



DEW F0002547601

Your ref: 7429519

Date: 08 JUL 2019

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Dear [REDACTED]

I refer to your application pursuant to the *Freedom of Information Act 1991* (the Act) received by the Department for Environment and Water (DEW) on 11 June 2019, seeking access to:

“(1) a copy of the vegetation mapping of the native grasslands on/or around the Twin Creek wind farm site referred to in previous FOI request F0001648601 in document 3 that was previously provided [email from K Graham stating: ‘DEWNR has vegetation mapping of the area (in a private report) that shows other grassland communities that have not been mapped in the EBS report so these should be incorporated’]

(2) a copy of the report referred to above.”

DETERMINATION

Searches of the Department’s records have found one (1) document held by this agency within scope of your request.

As a DEW Accredited FOI Officer, I have determined to grant you partial access to this document. Section 20 of the Act provides that an agency may refuse access to a document if it is an exempt document under the Act.

Parts of the document to which I am refusing access are explained in more detail below.

Schedule 1, Clause 6(1) of the Act states that:

6—Documents affecting personal affairs

- (1) *A document is an exempt document if it contains matter the disclosure of which would involve the unreasonable disclosure of information concerning the personal affairs of any person (living or dead).*

The full release of this document would involve the unreasonable disclosure of information concerning personal affairs, thus those parts are exempt pursuant to Clause 6(1) of the FOI Act.

Schedule 1, Clause 7 of the Act states that:

7 — Documents affecting business affairs

(1) A document is an exempt document—

...

(c) if it contains matter—

(i) consisting of information (other than trade secrets or information referred to in paragraph (b)) concerning the business, professional, commercial or financial affairs of any agency or any other person; and

(ii) the disclosure of which—

(A) could reasonably be expected to have an adverse effect on those affairs or to prejudice the future supply of such information to the Government or to an agency; and

(B) would, on balance, be contrary to the public interest.

Clause 7(1)(c) of Schedule 1 of the Act requires me to weigh up the public interest when determining to allow access to the above information.

Factors I have considered in favour of the public interest from any such release are:

- Meeting the objects of the FOI Act, which promotes public access to documents.
- Promoting public participation in government
- Providing an individual with information of special interest to them

Factors I have considered contrary to the public interest for any such release are:

- Satisfying the elements of an exemption clause
- Protecting the personal information of an individual
- Protecting the commercial and/or financial interests of third parties, in relation to land management techniques used.
- Disclosure of third party business operations would likely have an adverse effect on the Agency's future business opportunities and impact existing relationships with the general public.

In making my determination, I have considered the public interest factors in favour of disclosure, particularly the objects of the Act which promote full disclosure of documents. I have weighed this against the factors contrary to the public interest and consider that there are real grounds for an expectation that disclosure would have an adverse effect on deliberative processes of the agency.

Based on the above considerations, I determine parts of the document are considered exempt, pursuant to clause 7(1)(c) of the Act, as disclosure would, on balance, be contrary to the public interest.

In accordance with PC045 – Disclosure logs for Non-personal information once a determination has been provided, the agency is required to make available on our website information and documents that have been disclosed. Information will be publicised online at <http://www.environment.sa.gov.au/about-us/freedom-of-information/foi-disclosure-log>.

FEES AND CHARGES**YOUR APPEAL RIGHTS**

If you are dissatisfied with this determination, you are entitled to exercise your rights to internal review and appeal as outlined in the attached documentation, by completing the attached Application for Review of Determination. If you decide to apply to exercise your rights to review, the completed form must be returned within 30 days to:

Chief Executive
Department for Environment and Water
GPO Box 1047
ADELAIDE SA 5001

If you have any queries in relation to the above please contact a Freedom of Information Officer on telephone (08) 8463 6625 or email DEW.FOI@sa.gov.au.

Yours sincerely



Katrina Button

**ACCREDITED FREEDOM OF INFORMATION OFFICER
DEPARTMENT FOR ENVIRONMENT AND WATER**

Flora and Fauna Assessment of the Twin Creek property, Adelaide and Mount Lofty Ranges Region

A flora and habitat biodiversity assessment incorporating targeted surveys for the Southern Hairy Nosed Wombat, Pygmy Bluetongue Lizard and grassland bird species



Prepared by Luke Price, Meg Robertson and Graham Carpenter for the Department of Environment and Natural Resources and the Adelaide and Mount Lofty Ranges Natural Resources Management Board

Autumn 2011

Acknowledgements

Flora and Habitat - Assistance from Kate Graham, Luke Price (DENR) and [REDACTED] ^{6 - Documents affecting personal affairs} is greatly appreciated. Rosemary Taplin assisted with plant identification and Natalia Diaz (DENR) processed the electronic load of data into the survey database.

Mammals, Frogs and Reptiles – Assistance from volunteers; [REDACTED] ^{6 - Documents affecting personal affairs} Meg Robertson (DENR), Graham Carpenter (DENR), Liz Ankor (DENR) and Steven Johnson (DENR), and [REDACTED] ^{6 - Documents affecting personal affairs} is greatly appreciated.

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Introduction

Open native grassy ecosystems were once widespread in south-eastern Australia however; over 99% of these ecosystems in this region have been destroyed or significantly modified since European settlement (Barlow, 1999 in Schofield, 2010). As a consequence of this destruction and degradation, many of these ecosystems, and the flora and fauna species which function within them, are nationally threatened. Remaining, open native grassy ecosystem remnants which bear some resemblance to their pre-European state, now persist in a highly fragmented landscape; and remain under threat from continued clearance of native vegetation, weed invasion and inappropriate grazing regimes. Additional threats to these fragments include road and rail maintenance actions, agricultural snails (e.g. *Theba pisana*) and inappropriate tree planting. Protection of remaining grassy ecosystem remnants is of utmost importance if their biodiversity values and ecosystem services are to be conserved.

Considerable areas of plentiful, open grasslands are thought to have existed through sections of the Fleurieu, southern districts, Adelaide Plains, the Mid-North and valleys of the eastern Mount Lofty Ranges (Hyde 1995) yet; within the AMLR, grassy ecosystems are under-represented in protected conservation areas (Wilson and Bignall, 2009). Grasslands and grassy woodlands were extensively cleared for agricultural production, with approximately less than one per cent and eight percent, respectively, of their pre-European extent remaining (Wilson and Bignall, 2009). It is estimated that approximately 5% of the total remnant vegetation within the AMLR is native grassland, with the majority located on plains either side of the spine of the MLR (Wilson and Bignall, 2009).

Much of the remaining grassland and grassy woodland ecosystems in the region are used for pasture and grazed, which allows some ecosystem function to be maintained. However, the replacement of pasture with crops and the seasonal change in cover coupled with crop harvesting, effect the ability of these areas to function as habitat (Wilson and Bignall, 2009). Additionally, the removal of rocks for landscaping and dead and live timber for firewood combined with the general ‘tidying up’ of agricultural paddocks, significantly decrease the availability of food resources and habitat (i.e. structural complexity) for fauna and modify micro-habitat conditions for native flora (Wilson and Bignall, 2009). Few of the remnant grasslands and grassy woodlands in northern part the AMLR region have been extensively surveyed and much remains to be discovered of the flora and fauna species which persist within them.

In 2010, a population of the Pygmy Blue-tongue Lizard was detected on a section of native grassland located on Twin Creek, a private mixed sheep/cropping farm in the Mid-North Ranges (Schofield, 2010). A grassland specialist, the Pygmy Bluetongue Lizard is listed under the EPBC Act and Schedule 7 of the National Parks and Wildlife Act 1972 as Endangered. In addition to the endangered Pygmy Blue-tongue Lizard, the Southern Hairy-nosed Wombat was also reported to occur on the property which is the only known location within the Adelaide and Mt Lofty Ranges (AMLR) region. Twin Creeks is a relatively rare property in the AMLR region, containing large areas of remnant native grassland. The combined discovery of listed threatened species and unusually large areas of remnant native grassland on Twin Creek prompted this additional study into the biodiversity of the area..

The Twin Creek property is situated on Twin Creek Road in the Bagot Well area (east of Kapunda). The grazed sections of the property are characterised by rolling hills, intersected by seasonally flowing waterways, which support a diversity of grassland communities.

Flora and habitat biodiversity of Twin Creek

Presented by Meg Robertson

Introduction

The following, reports on a plant and habitat biodiversity assessment of the Twin Creek property. The assessment is based on 6 visits to the property and provides a flora species list, broad mapping of plant communities including an evaluation of vegetation and site condition.

Methods

Assessment of plant and habitat biodiversity was based on field work in April and June 2011 (6 days in total). The objectives of the field survey were to identify the most intact examples of vegetation communities and document their species composition as well as record the locations of features of particular interest including species. The other main objective was to map the extent of different vegetation types and their condition. The timing of the survey was not ideal (better to be conducted in spring) but dictated by funding schedules.

Vegetation mapping was undertaken in the field by recording rapid assessment datasheets, vegetation boundaries and photo locations at GPS points. Attributes recorded at point locations during the rapid assessment method are listed in Appendix 2.

Information recorded in the field, photos and aerial imagery were then used to draw vegetation boundaries in ArcGIS.

Modified vegetation survey datasheets were used to record flora information on the property. In accordance with the brief and the suboptimal season, the standard Biological Survey of SA quadrat was modified. Minimal physical data was recorded and native plant species that were identifiable were recorded within a quadrat of 100m X 100m. Only the most abundant, identifiable non-native species were recorded. Nine sites were entered in BDBSA; opportunistic plant records at 31 additional sites were also entered.

Results

Plant phenology

A range of native plant growth patterns and life forms were represented.

The major attributes of healthy native grassland vegetation are a framework of tussock-forming perennial grasses and gaps between the tussocks occupied by various other native life forms - smaller plant species, bare soil, cryptogam crust, lichen or moss. Disturbance of the soil crust by livestock and selective grazing typically result in colonisation and eventually dominance of the intertussock spaces by introduced species. Many of the rarest herbaceous grassland plant species are seasonal forbs which have perennial roots and above ground parts that die off annually. Many of these, as well as smaller annual forbs are unlikely to be observed in the autumn survey.

Small native herbaceous plants were recorded at several locations but are likely to be under-represented in an autumn survey. While the collective cover of native perennial grasses was evident, the total species diversity could not be determined. Well above average summer rainfall in December 2010 and January-February 2011 (Bureau of Meteorology Climate online for Bagot Well Station: www.bom.gov.au) favoured the growth of a range of native grasses. A number of warm season grasses (kangaroo grass, black head grass, brush wire grass and windmill grasses) were abundantly flowering and seeding, while cool season grasses including spear and wallaby grasses had abundant green leaves and old stalks, but few seeds.

In general, annual non-native species such as Salvation Jane, *Erodium*, saffron thistle and other thistles and daisies had already germinated and formed rosettes. Annual non-native grass was also abundant in the vegetative state but could not be readily identified.

General description of the property

The majority of the area where native vegetation was assessed is non-arable; being low hills and higher land dissected by steep gullies containing Spring Creek and tributaries. Arable land is situated along Flagstaff and Mosey Roads on the southern and eastern boundaries of the property and in the south western corner, with both regular and irregular cropping. Several other areas show evidence of having been cultivated in the past. Most of the cultivated area lies towards the east where the land is higher and more level.

Vegetation communities

Lomandra grassland

Grassland containing *Lomandra* species is widespread in the non-arable areas. *Lomandra effusa* is more widespread, with *Lomandra multiflora dura* co-occurring on lower, less steep slopes (this species was found in three locations). The most widespread native grasses are *Austrostipa* spp., *Austrodanthonia* spp. and *Aristida behriana*, with *Enneapogon nigricans* (Figure 18) being dominant over extensive areas and *Themeda triandra* (Figure 10) in discrete patches. The more intact *Lomandra* grassland occurs on gentle to moderate slopes, relatively extensive examples being in sections 251-254 and 104 and a small area in 269 (Figure 1).

Austrodanthonia/Austrostipa grassland

Sparse native grassland dominated by *Austrodanthonia* species with intact soil crust and native forbs occupying the intertussock spaces (Figure 5) was associated with the larger patch of woodland (Figure 1 and Figure 9). Several native species occurred here that were not recorded elsewhere on the property including species of conservation significance (Table 1). Comprehensive plant survey of these areas in spring would be needed to assess their diversity.

Woodland

Open eucalypt woodland occurs in the eastern areas (Figure 1). The larger patch in sections 20 and 21 is dominated by *Eucalyptus leucoxylon* ssp. *pruinosa* with *E. odorata* subdominant over *Austrostipa* spp. and other native herbaceous species. Cover of non-native species in this area was relatively low and the intertussock spaces were relatively intact. No native shrubs or dominant *Lomandra* species were observed in the woodland and native forbs were scarce. The woodland in section 21 and 20 was in moderately good condition throughout with spear grass dominant in the understorey and intertussock spaces present (Figure 9). The tussock structure with intertussock spaces was more intact in this area and in adjoining grassland than elsewhere on the property (Figure 12). They provide potential habitat for small native forbs in the winter to spring. Mature, senescent, dead trees and seedlings or saplings less than one metre tall were present but saplings and young trees were absent, indicating that regeneration has been suppressed until recently.

An isolated patch of woodland dominated by SA blue gum in sections 284-3 (Figure 1), adjacent Mosey road, was not inspected but viewed from the road. It appeared to have an understorey of mainly annual grasses.

Decaying tree stumps are common in pasture along the eastern band of hills. Two living sheoak trees were recorded on the crests above the upper reaches of Spring Creek (Figure 19). Old logs were recorded there and on a number of other ridges and crests and these were also tentatively

identified as sheoaks (Figure 20). The understorey consisted predominantly of weeds and other non-native species. Sheoak woodland may originally have occurred in a mosaic with *Lomandra* grassland, with trees on the higher ridges and *Lomandra* grassland on the lower rises and slopes. However a few logs were present on lower slopes.

The vegetation patterns observed, including presence of two sheoak trees and numerous large fallen logs on ridgetops support existing generalised mapping of pre-European vegetation. It appears that from east to west the original vegetation comprised eucalypt woodland on the higher, gentle slopes, with sheoak woodland on the crests and grassland on the slopes in the steep dissected country grading into *Lomandra* grassland on the lower rises and in the valleys. Woodland may formerly have been more widespread, however there is insufficient evidence to indicate the original tree cover. Isolated individuals of other tree and shrub species were recorded on the property and adjacent roadsides (e.g. Figure 17).

Vegetation mapping units

Broad vegetation units for the Twin Creek property are provided in Figure 1. Vegetation units 6 through to 9 (Figure 1) contain varying amounts of native grasses and have not been assigned to a particular plant community type. Non-shaded areas of the property are those that are regularly cultivated for cropping (but may include sections of native grassland, particularly within parcels 102, 278 and 279).

DR

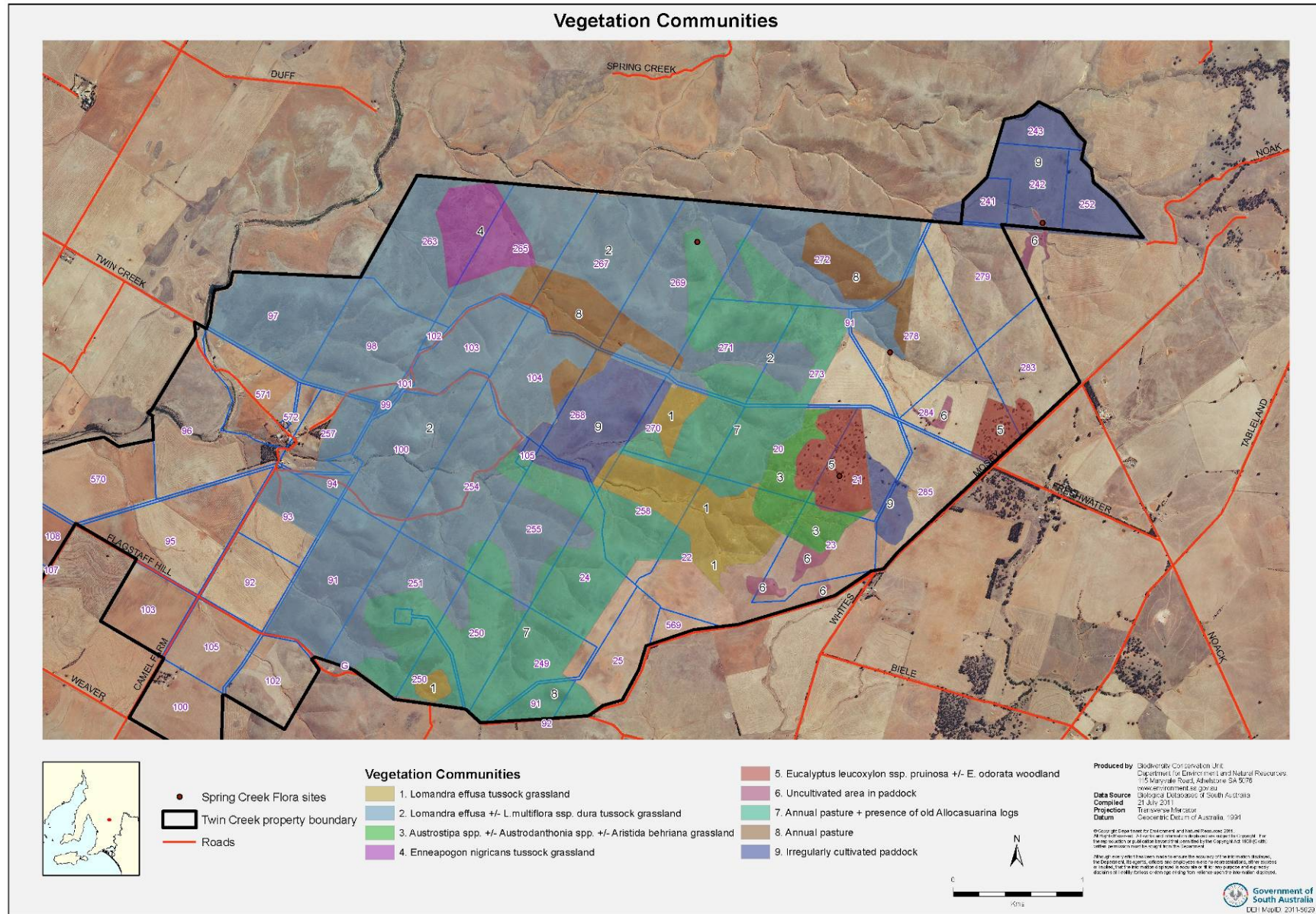


Figure 1. Vegetation communities. Section/parcel boundaries are shown in purple text with white edging.

Plant Species

One hundred and eleven plant species were recorded during the survey of which 77 are indigenous (Appendix 5). Whilst none are of national conservation significance, 8 species are of state significance and two are listed as threatened under the *NPW Act 1972*.

Table 1. Indigenous plant species of conservation significance

Family Name	Species	SA Status Code	NPW Act Status Code
GRAMINEAE	<i>Austrostipa curticoma</i>	Q	
CYPERACEAE	<i>Carex inversa var. inversa</i>	R	
CHENOPODIACEAE	<i>Maireana rohlachii*</i>	R	R
LEGUMINOSAE	<i>Swainsona behriana*</i>	T	V
POLYGONACEAE	<i>Persicaria prostrata</i>	U	
COMPOSITAE	<i>Leptorhynchos tetrachaetus</i>	U	
COMPOSITAE	<i>Solenogyne dominii*</i>	U	
GRAMINEAE	<i>Austrodanthonia fulva</i>	U	

* Images of some indigenous plant species of conservation significance are shown below in Figure 7 and Figure 8.



Figure 2. *Austrostipa* tussock grassland with emergent *Lomandra multiflora dura*. Waypoint 149



Figure 3. *Lomandra effusa* over *Austrostipa* tussock grassland. Waypoint 314



Figure 4. *Lomandra multiflora dura*/L.. *effusa* over *Austrostipa* tussock grassland. Waypoint 179



Figure 5. Sparse *Austrodanthonia* tussock grassland. Waypoint 292. This site supports pygmy bluetongue lizards (Section 4 - Docs in Figure 33).



Figure 6. Sparse *Austrostipa/Austrodanthonia* grassland with emergent *Lomandra effusa*. Waypoint 343



Figure 7. *Maireana rohrlachii* in sparse *A. nigricans* dominated grassland. A few individuals from a small patch of 20-30 plants are pictured.



Figure 8. *Solenogyne dominii* in fruit and vegetative *Swainsona behriana* in sparse *Austrodanthonia* tussock grassland. Waypoint 196.



Figure 9. Very open *Eucalyptus leucoxylon* +/- *E. odorata* woodland with *Austrostipa* spp. tussock grass understorey. Waypoint 299.



Figure 10. Patch of *Themeda triandra* in *Lomandra* grassland. Waypoint 127.



Figure 11. Fenceline contrast: *Aristida* low tussock grassland on rocky knoll, cropped land. Waypoint 282. Grassland on the left supports pygmy bluetongue lizards (Section 4.1.1 in Figure 33).



Figure 12. *Aristida* low tussock grassland. Intertussock space with soil crust. Waypoint 282.



Figure 13. *Austrostipa* over dense annual grasses tussock grassland with emergent *Lomandra* sp. Waypoint 151.



Figure 14. *Austrostipa* over annual rosette forbs tussock grassland. Waypoint 152.



Figure 15. Gully erosion. Waypoint 284.



Figure 16. Burnt patch of grassland, grazed. Waypoint 162.



Figure 17. Solitary *Pittosporum angustifolium* (native apricot) tree. Waypoint 204.



Figure 18. *Enneapogon nigricans* grassland over weeds. Waypoint 204.



Figure 19. Solitary male *Allocasuarina verticillata* (sheoak) overlooking Spring Creek. Waypoint 201.



Figure 20. Sheoak log in sheep camp zone, *Lomandra* grassland. Waypoint 212.



Figure 21. Sheep camp in foreground; cropped land and pasture with *Austrostipa* in background. Waypoint 311.



Figure 22. Weedy annual pasture on crest. Waypoint 171.

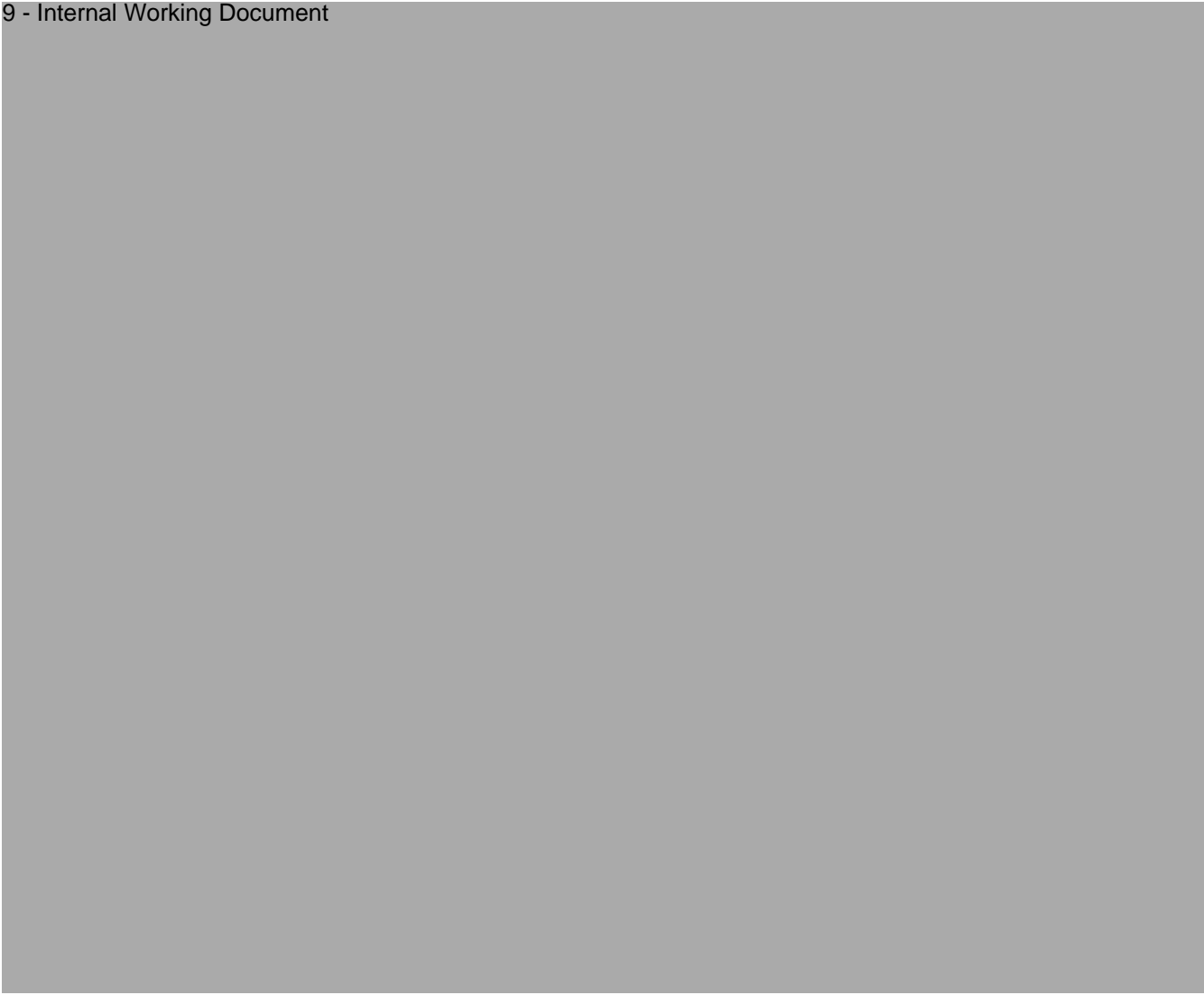
RAA

Vegetation condition and potential for restoration

Following autumn survey of the area, it appears that in general the condition of the grassland is poor to moderate. It is important to note that a spring survey is likely to have provided better information on the flora diversity and how intact the different plant communities are. In addition, it is very important to recognise that there is unlikely to be any similarly large areas of native grasslands in the AMLR region that are in better condition. Grassland condition is highly heterogeneous (Figure 23) and varies within the vegetation mapping units identified in the mapping layer (Figure 1). Extensive areas support a healthy cover of native tussock grasses and *Lomandra* species, but the intertussock spaces are dominated by weeds and annual non-native grasses. Smaller patches of moderately high quality grassland are also present. The larger woodland patch (Figure 9) and associated areas of sparse *Austrodanthonia* grassland (Figure 5) are also of high biodiversity value. The sparse grassland contains native forbs not recorded elsewhere on the property, which are conservation-rated (Table 1). The diversity of the higher quality patches and their extent need to be further assessed in spring.

In non-arable areas, the poorest vegetation condition is found in sheep camps (Figure 20, Figure 21 and Figure 22) that are situated on hilltops or towards the north east corner of paddocks. They comprise a dense sward of non-native pasture or weed species with low or nil native plant presence.

9 - Internal Working Document



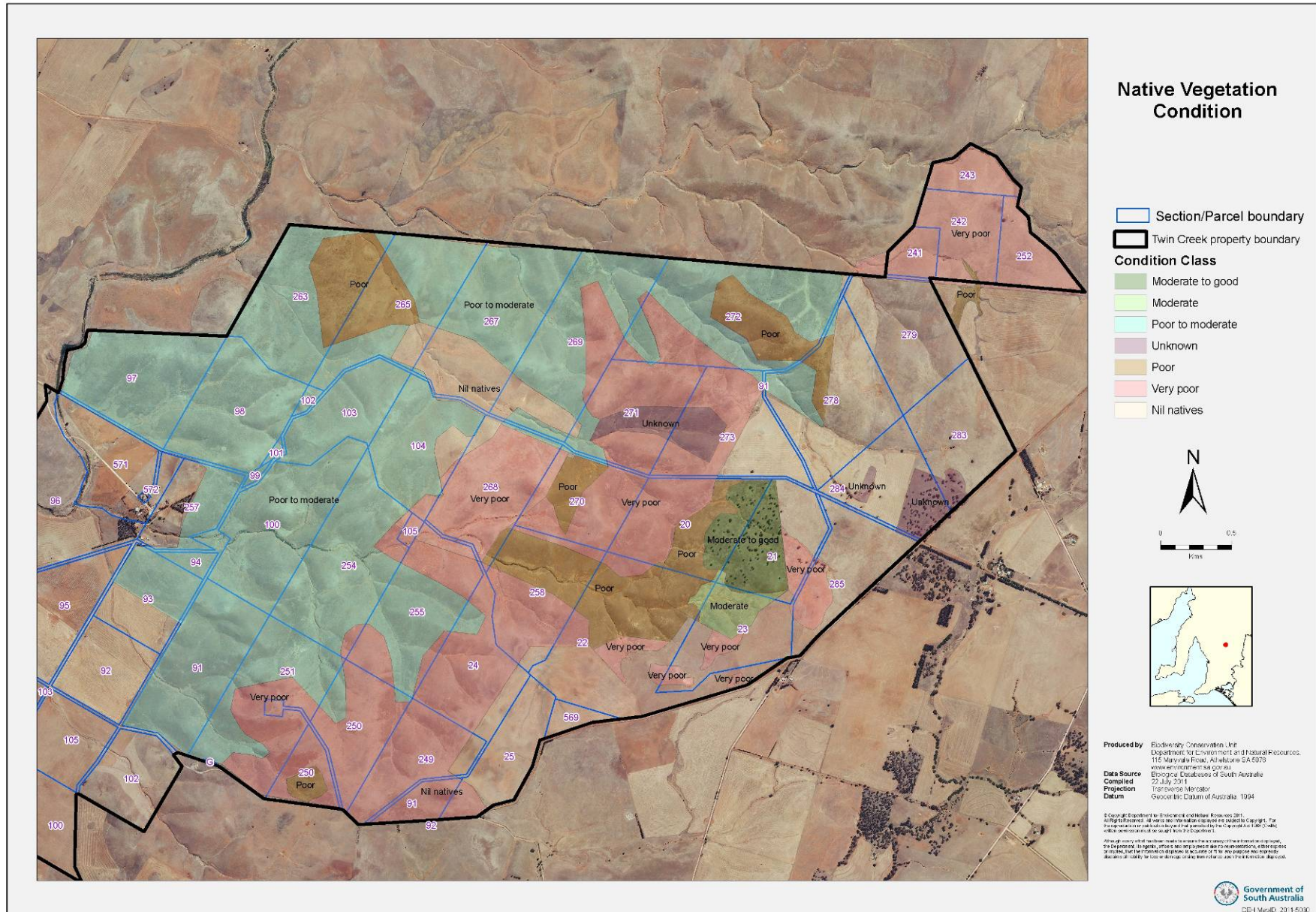


Figure 23. Native vegetation condition. Section/parcel numbers are shown in purple text with white edging.

Fauna of the Twin Creek Property

Mammals

Presented by Luke Price

Due to time constraints and the need to prioritise survey effort, no attempt was made to survey for mammal species other than the Southern Hairy-nosed Wombat. Opportunistic sightings of a number of mammal species were made by the authors whilst performing flora and habitat surveys and targeted Pygmy Blue-tongue, Southern Hairy-nosed Wombat and bird surveys. Including the southern hairy nosed wombat, 6 species of mammal (3 introduced) were recorded on the property, these were:

Euro (*Macropus robustus*) – Creek lines

Western Grey Kangaroo (*Macropus fuliginosus*) – Creek lines and grassland

Common house mouse* (*Mus musculus*) – Grasslands and creek lines, evidence of holes excavated around large grass tussocks and rocky areas

European Fox* (*Vulpes vulpes*) – Creek line in native grassland

Rabbit* (*Oryctolagus cuniculus*) – Grasslands and previously cropped paddocks, active warrens present.

*Introduced species

Native mammals which may also occur on the property include bat species; Gould's Wattled bat (*Chalinolobus gouldii*), Chocolate Wattled Bat (*C. morio*), Southern Freetail-bats (*Mormopterus* species complex) and the White-striped Freetail-bat (*Tadarida australis*). These bat species have been recorded in grassland survey sites within the Mid-North region and are likely to rely on woodlands for roosting habitat (Brandle 2008a). Suitable habitat for these species exists on the property. Likewise the presence of suitable habitat for the Short-beaked Echidna (*Tachyglossus aculeatus*) and the Fat-tailed Dunnart (*Sminthopsis crassicaudata*) on the Twin Creek property suggests they could occur there. Surveys in spring and-summer are required to better determine the presence of other mammal species.

Southern Hairy-nosed Wombat

Introduction

The Southern Hairy-nosed Wombat (*Lasiorchinus latifrons*) occurs in semi-arid areas of open woodland, savanna, shrublands, open plains and grassland (Taggart & Robinson, 2008). The species has not been recorded in the AMLR region since 1976 (Figure 24). The 1976 records were in Collingrove and made by the Mammal Club of SA, who reported the presence of four burrows and an observed individual. They indicated the animals present in the area were likely to be escapees.

In South Australia the Southern Hairy-nosed Wombat is distributed in numerous fragmented populations of varying size. Whilst a large, population size (between 50,000 and 100,000) has been estimated for the species on the South Australia portion of the Nullarbor Plain, the majority of other populations, such as those on the Yorke and Eyre Peninsula, are highly fragmented (Taggart & Robinson, 2008). Population estimates for the Yorke Peninsula populations are much lower, with the majority of populations below 100 individuals (Sparrow, 2010). Population estimates for the Murray Lands populations are between 10,000 and 15,000; however these populations have undergone serious declines of about 70% since 2002 (Taggart & Robinson, 2008).

Contemporary population declines are thought to be caused by sarcoptic mange and drought (Taggart & Robinson, 2008). In the Murray Lands region sarcoptic mange kills 80-90% of affected populations (Taggart & Robinson, 2008). Despite recorded declines the species is currently listed as least concern (Taggart & Robinson, 2008) following IUCN Red List assessment.

The aim of the present survey was to determine the extent of active southern hairy-nosed wombat warrens on the Twin Creek property.

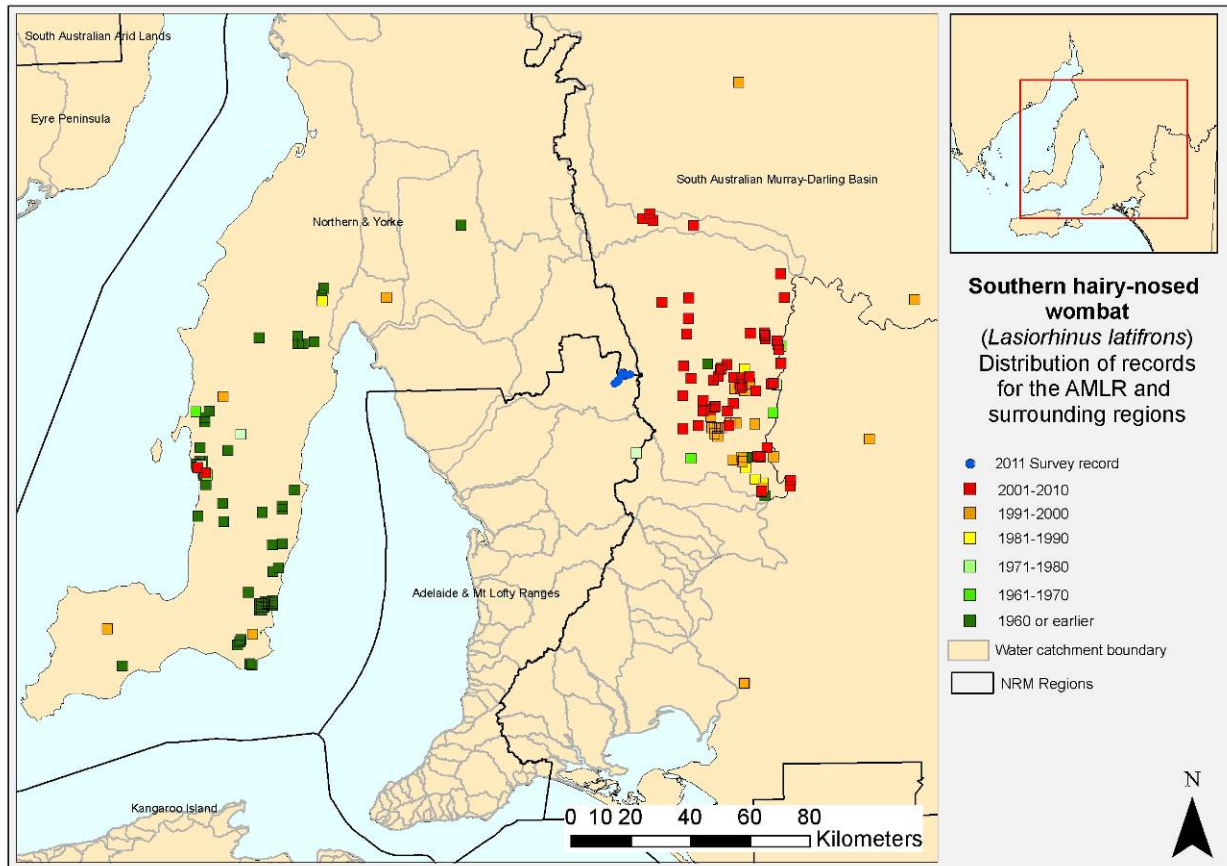


Figure 24. Distribution of records for the Southern Hairy-nosed wombat in the Adelaide and Mount Lofty Ranges Region and surrounding areas. The Twin Creek survey records is also indicated.

Methods

Twin Creek was visited on 10 separate occasions between March 9th and May 5th 2011, and assessed by vehicle and on foot. A GPS was used to record the location of all active warrens observed. For each record a general description was made of the warren site and general habitat features were recorded. Habitat types assessed included; SA Blue Gum woodland, Grassland and Creeklines.

Results

Active warrens were detected at 6 sites, each in separate creeklines (Figure 27). Whilst no wombats were observed during the survey, recent diggings and scats were prevalent at all warrens recorded. Active warren records have been lodged with the Biological Databases of South Australia under survey number 754. All warrens detected were situated adjacent to or immediately flanking drainage lines within native grassland and adjacent to large areas of continuous grassland, which had not been cropped (Figure 25 and Figure 26).



Figure 25. Active Southern Hairy-nosed wombat warrens situated along a drainage line.



Figure 26. Active Southern Hairy-nosed wombat warren located adjacent to a drainage line. The drainage line is situated about 10 metres to the left of the warren entrance in the bottom right of the image.

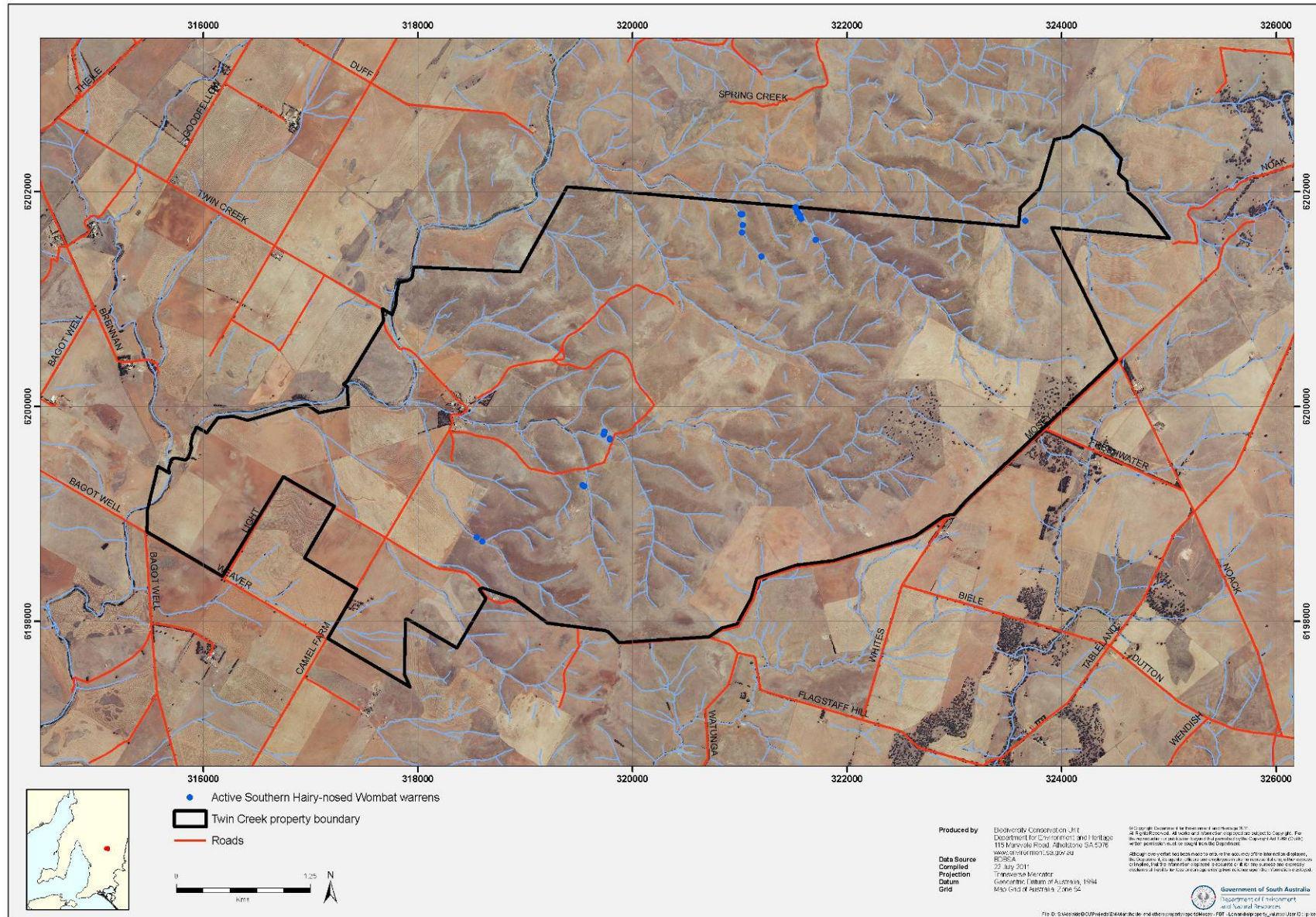


Figure 27. Records of active Southern Hairy-nosed wombat warrens on the Twin Creek Property. The landholder has indicated additional active warrens are present along some drainage lines that were not surveyed.

Consultation with the property owner indicated that the extensive areas of native grassland (~4000 acres), dissected by numerous drainage lines, are likely to contain more active warrens in areas that were not surveyed. Several wombat warrens appeared to be excavated at sites of old rabbit warrens, some of which were likely to have been destroyed by ripping prior to the inhabitation by wombats.

Discussion

The Twin Creek property contains the only contemporary southern hairy-nosed wombat population known for the AMLR region (Figure 24). Despite active land use by four generations of the same family, spanning over 100 years, southern hairy-nosed wombats have only recently been (< 10 years) recorded on the property (^{s - Documents affecting personal}, property owner, pers comm.). This observation is likely to reflect a true historical absence of the species within the property boundary, indicating recent dispersal from neighbouring areas. Considering the location, in relation to known wombat populations, it is likely animals residing on the Twin Creek property have come from the 'Murray Lands population' situated to the east (Figure 24).

A survey is currently underway to determine the extent of southern hairy-nosed wombat populations across their range (^{s - Documents affecting personal affairs} pers. comm.), the results of which will greatly enhance our understanding of the context of the Twin Creek population in regards to the Murray Lands population. It is anticipated that this comprehensive survey throughout the species distribution will lead to better management outcomes, which will not only benefit the species but also the agricultural sector.

Frogs and Reptiles

Presented by Luke Price

Due to time constraints and the need to prioritise survey effort, minimal effort was made to survey for frogs or reptile species other than pygmy blue-tongue lizards. Opportunistic sightings of a number of frog and reptile species were made whilst performing flora and habitat surveys and targeted pygmy blue-tongue, wombat and bird surveys. Including the Pygmy blue-tongue skink, 5 species of reptile and 2 species of frog were recorded on the property, these were:

- Common Froglet** (*Crinia signifera*) – adults and tadpoles wherever water was present
- Spotted Grass Frog** (*Lymnodynastes tasmaniensis*) – tadpoles in creek line
- Shingle-back Lizard** (*Tiliqua rugosa*) – numerous sites across the property
- Eastern Brown Snake** (*Pseudonaja textilis*) – single juvenile in spider hole adjacent to creek line
- Three-toed Earless Skink** (*Hemiergus decresiensis*) – under rock in small patch of outcropping on hill top
- Eastern Bearded Dragon** (*Pogona barbata*) – in INTG (community yet to be formally assessed)

All frog and reptile records have been lodged with the Biological Databases of South Australia under survey number 754.

Some reptile and frog species that may also occur on the property, but are more difficult to detect, without additional survey effort, include; the Adelaide Snake-lizard (*Delma mollerii*), Bougainville's Skink (*Lerista bougainvillii*), Burton's Legless Lizard (*Lialis burtonis*), Common Snake-eye (*Morethia boulengeri*), Dwarf Skink (*Menetia greyii*), Eastern Stone Gecko (*Diplodactylus vittatus*), Flinders Ranges Worm Lizard (*Aprasia pseudopulchella*), Four-toed Earless Skink (*Hemiergus peronii*), Garden Skink (*Lampropholis guichenoti*), Sand Goanna (*Varanus gouldii*), Southern Four-toed Slider (*Lerista dorsalis*), Spinifex Snake-Lizard (*Delma butleri*), Yellow-faced Whipsnake (*Demansia psammophis*), and the Painted Frog (*Neobatrachus pictus*). These species have been recorded in grassland and woodland communities within the Mid-North region (Brandle 2008b), that resemble those present on the Twin Creek property. There is a museum record of the Carpet python (*Morelia spilota*) from Kapunda so there is a possibility this species once occurred in the area. Surveys in spring-summer utilising drift fences, pitfall traps and funnel traps combined with spotlight searches are required to better determine the presence of other reptile and frog species.

Pygmy blue-tongue Lizard

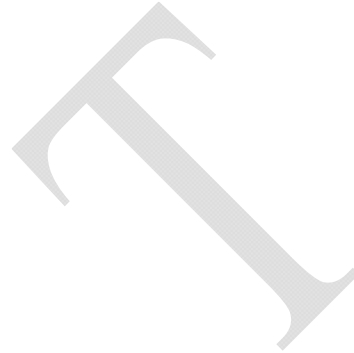
Introduction

The Pygmy Bluetongue Lizard is a small skink (~10cm in length) which inhabits fragmented native grassland remnants situated in the mid north of South Australia (Armstrong and Reid, 1993; Hutchinson *et al.*, 1994 in Schofield 2010). Historically, populations were distributed within the Adelaide and Mount Lofty Ranges Region and the species' range extended from the Adelaide plains to Burra in the mid north, a distance of over 150kms (Ehmann, 1982). Close to 30 populations have been located since the species was rediscovered (Figure 28). These populations are distributed entirely on private lands and are potentially threatened by habitat fragmentation and agricultural disturbance (Milne, 1999).

Whilst the species has only been found in areas of native grassland, the type of grassland that it inhabits varies and there is no evidence to suggest the lizards prefer a particular grassland community. Grasslands which are inhabited range from those dominated by *Austrostipa* and

Danthonia to others with a high density of *Lomandra* tussocks. It is thought that the quality of spider holes and soil type are more likely to influence the distribution of the species.

In 2010, surveys of remnant native grassland in the Adelaide and Mount Lofty Ranges Region for the Pygmy Bluetongue Lizard were undertaken (Schofield, 2010). The 2010 surveys located a single population of the species near the northern limit of the AMLR region, on the Twin Creek property. The aim of the present survey was to determine the extent of the recently discovered population on the Twin Creek Property.



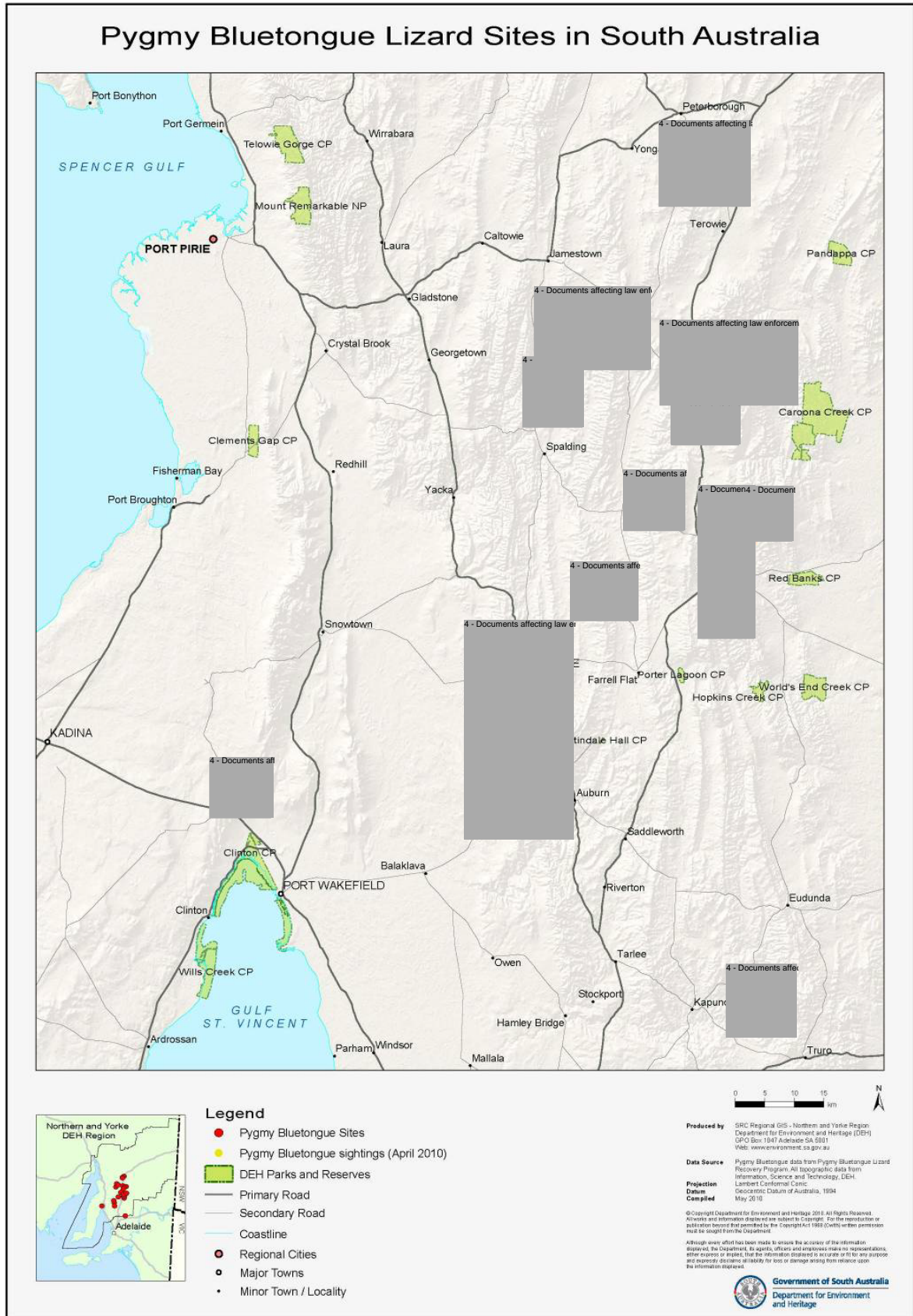


Figure 28. Pygmy Blue-tongue Lizard Sites in South Australia (Schofield 2010).

Methods

Survey site selection

Grasslands were considered suitable for survey if they had not been recently (i.e. within the last 20 years) disturbed by cropping or earthworks. Discussions with the property owner about historical land use identified numerous sites across the property which fitted our survey criteria. The presence of native grasses was taken in to consideration when selecting search areas within broader survey areas however sites dominated by weed species were given equal importance; because previous survey work had indicated the species can persist in floristically degraded and heavily grazed areas (Schofield, 2010). Within survey areas, those areas infested with dense perennial grasses were generally avoided due to the lack of intertussock space and an inability to see the ground. Preference was also given to suitable areas on flat or gently sloping land and on the lower slopes of hills. Hilltops or ridges were generally avoided.

Survey technique

The skink survey methodology followed the protocols for ‘presence absence surveys’ developed by the Pygmy Bluetongue Lizard Recovery team in 2009 (Schofield, 2010), with a few minor modifications. Upon arriving at a suitable site, searching for spider burrows of appropriate specifications (e.g. hole diameter 14-20 mm, smoothed entrance) was performed in a systematic fashion. An optical fibre scope was used to search burrows once they were located. Searching continued until 100 burrows had been checked or one or two lizards were found. When a burrow was found to be occupied by a Pygmy Blue-tongue Lizard, the GPS location, number of lizards in a burrow and a brief description of the habitat quality were recorded.

Results

The property was visited on 10 separate occasions between March 9th and May 5th 2011, with potential sites assessed by foot. All sections/parcels surveyed for pygmy blue-tongue lizards were found to support lizards. The results of the Pygmy Blue-tongue surveys are summarised in Table 2. A total of 1169 holes were searched during the survey period. The total number of Pygmy Blue-tongue Lizards recorded during the survey period was 75 and the largest numbers of lizards observed within one ‘survey site’ was in Sections [REDACTED] (17 individuals) and in Section [REDACTED] (12 individuals). The distribution of records of Pygmy Blue-tongue Lizard on the property is shown in Figure 33. Records have been lodged with the BDBSA under survey 754.

Pygmy Blue-tongue Lizards were found in a variety of grassland vegetation communities. The vegetation and habitat condition in which they were found ranged from very poor to good condition. The majority of Pygmy Blue-tongue Lizards were found in *Lomandra effusa* tussock grassland, *Lomandra effusa* +/- *L. multiflora* ssp. +/- *Aristida behriana* grassland, *Austrostipa* spp. +/- *Austrodanthonia* spp. +/- *Aristida behriana* grassland. A few pygmy blue-tongue lizards were found in *Enneapogon nigricans* tussock grassland and 1 in *Eucalyptus leucoxylon* ssp. *pruinosa* +/- *E. odorata* woodland. Nil lizards were found in that are or have been cultivated.

Table 2. Results of the Twin Creek Pygmy blue-tongue survey.

Site Name	No. of holes	No. of lizards	Habitat type with additional notes
4 - Documents affecting law enforcement and public safety, 8 - Documents affecting the conduct of research, 16 - Documents concerning the operations of agencies			
[Redacted content]			
Total	1169	75	

At one site (Section ^{4 - Document} [redacted]) searches were performed past the cut off of 100 burrows because the survey area was large and the habitat appeared suitable. Surveys ceased at 123 after a single individual was found.

At three sites ('Section ^{4 - Document} [redacted]', 'Sections ^{4 - Documents affecting law enforcement} [redacted] and 'Sections ^{4 - Documents affecting law enforcement} [redacted] searching continued after pygmy blue-tongues were detected; rather than stopping after a few lizards were found. The greater survey effort came about because repeat surveys were performed within the same sections/parcels so new volunteers who were assisting with the survey could be trained in the survey techniques required. To achieve the high level of competency required to perform the survey training, sites where pygmy blue-tongue lizards were known to occur were chosen. Consequently the higher number of lizards recorded at these sites compared to other survey sites is a reflection of the greater survey effort undertaken within them.

The pygmy blue-tongue lizard occurs in two sites on the property in which the vegetation community is possibly ^{4 - Documents affecting law enforcement and public safety, 8 - Documents affecting the conduct of research, 16 - Documents concerning the operations of agencies} [redacted] [redacted]). These sites were not formally assessed against the EPBC condition class criteria.



Figure 29. Pygmy blue-tongue lizard site (Section [redacted]) in possible Grassland [redacted]. One of two sites surveyed on the Twin Creek property where the Pygmy Blue-tongue Lizard occurs in possible [redacted].



Figure 30. Pygmy blue-tongue lizard site (Section [redacted]) in [redacted] dominated grassland. Very open [redacted] can be seen in the background.



Figure 31. Pygmy blue-tongue lizard site (Section [redacted]) in [redacted] dominated grassland. Large tussocks of *Lomandra effusa* are scattered throughout the site.



Figure 32. Pygmy blue-tongue lizard site (Section [redacted]) in [redacted] dominated grassland. Site is within very open grassy [redacted]. The spider burrow being investigated with a fibre optic scope, by the pictured observer, was occupied by a pygmy blue-tongue lizard.

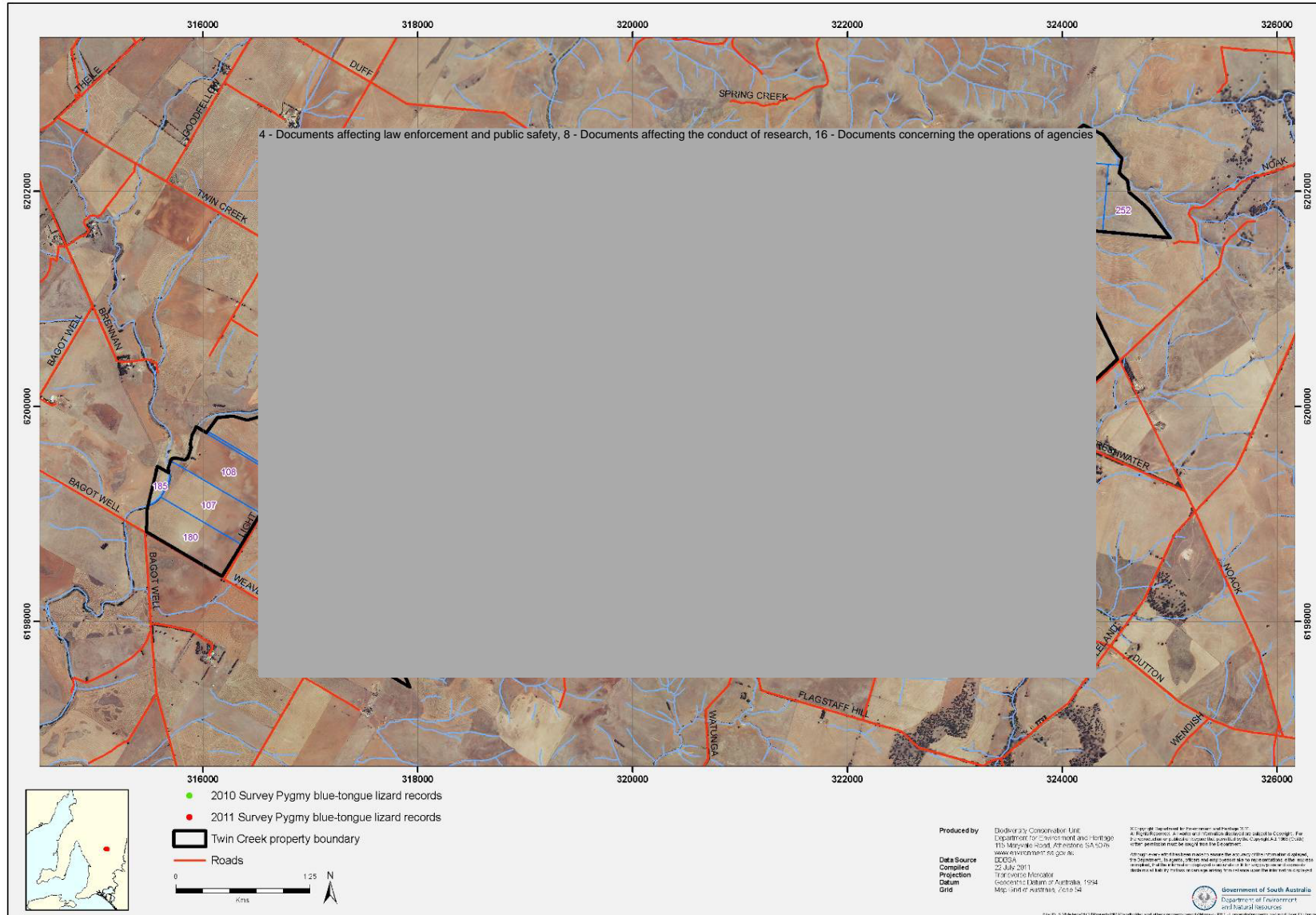


Figure 33. Pygmy blue-tongue skink records on the Twin Creek Property. Records are based on skink observations. Most observations were made using an optic fibre scope whilst individuals were taking refuge in spider burrows. Survey records made by Julie Schofield in 2010 are represented as green dots. Section/parcel boundaries are shown as blue lines with section/parcel numbers shown in purple font with a white border.

Discussion

Because of the small number and isolated nature of populations currently known to exist, the Twin Creek Pygmy Blue-tongue Lizard population is of high significance for the conservation and management of the species (Duffy *et. al.* 2009). Additionally, the population is significant because it is the only contemporary Pygmy Blue-tongue Lizard population known for the Adelaide and Mt Lofty Ranges Region and the most southerly distributed for the species (Figure 28). The distribution of the species on the property appears to be quite extensive and with further study and population density estimates, may prove to be one of the larger populations known for this species.

The Pygmy Blue-tongue Lizard recovery team is aware of the property and last year provided the landholders, with Pygmy Blue-tongue Lizard best practise guidelines and fact sheets to aid in the management of the lizard population on their property (Schofield, 2010). Future efforts should be made to work with the landholders, promoting the best practise guidelines and implementing measures to improve habitat quality and/or extent, as outlined in the draft recovery plan for this species (Duffy *et. al.* 2009).

Whilst burrow search effort was biased to better condition native vegetation communities, which were characterised by more intertussock space, several sites of poor floristic condition were also found to support pygmy blue-tongue lizards. Searching in poorer condition sites was often aided by recent heavy grazing, where the lack of vegetation cover facilitated searching by increasing burrow visibility. The presence of lizards in grasslands of differing floristic communities and with a variety of habitat conditions is coherent with other known locations (Schofield, 2010). Likewise, the species presence in sites which haven't undergone ploughing or other large scale soil disturbances in the past is consistent with the species known habitat preferences (Duffy *et. al.* 2011). The occurrence of the species in patches adjacent (i.e. < 5 metres) to regularly cropped areas was an interesting observation.

This latest survey has significantly increased our knowledge of the species distribution within the area and highlights the value of grasslands in varying condition. Whilst many areas were classified as being of poorer condition, based on surveys in Autumn, these poorer condition grassy ecosystems appear to be functioning at a level suitable enough to support a substantial Pygmy Blue-tongue Lizard population and their conservation importance should not be overlooked.

This survey was limited by time and resources and although significant portions of the property were surveyed, searches were by no means comprehensive. Further surveys are likely to discover additional sites throughout the property which support this species. In addition to better condition grassland communities, surveys of areas dominated by perennial weeds in summer months may prove fruitful because the density of vegetation cover is likely to be reduced, therefore increasing the potential for burrow detection. As highlighted by Schofield (2010), further searches for additional populations within the AMLR and neighbouring regions are warranted in light of this population's discovery.

Examples of sites where the EPBC listed INTG ecological community supports the nationally endangered Pygmy Blue-tongue Lizard are extremely rare and therefore represent a highly significant association (Turner, 2011). Formal assessment, against the EPBC condition class criteria, of two Pygmy Blue-tongue Lizard sites on the property ('Section [REDACTED] Documents' 'Sections [REDACTED] Documents all' [REDACTED] Northern part') which are possibly INTG would be valuable.

Birds

Presented by Graham Carpenter

Introduction

This report provides information on the birds and habitat value of the Twin Creek property. The assessment is based on a single site visit and a review of previous surveys in the district.

Methods

The property was visited with Luke Price, DENR, on 5 May 2011, when much of the property was assessed by vehicle and on foot. Weather during the survey was fine with light winds. A GPS was used to record the location of all birds seen or heard, and records entered onto an excel file. For each record the number of individuals and general habitat was recorded. Habitat types assessed were:

1. SA Blue Gum woodland – small areas on eastern side of property, with some Peppermint Box.
2. Grassland – widespread and dominated by *Austrostipa* spp, *Enneapogon nigricans* and *Aristida behriana*.
3. Creeklines – small areas of perennial springs with *Typha* and *Phragmites* reedbeds on major creeks.
4. Dams – full during survey.
5. Roadside – patches of shrubs along Flagstaff Hill and Mosey Roads including *Acacia acinacea* and *Rosa* spp.

Results

28 bird species were recorded on the survey, including 3 introduced species (List below). Luke Price (pers. comm.) also recorded a pair of Banded Lapwings in grassland on a previous survey. The most species were recorded in SA Blue Gum woodland (16 species) and grassland habitats (10 species).

List of species recorded (*=introduced)

Adelaide Rosella – several in SA Blue Gum woodland at two sites.

Australasian Grebe – one on a dam.

Australian Magpie – widespread in a variety of habitats.

Australian Wood Duck – one on a dam bank.

Black-faced Cuckoo-shrike – one in SA Blue Gum woodland

Brown Falcon – one flying over grassland.

Brown Songlark – single or pairs in grassland at 3 sites.

***Common Starling** – about 100 in SA Blue Gum woodland.

Crested Pigeon - a group of 5 in SA Blue Gum woodland.

Galah – flocks of about 50 in SA Blue Gum woodland, and 4 along a creekline.

***House Sparrow** – a flock of about 50 in roadside shrubs.

Little Raven – a few in SA Blue Gum woodland.

Nankeen Kestrel – single birds over grassland and in SA Blue Gum woodland.

Noisy Miner – small groups in SA Blue Gum woodland at two sites.

Purple-crowned Lorikeet - a pair flying through SA Blue Gum woodland.

Red Wattlebird – 2 in SA Blue Gum woodland.

Red-rumped Parrot – several in SA Blue Gum woodland at two sites.

Richard's Pipit – widespread in grassland including nestlings at one site.

Singing Bushlark - single or pairs in grassland at 4 sites.

- ***Skylark** – in grassland at 3 sites including a group of c. 10.
- Striated Pardalote** – a few in SA Blue Gum woodland at two sites.
- Tree Martin** – 3 in SA Blue Gum woodland at one site.
- Wedge-tailed Eagle** – a pair with a recent and an old nest in SA Blue Gum woodland.
- Welcome Swallow** – a few at two sites.
- White-naped Honeyeater** – a flock of 4 flying through SA Blue Gum woodland.
- Willie Wagtail** – at two sites.
- Yellow-rumped Thornbill** - a group in roadside shrubs.

Little has been published on the birds of the Kapunda region. Additional species recorded previously in the Kapunda district (based on the Bird Atlas of the Adelaide region – SAOA 1977) and thus could occur on the subject land are Appended. The list includes another 61 species. Of the total list, 5 species are introduced, 30 species are considered likely to be resident (=occur in area throughout year and are likely to breed) (25 species recorded during survey), 34 species irregular visitors (1 recorded during survey), 17 spring-summer visitors (most likely to breed) (none recorded during survey) and 8 autumn-winter visitors (2 recorded during survey).

Of the observed and predicted habitat use, 24% use grassland habitat, 61% use SA Blue Gum woodland, 20% use creek-line vegetation and 16% are associated with dams. 23% of species are considered declining in the Mount Lofty Ranges region. Some of these (Jacky Winter, Zebra Finch) probably no longer occur in the district.

Discussion

Birds recorded during the survey are relatively common species associated with grassy and woodland habitats in the northern Mount Lofty Ranges. None have State or regional conservation ratings, although Red-rumped Parrots and Tree Martins have been assessed as declining species in the Mount Lofty Ranges.

Particular effort was made to search for grassy woodland birds of conservation significance, namely Diamond Firetail, Brown Treecreeper, Jacky Winter and Restless Flycatcher. Neither of these species was recorded, although it is considered that the SA Blue Gum woodland would provide suitable habitat for the Diamond Firetail. The distribution and status of this species has recently been investigated, with previous reports from Julia Creek (10 km north) and Nain Range (10 km south). Results from the study (Carpenter, 2011) suggest a lower recording rate in winter, indicating that Diamond Firetails may disperse from the region. Thus further surveys in summer are warranted. The Brown Treecreeper has been recorded recently at St Kitts (3 km south-east) but occurs in denser woodland than is present at Twin Creeks. The Jacky Winter and Restless Flycatcher have declined extensively in the region with no recent records. Additional surveys in different seasons would increase the list of birds present.

The Adelaide Plains area supports several records of the Plains-wanderer, a nationally vulnerable species that inhabits grasslands. Most records are from cereal-growers or quail-shooters and are from cleared cropping land. Preferred habitat is red soil plains with sparse short grass, while hilly areas are generally avoided (D. Baker-Gabb pers. comm.). This would suggest that the grassland on the subject land is unsuitable for this species, although spotlighting surveys are required. The area may also provide habitat for two other rarely reported quails, namely Brown Quail and Red-chested Button-quail. The former has experienced an influx in recent years, but is generally associated with areas of more rank grass. Little is known of the latter species.

General Summary

The Autumn survey enabled the documentation of numerous native plant species however, additional surveys are required in Spring to detect most native species. Many of the rarest herbaceous grassland plant species are seasonal forbs which have perennial roots and above ground parts that die off annually. Many of these, as well as smaller annual forbs are unlikely to be observed in the Autumn survey. Small native herbaceous plants were recorded at several locations but are likely to be under-represented in an autumn survey. While the collective cover of native perennial grasses was evident, the total species diversity could not be determined.

The Twin Creek property supports a significant population of the Southern Hairy-nosed Wombat and is the only known population for the AMLR region. Surveys in spring and-summer, utilising baited cage and Elliot traps, Anabat sound recording as well as spotlight searches are required to better determine the presence of other mammal species.

The Twin Creek Pygmy Blue-tongue Lizard population is of high significance for the conservation and management of the species. The most southerly for the species, it is the only contemporary Pygmy Blue-tongue Lizard population known for the Adelaide and Mt Lofty Ranges Region. This survey has highlighted the value of grasslands ranging from very poor to good condition, with even the poorest condition sites maintaining important ecosystem function; i.e. supporting an EPBC listed endangered fauna species.

The large area of relatively intact grasslands is used by mostly common grassland (including cropland) bird species. It is unlikely to provide habitat for significant numbers of threatened grassy woodland bird species, but may be used by rarely reported native grassland specialists including Plains-wanderer, Red-chested Button-quail and Brown Quail. Assessment of these species is difficult, requiring intensive spotlight surveys over several seasons. Surveys in spring-summer are also required to better determine the status of other species that are irregular or spring-summer visitors to the region. These include the Diamond Firetail, a species more likely to be detected at that time.

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Appendix 1

Spring Creek grassland flora and fauna (BS742)– Flora assessment. Survey Brief and data obtained.

- Flora species list for the Property collected in a way that allows for download / entry into the Biological Databases of South Australia (BDBSA). It is preferable that the species list is collected so that species are linked to a particular vegetation community and collected within 100m of the co-ordinates recorded for the point.
 - A consolidated species list of 111 species is shown in Appendix 5
- Data to be entered into BDBSA and validated.
 - 260 plant records have been entered into the survey database including 10 quadrats with partial species lists and the remaining opportune. Vouchers were collected and lodged in the state herbarium.
- Broad mapping of plant communities – showing differentiation of areas of tussock (Graminoid) grassland versus *Lomandra* Iron-grass dominated grassland.
 - See Figure 1
- Mapping of vegetation and site condition in relation to Vegetation community composition and structure, dominant species, soil cryptogam (crust) assessment. Consideration should be given to condition in relation to the location of fence lines and watering points. Mapping to be captured in shapefile format compatible with ESRI's ArcMap software (discuss with DENR staff if need access to software etc.).
 - Layers created;
 - 1. Fence lines, roads, tracks, drainage lines and water points
 - 2. Vegetation community mapping and features
 - 3. Vegetation condition mapping
- Provide a report to the Department of Environment and Natural Resources (DENR) including the methods, vegetation / condition maps, discussion of the condition of the native grasslands over the property and photographs of representative sites.
 - Datasheets provided

Appendix 2

Rapid assessment field datasheet for mapping of vegetation communities, structure and condition.
Features recorded at GPS point locations.

Waypoint no	
trees, logs or stumps	
Subject	
Voucher number	
Photo number	
photo direction	
Notes	
Species	

Vegetation components: estimated cover

*Cover class: n=nil; r=0-10%; i=10-30%; c=30-70%; d=70-100%; p=present, cover not recorded

Attribute	Abbrev.	*Cover class:
soil crust/lichen/moss		
intertussock spaces		
Lomandra		
native perennial grass	NPG	
native annual forb	NAF	
native perennial forb	NPF	
annual alien grass	AAG	
annual alien forb	AAF	
alien perennial	AP	

Identify plant species of conservation significance

Excel spreadsheets:

SpringCkBS742data1.xls

Sitesummary

voucherlist

species records

BDBSAspeciesandvouchers.xls

Sppatsites

speciesXpatch

alldata

covcode

Appendix 3

Property management – past and present

Information from discussions with 6 - Documents affecting personal affairs, 1/6/2011

6 - Documents affecting personal affairs, 7 - Documents affecting business affairs



The soils are very erodible in nature – erosion is evident in creeklines and on hill slopes. Two of the main creek heads have been fenced off.

Appendix 4

Table 3. Bird species likely to occur in the Twin Creeks district, Kapunda, with an indication of likely status, abundance and habitat use. *=introduced species

Status: Resident=occurs throughout year; Irregular = occurs irregularly; Summer=occurs in spring-summer; Winter=occurs in autumn-winter. Abundance: Common=occurs in reasonable numbers on most visits; Uncommon=occurs in low numbers on some visits; Rare=occurs in low numbers on few visits. Declining=species assessed as declining in the Mount Lofty Ranges

Species	Status	Abundance	Grass	Blue Gum	Creek	Dam	Survey	Declining
Stubble Quail	Resident	Common	x				x	
Brown Quail	Irregular	Rare			x			
Australian Wood Duck	Resident	Uncommon				x	x	
Grey Teal	Irregular	Rare				x		
Pacific Black Duck	Irregular	Rare				x		
Australasian Grebe	Resident	Uncommon				x	x	
Hoary-headed Grebe	Irregular	Rare				x		
*Rock Dove	Irregular	Uncommon			x			
Crested Pigeon	Resident	Uncommon		x			x	
Peaceful Dove	Irregular	Rare		x				x
Little Pied Cormorant	Irregular	Rare				x		
Little Black Cormorant	Irregular	Rare				x		
White-necked Heron	Irregular	Rare				x		
White-faced Heron	Irregular	Rare				x		
Black-shouldered Kite	Irregular	Rare	x	x				
Whistling Kite	Irregular	Rare		x				x
Brown Goshawk	Irregular	Rare		x				
Spotted Harrier	Summer	Rare	x					
Wedge-tailed Eagle	Resident	Rare		x			x	
Nankeen Kestrel	Resident	Common	x	x			x	
Brown Falcon	Resident	Uncommon	x	x			x	
Black Falcon	Summer	Rare	x					
Black-tailed Native-hen	Irregular	Rare			x			
Dusky Moorhen	Irregular	Rare			x			
Black-fronted Dotterel	Irregular	Rare			x			
Banded Lapwing	Resident	Rare	x					x
Masked Lapwing	Irregular	Uncommon				x		
Red-chested Button-quail	Summer	Rare	x					x
Little Button-quail	Summer	Uncommon	x					
Galah	Resident	Common		x		x	x	
Little Corella	Summer	Uncommon		x				
Cockatiel	Summer	Rare		x				
Musk Lorikeet	Winter	Rare		x				
Purple-crowned Lorikeet	Winter	Rare		x			x	x
Adelaide Rosella	Resident	Common		x			x	
Mallee Ringneck	Irregular	Rare		x				x
Red-rumped Parrot	Resident	Uncommon		x			x	x
Budgerigar	Irregular	Rare	x	x				
Elegant Parrot	Irregular	Rare	x					
Horsfield's Bronze-cuckoo	Summer	Rare		x				
Pallid Cuckoo	Winter	Rare		x				x
Southern Boobook	Resident	Rare		x				
Barn Owl	Irregular	Uncommon	x	x				
Laughing Kookaburra	Irregular	Rare		x				
Sacred Kingfisher	Summer	Rare		x				x
Rainbow Bee-eater	Summer	Rare			x			

Brown Treecreeper	Irregular	Rare		x				x
Striated Pardalote	Resident	Uncommon		x			x	
Weebill	Resident	Rare		x				
Yellow Thornbill	Resident	Rare		x				
Yellow-rumped Thornbill	Resident	Uncommon		x			x	
Southern Whiteface	Irregular	Rare		x				x
Yellow-faced Honeyeater	Winter	Rare		x				
White-plumed Honeyeater	Resident	Uncommon		x				
Noisy Miner	Resident	Uncommon		x			x	
Red Wattlebird	Resident	Uncommon		x			x	
White-fronted Chat	Irregular	Rare				x		
Brown-headed Honeyeater	Irregular	Rare		x				
White-naped Honeyeater	Winter	Rare		x			x	
Varied Sittella	Irregular	Rare		x				x
Black-faced Cuckoo-shrike	Irregular	Uncommon		x			x	
White-winged Triller	Summer	Rare		x				
Rufous Whistler	Summer	Rare		x				x
Grey Shrike-thrush	Irregular	Rare		x				
White-browed Woodswallow	Summer	Rare		x				
Dusky Woodswallow	Irregular	Rare		x				x
Australian Magpie	Resident	Common	x	x	x		x	
Grey Fantail	Winter	Rare		x				
Willie Wagtail	Resident	Uncommon	x	x	x	x	x	
Little Raven	Resident	Common	x	x			x	
Magpielark	Winter	Uncommon			x	x		
White-winged Chough	Irregular	Rare		x				
Jacky Winter	Irregular	Rare		x				x
Singing Bushlark	Resident	Common	x				x	x
*Skylark	Resident	Common	x				x	
Australian Reed-warbler	Summer	Rare				x		
Little Grassbird	Irregular	Rare				x		
Rufous Songlark	Summer	Uncommon		x				
Brown Songlark	Resident	Common	x				x	
White-backed Swallow	Summer	Rare				x		
Welcome Swallow	Resident	Uncommon	x	x	x	x	x	
Fairy Martin	Summer	Rare				x		
Tree Martin	Resident	Uncommon		x			x	x
*Common Starling	Resident	Common		x			x	
Zebra Finch	Irregular	Rare				x		x
Diamond Firetail	Summer	Rare		x				x
*European Goldfinch	Winter	Rare	x	x	x			x
*House Sparrow	Resident	Uncommon				x	x	
Australasian Pipit	Resident	Common	x			x	x	
TOTAL 89			21	54	19	14	28	20

Appendix 5

Table 4. Plant species recorded on the Twin Creek Property during the survey period. Records have been lodged with BDBSA under Survey number 742.

No. of records	NSX Code	Family Name	Native?	First of Voucher no.	Scientific name	SA status code	NPW Act Status code	Common Name	4/04/2011	5/04/2011	6/04/2011	18/04/2011	19/04/2011	1/06/2011
1	Y01536	LEGUMINOSAE	Y	118	<i>Acacia acinacea</i>	N		Wreath Wattle						1
1	M01598	LEGUMINOSAE	Y		<i>Acacia paradoxa</i>			Kangaroo Thorn			1			
1	C01605	LEGUMINOSAE	Y		<i>Acacia pycnantha</i>			Golden Wattle		1				
1	U05842	ROSACEAE	Y	87	<i>Acaena echinata</i>			Sheep's Burr				1		
1	K04993	POLYGONACEAE	N	120?	<i>Acetosella vulgaris</i>			Sorrel						1
2	A03636	CASUARINACEAE	Y		<i>Allocasuarina verticillata</i>			Drooping Sheoak						2
1	E00302	GRAMINEAE	Y	103	<i>Amphipogon strictus</i>	N		Spreading Grey-beard Grass						1
8	K00197	GRAMINEAE	Y	2	<i>Aristida behriana</i>	N		Brush Wire-grass	1	1	3	1	2	
2	Y10088	LILIACEAE	Y		<i>Arthropodium sp.</i>			Vanilla-lily				1	1	
1	G02491	RUBIACEAE	Y	84b	<i>Asperula conferta</i>			Common Woodruff		1				
2	W01151	CHENOPODIACEAE	Y	96	<i>Atriplex semibaccata</i>	N		Berry Saltbush		1			1	
1	E01154	CHENOPODIACEAE	Y	78	<i>Atriplex stipitata</i>	N		Bitter Saltbush		1				
1	Q00164	GRAMINEAE	Y	8	<i>Austrodanthonia auriculata</i>	N		Lobed Wallaby-grass	1					
1	S00165	GRAMINEAE	Y	55	<i>Austrodanthonia caespitosa</i>	N		Common Wallaby-grass		1				
1	A05836	GRAMINEAE	Y		<i>Austrodanthonia carphoides</i>			Short Wallaby-grass						1
1	C00169	GRAMINEAE	Y		<i>Austrodanthonia eriantha</i>	N		Hill Wallaby-grass			1			
1	Q00172	GRAMINEAE	Y	37	<i>Austrodanthonia fulva</i>	U		Leafy Wallaby-grass	1					
8	U06166	GRAMINEAE	Y		<i>Austrodanthonia sp.</i>					1	3	2	2	
7	G00127	GRAMINEAE	Y	1	<i>Austrostipa blackii</i>	N		Crested Spear-grass	1	1	1	2	2	
1	E00134	GRAMINEAE	Y	10	<i>Austrostipa curticola</i>	Q		Short-crest Spear-grass	1					
1	Y00136	GRAMINEAE	Y		<i>Austrostipa elegantissima</i>	N		Feather Spear-grass						1
8	M00146	GRAMINEAE	Y	29	<i>Austrostipa nodosa</i>	N		Tall Spear-grass	2	2	2	1	1	
2	S04769	GRAMINEAE	Y		<i>Austrostipa scabra ssp. falcata</i>			Slender Spear-grass			2			
3	E10950	GRAMINEAE	Y	27	<i>Austrostipa sp.</i>			Spear-grass	1			1	1	
3	K03913	GRAMINEAE	N		<i>Avena barbata</i>			Bearded Oat	1	1	1			
2	U04070	NYCTAGINACEAE	Y	99	<i>Boerhavia dominii</i>			Tar-vine			1	1		
4	Y00224	GRAMINEAE	N	14	<i>Briza maxima</i>			Large Quaking-grass	1	1	1			1
1	A04208	PITTOSPORACEAE	Y	100	<i>Bursaria spinosa ssp. spinosa</i>			Sweet Bursaria				1		
1	E00718	AMARYLLIDACEAE	Y		<i>Calostemma purpureum</i>	N		Pink Garland-lily				1		
1	Z00471	CYPERACEAE	Y	112	<i>Carex inversa var. inversa</i>	R		Knob Sedge						1
7	Y03012	COMPOSITAE	N	17	<i>Carthamus lanatus</i>			Saffron Thistle	1	1	3	1	1	
1	Y03020	COMPOSITAE	N	110	<i>Centaurea calcitrapa</i>			Star Thistle						1

No. of records	NSX Code	Family Name	Native?	First of Voucher no.	Scientific name	SA status code	NPW Act Status code	Common Name	4/04/2011	5/04/2011	6/04/2011	18/04/2011	19/04/2011	1/06/2011
2	Q05912	GENTIANACEAE	N		<i>Centaureum tenuiflorum</i>			Branched Centaury			1			1
4	A06328	EUPHORBIACEAE	Y	12	<i>Chamaesyce drummondii</i>				1		1	1		1
1	Q00040	ADIANTACEAE	Y	111	<i>Cheilanthes lasiophylla</i>	N		Woolly Cloak-fern						1
4	S00041	ADIANTACEAE	Y	105	<i>Cheilanthes sieberi</i> ssp. <i>sieberi</i>	N		Narrow Rock-fern	1	1	1			1
1	K01165	CHENOPODIACEAE	Y	116	<i>Chenopodium desertorum</i> ssp. <i>desertorum</i>			Frosted Goosefoot						1
1	Z00367	GRAMINEAE	Y		<i>Chloris truncata</i>	N		Windmill Grass			1			
1	Q03032	COMPOSITAE	N	98	<i>Chondrilla juncea</i>			Skeleton Weed						1
2	Y05952	CONVOLVULACEAE	Y		<i>Convolvulus angustissimus</i> ssp. <i>angustissimus</i>			Australian Bindweed					1	1
4	Y10256	CONVOLVULACEAE	Y		<i>Convolvulus</i> sp.			Bindweed			2	1		1
1	W03511	CUCURBITACEAE	N	33	<i>Cucumis myriocarpus</i>			Paddy Melon	1					
1	C03785	LEGUMINOSAE	Y	109	<i>Cullen australasicum</i>			Tall Scurf-pea						1
1	K00445	GRAMINEAE	Y	39	<i>Cymbopogon ambiguus</i>	N		Lemon-grass	1					
1	W00491	CYPERACEAE	Y	57	<i>Cyperus gymnocaulos</i>	N		Spiny Flat-sedge		1				
1	K01173	CHENOPODIACEAE	Y	54	<i>Dysphania pumilio</i>			Clammy Goosefoot		1				
6	E02546	BORAGINACEAE	N	13	<i>Echium plantagineum</i>			Salvation Jane	1	1	1	1		2
2	G06231	GRAMINEAE	Y	83a	<i>Elymus scaber</i> var. <i>scaber</i>	N		Native Wheat-grass		1				1
6	W00327	GRAMINEAE	Y	4	<i>Enneapogon nigricans</i>	N		Black-head Grass	1		3	1		1
3	Q05372	GRAMINEAE	Y	101	<i>Enteropogon acicularis</i>	N		Umbrella Grass	1		1			1
1	W03431	GRAMINEAE	N	25	<i>Eragrostis minor</i>			Small Stink-grass	1					
8	U01866	GERANIACEAE	N	19	<i>Erodium botrys</i>			Long Heron's-bill	1	1	3	2		1
2	G05343	MYRTACEAE	Y	115	<i>Eucalyptus leucoxydon</i> ssp. <i>pruinosa</i>	N		Inland South Australian Blue Gum		2				
1	E02254	MYRTACEAE	Y	81b	<i>Eucalyptus odorata</i>	N		Peppermint Box		1				
1	E01674	LEGUMINOSAE	Y	77	<i>Eutaxia microphylla</i>			Common Eutaxia		1				
1	G02327	HALORAGACEAE	Y	117	<i>Gonocarpus elatus</i>			Hill Raspwort						1
3	S02893	GOODENIACEAE	Y		<i>Goodenia pusilliflora</i>	N		Small-flower Goodenia				1		2
6	C02553	BORAGINACEAE	Y?	38	<i>Heliotropium europaeum</i>			Common Heliotrope	2	1	3			
1	W02375	UMBELLIFERAE	Y	83b	<i>Hydrocotyle laxiflora</i>	N		Stinking Pennywort		1				
7	Y03196	COMPOSITAE	N	30	<i>Hypochaeris glabra</i>			Smooth Cat's Ear	1	1	3	1		1
1	K03197	COMPOSITAE	N		<i>Hypochaeris radicata</i>			Rough Cat's Ear						1
2	U00618	JUNCACEAE	Y	52	<i>Juncus aridicola</i>			Inland Rush		2				
2	Y03216	COMPOSITAE	Y	73	<i>Leptorhynchus tetrachaetus</i>	U		Little Buttons		1				1
1	Y01908	LINACEAE	Y	102	<i>Linum marginale</i>	N		Native Flax						1
1	U01910	LINACEAE	N	70	<i>Linum trigynum</i>			French Flax		1				
2	Y00680	LILIACEAE	Y	24	<i>Lomandra densiflora</i>	N		Soft Tussock Mat-rush	1	1				

No. of records	NSX Code	Family Name	Native?	First of Voucher no.	Scientific name	SA status code	NPW Act Status code	Common Name	4/04/2011	5/04/2011	6/04/2011	18/04/2011	19/04/2011	1/06/2011
8	M00682	LILIACEAE	Y	16	<i>Lomandra effusa</i>	N		Scented Mat-rush	1	1	3	2	1	
2	M04730	LILIACEAE	Y		<i>Lomandra multiflora ssp. dura</i>	N		Hard Mat-rush			1		1	
1	W04875	LILIACEAE	Y	107	<i>Lomandra nana</i>	N		Small Mat-rush					1	
1	Q01184	CHENOPODIACEAE	Y	97	<i>Maireana brevifolia</i>			Short-leaf Bluebush					1	
7	C01189	CHENOPODIACEAE	Y	81a	<i>Maireana enchylaenoides</i>	N		Wingless Fissure-plant		2	2	2	1	
1	U01206	CHENOPODIACEAE	Y	114	<i>Maireana rohrlachii</i>	R	R	Rohrlach's Bluebush					1	
1	Y02600	LABIATAE	N	89	<i>Marrubium vulgare</i>			Horehound		1				
1	K01721	LEGUMINOSAE	N	26	<i>Medicago minima var. minima</i>			Little Medic	1					
2	C10625	LEGUMINOSAE	N		<i>Medicago sp.</i>			Medic			1		1	
1	S20257	MYOPORACEAE	Y	56	<i>Myoporum platycarpum ssp.</i>			False Sandalwood		1				
1	E02562	BORAGINACEAE	N		<i>Neatostema apulum</i>			Hairy Sheepweed			1			
1	A03264	COMPOSITAE	N	32	<i>Onopordum acaulon</i>			Horse Thistle	1					
6	A06336	OXALIDACEAE	Y	6	<i>Oxalis perennans</i>			Native Sorrel	1	1	2	2		
1	A00408	GRAMINEAE	Y	104	<i>Panicum effusum var. effusum</i>	N		Hairy Panic					1	
2	E02730	SCROPHULARIACEAE	N	7	<i>Parentucellia latifolia</i>			Red Bartsia	1		1			
1	S01301	POLYGONACEAE	Y	59	<i>Persicaria prostrata</i>	U		Creeping Knotweed		1				
1	A01508	PITTOSPORACEAE	Y	119?	<i>Pittosporum angustifolium</i>	N		Native Apricot						1
1	G04975	PLANTAGINACEAE	N	91	<i>Plantago coronopus ssp. coronopus</i>			Bucks-horn Plantain			1			
1	Y03876	ASPLENIACEAE	Y	113	<i>Pleurosorus rutifolius</i>	N		Blanket Fern					1	
3	Q00244	GRAMINEAE	N	9	<i>Poa bulbosa</i>			Bulbous Meadow-grass	1			1	1	
1	U01346	COMPOSITAE	Y		<i>Pogonolepis muelleriana</i>	N		Stiff Cup-flower				1		
1	M06066	POLYGONACEAE	N	58	<i>Polygonum aviculare</i>			Wireweed		1				
1	U32242	AMARANTHACEAE	Y		<i>Ptilotus spathulatus</i>	N		Pussy-tails				1		
1	Y03292	COMPOSITAE	N	95	<i>Reichardia tingitana</i>			False Sowthistle			1			
6	Z00755	IRIDACEAE	N	22	<i>Romulea rosea var. australis</i>			Common Onion-grass	1		3	1	1	
4	S04565	CHENOPODIACEAE	Y	36	<i>Salsola tragus</i>			Buckbush	1		2	1		
4	Y04756	LABIATAE	N	21	<i>Salvia verbenaca var. verbenaca</i>			Wild Sage	1	1	1	1		
1	W00415	GRAMINEAE	Y	106	<i>Setaria constricta</i>	N		Knotty-butt Paspalidium					1	
3	Z02099	MALVACEAE	Y	79	<i>Sida corrugata var. corrugata</i>	N		Corrugated Sida		1		1	1	
1	G02679	SOLANACEAE	N	93	<i>Solanum elaeagnifolium</i>			Silver-leaf Nightshade			1			
1	W02691	SOLANACEAE	N	23	<i>Solanum nigrum</i>			Black Nightshade	1					
2	G03427	COMPOSITAE	Y	80	<i>Solenogyne dominii</i>	U		Smooth Solenogyne		1			1	
3	K30081	COMPOSITAE	N	5	<i>Sonchus oleraceus</i>			Common Sow-thistle	1		1		1	
1	Q05320	LEGUMINOSAE	Y	82	<i>Swainsona behriana</i>	T	V	Behr's Swainson-pea					1	

No. of records	NSX Code	Family Name	Native?	First of Voucher no.	Scientific name	SA status code	NPW Act Status code	Common Name	4/04/2011	5/04/2011	6/04/2011	18/04/2011	19/04/2011	1/06/2011
2	C02405	GRAMINEAE	Y	3	<i>Themeda triandra</i>	N		Kangaroo Grass	1					1
4	Q01820	LEGUMINOSAE	N	15	<i>Trifolium angustifolium</i>			Narrow-leaf Clover	1		2			1
2	G01827	LEGUMINOSAE	N		<i>Trifolium glomeratum</i>			Cluster Clover			1			1
6	Q04424	COMPOSITAE	Y	71	<i>Triptilodiscus pygmaeus</i>			Small Yellow-heads			3	1		2
1	E03346	COMPOSITAE	N	18	<i>Urospermum picroides</i>			False Hawkbit	1					
2	G03347	COMPOSITAE	Y	72	<i>Vittadinia cervicularis</i> var. <i>cervicularis</i>			Waisted New Holland Daisy		1	1			
4	E03494	COMPOSITAE	Y	20	<i>Vittadinia gracilis</i>			Woolly New Holland Daisy	1	1	2			
1	S11041	GRAMINEAE	N		<i>Vulpia</i> sp.			Fescue			1			
3	C04525	CAMPANULACEAE	Y	74	<i>Wahlenbergia luteola</i>	N		Yellow-wash Bluebell		1	1	1		
1	U11042	CAMPANULACEAE	Y		<i>Wahlenbergia</i> sp.			Native Bluebell						1
1	U04522	CAMPANULACEAE	Y	94	<i>Wahlenbergia stricta</i> ssp. <i>stricta</i>			Tall Bluebell			1			

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