

Appendix 9 Vegetation of Day Creek and Associated Floodplain (Desert Wildlife Services, October 2016)

VEGETATION OF DAY CREEK AND ASSOCIATED FLOODPLAIN

A report by Desert Wildlife Services for GHD

October 2016

Summary

Groundwork assessing and characterising the variety of vegetation types of Day Creek area took place on the 18th and 19th of October 2016. The vegetation of the creek and floodplain was divided into six different units (Fig. 1). Two of these, Day Creek channels and banks (RGC) and *Corymbia* alluvial woodlands (CAW), include a significant component of tree species, namely river red gums (*Eucalyptus camaldulensis* subsp. *arida*), bean trees (*Erythrina vespertilio*) and bloodwoods (*Corymbia opaca*) which possibly utilise groundwater resources. Localised flow and run-on areas supporting river red gums, *Erythrina* and *Corymbia* spp. occur in small areas on the greater alluvial floodplain at a scale that is not readily mapped. The remainder of the alluvial floodplain was characterised by tree species including whitewood (*Atalaya hemigaluca*), ironwood (*Acacia estrophiolata*) and supplejack (*Ventilago viminalis*), which are not known to be associated with groundwater.

An additional unit (BWS, bloodwood sandplain) located between the Day Creek floodplain and base of the Reaphook Hills was also assessed as indicative of good deep soil water resources on the base of the size and density of bloodwood trees, which could potentially include groundwater.

Besides large high-water use trees, there was a lack of other vegetation indicative of GDEs, such as groundwater dependent sedges (e.g. perennial *Cyperus* spp.), in the Day Creek area.

Introduction

Day Creek originates in the Yalyirimbi Range, and flows past the Reaphook Hills to floodout within the regional sandplain east of Lake Lewis. Extraction of groundwater associated with the Nolan's Bore rare earth mining project is anticipated to impact on groundwater levels in the Day Creek area south of the Yalyirimbi Range, with the largest draw-downs north of the Reaphook Hills. The aim of the survey of the Day Creek area was to map the vegetation along the creek and floodplain to highlight areas that may be potentially affected by groundwater draw-down.

Methods

The Day Creek area was examined on both Landsat satellite imagery and Google Earth. Several distinct vegetation types could be readily distinguished along the creek and associated floodplain on both sets of imagery. For ease of importing a rectified image to use as a base map in the field, Landsat imagery was used as the basis for field work.

The survey consisted of rapid assessment of the dominant plant species present at 47 points across a range of vegetation types identified from the available imagery (Fig. 1). Areas visited were mostly restricted to along vehicle access tracks, with the lower floodout accessed on foot. Dominant species in each structural layer were recorded, with estimates of tree basal area obtained by using a Bitterlich gauge.

Results

On ground survey confirmed that the creek and floodplain area was split into the following vegetation types (Fig. 2):

1. the vegetation of the main creek channel and banks characterised by river red gums and bean trees (RGC)
2. the vegetation of the broader floodplain characterised by scattered whitewood and dead finish (AFP)
3. broad back channels and run-on areas with bloodwoods and ghost gums, sometimes also associated with red gums and bean trees (CAW)
4. mulga woodlands of the lower floodout (LFM)
5. a broad area of mulga woodland on alluvial soils flanking sections of the floodplain above the Reaphook Hills (MAP)
6. an area of sandplain with large bloodwoods and ghost gums located between the floodplain and the Reaphook Hills (BWS)

Mulga woodlands on alluvial soils, on the eastern side the Day Creek floodplains and north of the Reaphook Hills, merge with the adjacent spinifex sandplains, and were mapped as a combination unit (MSP).

The different mapped vegetation types are described in more detail below.

Table1 : Area of vegetation types along Day Creek

UNIT	DESCRIPTION	AREA km ²
RGC	River red gum/bean tree woodlands along creek channel and banks	7.35097
CAW	Corymbia alluvial open woodland	6.27835
AFP	Whitewood very open woodlands on alluvial floodplain	37.88512
LFM	Lower floodout mulga woodlands	12.98944
BWS	Bloodwood open woodlands on sandplain	3.01307
MAP	Mulga alluvial plains	90.57972
MSP	Mulga and black gidgee and spinifex on alluvial plains	6.25988

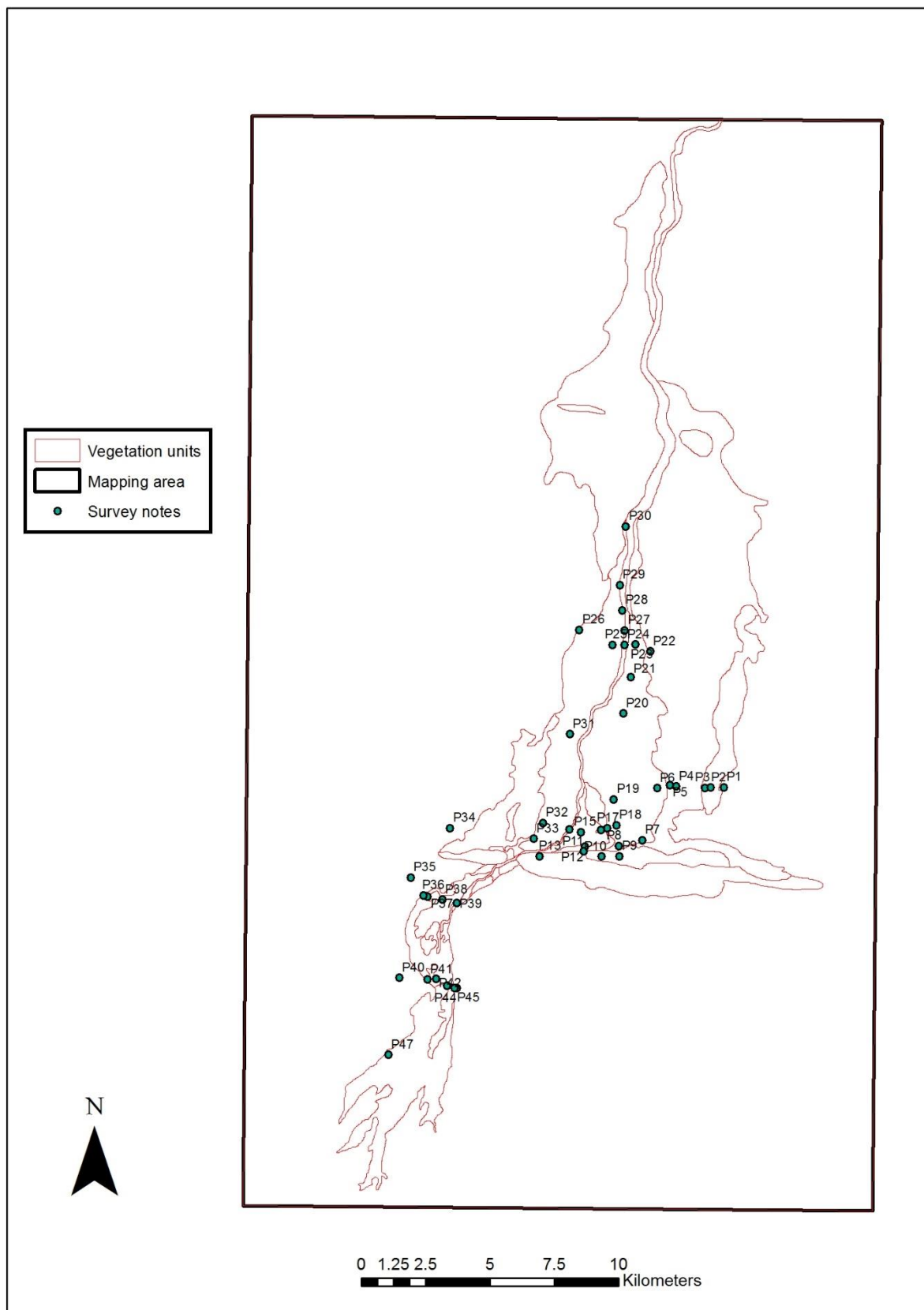


Figure 1. Location of rapid survey sites along Day Creek and associated floodplain

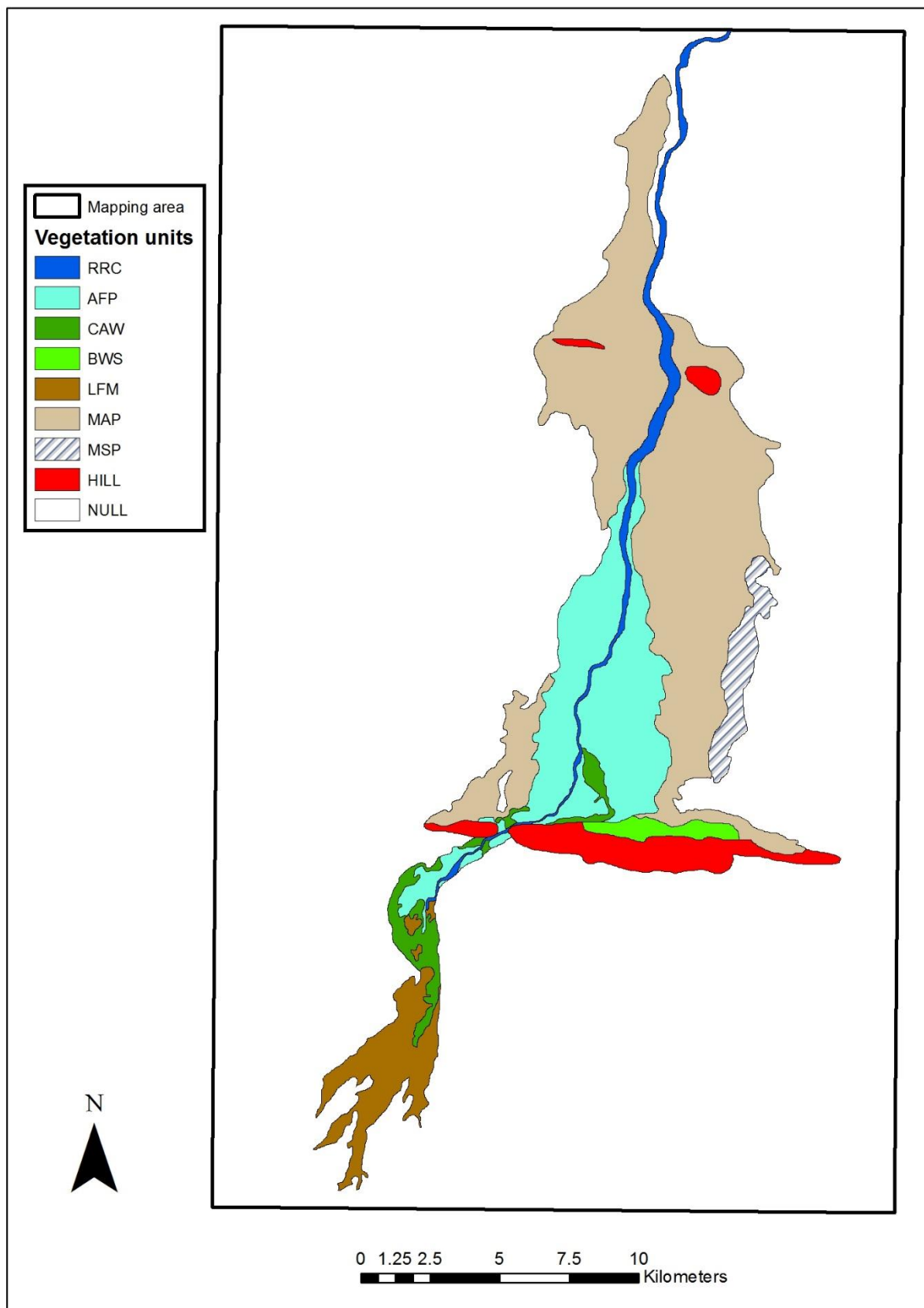


Figure 2. Vegetation units of Day Creek and associated floodplain

DAY CREEK CHANNEL AND BANKS (RGC)

Sites: P14, P24, P16, P11, P12

Most of Day Creek has a single sandy channel 1-2 m deep, which varies from 60 m wide in the middle upper section, to less than 10 m wide at its lower end south of the Reaphook Hills.

Creek banks and channels were dominated by river red gums (*Eucalyptus camaldulensis* subsp. *arida*) together with bean trees (*Erythrina vespertilio* subsp. *biloba*); figure 3.

OVERSTOREY: Woodland of approximately 6-8m²/Ha tree basal area

Dominants:

Eucalyptus camaldulensis subsp. *arida*

Erythrina vespertilio subsp. *biloba*

Minor occurrences:

Atalaya hemiglauca

Acacia estrophiolata

Capparis mitchellii

Corymbia opaca

Corymbia aparrerinja

MIDSTOREY: sparse

Vachellia farnesiana

GROUNDLAYER: patchy, can be dense along banks

Cenchrus ciliaris

Cynodon dactylon

Bothriochloa ewartiana

Eulalia aurea

Crotalaria eremaea subsp. *strehlowii*

Senecio magnificus

Cynanchum floribundum

CORYMBIA ALLUVIAL OPEN WOODLAND (CAW)

Sites: P11

A section that branches off just north of the Reaphook Hills is wider and flatter, with no defined channel, and is much more clayey. Some sections include *Eucalyptus camaldulensis* subsp. *arida* and *Erythrina*, others just *Corymbia* spp. (*C. opaca* and *C. aparrerinja*); figure 4.

OVERSTOREY: Woodlands with basal area up to 8m²/Ha

Dominants:

Corymbia opaca

Corymbia aparrerinja

Minor occurrences:

Eucalyptus camaldulensis subsp. *arida* (can be thick but trees of smaller size than creek channels)

Erythrina vespertilio subsp. *biloba*

Atalaya hemiglauca

Acacia estrophiolata

MIDSTOREY: sparse to moderately dense (5-15% cover)

Vachellia farnesiana

GROUNDLAYER: sparse with abundant leaf litter to dense

Cenchrus ciliaris

Cynodon dactylon

Bothriochloa ewartiana

Malvastrum americanum

Leipidium muelleriferdinandi

Enteropogon ramosus

Boerhavia burbridgeana

Panicum decompositum

Includes *Elerocharis pallens* swamp with *Alternanthera angustifolium* near the Reaphook Hills (ephemeral periodically inundated, no indication of any reliance on groundwater)

ALLUVIAL FLOODPLAIN (AFP)

Sites: P6, P7, P8, P15, P18, P19, P25

Gritty sandy loam soils, with areas of clayey scalds (figures 5 & 6). Some lower lying broad drainages receiving extra run-on may have species associated with the above 2 units, namely river red gums, *Corymbia* spp. and *Erythrina*, along with a number of perennial grasses which are also associated with drainage lines.

TREE LAYER: sparse, 5-10% cover, <0.5-1m²/Ha basal area

Dominant:

Atalaya hemiglauca

Other species:

Ventilago viminalis

Acacia estrophiolata

Corymbia opaca

Corymbia aparrerinja

Grevillea striata

Capparis mitchellii

MID LAYER:

Dominant:

Hakea divaricata

Hakea lorea

Acacia tetragonophylla

Vachellia farnesiana

Other species:

Rhagodia eremaea

Senna artemisoides subsp. *filifolia*

Senna artemisioides subsp. *quadrifolia*

Acacia aptaneura

Acacia kempeana

GROUND LAYER: sparse, dense in small run-on areas

Dominant:

Tripogon loliformis

Fimbristylis dichotoma

Aristida contorta

Enneapogon polyphyllus

Cenchrus ciliaris

Sclerolaena cornishiana

Sclerolaena costata

Sida platycalyx

Portulaca oleracea

Other species:

Calotis hispidula

Calocephalus platycephalus
Calocephalus knappii
Dactyloctenium radicans
Tribulus eichlerianus
Abutilon otocarpum
Dysphania melanocarpum
Brachyscome ciliaris
Atriplex elachophylla
Einadia nutans subsp.
Atriplex elachophylla
Einadia nutans subsp. *eremaea*
Salsola tragus
Sclerolaena convexula
Triodia longiceps
Indigofera linnaei
Eragrostis eriopoda
Solanum quadriloculatum

Run-on areas:

Bothriochloa ewartiana
Eulalia aurea
Enteropogon ramosus
Themeda triandra
Chrysopogon fallax
Leptochloa fusca subsp. *muelleri*
Urochloa gilesii
Cenchrus ciliaris
Cynodon dactylon
Zaleya galericulata
Malvastrum americanum
Goodenia fascicularis
Swainsona oroboides
Alternanthera angustifolium
Eragrostis leptocarpa
Rhodanthe charsleyae

LOWER FLOODPLAIN MULGA (LFM)

Site: P47

Dense mulga (mostly *Acacia aptaneura*, minor *Acacia aneura*) with over 50% projected foliar cover and around 6m²/Ha basal area, over sparse grasses and forbs on clayey loam.

Corymbia species (*C. opaca* and *C. apparerinja*) are only a rare occurrence, with individuals generally small in stem diameter and height.

Vegetation is essentially the same as the thicker bands of mulga in MAP and MSP (see e.g. P2), and could be grouped together with this unit.

EMERGENT TREE LAYER: Absent

TALL SHRUB LAYER: Dense (up to over 50% projected foliar cover and 6m²/Ha basal area)

Acacia aptaneura

Acacia aneura

LOW SHRUB LAYER: Sparse

Spartothamnella teucriflora

Rhagodia eremaea

GROUND LAYER: Sparse

Fimbristylis dichotoma

Tripogon lolliformis

Aristida contorta

Enneapogon polyphyllus

Sida platycalyx

Portulaca oleacea

Maireana villosa

Evolvulus alsinoides var. *villosicalyx*

Solanum quadriloculatum

Abutilon macrum

Abutilon fraseri

Eragrostis eriopoda subsp. Red earth

MULGA OLD ALLUVIAL PLAIN (MAP)

Sites: P2, P4, P22, P26

North-south bands of mulga, with more open mulga in between (figure 7).

This unit does not appear to have any species which may be significant users of groundwater.

Corymbia spp. (*C. opaca* and *C. aparrerinja*) are only a rare occurrence, with individuals generally small in stem diameter and height.

Vegetated claypans lacking trees and shrubs occur near the boundary of the mulga alluvial plains and the alluvial floodplain (figure 8).

EMERGENT TREE LAYER: Absent

TALL SHRUB LAYER: Dense (up to over 50% projected foliar cover and 6m²/Ha basal area)

Acacia aptaneura

Acacia aneura

Psyrax ammophila

Acacia kempeana

Hakea lorea

LOW SHRUB LAYER: Sparse

Eremophila gilesii

Spartothamnella teucriflora

Rhagodia eremaea

GROUND LAYER: Sparse

Fimbristylis dichotoma

Tripogon loliformis

Aristida contorta

Enneapogon polyphyllus

Sclerolaena cornishiana

Sida platycalyx

Portulaca oleracea

Sclerolaena convexula

Evolvulus alsinoides var. *villosicalyx*

Solanum quadrilculatum

Eragrostis eriopoda subsp. Red earth

Hibiscus burtonii

Dactyloctenium radulans

Abutilon macrum

Abutilon fraseri

Sporobolus blakei

Cheilanthes sieberi

Eriachne helmsii

Euphorbia tannensis

Digitaria brownii

MULGA/SPINIFEX ALLUVIAL SANDPLAIN (MSP)

Sites: P1, P3

On the eastern edge adjacent to the spinifex sandplain the inter-mulga sections are spinifex (*Triodia basedowii*) with a variety of *Acacia* shrubs, including *Acacia pruinocarpa* which is mostly absent from the adjacent open sandplain, and fork-leafed corkwoods (figure 9).

EMERGENT TREE LAYER: very sparse

Acacia estrophiolata

Corymbia opaca

TALL SHRUB/SMALL TREE LAYER:

Acacia pruinocarpa

Acacia kempeana

Acacia ayersiana

Acacia aptaneura

Hakea divaricata

SHRUB LAYER:

Acacia adsurgens

Acacia melleodora

Acacia ligulata

Eremophila longifolia

Grevillea juncifolia

Acacia murrayana

Senna artemisioides subsp. *filifolia*

Rhagodia eremaea

Eremophila latrobei subsp. *glabra*

GROUND LAYER: around 25 % spinifex cover

Triodia basedowii

Calandrinia balonensis

Eragrostis eriopoda subsp. Red earth

Dicrastylis lewellenii

Senna pleurocarpa

Solanum centrale

Enneapogon polyphyllus

Portulaca oleracea

Ipomoea muelleri

Sida sp. Wakaya Desert

Calotis hispidula

BLOODWOOD SANDPLAIN (BWS)

Site: P10 (lower colluvial slope P11)

Adjacent to the colluvial slopes flanking the northern side of the Reaphook Hills, this narrow strip of sandplain is characterised by large bloodwood trees, which intermix with ghost gums closer to the ghost-gum dominated colluvial slopes (figure 10).

EMERGENT TREES: scattered, approx. 5-10% cover, basal area around 0.5-2m²/Ha

Corymbia opaca

Corymbia aparrerinja (becoming more dominant towards the colluvial slope of Reaphook Hills)

LARGE SHRUBS/SMALL TREES: very scattered

Acacia pruinocarpa

Hakea lorea

Hakea divaricata

Acacia sericophylla

Acacia aptaneura

SMALL SHRUBS: sparse

Acacia murrayana

GROUND LAYER: moderate cover of spinifex

Triodia basedowii (*Triodia pungens* is dominant on the colluvial slope)

Solanum centrale

Calandrinia balonensis

Lechenaultia divaricata

Portulaca oleracea

Hibiscus sturtii

Crotalaria eremaea subsp. *strehlowii*

Paraneurachne muelleri

Goodenia triodiophila

Aristida inaequiglumis



Figure 3. RRC River red gums and bean trees along Day Creek, between the Laramba Road and the Reaphook Hills.



Figure 4. CAW *Eleocharis pallens* ephemeral swamp with fringing ghost gums, near the Reaphook Hills



Figure 5. AFP Scattered whitewood with a shrub layer of dead finish over short lived graminoids and *Sclerolaena* spp. on gritty alluvial soils, Day Creek floodplain.



Figure 6. AFP Scattered whitewoods and fork-leafed corkwoods with dead finish over buffel grass on gritty sandy alluvial soils of the Day Creek floodplain.



Figure 7. MAW Mulga woodlands on alluvial soils on the western side of the Day Creek floodplain.



Figure 8. MAW Vegetated claypan dominated by *Alternanthera angustifolia* and *Leptochloa fusca* subsp. *muelleri*, located near the junction of the mulga alluvial plain and the whitewood open woodland of the alluvial floodplain. Both of these species would rely on ephemeral water supplies when claypans are inundated after large rainfall events.



Figure 9. MSP Spinifex sandplain with *Acacia pruinocarpa* adjacent to and interspersed with mulga woodlands on alluvial soil.



Figure 10. BWS Bloodwood spinifex sandplain adjacent to the Reaphook Hills and the Day Creek floodplain.

Relationships of vegetation with groundwater

The reliance of central Australian vegetation on groundwater is poorly known. Within the Day Creek area, the vegetation that may be most likely to be reliant on groundwater are river red gums, bloodwoods and bean trees (O'Grady et al. 2009; Santini et al. 2016). Ghost gums may also possibly access groundwater resources, but this has not been examined in central Australia. Tree height and tree basal area are good indicators of available water resources for tree growth (Zolfhager 2013).

Three separate vegetation types may possibly utilise groundwater resources.

1. River red gums and bean trees along the main channel and banks of Day Creek.
River red gums and bean trees along the main creek (where they are largest and have the highest tree basal area (up to around 8m²/Ha) are the most likely species in the Day Creek area to be utilising groundwater resources.
2. *Corymbia* alluvial open woodlands
These areas are characterised by bloodwoods and ghost gums, and mainly occur close to the Reaphook Hills in areas that would periodically receive some water flow from either local runoff or larger creek flows. The area of largest trees (bloodwoods co-occurring with bean trees) with the highest basal area observed (up to 8m²/Ha) was on a back-channel of Day Creek just north of the Reaphook Hills.
3. Bloodwood woodlands on spinifex sandplain
Just north of the Reaphook Hills, and between the back channel of Day Creek and the colluvial slope of the Reaphook Hills. Bloodwood woodlands over spinifex in the Ti Tree basin area to the north-east of the Nolan's Bore project area appear to be associated with groundwater accessible within 8m of the surface (James Cleverly University of Technology, Sydney pers comm. 2015).

No other vegetation such as sedges indicated the presence of shallow groundwater. On larger creeks in the McDonnell bioregion, sedges such as *Cyperus gymnocaulos* and *C. vaginatus* are indicative of shallow groundwater along drainage lines. However these species were not observed along Day Creek. A large clayey swamp area near the Reaphook Hills dominated by *Eleocharis pallens* (adjacent to P11) is likely to rely only on ephemeral water from runoff rather than from groundwater.

References

- O'Grady, AP, Cook, PG, Eamus, D, Duguid, A, Wischusen, JDH, Fass, T, Worldege, D (2009) Convergence of tree water use within an arid-zone woodland. *Oecologia* **160**:643–655 DOI 10.1007/s00442-009-1332-y
- Santini, NS, Cleverly, J, Faux, R, Lestrangle, C, Rumman, R and Eamus, D (2016) Xylem traits and water-use efficiency of woody species co-occurring in the Ti Tree Basin arid zone. *Trees* **30**:295–303 DOI 10.1007/s00468-015-1301-5
- Zolfhager, S (2013) Comparative ecophysiology of *Eucalyptus* woodlands along a depth-to-groundwater gradient. PhD Thesis, University of Technology, Sydney.