After the five sampling periods, depending on which estimator is used, more than 80% of the predicted fauna had been recorded for most sites. This has implications for environmental impact assessment and indicates that relying solely on trapping alone over only two sampling periods in these types of environments will provide significantly less than the full assemblage of species at the site scale, particularly for reptiles and mammals. Bootstrapping was the most conservative of these estimators, followed by Jackknife 1 and then by Chao 1 (bias-corrected). The latter estimator was particularly poor in estimating the number of species at the dune site (site 22) where despite recording 19 species the prediction was that this represented only 41% of the site's fauna. As Chao 1 calculates richness based on species appearing as either singletons or doubletons, in a linear feature such as a dune it is quite likely the proportion of singletons will be high as a result of occasional incursions or dispersal of species from the surrounding landscape. In contrast to the low percentage predicted by Chao 1, Bootstrapping predicted 82% of the reptiles had been sampled at the same site.

Faunal assemblages

The correlation matrix between assemblages for reptiles and mammals derived from the cumulative data showed that at least three sampling periods for reptiles and four sampling periods for mammals were required before the structure of the assemblages showed little change with additional sampling. This indicates that despite incomplete inventories at the site scale, at least for reptiles, it is possible to derive comparatively robust baseline assemblage structures over relatively short temporal scales. While this is not unexpected, it provides confidence in the patterns ascertained from the data.

Comparison of trap types

Although buckets and PVC pipe have been compared in other studies, often the experimental design has had limitations that have made interpretation of the results problematic. For example Rolfe and McKenzie (2000) found PVC pipe to be more effective than 20 L buckets but their results were confounded by differences in pit trap array design for each of the trap types. In other examinations, the interpretation of relative efficiency of trap types has been confused by testing three trap types simultaneously along a single fence line and thus negating independence of each of the trap types (Thompson & Thompson 2007). While the influence of trap types on data interpretation was also assessed by Thompson et al. (2005), we only examined differences in overall species detection and conclude that while buckets were superior in overall captures of individuals, both trap types complement each other and each were responsible for detecting as many as 10 species not caught in the other trap type. This represents a significant proportion of the overall species richness (ca. 20%). If a selection of one trap type was to be made over the other, however, our data would support the use of buckets in preference to the narrow PVC pipe, particularly where short-duration surveys are undertaken as the buckets accumulated species richness more rapidly due to higher overall captures. In this study the total richness assessed by each trap type was almost equivalent but relative abundance for most species remained higher with the buckets. The implication of sampling techniques was also highlighted for captures of *S. longicaudata.* This species was considered to have disappeared across more than 90% of its pre-European Range (Lomolino & Channell 1995); however, data from this study and other unpublished surveys that we have conducted within the Murchison Bioregion indicate that recorded declines in species can sometimes be attributed to inappropriate sampling techniques or to sampling incorrect parts of the landscape. We readily caught this species in pits (buckets and PVC pipe) when they remained undetected in Elliott traps, despite equivalent effort at the same sampling locations. We conclude, therefore, that the use of Elliott traps is not an efficient means for sampling this species.

Survey timing

Our sampling spanned multiple seasons and incorporated an early- and late-spring sampling period in both years, with an additional autumn sampling period in year two. While we did not specifically examine seasonal effects, the greatest abundance of trapped vertebrates occurred in both spring samples of year one, following an above average rainfall year. Throughout trapping in year two, captures declined from those in year one irrespective of season. From the data evaluated here, late spring sampling following a season of above average rainfall was most productive, but early spring was also better than the same time, or autumn sampling, in a particularly dry year.

Mean maximum temperature was shown to be highly correlated to capture rates for a several reptile families. This is an important consideration in any sampling design where documenting the full assemblage of the reptile fauna is a target. An interesting correlation emerged for the Agamids but this was in relation to survey sequence rather than temperature. While this may have resulted from declining rainfall and a reduction in overall abundance, particularly for annual species such as *Ctenophorus isolepis,* it is also possible that it was a response to repeated site sampling and that there was a trap avoidance mechanism in train

Site stratification

While land systems were used as a partial method for stratifying survey sites in this study, their utility for this very much depends on their differentiation from each other through the constituent land units. For example, there are clear differences between land systems comprising greenstone hills (e.g. Gabanintha) as opposed to systems incorporating playa lakes (e.g. Carnegie) but often the land units within other systems are repeated across multiple systems. As a result it is possible to find significant differences in assemblages within some land systems, while little variation exists between others. This was particularly evident within the Bullimore land system, which is the primary system consisting of spinifex on these ex-pastoral stations. Here many sites showed considerable variation between assemblage structures, and this was the case for all the biotic groups. This was particularly influenced by topographic position, for example dune crests, slopes, swales or plains, and for elements such as soil type, dominant vegetation and fire history. As this is the primary system that has had fire management applied to it, there needs to be careful decision-making to identify and incorporate these elements in fire planning scenarios. Without this there is a risk of inadvertently affecting the persistence and ecological function of a number of the more restricted assemblages and species.

The Murchison Bioregion continues to lack a formal comprehensive, adequate and representative reserve system, while much of the land use of this region remains incompatible with ensuring the long-term viability of all of the constituent ecosystems or in supporting all their component species. Lake Mason and Black Range stations, therefore, remain essential for conservation. They also provide a comprehensive set of benchmark sites, in conjunction with those intensively assessed on other stations of the Gascoyne and Murchison such as Goongarrie, Matuwa, Muggon and Waldburg, that will allow us to assess how future management actions and environmental change affect ecological communities in the region.

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REFERENCES

Barrett G, Silcocks A, Barry S, Cunningham R, Poulter R (2003) *The New Atlas of Australian Birds*. Royal Australasian Ornithologists Union, Melbourne.

Beard JS (1976) *The Vegetation of the Murchison Region. Vegetation Survey of Western Australia, 1:1,000,000 Series, Sheet 6 and Explanatory Notes*. University of Western Australia Press, Perth.

Biological Surveys Committee (1984) Biological survey of the Eastern Goldfields of Western Australia. Part 1. Introduction and methods. *Records of the Western Australian Museum Supplement* **18**, 1–19.

Blacket MJ, Adams M, Cooper SJB, Krajewski C, Westerman M (2001) Systematics and evolution of the Dasyurid Marsupial genus *Sminthopsis*: I. The *macroura* species group. *Journal of Mammalian Evolution* **8**, 149–170.

Burbidge AH, Harvey MS, McKenzie NL eds (2000) Biodiversity of the southern Carnarvon Basin. *Records of the Western Australian Museum Supplement* **61**, 1– 595.

Burbidge AA, McKenzie N, Brennan K, Woinarski J, Dickman C, Baynes A, Gordon G, Menkhorst P, Robinson A (2008) Conservation status and biogeography of Australia's terrestrial mammals. *Australian Journal of Zoology* **56**, 411–422.

Chao A, Shen T (2003) User's guide for program SPADE (species prediction and diversity estimation). National Tsing Hua University, Taiwan. Available at http://chao.stat.nthu.edu.tw/wordpress/wp-content/uploads/software/SPADE_UserGuide(20160621).pdf [accessed November 2016].

Chen SF (2005) *Geology of the Atley , Ray Rocks, and Southern Sandstone 1:100 000 Sheets. 1:100 000*

Geological Series Explanatory Notes. Western Australia Geological Survey, Perth.

Clarke KR, Gorley RN (2006) *Primer v6 User Manual/ Tutorial*. Primer-E Ltd, Plymouth.

Cogger HG (1984) Reptiles in the Australian arid zone. In *Arid Australia* (eds HG Cogger, EE Cameron), pp. 235–252. Australian Museum, Sydney.

Cooper NK, Teale RJ, Kendirck PG (2006) Recently observed increase in the distribution of the desert mouse, *Pseudomys desertor*, in Western Australia. *Western Australian Naturalist* **25**, 169–186.

Cowan M (2003) Murchison 1 (Mur1–Eastern Murchison Subregion). In *A Biodiversity Audit of Western Australia's 53 Biogeographic Subregions in 2002* (eds JE May, NL McKenzie), pp. 466–479. Department of Environment and Conservation, Perth.

Dell J, How RA, Milewski AV (1992) Biological Survey of the Eastern Goldfields of Western Australia. Part 6. Youanmi-Leonora Study Area. *Records of the Western Australian Museum Supplement* **40**, 1–63.

Dickman C, Mahon P, Masters P, Gibson D (1999) Long-term dynamics of rodent populations in arid Australia: The influence of rainfall. *Wildlife Research* **26**, 389–403.

Dufrene M, Legendre P (1997) Species assemblages and indicator species: The need for a flexible asymmetrical approach. *Ecological Monographs* **67**, 345–366.

Environmental Protection Authority and Department of Environment and Conservation (2010) *Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (eds BM Hyder, J Dell and MA Cowan). Environmental Protection Authority and Department of Environment and Conservation, Perth.

George AS, McKenzie NL, Doughty P eds (2011) A biodiversity survey of the Pilbara region of Western Australia, 2002–2007. *Records of the Western Australian Museum Supplement* **78**, 1–311.

Hall NJ, Mckenzie NL, Keighery GJ eds. (1994) The biological survey of the eastern goldfields of Western Australia. Part 10, Sandstone – Sir Samuel and Laverton–Leonora study area. *Records of the Western Australian Museum Supplement* **47**, 1–166.

Haythornthwaite AS, Dickman CR (2006) Distribution, abundance, and individual strategies: A multi scale analysis of Dasyurid Marsupials in arid central Australia. *Ecography* **29**, 285–300.

How RA, Cowan MA (2006) Collections in space and time: Geographical patterning of native frogs, mammals and reptiles through a continental gradient. *Pacific Conservation Biology* **12**, 111–133.

How RA, Dell J (2004) Reptile assemblage of the Abydos Plain, north-eastern Pilbara, Western Australia. *Journal of the Royal Society of Western Australia* **87**, 85–95.

Hughes M (2003) 'Eleven mile well project fauna trapping survey'. Unpublished report for BHP Leinster Nickel Operation, Leinster, Western Australia.

James CD (1994) Spatial and temporal variation in structure of a diverse lizard assemblage in arid Australia. In *Lizard ecology: Historical and Experimental Perspectives* (eds LJ Vitt, ER Pianka), pp. 287–317. Princeton University Press, Princeton, New Jersey.

Keighery G, Hall N, Milewski A (1994) Vegetation and flora. In The Biological Survey of the Eastern Goldfields of Western Australia. Part 10 Sandstone – Sir Samuel and Laverton–Leonora Study Areas (eds NJ Hall, NL McKenzie, GJ Keighery). *Records of the Western Australian Museum Supplement* **47**, 24–50.

Laurance I (1996) 'Gascoyne–Murchison rangeland strategy'. Draft report for Gascoyne-Murchison Rangeland Strategy Steering Group, Department of Agriculture Western Australia, Perth.

Lee A, Mercer E (1967) Cocoon surrounding desert-dwelling frogs. *Science*, **157**, 87–88.

Legendre P, Legendre L (1998) *Numerical Ecology*. Elsevier, Amsterdam.

Lomolino MV, Channell R (1995) Splendid isolation: Patterns of geographic range collapse in endangered mammals. *Journal of Mammalogy* **76**, 335–347.

Mabbutt JA (1968) Review of concepts of land classification. In *Land Evaluation* (ed GA Stewart), pp. 11–28. MacMillan, Melbourne.

Magurran AE (2004) *Measuring Biological Diversity*. Blackwell Publishing, Malden, Massachusetts.

Masters P (1993) The effects of fire-driven succession and rainfall on small mammals in spinifex grassland at Uluru National Park, Northern Territory. *Wildlife Research* **20**, 803–813.

McCune B, Grace JB, Urban DL (2002) *Analysis of Ecological Communities*. MjM Software Design, Gleneden Beach, Oregon.

McCune B, Mefford M.J. (1999) *PC-Ord Multivariate Analysis Of Ecological Data for Windows (software) Version 5*. MJM Software, Oregon.

McKenzie N, Keighery G, Gibson N, Rolfe J (2000) Patterns in the biodiversity of terrestrial environments in the southern Carnarvon Basin, Western Australia. *Records of the Western Australian Museum Supplement* **61**, 511–546.

McKenzie NL, Rolfe JK, Youngson WK (1994) Vertebrate Fauna. In The Biological Survey of the Eastern Goldfields of Western Australia. Part 10 Sandstone – Sir Samuel and Laverton–Leonora Study Areas (eds NJ Hall, NL McKenzie, GJ Keighery). *Records of the Western Australian Museum Supplement* **47**, 51–84.

Menkhorst PW, Knight F (2004) *A Field Guide to the Mammals of Australia*. Oxford University Press, Melbourne.

Morton SR, James CD (1988) The diversity and abundance of lizards in arid Australia: a new hypothesis. *American Naturalist* **132**, 237–256.

Oliver I, Holmes A, Dangerfield JM, Gillings M, Pik AJ, Britton DR, Holley M, Montgomery ME, Raison M, Logan V, Pressey RL, Beattie AJ (2004) Land systems as surrogates for biodiversity in conservation planning. *Ecological Applications* **14**, 485–503.

Payne AL (1997) *An Inventory and Condition Survey of the Sandstone – Yalgoo – Paynes Find Area, Western Australia*. Department of Agriculture, Perth.

Pianka ER (1969) Habitat specificity, speciation, and species density in Australian desert lizards. *Ecology* **50**, 498–502.

Pianka ER (1986) *Ecology and Natural History of Desert Lizards*. Princeton University Press, Princeton, New Jersey.

Pianka ER (1996) Long-term changes in lizard assemblages in the Great Victoria Desert. In *Long-Term Studies of Vertebrate Communities* (eds ML Cody, JA Smallwood), pp. 191–215. Academic Press, New York.

Pianka ER, Pianka HD (1976) Comparative ecology of twelve species of nocturnal lizards (Gekkonidae) in the Western Australian desert. *Copeia* **1976**(1), 125–142.

Poulin R (1998) Comparison of three estimators of species richness in parasite component communities. *The Journal of Parasitology* **84**, 485–490.

Rabosky DL, Talaba AL, Donnellan SC, Lovette IJ (2009) Molecular evidence for hybridization between to Australian desert skinks, *Ctenotus leonhardii* and *Ctenotus quattuordecimlineatus* (Scincidae: Squamata). *Molecular Phylogenetics and Evolution* **53**, 368–377.

Senior SL (1995) *Sandstone, From Gold to Wool and Back Again, A District History*. Shire of Sandstone, Sandstone, Western Australia.

Storr GM, Smith LA, Johnstone RE (1983) *Lizards of Western Australia II: Dragons and Monitors*. Western Australian Museum, Perth.

Storr GM, Smith LA, Johnstone RE (1990) *Lizards of Western Australia: Geckos and Pygopods*. Western Australian Museum, Perth.

Storr GM, Johnstone RE, Smith LA (1999) *Lizards of Western Australia I: Skinks*. Western Australian Museum, Perth.

Storr GM, Johnstone RE, Smith LA (2002) *Snakes of Western Australia*. Western Australian Museum, Perth.

Thackway R, Cresswell ID (1995) *An Interim Biogeographic Regionalisation for Australia: A Framework for Setting Priorities in the National Reserves System Cooperative*. Australian Nature Conservation Agency, Reserve Systems Unit, Canberra.

Thompson GG, Thompson SA (2007) Usefulness of funnel traps in catching small reptiles and mammals, with comments on the effectiveness of the alternatives. *Wildlife Research* **34**, 491–497.

Thompson GG, Thompson SA, Withers PC, Pianka ER (2003) Diversity and abundance of pit-trapped reptiles in Australian arid and mesic habitats: Biodiversity for environmental imapct assessment. *Pacific Conservation Biology* **9,** 120–135.

Thompson WA, Sheehy N (2010) Flora and vegetation of banded iron formations of the Yilgarn Craton: the Lake Mason Zone of the Gum Creek Greenstone Belt. *Conservation Science Western Australia* **8**, 77–94.

Tingey RJ (1985) *Sandstone, Western Australia. 1:250,000 Geological Series, Sheets G/50-16: Map and Explanatory Notes*. Australian Government Publishing Service, Canberra.

Tyler MJ, Doughty P (2009) *Field Guide to Frogs of Western Australia*. Western Australian Museum, Perth.

Van Dyck S, Strahan R (2008) *The Mammals of Australia*. New Holland Publishers, Sydney.

Van Vreeswyk AME, Payne AL, Leighton KA (1998) *Pastoral Resources and their Management in the Sandstone – Yalgoo – Paynes Find Area of Western Australia*. Western Australian Department of Agriculture, Perth.

Western Australian Herbarium (1998–) Florabase – The Western Australian Flora, Department of Parks and Wildlife. Available at https://florabase. dpaw.wa.gov.au/ [accessed March 2017].

Western Australian Museum (2010–) Vertebrate databases, Western Australian Museum, Perth [accessed February 2017, not available online].

Woolley P (2005) The species of *Dasycercus* Peters, 1875 (Marsupialia: Dasyuridae). *Memoirs of Museum Victoria* **62**, 213–221.

Wyche S, Chen SF, Doyle MG (2004) *Recent Mapping in the Sandstone Region:Implications for Gold Mineralization.* Record 2004/5, Western Australian Geological Survey, Perth.

Appendix 1

Survey site details including land systems, land units, habitat descriptions and site description for each of the 24 survey sites.

Site no.	Land system	Area of land system within the study area (ha)	Land unit	Habitat description	Site description
1	Brooking	426	Banded Ironstone stony plain	Hill, ridge and breakaway plateau sclerophyll shrubland or woodland habitats	Stony plain at base of Jasper Hills
2	Nubev	238	Saline stony plain	Stony plain and low rise chenopod shrubland (and occasional woodland) habitats	Shrubland on gibber plain
3,4,8,19	Bullimore	119990	Sand sheet	Sandplain hummock grassland habitats	Spinifex shrubland
5	Norie	297	Hills, domes and tor fields	Hill, ridge and breakaway plateau sclerophyll; shrubland or woodland habitats	Granite apron
6	Challenge	668	Stony plains	Stony plain and low rise sclerophyll shrubland habitats	Rocky quartz area
7	Kalli	3256	Loamy plains	Broad sheet flood hardpan plain sclerophyll shrubland or woodland habitats	Acacia (bowgada)-Eremophila shrubland
9,10	Carnegie	24901	Sandy banks	Alluvial plains with conspicuous chenopod shrubland (and occasional woodland) habitats.	Well wooded sandplain
11	Cunyu	6969	Calcrete platforms	Calcrete or kopi associated shrubland or woodland habitats	Casuarina woodland
12	Woodline	1608	Hardpan plains/loamy plains	Plains transitional to sandplain with sclerophyll shrubland or woodland habitats	Mulga shrubland, bare ground
13	Yanganoo	32867	Hardpan plains	Broad sheet flood hardpan plain sclerophyll shrubland or woodland habitats	Bare mulga woodland over Eremophilas
14	Violet	2906	Stony-gravelly hardpan plains	Broad sheet flood hardpan plain sclerophyll shrubland or woodland habitats	Eremophila shrubland over gibber plain
15,18	Gabanintha	4135	Hillslopes	Hill, ridge and breakaway plateau sclerophyll; shrubland or woodland habitats	Eremophila shrubland over gibber plain
16	Wiluna	6078	Stony plains and interfluves	Stony plain and low rise sclerophyll shrubland habitats	Drainage line below hill, stony quartz ironstone
17	Jundee	4449	Drainage tracts	Broad sheet flood hardpan plain sclerophyll shrubland or woodland habitats	Herbfield by drainage line
20	Waguin	1638	Drainage floor	Alluvial plains with conspicuous chenopod shrubland (and occasional woodland) habitats.	Bare mulga shrubland, washout over clay flat
21,22	Bullimore	119990	Sand dune	Sandplain sclerophyll shrubland habitats	Sand dune and swale below dune
23	Sherwood	11824	Lower footslopes	Hill, ridge and breakaway plateau sclerophyll; shrubland or woodland habitats	Washout below breakaway in mulga woodland
24	Mileura	1200	Calcrete platforms and plains	Calcrete or kopi associated shrubland or woodland habitats	Herbfield under Acacias & Eremophilas

Appendix 2

List of frogs, reptiles and mammals recorded in the 24 survey sites on Black Range and Lake Mason stations, indicating number of individuals caught at each sites, total number of individuals caught, and the number of sites each species was recorded in. * indicates species recorded but not included in analysis or summations and indices; ** indicates alien species; and *** indicates species listed as a priority.

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total individuals	Number of sites
FROGS																										
Limnodynastidae																										
*Neobatrachus wilsmorei**	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Myobatrachidae																										
*Pseudophryne occidentalis**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	1
REPTILES																										
Agamidae																										
Ctenophorus caudicinctus	-	-	-	-	11	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	13	2
Ctenophorus isolepis	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-	6	-	-	-	16	3
Ctenophorus nuchalis	-	-	-	22	-	-	-	-	1	8	-	-	-	-	-	-	-	-	1	-	-	-	-	-	32	4
Ctenophorus reticulatus	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	5	2
Ctenophorus salinarum	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Ctenophorus scutulatus	-	-	-	-	-	-	14	-	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	41	3
Moloch horridus	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	2	-	-	2	2	-	1	-	-	8	5
Pogona minor	1	1	1	-	-	-	-	2	1	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	8	9
Tympanocryptis pseudopsephos	-	6	-	-	-	-	-	-	-	-	-	-	-	4	-	-	1	-	-	-	-	-	-	-	11	3
Carphodactylidae																										
Nephrurus laevissimus	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Nephrurus vertebralis	-	1	2	-	-	1	1	1	10	1	2	-	3	-	-	-	-	-	1	-	-	4	-	-	27	11
Nephrurus wheeleri	-	1	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	1	4	3
Diplodactylidae																										
Diplodactylus conspicillatus	-	1	12	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	10	-	-	-	-	36	5
Diplodactylus granariensis	-	2	2	-	3	-	3	-	-	-	-	-	-	-	2	-	8	4	2	-	2	2	10	-	40	11
Diplodactylus pulcher	-	12	-	-	-	9	-	-	-	-	3	2	6	8	5	-	7	-	1	33	-	-	8	1	95	12
Lucasium squarrosum	-	12	-	-	2	2	2	-	4	17	9	7	-	21	3	3	8	4	-	-	-	1	-	10	105	15
Lucasium stenodactylum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	2	2
Rhynchoedura ornata	-	22	2	12	1	1	2	-	33	-	15	6	2	4	1	1	1	-	9	2	5	7	2	1	129	20
Strophurus assimilis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	2	-	1	-	-	1	-	-	-	11	4
Strophurus elderi	-	-	9	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	18	-	30	34	-	-	95	5
Strophurus strophurus	-	2	1	4	-	-	2	1	10	6	-	-	-	-	-	-	-	-	5	2	-	3	-	3	39	11
Strophurus wellingtonae	3	5	3	-	1	7	5	-	-	-	-	17	6	1	-	-	-	-	-	-	-	-	5	-	53	10
Gekkonidae																										
Gehyra variegata	22	-	-	3	22	2	-	-	13	1	11	1	1	3	11	13	1	3	5	-	1	1	5	44	163	19
Heteronotia binoei	9	1	2	-	2	1	-	2	18	6	9	4	2	-	2	22	-	1	-	-	-	-	4	7	92	16
Pygopodidae																										
Delma butleri	-	-	1	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	5	-	3	4	-	-	15	5
Pygopus nigriceps	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	2

Scincidae																										
Cryptoblepharus buchananii	-	-	-	-	-	-	-	-	-	-	16	-	-	-	-	7	-	-	-	1	-	-	1	-	25	4
Ctenotus grandis	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	3	-	-	-	4	2
Ctenotus helenae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	5	-	-	7	2
Ctenotus leonhardii	-	-	3	-	-	-	-	1	51	15	1	-	-	-	-	-	-	-	-	1	-	-	-	1	73	7
Ctenotus pantherinus	-	-	12	-	-	-	-	18	-	-	-	-	-	-	-	-	-	-	7	-	1	-	-	-	38	4
Ctenotus aff.*quattuordecimlineatus*	-	-	1	1	-	-	-	15	-	-	-	-	-	-	-	-	-	-	5	1	7	3	-	-	33	7
Ctenotus schomburgkii	-	2	-	-	-	2	8	-	4	-	-	2	6	1	-	-	-	-	3	4	-	-	-	-	32	9
Ctenotus severus	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Ctenotus uber	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	1
Egernia depressa	-	-	-	-	-	-	-	-	-	-	2	-	4	-	1	-	6	-	-	1	-	-	-	-	14	5
Liopholis inornata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	2	2
Eremiascincus richardsonii	-	3	-	-	2	1	-	-	-	-	2	-	-	1	1	-	-	3	-	-	-	-	-	1	14	8
Lerista desertorum	-	-	-	-	-	-	-	-	13	1	6	-	-	-	-	-	-	-	-	-	-	-	-	-	20	3
Lerista macropisthopus	-	-	-	1	4	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	1	1	-	2	13	6
Lerista timida	4	6	-	-	1	-	-	-	-	-	10	11	9	2	1	24	1	-	-	-	-	1	-	10	80	12
Menetia greyii	5	4	2	2	2	5	1	-	1	2	6	1	9	7	5	7	11	-	2	-	-	-	-	-	72	17
Morethia butleri	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	2	-	-	-	3	9	3
Tiliqua occipitalis	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Varanidae																										
Varanus caudolineatus	3	-	-	-	-	4	3	-	-	-	-	-	5	3	-	-	4	4	-	-	-	-	-	-	26	7
Varanus eremius	-	-	3	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	7	4
*Varanus giganteus**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
*Varanus gouldii**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	1
Varanus panoptes *	-	-	-	-	-	1	-	-	-	-	1	-	1	-	1	2	-	2	-	1	-	-	-	-	9	7
*Varanus tristis**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	1
Boidae																										
*Antaresia stimsoni**	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Elapidae																										
Brachyurophis semifasciata	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	3	2
*Pseudonaja modesta**	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2
*Pseudonaja mengdeni**	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	2	2
Simoselaps bertholdi	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	3	2
Suta fasciata	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	1
Typhlopidae																										
Anilios hamatus	-	-	1	-	-	-	-	-	-	1	1	3	2	1	-	-	-	1	-	2	-	1	-	-	13	9
Anilios waitii	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	3	4
MAMMALS																										
Dasyuridae																										
Antechinomys laniger	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	2	1
*Dasycercus blythi****	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	2	2
Ningaui ridei	-	-	27	1	-	-	1	21	-	-	-	-	-	-	-	-	-	-	23	1	2	-	-	-	76	7
Pseudantechinus woolleyae	4	-	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	2
Sminthopsis crassicaudata	-	2	2	-	-	-	-	-	2	11	1	-	-	-	-	-	-	-	-	12	2	-	-	4	36	8
Sminthopsis hirtipes	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	10	3	-	-	19	4
*Sminthopsis longicaudata****	3	1	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	17	-	1	-	-	5	-	29	7

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total individuals	Number of sites
Sminthopsis macroura	-	6	-	-	-	24	12	-	1	5	3	3	4	7	15	4	5	13	1	3	1	-	12	7	126	18
Sminthopsis ooldea	2	-	6	3	5	2	8	3	2	-	9	2	20	2	-	1	3	-	3	-	2	1	2	-	76	18
Macropodidae																										
*Macropus robustus**		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
*Macropus rufus**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Tachyglossidae																										
*Tachyglossus aculeatus**	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	1
Muridae																										
*Mus musculus***	-	2	-	8	-	-	1	-	-	9	-	1	-	-	-	-	-	-	-	2	1	-	1	9	34	9
Notomys alexis	2	-	-	-	-	-	-	1	4	-	2	1	-	3	-	-	-	1	1	3	9	4	-	-	31	11
Pseudomys desertor	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1
Pseudomys hermannsburgensis	-	1	4	-	-	1	2	1	8	-	1	1	-	-	1	-	5	-	1	-	1	-	-	-	27	12
Emballonuridae																										
*Saccolaimus flaviventris**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Vespertilionidae																										
*Chalinolobus gouldii**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
*Nyctophilus geoffroyi**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Species (Reptiles)	8	17	16	9	12	12	12	11	18	11	16	11	14	13	13	11	13	10	18	16	16	19	7	12		
Individuals (Reptiles)	48	84	57	48	52	36	43	49	193	59	96	55	57	57	41	84	54	25	91	66	66	73	35	84		
Species (Mammals)	4	5	4	4	2	4	5	6	5	3	5	5	2	3	3	2	3	3	7	7	8	3	4	3		
Individuals (Mammals)	11	12	39	17	11	28	24	29	17	25	16	8	25	12	17	5	13	31	31	24	28	8	20	20		

Appendix 3

List of birds recorded in the 24 survey sites on Black Range and Lake Mason stations, indicating presence (+) and the number of sites each species was recorded in. * indicates species recorded but not included in analysis or summations; ** species known from survey area but not recorded during this work ; and *** specially protected, priority species or protected through international agreement.

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Number of sites
Acanthizidae																									
Acanthiza apicalis	-	-	-	-	-	-	+	-	-	-	-	+	+	-	+	-	+	+	-	+	-	-	+	-	8
Acanthiza chrysorrhoa	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+	-	-	+	-	-	+	-	4
Acanthiza robustirostris	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	+	+	-	+	-	-	+	-	8
Acanthiza uropygialis	-	-	-	-	+	-	+	+	-	-	-	+	+	-	+	-	+	+	+	+	-	-	+	-	11
Aphelocephala leucopsis	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-	-	+	-	3
Calamanthus campestris	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
*Gerygone fusca***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pyrrholaemus brunneus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	1
Smicrornis brevirostris	+	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	5
Accipitridae																									
*Accipiter fasciatus***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aquila audax	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	2
*Haliastur sphenurus***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aegothelidae																									
*Aegotheles cristatus***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Alcedinidae																									-
Todiramphus pyrrhopygius	-	-	-	-	-	-	-	-	-	+	-	-	-	+	-	-	+	-	-	+	-	-	-	-	4
Anatidae																									
*Anas superciliosa***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Anas gracilis***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Chenonetta jubata***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Cygnus atratus***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Malacorhynchus membranaceus***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Tadorna tadornoides***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ardeidae																									
*Ardea modesta****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Artamidae																									
Artamus cinereus	-	+	+	+	-	-	+	+	-	+	-	-	+	+	+	+	+	-	-	+	-	-	-	+	13
Artamus minor	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	1
*Artamus personatus***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burhinidae																									
Burhinus grallarius	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	1
Campephagidae																									
Coracina maxima	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	2
Coracina novaehollandiae	+	+	-	-	+	-	+	+	+	-	+	-	-	+	-	-	-	-	-	+	-	-	+	-	10
Lalage tricolor	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	2

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Number of sites
Caprimulgidae																									
Eurostopodus argus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	1
Casuariidae																									
Dromaius novaehollandiae	-	-	+	+	+	-	-	+	-	-	+	-	+	-	-	-	+	-	-	-	+	+	+	-	10
Charadriidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Charadrius ruficapillus***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Elseyornis melanops***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Erythrogonys cinctus***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Peltohyas australis***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Stiltia isabella***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Vanellus tricolor***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cinclosomatidae																									
Cinclosoma marginatum	+	+	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+	-	-	-	-	-	-	5
*Psophodes occidentalis***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Climacteridae																									
*Climacteris affinis***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Columbidae																									
*Geopelia cuneata***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ocyphaps lophotes	+	-	-	+	+	-	-	-	+	+	-	-	-	+	-	-	+	-	-	+	-	-	+	-	9
Phaps chalcoptera	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-	-	-	-	-	-	-	3
Corvidae																									
Corvus bennetti	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Corvus orru	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+	+	+	-	5
Cracticidae																									
Cracticus nigrogularis	+	+	+	+	+	+	-	+	+	+	+	+	-	-	-	+	+	+	+	-	-	-	+	+	17
Cracticus tibicen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+	-	-	+	-	3
Cracticus torquatus	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	23
Strepera versicolor	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	2
Culculidae																									
Chrysococcyx basalis	-	-	-	-	-	-	-	-	-	+	-	-	-	+	-	-	-	-	-	+	-	-	+	-	4
Chrysococcyx osculans	-	-	-	-	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	+	-	-	+	-	4
Cacomantis pallidus	-	+	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	+	-	-	-	-	4
Dicaeidae																									
Dicaeum hirundinaceum	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Dicruridae																									
Grallina cyanoleuca	+	+	-	-	-	-	-	-	+	-	+	-	-	-	-	-	+	-	-	+	-	-	+	-	7
Rhipidura leucophrys	-	+	-	-	-	-	-	+	+	-	-	-	+	+	+	-	+	-	-	+	-	-	+	+	10
Falconidae																									
Falco berigora	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	2
Falco cenchroides	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	+	-	-	+	+	4

Falco longipennis	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	1
*Falco peregrinus****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	1
Halcyonidae																									
*Todiramphus sanctus***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hirundinidae																									
*Hirundo neoxena**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Petrochelidon ariel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	1
*Petrochelidon nigricans**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Laridae																									
*Sterna hybrida***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maluridae																									
*Malurus lamberti**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Malurus leucopterus	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Malurus splendens	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	2
Megapodiidae																									
Leipoa ocellata/****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Meliphagidae																									
Acanthagenys rufogularis	+	+	-	-	+	+	+	+	+	-	-	+	+	+	+	-	+	+	+	+	+	+	+	+	19
Certhionyx variegatus	-	-	-	-	-	-	+	+	+	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	4
*Epthianura aurifrons***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Epthianura tricolor	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	+	-	2
Gavicalis virescens	+	+	-	+	+	+	+	+	+	+	+	-	+	+	+	-	+	+	+	+	+	+	+	+	21
Lichmera indistincta	+	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	3
Manorina flavigula	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	23
*Ptilotula penicillata***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ptilotula plumula	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Purnella albifrons	-	-	-	-	-	-	-	-	+	-	-	-	-	-	+	-	+	-	-	-	-	-	-	-	3
Sugomel nigrum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	1
Meropidae																									
*Merops ornatus****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Motacillidae																									
Anthus australis	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	+	-	2
Neosittidae																									
Daphoenositta chrysoptera	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	+	-	-	-	-	2
Otididae																									
*Ardeotis australis***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pachycephalidae																									
Colluricincla harmonica	+	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	+	+	-	-	-	-	+	-	6
Oreoica gutturalis	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	-	+	-	-	+	+	20
Pachycephala rufiventris	+	+	-	-	+	-	-	+	-	-	-	+	+	+	+	-	+	+	+	+	-	-	+	-	13
Pardalotidae																									
*Pardalotus rubricatus***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pardalotus striatus	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	2
Passeridae																									
Emblema pictum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Taeniopygia guttata	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	+	-	-	+	+	+	-	-	5

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Number of sites
Pelecanidae																									
*Pelecanus conspicillatus***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Petroicidae																									
Melanodryas cucullata	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	+	-	-	+	-	-	+	-	5
Petroica goodenovii	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	+	+	-	+	-	-	+	+	7
Podargidae																									
*Podargus strigoides***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Podicipedidae																									
*Tachybaptus novaehollandiae***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pomatostomidae																									
Pomatostomus superciliosus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	+	-	2
Pomatostomus temporalis	+	+	-	-	-	+	-	+	+	-	+	+	+	+	+	-	-	-	-	+	-	-	+	+	13
Psittacidae																									
Cacatua roseicapilla	+	-	-	-	+	+	-	-	+	+	+	+	+	+	+	+	-	-	-	+	-	-	+	+	14
*Cacatua sanguinea***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Cacatua leadbeateri***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Melopsittacus undulatus	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Neophema bourkii	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+	-	+	-	-	-	-	3
*Nymphicus hollandicus***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Platycercus varius	-	-	-	-	+	+	-	-	+	-	-	+	-	+	+	+	-	-	-	+	-	-	+	-	9
Platycercus zonarius	+	+	+	-	+	-	-	-	+	-	+	+	-	+	-	+	-	+	-	+	-	-	+	+	13
Ptilonorhynchidae																									
Ptilonorhynchus nuchalis	-	-	-	-	+	-	-	-	-	-	+	-	-	-	+	-	+	-	-	-	-	-	+	-	5
Rallidae																									
*Tribonyx ventralis***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Recurvirostridae																									
*Cladorhynchus leucocephalus***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Himantopus himantopus***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Recurvirostra novaehollandiae***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Strigidae																									
Ninox boobook	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Sylviidae																									
*Megalurus mathewsi**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Threskiornithidae																									
*Platalea flavipes***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Threskiornis spinicollis***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tytonidae																									
*Tyto alba***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total number of species recorded	17	17	9	9	17	12	13	14	20	14	13	14	19	23	21	11	28	14	8	34	7	7	46	13	

Appendix 4

List of vascular plants recorded in the quadrats at the 24 survey sites on Black Range and Lake Mason stations, indicating presence (+) and the number of sites each taxa was recorded in. * taxa recorded during survey but not on quadrats; ** alien species; *** priority listed species; and **** species recorded prior to this survey or after this survey. Note- taxa that were only identified to genus are recorded here but were not included in analysis.

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Number of sites
Aizoaceae																									
Carpobrotus modestus	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Disphyma crassifolium *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gunniopsis quadrifida *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gunniopsis rodwayi *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tetragonia cristata	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Tetragonia eremaea	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Amaranthaceae																									
Alternanthera nodiflora ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ptilotus albidus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	1
Ptilotus divaricatus *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ptilotus gaudichaudii subsp. *eremita*	-	+	-	-	-	-	-	-	-	-	-	-	-	+	+	-	+	+	-	+	-	-	-	-	6
Ptilotus helichrysoides ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ptilotus helipteroides	+	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-	-	-	-	-	5
Ptilotus macrocephalus	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Ptilotus nobilis	+	-	-	-	-	-	-	-	-	-	+	-	-	-	+	+	-	-	-	-	-	-	-	+	5
Ptilotus obovatus	+	+	-	-	-	+	+	-	-	+	+	+	+	+	-	+	+	+	-	+	-	-	+	-	14
Ptilotus polystachyus	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	3
Ptilotus roei	+	+	-	-	+	+	-	-	-	-	+	-	-	+	+	+	-	+	-	+	-	-	-	+	11
Ptilotus schwartzii	+	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	3
Rhagodia drummondii	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	+	4
Apiaceae																									
Daucus glochidiatus	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	+	-	-	-	-	-	-	-	2
Apocynaceae																									
Marsdenia australis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+	2
Rhyncharrhena linearis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	1
Araliaceae																									
Trachymene bialata *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trachymene ornata	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	2
Asparagaceae																									
Lomandra leucocephala subsp. *robusta*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	1
Thysanotus exiliflorus	-	-	-	-	+	+	-	-	-	-	-	+	+	+	-	-	-	-	-	-	-	-	-	-	5
Thysanotus manglesianus	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	-	-	3
Bulbine semibarbata	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Number of sites
Asteraceae																									
Actinobole uliginosum *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Angianthus cornutus	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Brachyscome ciliaris	+	+	-	-	+	+	-	-	+	+	-	+	-	+	+	+	+	+	-	+	-	-	+	+	15
Calocephalus multiflorus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	1
Calotis hispidula	-	-	-	-	-	+	-	-	+	-	-	-	-	+	-	-	+	-	-	-	-	-	+	-	5
Calotis multicaulis	-	+	-	-	+	+	-	-	-	+	-	-	-	-	-	-	-	-	-	+	-	-	-	+	6
Cephalipterum drummondii	+	+	-	-	-	+	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	+	6
Chrysocephalum apiculatum *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chrysocephalum eremaeum	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	2
Chrysocephalum puteale *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cratystylis subspinescens *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Erodiophyllum acanthocephalum ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Erymophyllum ramosum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	2
Gnephosis angianthoides *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gnephosis arachnoidea	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	1
Gnephosis brevifolia *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gnephosis tenuissima	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Helipterum craspedioides	+	-	-	-	+	-	-	-	-	-	-	-	-	+	+	-	+	-	-	-	-	-	-	-	5
Isoetopsis graminifolia *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lawrencella davenportii	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Lemooria burkittii *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Millotia incurva *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Myriocephalus guerinae	-	-	+	-	-	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
Myriocephalus pygmaeus *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Olearia humilis	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Olearia pimeleoides	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	1
Olearia plucheacea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	1
Olearia stuartii *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Podolepis sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	2
Podolepis capillaris	-	-	-	-	-	-	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	2
Podolepis gracilis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	1
Podolepis kendallii *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Podolepis lessonii *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pogonolepis muelleriana	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	2
Rhodanthe battii	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	+	3
Rhodanthe charsleyae	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Rhodanthe chlorocephala subsp. *splendida*	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	2
Rhodanthe floribunda	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	+	2
Rhodanthe humboldtiana	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	1
Rhodanthe maryonii	+	+	-	-	+	-	-	-	+	-	-	-	-	+	-	-	-	-	-	+	-	-	+	-	7
Rhodanthe propinqua	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	+	-	-	-	-	-	-	-	2

Roebuckia ciliocarpa	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	1
Schoenia cassiniana *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Senecio glossanthus	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
*Sonchus oleraceus***	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	+	2
Streptoglossa liatroides	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Tietkensia corrickiae *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichanthodium skirrophorum	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Vittadinia eremaea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	1
Vittadinia sulcata ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waitzia acuminata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	1
Boraginaceae																									
Convolvulus clementii	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	1
Halgania cyanea var. Allambi Stn (BW Strong 676) ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Halgania integerrima *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Heliotropium heteranthum ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Brassicaceae																									
Cuphonotus andraeanus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	1
Lepidium muelleri-ferdinandii	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Lepidium oxytrichum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	1
Lepidium phlebopetalum	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Lepidium platypetalum	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	2
Menkea australis *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sisymbrium orientale **	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	1
Stenopetalum anfractum *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stenopetalum filifolium	-	-	-	-	-	+	-	-	-	-	-	-	-	-	+	-	+	-	-	+	-	-	-	-	4
Campanulaceae																									
Isotoma petraea	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	1
Lobelia winfridae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	1
Wahlenbergia tumidifructa	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	2
Caryophyllaceae																									
Spergularia marina *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spergularia rubra */**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Casuarinaceae																									
Casuarina pauper	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Celastraceae																									
Macgregoria racemigera ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stackhousia megaloptera	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	2
Stackhousia monogyna *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stackhousia muricata *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stackhousia sp. Mt Keith (G Cockerton & G O'Keefe 11017) ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waitzia fitzgibbonii	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	1

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Number of sites
Chenopodiaceae																									
Atriplex bunburyana *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Atriplex holocarpa	-	+	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Chenopodium gaudichaudianum	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Dissocarpus paradoxus	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Dysphania cristata *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dysphania glomulifera subsp. *eremaea*	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	1
Dysphania kalpari	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	1
Dysphania melanocarpa	-	-	-	-	-	-	-	-	+	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	2
Dysphania rhadinostachya subsp. *rhadinostachya*	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Einadia nutans	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Enchylaena tomentosa	-	+	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-	+	-	-	-	-	+	5
Maireana amoena	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Maireana carnosa	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+	-	-	-	-	3
Maireana convexa	-	-	+	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Maireana georgei	+	+	-	-	-	-	-	-	-	+	-	-	-	-	+	+	-	-	-	+	-	-	-	-	6
Maireana glomerifolia	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	2
Maireana oppositifolia ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maireana planifolia	-	-	+	-	-	+	+	-	-	-	-	-	+	-	-	-	-	-	+	+	-	-	+	-	7
Maireana planifolia/villosa *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maireana pyramidata	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Maireana sp.	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	+	-	-	-	-	-	-	-	+	4
Maireana thesioides	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Maireana triptera	-	+	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Maireana villosa *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rhagodia preissii *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rhagodia sp.	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Salsola australis	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Sclerolaena cuneata	-	+	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Sclerolaena densiflora	+	+	-	-	-	+	-	-	-	+	+	-	-	+	+	-	-	-	-	-	-	-	-	-	7
Sclerolaena diacantha	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	+	+	4
Sclerolaena eurotioides *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sclerolaena fusiformis	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Sclerolaena obliquicuspis ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sclerolaena patenticuspis *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sclerolaena sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	1
Tecticornia disarticulata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	1
Tecticornia halocnemoides	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Tecticornia indica subsp. *bidens*	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Tecticornia indica subsp. *leiostachya* ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Tecticornia sp. Dennys Crossing (KA Shepherd & J English KS 552) *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tecticornia undulata ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Colchicaceae																									
Wurmbea sp. Great Victoria Desert (GJ Keighery 7501) ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Convolvulaceae																									
Bonamia rosea	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Cuscuta epithymum **	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	+	2
Duperreya commixta *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Duperreya sericea	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	-	-	-	2
Crassulaceae																									
Crassula colorata var. acuminata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	1
Cupressaceae																									
Callitris columellaris *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Callitris preissii	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	2
Cyperaceae																									
Chrysitrix distigmatosa *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Schoenus subaphyllus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	1
Droseraceae																									
Drosera macrantha	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Euphorbiaceae																									
Euphorbia australis	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Euphorbia boophthona	+	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+	-	-	-	-	-	-	3
Euphorbia drummondii	-	+	-	-	+	-	-	-	+	+	-	-	-	-	-	-	-	-	-	+	-	-	-	-	5
Fabaceae																									
Acacia aneura	+	-	-	-	-	+	-	-	-	-	-	+	+	-	+	-	-	+	+	+	-	-	+	+	12
Acacia aptaneura	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acacia aulacophylla	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	1
Acacia ayersiana	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Acacia burkittii	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	+	-	-	-	-	+	4
Acacia burrowsiana ***/****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acacia caesaneura	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Acacia craspedocarpa	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+	+	-	-	-	-	+	-	4
Acacia craspedocarpa (hybrid) ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acacia effusifolia	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Acacia eremophila var. *eremophila* ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acacia fuscaneura	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Acacia grasbyi *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acacia heteroneura var. *prolixa* ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acacia jennerae ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acacia incurvaneura	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acacia ligulata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	1
Acacia nyssophylla	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	-	-	2

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Number of sites
Acacia oswaldii	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	1
Acacia prainii	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	2
Acacia pteraneura	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acacia pruinocarpa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	1
Acacia quadrimarginea	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	3
Acacia ramulosa var. ramulosa	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	+	-	-	-	-	+	+	-	4
Acacia rhodophloia *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acacia sibina	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	1
Acacia sibirica	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	1
Acacia sp.	-	-	-	+	-	+	+	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	4
Acacia sp. *juliflorae* - terete Eremaean Region (D Edinger et al. 30) ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acacia tetragonophylla	-	+	+	-	-	+	-	-	-	+	+	-	+	+	+	+	+	-	+	+	-	-	+	+	14
Acacia victoriae subsp. *victoriae*	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	+	2
Acacia xanthocarpa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	1
Bossiaea eremaea ***/****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Daviesia grahamii	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	1
Gastrolobium laytonii *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Glycine canescens ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indigofera georgei	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	1
Kennedia prorepens *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Labichea eremaea ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	1
Leptosema chambersii	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Lotus cruentus	-	+	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	+	-	-	-	-	4
Mirbelia microphylla *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mirbelia seorsifolia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	2
Petalostylis cassioides *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phyllota humilis	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	2
Senna artemisioides	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	+	+	-	+	+	-	-	-	-	8
Senna artemisioides subsp. *filifolia*	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Senna artemisioides subsp. *helmsii*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	1
Senna artemisioides subsp. ? *artemisioides*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	1
Senna glaucifolia *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Senna glutinosa	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	3
Senna sp. Austin (A Strid 20210)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	1
Senna sp. Meekatharra (E Bailey 1-26)	+	+	-	-	+	-	-	-	+	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	6
Swainsona affinis ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Swainsona beasleyana ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Swainsona canescens *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Swainsona halophila	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Swainsona kingii ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Swainsona paradoxa *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Swainsona paucifoliolata *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Swainsona rostellata ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Swainsona sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	1
Frankeniaceae																									
Frankenia cinerea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	1
Frankenia fecunda *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Frankenia laxiflora ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Frankenia pauciflora	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Geraniaceae																									
Erodium aureum **	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	1
Erodium cygnorum	+	+	+	+	+	+	+	+	+	-	-	+	+	+	-	+	+	-	-	-	-	-	-	+	15
Goodeniaceae																									
Brunonia australis	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	+	+	-	-	-	+	-	-	5
Dampiera eriocephala	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	1
Dampiera plumosa */***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dampiera roycei *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Goodenia havilandii	-	-	-	-	+	-	-	-	-	-	-	-	-	+	-	-	+	+	-	+	-	-	+	-	6
Goodenia macroplectra	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	1
Goodenia maideniana	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Goodenia mimuloides	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	+	-	-	-	-	-	-	-	3
Goodenia mueckeana	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	4
Goodenia occidentalis *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Goodenia peacockiana	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Goodenia tenuiloba	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Goodenia triodiophila *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Scaevola parvifolia subsp. *acuminata*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	1
Scaevola parvifolia subsp. *parvifolia*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	1
Scaevola spinescens	-	-	-	-	-	-	-	-	+	-	-	-	-	-	+	+	-	+	+	-	-	-	-	-	5
Velleia connata *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Velleia hispida	-	+	-	-	-	+	-	-	-	-	-	-	-	-	+	+	+	+	-	+	-	-	-	+	8
Velleia rosea	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Gyrostemonaceae																									
Gyrostemon ramulosus *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Haloragaceae																									
Glischrocaryon flavescens	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	2
Haloragis odontocarpa	+	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	+	-	-	-	-	-	-	4
Haloragis trigonocarpa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	+	-	-	-	-	-	+	4
Hemerocallidaceae																									
Dianella revoluta var. *divaricata*	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	+	-	+	-	-	-	-	-	4
Lamiaceae																									
Hemigenia tomentosa *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dicrastylis brunnea	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	3
Hemiphora elderi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	2
Newcastelia hexarrhena	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	2

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Number of sites
Pityrodia canaliculata ***/****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Prostanthera albiflora ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Prostanthera althoferi subsp. *althoferi*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	1
Prostanthera althoferi/campbellii *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Prostanthera althoferi/sericea *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Prostanthera campbellii	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	1
Prostanthera sericea	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Spartothamnella teucriiflora	-	-	-	-	-	+	+	-	-	-	-	-	+	-	-	-	+	-	-	+	-	-	-	-	5
Loranthaceae																									
Amyema fitzgeraldii ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Amyema gibberula var. *gibberula*	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Amyema miquelii *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lysiana casuarinae ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lysiana exocarpi subsp. *exocarpi* ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lysiana murrayi	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+	3
Malvaceae																									
Abutilon cryptopetalum	-	+	-	-	-	+	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	+	4
Abutilon fraseri *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Abutilon otocarpum	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	1
Abutilon oxycarpum subsp. Prostrate (AA Mitchell PRP 1266)	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Abutilon sp.	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	+	-	-	-	-	2
Alyogyne pinoniana	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	2
Androcalva loxophylla	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Brachychiton gregorii *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hannafordia quadrivalvis subsp. *quadrivalvis*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	1
Hibiscus sp. Gardneri	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Hibiscus sturtii var. *grandiflorus*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	1
Seringia elliptica	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	2
Lawrencia helmsii	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Radyera farragei ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sida calyxhymenia	-	-	-	-	-	-	-	-	+	-	-	-	-	+	-	-	-	+	-	+	-	-	+	-	5
Sida cardiophylla *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sida ectogama	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Sida fibulifera	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Sida sp.	-	-	-	-	+	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	3
Sida sp. Dark green fruits (S van Leeuwen 2260)	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	3
Sida sp. Excedentifolia (JL Egan 1925)	+	-	-	-	+	-	-	-	-	-	-	-	-	+	-	-	+	+	-	+	-	-	+	-	7
Sida spodochroma	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	2

Myrtaceae																									
Aluta maisonneuvei subsp. *auriculata*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	2
Baeckea sp. Sandstone (CA Gardner s.n. 26 Oct. 1963) ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	1
Baeckea sp. Great Victoria Desert (AS Weston 14813) *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calytrix amethystina *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calytrix carinata *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calytrix erosipetala *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calytrix uncinata *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Corymbia lenziana ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Enekbatus eremaeus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	1
Eucalyptus carnei	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	1
Eucalyptus gongylocarpa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	1
Eucalyptus gypsophila	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Eucalyptus kingsmillii subsp. *kingsmillii*	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Eucalyptus kochii subsp. *amaryssia*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	1
Eucalyptus kochii subsp. *plenissima*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eucalyptus lucasii ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eucalyptus oldfieldii	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	2
Eucalyptus sp. Little Sandy Desert (D Nicolle & M French DN 4304) *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eucalyptus striaticalyx ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eucalyptus trivalva	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Euryomyrtus inflata */***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Homalocalyx thryptomenoides	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	2
Melaleuca pauperiflora *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Melaleuca xerophila	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Micromyrtus sulphurea *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thryptomene costata	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Parmeliaceae																									
Xanthoparmelia antleriformis ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Xanthoparmelia reptans ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phrymaceae																									
Peplidium muelleri *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Peplidium sp. C Evol. Fl. Fauna Arid Aust. (NT Burbidge & A Kanis 8158) *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pittosporaceae																									
Pittosporum angustifolium	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Plantago drummondii	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	2
Plumbaginaceae																									
Muellerolimon salicorniaceum *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Number of sites
Poaceae																									
Amphipogon caricinus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	1
Aristida contorta	-	-	-	-	-	-	-	-	+	+	-	-	-	-	+	-	+	+	-	-	-	-	-	-	5
Aristida holathera var. *holathera*	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Austrostipa elegantissima	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	+	-	-	-	-	-	-	-	2
Austrostipa nitida *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Austrostipa platychaeta	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Austrostipa scabra	-	-	-	-	+	-	-	-	-	-	-	-	-	+	+	+	+	-	-	+	-	-	-	+	7
Austrostipa sp.	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Austrostipa trichophylla *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Austrostipa tuckeri *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromus arenarius	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	1
Cymbopogon ambiguus *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cymbopogon obtectus	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Dactyloctenium radulans *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Digitaria brownii ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Enneapogon caerulescens	-	+	-	-	-	-	-	-	+	-	+	-	-	-	+	+	-	-	-	-	-	-	-	+	6
Eragrostis dielsii	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Eragrostis eriopoda	-	-	-	-	-	-	+	-	-	-	-	+	+	-	-	-	-	+	+	+	-	-	+	-	7
Eragrostis lacunaria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	1
Eragrostis lanipes ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eragrostis pergracilis	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	1
Eriachne benthamii ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eriachne helmsii ? *mucronata* *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eriachne mucronata	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Eriachne pulchella subsp. *pulchella*	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	+	+	-	-	-	-	+	-	5
Monachather paradoxus	+	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	3
Paspalidium basicladum	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Paspalidium clementii ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paspalidium rarum *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rostraria pumila **	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	1
Setaria dielsii *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Triodia basedowii	-	-	+	+	-	-	-	+	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-	7
Polygonaceae																									
Rumex hypogaeus **	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	+	-	-	-	-	-	-	-	2
Portulacaceae																									
Anacampseros sp. Eremaean (F Hort, J Hort & J Shanks 3248) */***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calandrinia creethiae	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	2
Calandrinia eremaea	-	-	-	+	-	-	-	-	+	+	-	-	-	-	+	-	-	-	-	-	-	-	-	-	4
Calandrinia polyandra	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Calandrinia ptychosperma	-	+	-	-	-	-	-	-	+	-	-	-	-	+	-	-	-	-	-	-	-	-	-	+	4

Calandrinia schistorhiza	-	+	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	2
Calandrinia sculpta *	-	+	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	2
Calandrinia sp.	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	2
Calandrinia sp. The Pink Hills (F Obbens FO 19/06) *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	1
Portulaca oleracea **	-	-	-	-	-	-	-	-	+	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	2
Primulaceae																									
Lysimachia arvensis **	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	+	-	-	-	-	-	-	-	2
Proteaceae																									
Grevillea acacioides	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	1
Grevillea didymobotrya subsp. *didymobotrya*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	1
Grevillea extorris *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grevillea inconspicua ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	2
Grevillea juncifolia subsp. *temulenta*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	2
Grevillea nana subsp. *nana* *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grevillea nematophylla subsp. *supraplana*	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	1
Grevillea sarissa subsp. sarissa	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Hakea francisiana	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	2
Hakea leucoptera subsp. *sericipes*	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Hakea lorea *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hakea preissii	-	+	-	-	-	-	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	3
Hakea recurva subsp. *arida*	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Pteridaceae																									
Cheilanthes lasiophylla	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Cheilanthes sieberi subsp. *sieberi*	+	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	+	-	5
Rubiaceae																									
Psydrax latifolia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	2
Psydrax rigidula	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Psydrax suaveolens	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	2
Synaptantha tillaeacea *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rutaceae																									
Philotheca brucei subsp. *brevifolia* *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Philotheca brucei subsp. *brucei* *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Santalaceae																									
Exocarpos aphyllus	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Exocarpos sparteus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	1
Santalum lanceolatum	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	+	-	-	-	-	2
Santalum spicatum	-	-	-	-	-	-	-	-	-	+	-	-	-	-	+	-	-	+	-	-	-	-	-	-	3
Sapindaceae																									
Dodonaea adenophora	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	1
Dodonaea microzyga var. *acrolobata* *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dodonaea pachyneura ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dodonaea petiolaris	+	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Dodonaea rigida	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	1

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Number of sites
Scrophulariaceae																									
Eremophila alternifolia	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	2
Eremophila arachnoides subsp. *arachnoides* ***	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Eremophila clarkei	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	+	-	-	-	-	-	2
Eremophila conglomerata ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eremophila decipiens subsp. *decipiens*	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Eremophila enata	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	1
Eremophila eriocalyx	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	2
Eremophila exilifolia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	1
Eremophila falcata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	1
Eremophila foliosissima	-	-	-	-	-	-	+	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	3
Eremophila forrestii subsp. *forrestii*	+	-	+	-	-	-	+	+	+	-	-	+	+	-	-	-	-	-	+	+	+	+	-	-	11
Eremophila forrestii subsp. *hastieana* ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eremophila fraseri	+	+	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	+	-	-	-	-	-	-	5
Eremophila galeata ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eremophila gilesii subsp. *gilesii* *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eremophila glabra subsp. *glabra* *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eremophila glabra subsp. *tomentosa*	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Eremophila granitica *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eremophila hughesii subsp. *hughesii* *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eremophila hygrophana *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eremophila jucunda subsp. *Jucunda*	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	4
Eremophila lachnocalyx *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eremophila latrobei	+	-	-	-	+	+	-	-	-	-	-	-	-	-	+	-	+	+	-	-	-	-	+	-	7
Eremophila latrobei subsp. *glabra* ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eremophila latrobei subsp. *latrobei* ****	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eremophila longifolia	-	+	-	-	-	-	-	-	+	+	+	-	-	-	-	-	-	-	+	-	-	-	-	+	6
Eremophila mackinlayi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	1
Eremophila maculata *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eremophila malacoides	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Eremophila metallicorum	+	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	3
Eremophila oldfieldii subsp. *angustifolia*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	1
Eremophila oppositifolia subsp. *angustifolia*	+	-	-	-	-	-	-	-	+	-	-	-	-	-	+	+	-	-	-	-	-	-	+	-	5
Eremophila pantonii	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	3
Eremophila pendulina	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Eremophila platycalyx subsp. *platycalyx*	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1

Eremophila platythamnos subsp. *platythamnos*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	2
Eremophila scoparia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	1
Eremophila serrulata	-	-	-	-	-	-	-	-	-	+	-	-	-	+	-	-	+	-	-	-	-	-	-	-	3
Eremophila shonae subsp. *shonae* *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eremophila spuria *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eremophila subfloccosa subsp. *lanata*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	1
Solanaceae																									
Anthotroche pannosa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	1
Duboisia hopwoodii *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lycium australe	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Nicotiana cavicola *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nicotiana rosulata subsp. *rosulata*	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	+	+	-	-	-	-	-	+	5
Nicotiana rotundifolia *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Solanum coactiliferum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	1
Solanum cleistogamum	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Solanum hoplopetalum *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Solanum lasiophyllum	-	+	+	+	+	+	+	+	+	+	+	+	-	+	-	+	+	+	-	+	-	-	+	+	18
Solanum nigrum **	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	2
Solanum orbiculatum subsp. *orbiculatum*	-	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	+	3
Solanum plicatile *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stylidiaceae																									
Stylidium induratum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	2
Stylidium limbatum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	1
Thymelaeaceae																									
Pimelea microcephala subsp. *microcephala*	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Pimelea trichostachya *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Urticaceae																									
Parietaria cardiostegia *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Xanthorrhoeaceae																									
Xanthorrhoea thorntonii *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zygophyllaceae																									
Tribulus astrocarpus	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Tribulus terrestris */**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zygophyllum compressum *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zygophyllum eichleri *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zygophyllum halophilum *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zygophyllum ovatum	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Zygophyllum simile *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zygophyllum sp.	-	-	-	-	-	-	-	+	-	+	-	-	+	-	+	+	-	+	-	+	-	-	-	-	7
Zygophyllum tetrapterum *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
No of species on quadrats	32	30	21	19	31	32	13	11	48	53	23	19	14	43	40	34	49	46	20	40	29	27	25	40	

Appendix 5

Indicator analysis results for significant species within each of the four major botanical groups. Indicator value is the proportion of sites within each group where the species is represented, and the p value is the proportion of randomised trials in which the indicator equals or exceeds those of the observed values.

Species	Group	Indicator value	p value
Daucus glochidiatus	A	100	0.0002
Podolepis sp.	A	85	0.0018
Atriplex holocarpa	A	66	0.0098
Callitris preissii	A	66	0.0152
Dysphania melanocarpa	A	66	0.0098
Lepidium platypetalum	A	66	0.0098
Maireana convexa	A	66	0.0098
Maireana glomerifolia	A	66	0.0098
Maireana pyramidata	A	66	0.0098
Rhodanthe chlorocephala	A	66	0.0098
Rhodanthe floribunda	A	66	0.0098
Rhodanthe propinqua	A	66	0.0098
Stackhousia megaloptera	A	66	0.0098
Wahlenbergia tumidifructa	A	66	0.0098
Acacia nyssophylla	A	62	0.0178
Homalocalyx thryptomenoides	B	50	0.0454
Glischrocaryon flavescens	B	48	0.035
Hibiscus gardneri	B	46	0.0422
Newcastelia hexarrhena	B	46	0.0362
Marsdenia australis	C	85	0.0002
Cuscuta epithymum	C	64	0.0134
Pogonolepis muelleriana	C	60	0.0046
Duperreya sericea	C	51	0.0144
Maireana triptera	C	51	0.0124
Seringia elliptica	C	47	0.0438
Alyogyne pinoniana	C	45	0.0416
Hemiphora elderi	C	45	0.036
Aluta maisonneuvei	C	40	0.0452
Austrostipa elegantissima	C	40	0.0482
Plantago drummondii	C	40	0.0482
Sida spodochroma	C	40	0.0452
Eriachne mucronata	C	35	0.0484
Chrysocephalum eremaeum	D	70	0.0006
Erymophyllum ramosum	D	70	0.0014
Sclerolaena cuneata	D	60	0.0132
Acacia prainii	D	50	0.0188
Acacia victoriae	D	50	0.0188
Mirbelia seorsifolia	D	50	0.0194
Phyllota humilis	D	50	0.02
Trachymene ornata	D	50	0.0002
Eucalyptus oldfieldii	D	45	0.0452