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BUSHLAND PLANT SURVEY RECORDING SHEET 1 - use pencil only

BUSHLAND AREA Goldmine Hill, Nth Dandalup SITE NUMBER GOHLØ1

DATE TRIP 17.11.96 RECORDERS AM

DATE TRIP _____ RECORDERS _____

DATE TRIP _____ RECORDERS _____

1. LOCATION of the QUADRAT

Mud Map Draw a sketch of the location of the site below



Road Location Whittakers Rd, Nth Dandalup

Geographic Location Latitude 32 32 20 S Longitude 115 58 55.3 E Altitude 160m
GPS ☒ Accuracy _____
Map Sheet PINJARRA F300m (GSATS)

Photograph Name _____ Number 94 + 35 Roll # 4

Topographic Position (Circle the correct response)
Upland _____ Lower slope _____
Upper slope _____ Valley _____
Midslope 3 scarp face Washline _____

2. SITE DATA Circle the correct response

Slope flat gentle steep _____ Aspect N NE E SE S SW W NW

Surface Soil loamy clay Depth to Rock >1m Colour drabolate brown

Exposed Rock type granite % surface cover 0.5% size range 1-10cm

Litter 780 % surface cover _____ Depth (cm) 15-20cm

Bare Ground 1 % surface cover _____

Adapted from 'Bushland Plant Survey' written by B. Keighery (1994) and published by Wildflower Society of WA (Inc). PO Box 64 Nedlands WA 6008

Rec. Res. 21041

BUSHLAND PLANT SURVEY RECORDING SHEET 2 (Mulr)- use pencil only

3. VEGETATION STRUCTURE AND COVER

For each layer record - appropriate life form, cover class (see below) and dominant species in each layer.

	TREES			MALLEES	
	over 15m	5-15m	under 5m	over 8m	under 8m
LIFE FORM					
COVER CLASS (%)	10-30%	2-10%			
DOMINANT SPECIES	<i>E. laelaei</i>	<i>E. laelaei</i>			

	SHRUBS			SHRUBS	
	over 2m	2m - 1.5m	1.5 - 1m	1 - 0.5m	under 0.5m
LIFE FORM					
COVER CLASS (%)				10-30%	>70%
DOMINANT SPECIES				<i>M. raedtii</i>	<i>Araria pulchella</i>
				<i>H. lissocarpa</i>	<i>Phy. cal.</i>
				<i>X. pleisii</i>	<i>Paedrea ramphor</i>

	GRASSES	HERBS	SEDGES	over 0.5m	under 0.5m
LIFE FORM					
COVER CLASS (%)	2-10%	2-10%			30-70%
DOMINANT SPECIES	<i>Briza maxima</i>	<i>Oxeye sp.</i>			<i>Tet. capillaris</i>
	<i>Avena sp.</i>	<i>Haemodorum sp.</i>			<i>Lepidosperma terete</i>
	<i>Stipa elegantissima</i>	<i>Stachysia sp.</i>			<i>Tet. oct.</i>

4. VEGETATION CONDITION

Comments

415. *E. laelaei* midslope woodland
Some weed invasion from adjacent pastures

and
case
2

BUSHLAND PLANT SURVEY RECORDING SHEET 1 - use pencil only

BUSHLAND AREA Goldmine Hill, Dandalup SITE NUMBER GOHL02 or GOML02

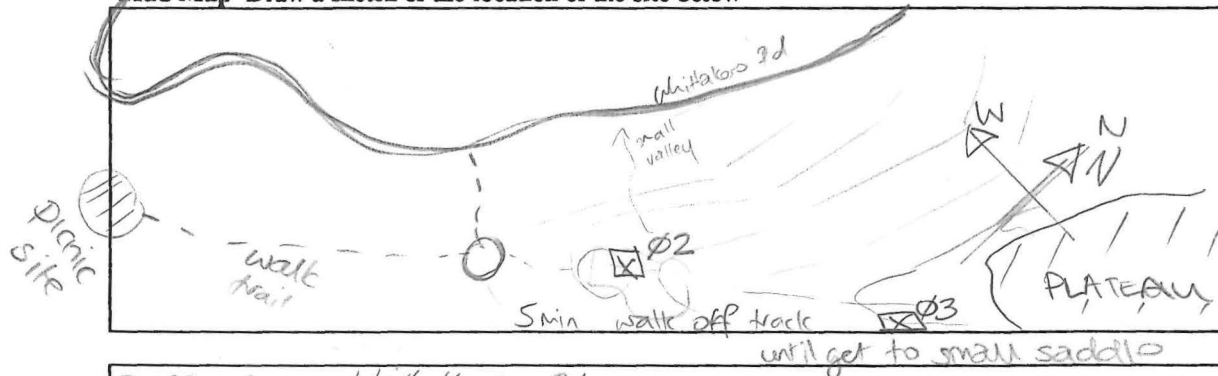
DATE TRIP 17.11.96 RECORDERS AM

DATE TRIP _____ RECORDERS _____

DATE TRIP _____ RECORDERS _____

1. LOCATION of the QUADRAT

Mud Map Draw a sketch of the location of the site below



Road Location Whitakers Rd

Geographic Location Latitude 32 32 22.0 S Longitude 115 59 06.1 E Altitude 225m (map)
GPS ☒ Accuracy
Map Sheet PINJARA 7SAT5 ±100

Photograph Name _____ Number #36 Roll # 4

Topographic Position (Circle the correct response)
Upland ☒ Upper slope ☒ Midslope ☐ Lower slope ☐ Valley ☐ Washline
granite heath 3+

2. SITE DATA Circle the correct response

Slope flat ☐ gentle ☒ steep 1.5 Aspect (N) NE E SE S SW W NW 18° NNE

Surface Soil gritty, loamy clay Depth to Rock 0-20cm Colour med-brown

Exposed Rock type granite % surface cover 8% size range 5-40cm 140cm

Litter 40 40 % surface cover 8 Depth (cm) 10-75cm

Bare Ground 2 % surface cover)

BUSHLAND PLANT SURVEY RECORDING SHEET 2 (Mulr)- use pencil only

3. VEGETATION STRUCTURE AND COVER

For each layer record - appropriate life form, cover class (see below) and dominant species in each layer.

Cover Class							
2-10%		10-30%		30-70%		over 70%	
TREES							
over 15m		5-15m		under 5m		MALLEES	
over 8m		under 8m					
LIFE FORM							30m 10m
COVER CLASS (%)	2-10%		2-10%				
DOMINANT SPECIES	E. calophylla		E. calophylla (Saplings)				
SHRUBS							
over 2m		2m - 1.5m		1.5 - 1m		SHRUBS	
over 0.5m		under 0.5m					
LIFE FORM							2m 1m
COVER CLASS (%)		10-30%		10-30%		>70%	
DOMINANT SPECIES		H. tr. fuscata H. undulata Allocas. huglii		Acacia pulchella Mel. scabra Dry. amata		Baeckea campidromosma Mel. scabra Hibb. hyperic. Phy. cal.	
GRASSES		HERBS		SEDGES			
over 0.5m		under 0.5m					
LIFE FORM							1m
COVER CLASS (%)		2-10%					
DOMINANT SPECIES		H. madroxum sp. Tetrathela nuda					

4. VEGETATION CONDITION

Comments

Some grassy weeds from adjacent properties. 4-4 1/5
abundant excellent condition. Granite under loam heath. (no outcrops in area)
Surrounded by mallee-wooded woodland on spur on scarp edge.

Cond. Code 452

GOHLØ3 - upper mixed Eucalypt
° Jural slopes

±300m

4 SATS

32° 32' 24" 23.3" - 3 SATS

115° 59' 09.1" Accuracy No!



240m altitude (Map)

32° 32' 22.0"

4 SATS

115° 59' 10.0"

±300m

+ upslope & veering to
Southern edge of spur

α ≈ 100m.

At base of 2 v. large E. wandoo

(Not E. laevis) - on steep³ slope dominated by Jural but
at uppermost edge of clayey spur v. wandoo & ghost gum appearing

• Photo #37

• upper slope (4)

• gravelly clay

• laterite - > 0.5% 1-3cm: size of gravel.

• 60-70% litter 10-20cm.

• 0% bare ground

Map - see other
sheet.

Depth of
soil =
≈ 80cm

W-RST (264°) Aspect

(7)

W 275
275

360

90 E

180

3

photo #37+38

leaf 11/10

leaf 11/10

leaf 11/10

BUSHLAND PLANT SURVEY RECORDING SHEET 3 - use pencil only

5. SPECIES PRESENCE

Label each plant with plants number, site code, date and plant's name or working name if required

SITE No GOHL03

Record on Sheet

Date 17.11.96

+ Locore 15.12.96

- Column 1 plant name
- Column 2 plant number
- Column 3 flowering time- TICK if species flowering
- Column 4 identification check

5-leaf clover - Lotus

Black, stringy-based domandria L. nigricans

Daucus gladiolatus

D. preisii (R)

TREES	No	FI	ID	SHRUBS (cont.)	No	FI	ID	HERBS (cont.)	No	FI	ID
<i>E. marginata</i>	✓			<i>Scaevola pulchra</i>	✓			<i>Stylidium amoenum/jacatum</i>			
<i>E. wandoo</i>	✓			<i>Dampiera alata</i>	✓			<i>Labechea punctata</i>	✓		
<i>E. calodrylla</i>	✓			<i>Dionaea nivea</i>	✓			<i>Musanotus sp. - 5-leaf leaf</i>	✓		
<i>E. laebei</i> (ADS)				<i>Isopogon sibiricophylla</i>	✓			<i>Xanthosia?</i>			
SHRUBS				<i>Phyllanthus calycinus</i>	✓			<i>Sphaerolobium medium</i>			
<i>Xan. gracilis</i>	✓			<i>Boraginaceae ornata</i> (sp. nov?)	✓			<i>Astiloma? ciliatum</i>	✓		
MAKES (ADS) <i>Caladenia longicauda</i>				<i>Clematis pubescens</i>	✓			<i>Acacia decurrens</i> late/cold	✓		
<i>Xan. preisii</i>	✓			<i>Tetralix multiflora</i>	✓			<i>Hibbertia amplexicaulis</i>	✓		
<i>Hakea amplexicaulis</i>	✓			GRASSES				<i>Poa sp.</i>			
<i>Hakea cyclocarpa</i>	✓			<i>Tetralix laevis</i>	✓			<i>Hakea lissocarpa</i>	✓		
<i>Daviesia preisii/decurrens</i>	✓			<i>Stipa elegantissima</i>	✓			<i>H. lissocarpa?</i>			
SHRUBS				<i>Unid. Grasses</i>				<i>Hypochaeris glabra</i>	✓		
<i>Hakea lissocarpa</i>	✓			<i>Danthonia sp.</i>	✓			<i>Cadytha sp.</i>	✓		
<i>Acacia alata</i>	✓			<i>Hypochaeris robustum</i>	✓			SEDGES			
<i>Hibbertia acerosa</i>	✓			<i>Briza maxima</i>	✓			<i>Lepidosperma lutea smooth</i>	✓		
<i>Dyandra nivea</i>				<i>Nelumbo glaucopurpurea</i>	✓			<i>Tetralix octandra</i>	✓		
<i>Hibbertia hypoleuca</i>	✓			<i>Alv. caryophylla</i>				<i>Tet. capillaris</i>	✓		
<i>Olearia paucidentata</i>	✓			<i>Briza minor</i>				<i>Lomandra hirsuta</i>	✓		
<i>Astiloma sp. lvs. ap</i>				HERBS				<i>blue, broadleaf</i>			
<i>Kennedia coccinea?</i>	✓			<i>Lagenaria vulgaris</i>	✓			<i>L. angustatum</i>			
<i>Macbratnia reidii</i>	✓			<i>Burchardia congesta</i>				<i>Domandria preisii? micro?</i>	✓		
<i>Boraginaceae eliocarpa?</i>	✓			<i>Pentstemon peltatus</i>	✓			<i>Wine-leaved domandria</i>			
<i>Hibbertia hyp</i>				<i>Chaenactis coronata</i>				<i>Lomandra sp. narrow</i>	✓		
<i>Tetralix hirsuta</i>				<i>Strophelia hirsuta</i>	✓			<i>lede leaf</i>			
<i>Conostylis setosa</i>	✓			<i>Crossopetalum sp.</i>	✓			<i>Acacia nemosa? undulate leaf</i>	✓		
				<i>Malpighia reidii</i>				<i>Drosera erythrorhiza</i>			
<i>Astiloma pallidum</i>	✓			<i>Tricoryne line = G. eremita</i>				<i>Con. setosa</i>	✓		
<i>Hibbertia confertiflora</i>	✓			<i>Ag. stratum</i>				<i>Lechenaultia biloba</i>			
<i>Dampiera linearis</i>	✓			<i>Caesia micrantha</i>				<i>Mesembryanthemum</i>	✓		
<i>Grevillea pilulifera</i>	✓			<i>Haemodorum sp (R)</i>				<i>Stylidium affine</i>			
<i>Leptomeria (santalalese)</i>	✓										
<i>Kennedia coccinea</i>	✓										

Not
misic
as
omae
(stelo)britan
e. regit

soil loamy, gravelly clay. Orange-brown

BUSHLAND PLANT SURVEY RECORDING SHEET 3 - use pencil only

5. SPECIES PRESENCE

Label each plant with plants number, site code, date and plant's name or working name if required

SITE No G-DHL-151

Record on Sheet

Date 17.11.96

HERB SHEET

• Column 1 plant name

• Column 2 plant number

• Column 3 flowering time- TICK if species flowering

• Column 4 identification check

ID
1st 2nd on sheet

TREES	No	FI	ID	SHRUBS (cont.)	No	FI	ID	HERBS (cont.)	No	FI	ID
Eucalyptus laevis	✓		✓R	Dryandra lindeniana lindeniana	✓		✓	Dampiera linearis	✓		✓R
ADS: Calothamnus quadrifidus	✓		✓R	Isotoma humerata fulvis	✓		✓	Didymella revoluta var divaricata	✓		✓R
ADS: Eucalyptus wandoo	✓		✓R	Oxalis pycnostachya	✓		✓	Waltherbergia preissii	✓		✓R
				Centaurea erythraea	✓		✓	Stylidium bulbiferum (uncol)	✓		✓R
				Steranthemum emarginata	✓		✓	Agrostocrinum scabrum	✓		✓
Bossiaea sp. Wandoo	✓			Trifolium ligusticum	✓		✓	Lomandra caespitosa	✓		✓R
MALLEES				Neurachme alopecuroides	✓		✓	Lomandra micrantha	✓		✓R
Astroloma pallicum	✓		✓R	Bromus diandrus	✓		✓	Cassylina racemosa	✓		✓R
Leucopogon capitellatus	✓		✓R	GRASSES				Cassylina pomiformis	✓		✓R
Hypocalymma angustifolium	✓		✓R	Aira canyophylla	✓		✓R	Haemodorum discolor	✓		✓R
Trimalium ledifolium var rosmarinifolium	✓			Brija maxima	✓		✓R	Haemodorum laxum	✓		✓R
SHRUBS				Brija minor	✓		✓R				
Hibbertia ovata / commutata	✓		✓R	Microlaena stipoides	✓		✓	SEDGES			
Xanthorrhoea gracilis	✓			Eulalia longifolia	✓		✓	Mesomelaena tetragona	✓		✓R
Grevillea bipinnatifida	✓		✓R	Danthoria setacea	✓		✓	Tetraria octandra	✓		✓R
Lechenaultia biloba	✓		✓R	Stipa pycnostachya	✓		✓	Tetraria capillaris	✓		✓R
Leucopogon asper	✓		✓	Tetraria levis	✓		✓				
Hakea laevis capitata	✓		✓R	Avena barbata	✓		✓				
Acacia pulchella var pulchella	✓		✓R	HERBS							
Thomasia foliosa	✓		✓R	Romulea rosea	✓		✓R				
Grevillea pilulifera	✓		✓R	Dampiera alata	✓		✓R				
Hibbertia hypericoides	✓		✓R	Scaevola calyptera	✓		✓R				
Baeckea canthorismae	✓		✓R	Anagallis arvensis	✓		✓R				
Dryandra bipinnatifida	✓		✓R	Donchus olivaceus	✓		✓				
Phyllanthus calycinus	✓		✓R	Chamaecilla cymbosa	✓		✓				
Bossiaea eriophora?	✓			Milleria tenuifolia var tenuifolia	✓		✓				
Acacia alata subsp alata	✓		✓R	Stachys monogyna	✓		✓R				
Bossiaea eriocarpa	✓		✓R	Goodenia caerulea	✓		✓R				
Syntherisma gracillima	✓		✓R	Opecladia vaginatum	✓		✓R				
Macropamia reidii	✓		✓R	Conostylis setosa	✓		✓R				
Xanthorrhoea gracilis	✓		✓R	Burchardia congesta	✓		✓R				
Xanthorrhoea preissii	✓		✓R	Petersonia pygmaea	✓		✓				

The 135 species were classified according to similarities in their co-occurrences at the same quadrats (Figure DENT). The four assemblages defined from the dendrogram are assessed below in terms of the distributional characteristics and habitat preferences of their component species throughout their geographical ranges in Australia. Relevant data are summarised in Ehman (1992), Dell & How (1985), How *et al.* (1988), McKenzie *et al.* (1987b, 1992, 1994, 1995) and Wilson & Knowles (1988), as well as from data associated with previous collections from the study area that are annotated in Storr & Hanlon (1978, 1980, 1984).

- Assemblage_1: Species characteristically restricted to hummock grass communities on the red sandplains and dune fields of the arid zone, with their geographical ranges extending across middle and tropical latitudes.
- Assemblage_2: Species of semi-arid to arid temperate areas of the southern half of Australia, and its west coast, that favour the variety of sandy surfaces (hummock grasslands and shrublands).
- Assemblage_3: Widespread arid to semi-arid species, many of which are confined to finer textured soils, from loamy-sands and sandy-loams to alluvial plains and even samphire pans. Exceptions are *Eremiascincus fasciolatus* and *Moloch horridus*.
- Assemblage_4: Species favouring flood plains and riverine flats in arid Australia. The inclusion of four singleton species normally associated with rock surfaces (*Ctenophorus caudicinctus*, *Gehyra punctata*, *Morelia perthensis* and *Morethia ruficauda*) reflects the ecotonal position of the quadrat GJ1: low on the scree slope of the Pell range, 0.1 km from the floodways and levee banks of the Gascoyne River.

In Figure DENT, the 63 quadrats have been re-ordered in terms of similarities in their species composition. The sorting strategy yielded a quadrat-dendrogram that summarised the herpetofaunal patterns of occurrence. Univariate data on aspects of the quadrat's physical environments were superimposed as a histogram on this dendrogram, attribute-by-attribute. This iterative process allowed us to identify the physical attributes that most closely conformed to the classification structure (the herpetofaunal patterns). Precipitation in the wettest quarter (PwetQ) and Temperature diurnal range (TdiurRa) provided the best fits, although average temperature in the coldest quarter (TcldQ), soil potassium ($K(H_2CO_3)$), carbon (C6) and electrical conductivity (EC) also showed significant but distinct relationships to the herpetofaunal patterns (**Fig dendo-histo1a-e**).

- Precipitation seasonality (Pseas), PcldQ, -TwarQ, annual precipitation (Pann), Latitude and C6 showed the same relationship as PwetQ.
- Similarly, temperature annual range (TannRa) and Longitude showed the same relationship as TdiurRa.
- Latitude showed a reciprocal, but otherwise similar, relationship to that of average temperature in the coldest quarter (TcldQ).
- $P(H_2CO_3)$, P, exK, exMg and -sandiness showed the same relationship to herpetofaunal patterns as $K(H_2CO_3)$.
- Soil nitrogen (N) and exchangeable calcium (exCa) conformed with the carbon (C6) relationship.
- The electrical conductivity relationship was tracked by soil cation exchange capacity (CEC), exchangeable sodium (exNa), $pH(H_2O)$ and $pH(CaCl_2)$.

12/10/1981

bag 11/ter

10-2000

Haemodorum sp

BUSHLAND PLANT SURVEY RECORDING SHEET 3 - use pencil only

5. SPECIES PRESENCE

Label each plant with plants number, site code, date and plant's name or working name if required

SITE No GOHLØ1

Record on Sheet

Date 17.11.96

Rescore 15.12.96

- Column 1 plant name
- Column 2 plant number
- Column 3 flowering time- TICK if species flowering
- Column 4 identification check

Colohan. quad.
ADS. E. wandoo

many wide, spreading leaves
opp-leaved drist weed ✓
Chamosila corymbosa ✓
phr fu

TREES	No	FI	ID	SHRUBS (cont.)	No	FI	ID	HERBS (cont.)	No	FI	ID
E laeolai	✓			Astroloma sp. (Leuco. capitellatus)	✓			Cassytha sp.	✓		
(check for wandoo) -	no			Dianella repulsa / Stipaandrasp	✓			Haemodorum sp.	✓		
				Xan. gracilis	✓			Sorbus decaris			
SHRUBS				Acacia alata	✓			Briza minor	✓		
Hakea lissocarpa	✓			Dampiera alata	✓			Conostylis sp. setosa	✓		
Xan. dreisii	✓			Dampiera linearis	✓			Arctostaphylos	✓		
MALKEES				Myrtus sp. (R)				Oralis sp.	✓		
Hibba hypericoides	✓			12. stroules				Alt-leaved "Tricoryne"	?		
Stackhousia sp.	✓			GRASSES				Paterisoria pygmaea			
Phyllanthus calycinus	✓			Briza maxima	✓			Leveshookia pusilla			
Baeckea carphor	✓			Stipa elegantior	✓			Doelia sp.			
SHRUBS				Avena sp.	✓			Danthonia sp.	✓		
Trochilium bipinnatifida	✓			Newmachne alopecuroides	✓			Crepidula pilulifera	✓		
Myrtus				Hairy-leaved grass	✓			SEDGES			
Dyandra bipinnatifida	✓			Tetras Tetrahebrae laevis	✓			Mesomelasma tetragona	✓		
Lechenaultia biloba	✓			Tetras				Tet. octandra	✓		
Hypochaeris angustifolium	✓			Ranunculus vosei to yes R.R.	✓			Tet. capillaris	✓		
Hibbertia communata	✓			Aira caryophyllae	✓			Lepidoperna terete small	✓		
Synedrella sp.	✓			HERBS				Lepidoperna angustatum	✓		
Acacia pulchella	✓			Opuntia echinocarpa	✓			Lomandra dreisii	✓		
Macrozamia reidii	✓			Burchardia ronsa	✓			Lep. kale. scabrous	✓		
Lechenaultia biloba	✓			Scaevola phaeopetala	✓			Small domandia sp.			
Astroloma pallidum	✓			Danthonia - mid grass				✓ - narrow-leaved Haemodorum			
Templetonia? Stenanthemum				Small mid grass	✓			Dyandra nives	✓		
Isoetes asps				Walterbergia. etc.	✓			Melba? sp?			
				Trifolium sp.							
Anthropodium capillipes				Thomazia filosa	✓			Goodenia caerulea (R)			
Bassia eriocarpa (R)				Stypanera glauca (R)				Trigonium seedling? (R)			
								2 species x cassytha (R)			
				Stylidium bulbiferum (R)							

Don't see 2-10%
in rescore GCHL02

100%

check seedling M. scabra

BUSHLAND PLANT SURVEY RECORDING SHEET 3 - use pencil only

5. SPECIES PRESCENCE

Label each plant with plants number, site code, date and plant's name or working name if required

SITE No GCHL02

Record on Sheet

Date 17.11.96

• Column 1 plant name

• Column 2 plant number

• Column 3 flowering time- TICK if species flowering

• Column 4 identification check

quartzite exposed rock

Hypochaeris glabra (R)

E. cal = 2-10%
20m tree

TREES	No	FI	ID	SHRUBS (cont.)	No	FI	ID	HERBS (cont.)	No	FI	ID
<i>E. calophylla</i> (saplings)	✓			<i>Xanthopia cordata</i>				<i>Cassipoua</i> sp.	✓		
<i>6. calophylla</i>	✓			<i>Dryandra nux</i>	✓			<i>Haemodorum</i> sp.	✓		
(ADS)				single-leaf <i>Ptilosoma</i>				uncl. climbing plant			
SHRUBS				<i>Thymelaea crinita</i>				<i>Xanthopia?</i>			
<i>Melaleuca scabra</i>	✓			<i>Hypocalymma angustifolium</i>	✓			<i>Tel. nuda</i>	✓		
MALLEES				<i>Baeckea androsmae</i>	✓			<i>Nolana</i> sp.			
<i>Dryandra armata</i>	✓			<i>Tymalium</i> (check also in GCHL01)				<i>Ara. canophyllae</i>			
<i>O. Kunzea</i> sp.	✓			<i>Isopogon asper</i>	✓			<i>Briar minor</i>	✓		
<i>Hakea undulata</i>	✓			GRASSES				<i>Vulpia</i> sp.			
<i>Allocasuarina humilis</i>	✓			<i>Microlema</i> sp. // Poz!				<i>Dobelia</i> sp.	✓		
SHRUBS				<i>Briar maxima</i>	✓			<i>Levenhookia pusilla</i>			
<i>Acacia pulchella</i>	✓			<i>Stipa</i> sp.	✓			<i>Daucus glachidiatus</i>			
<i>Hibbertia hypericoides</i>	✓			<i>Nerachne alpestrisoides</i>	✓			<i>Centrolepis? drummondii</i>			
<i>Phyllanthus calycinus</i>	✓			<i>Drosera monziesii</i>				SEDGES			
<i>Xen. preisi</i>	✓			<i>Ptilosoma spumosa</i>	✓			<i>Tetraria capillaris</i>	✓		
<i>Xen. gracilis</i>	✓			<i>Dactyloctenium</i> sp.	✓			<i>Lonandria</i> sp. - broad, purple row growth	✓		
<i>Hakea latifolia</i>				<i>Doronicum ciliolatum</i> - white	✓			→ <i>hemachidites?</i>			
<i>Hakea stenocarpa</i>	✓			<i>Anaerostoma corymbosa</i>				<i>Hydrochyle</i> sp.			
<i>Hakea issocarpa</i>	✓			HERBS				<i>Tel. oct</i>	✓		
<i>Macrozamia reidii</i>	✓			<i>Tetratheca nuda</i>	✓			<i>Lonandria preisi</i> ?? <i>micranthi</i> !	✓		
<i>Styphelia tenuifolia</i> - L. prop.	✓			<i>Legenifera huglii</i>	✓			<i>rep. angustatum</i>			
<i>Asroloma pallidum</i>	✓			<i>Dobelia</i> sp.	✓			<i>Lopidocarpus</i> - narrow, leaf	✓		
<i>Petrophile stricta</i>	✓			<i>Agrostocrinum scabrum</i>	✓			<i>epidosperm</i> - small	✓		
<i>Tymalium ledifolium</i>	✓			<i>Burchardia congesta</i>	✓			smooth tree			
<i>Leucophaea</i> sp. <i>pulchellus</i>	✓			<i>Corostylis setosa</i>	✓			<i>Anagallis arvensis</i>			
<i>Couch. marginatum</i>	✓			<i>Tricoline spumatum</i>				<i>Romulea rosea</i>			
<i>Hibb. minutata</i>	✓			<i>Mimelia spinescens</i> // <i>Cupressus</i> ? (NF)				<i>Crassula</i> sp.			
<i>Boswellia ornata</i>	✓			5-leaflet pea seedling				<i>stylidium calcaratum</i>			
<i>Grevillea ptilulera</i>				<i>Opuntia peltata</i> var.	✓			<i>Alternanthera</i> - leaf <i>Drosera</i>			
<i>Amorpha foetida</i>				<i>Tricoline elatior</i>				<i>Billardiera</i> sp.	✓		
<i>Tetrastemon laevis</i> (R)				<i>Tetrastemon laevis</i>				leaf - large leaf, smooth	✓		
				<i>Burchardia congesta</i> (R)				over 50cm!			

Not seen on rescore

Lobelia sp. (white)

↳ (*isotoma lycopodiifolia*)

381 4062

L. sericea

BUSHLAND PLANT SURVEY RECORDING SHEET 3 - use pencil only

5. SPECIES PRESENCE

Label each plant with plants number, site code, date and plant's name or working name if required

SITE No GOHL02

Record on Sheet

Date 17.11.96

15.12.96 (R)

- Column 1 plant name
- Column 2 plant number
- Column 3 flowering time- TICK if species flowering
- Column 4 identification check

1st 2nd 3rd sheet

TREES	No	FI	ID	SHRUBS (cont.)	No	FI	ID	HERBS (cont.)	No	FI	ID
Eucalyptus calophylla (sapling)	✓	✓	✓	Gonocarpus cordiger	✓	✓	✓	Tricoryne elatior	✓	✓	✓
ADS: Euc. calophylla	✓		✓	Darwinia citriodora	✓	✓	✓	Pterisantha pygmaea	✓	✓	✓
				Hakea stenocarpa	✓	✓	✓	Burchardia longista	✓	✓	✓
				Phyllanthus calycinis	✓	-	✓	Agrostocrinum scabrum	✓	✓	✓
				Xanthorrhoea preissii	✓	-	✓	Conostylis setosa	✓	✓	✓
SHRUBS				Xanthorrhoea gracilis	✓	-	✓	Centropogon drummondiana	✓	✓	✓
Bossiaea laevigata	✓			Macrozamia riedlii	✓	-	✓	Caspeedia varifolia	✓	✓	✓
Acacia pulchella var pulchella	✓	✓	✓	Dryadobla lindleyana sp. lindleyana	✓	-	✓	Lotus angustissimus	✓	✓	✓
Billardiera parviflora subsp. gillata	✓	✓	✓	GRASSES				Lotus sp. sterile	✓	✓	✓
Hibbertia hypericoides	✓	✓	✓	Briza maxima	✓	✓	✓	Wahlbergia preissii	✓	✓	✓
Moraccharia humilis	✓	✓	✓	Briza minor	✓	✓	✓	Thelymitra crinita	✓	✓	✓
Hakea dissocarpa	✓	✓	✓	Aira canyophylla	✓	✓	✓	Cassipoua pariformis	✓	✓	✓
Tymalium ledifolium var. rhamnifolium	✓	✓	✓	Avena (sterile) sp.	✓	✓	✓	Lomandra sericea	✓	✓	✓
Asterolaena pallidum	✓	✓	✓	Stipa pycnostachya	✓	✓	✓	SEDGES			
Isopogon asper	✓	✓	✓	Tetrarrhena laevis	✓	✓	✓	Tetraria capillaris	✓	✓	✓
Leucopogon propinquus	✓	✓	✓	Vulpia myuros	✓	✓	✓	Tetraria octanetra	✓	✓	✓
Dryadobla armata	✓	✓	✓	Poa drummondiana	✓	✓	✓				
Kurzea micrantha	✓	✓	✓	Danthonia sp.	✓	✓	✓				
Allocasuarina humilis	✓	✓	✓	HERBS							
Petrophile striata	✓	✓	✓	Burchardia longista	✓	✓	✓				
Melaleuca aff. scabra	✓	✓	✓	Hypochaeris glabra	✓	✓	✓	HERBS			
Grevillea pilulifera	✓	✓	✓	Opercularia vaginatum	✓	✓	✓	Haemodorum laxum	✓	✓	✓
Hypocalymma angustifolium	✓	✓	✓	ADS: Daucus glochidiatus	✓	✓	✓	Drosera nemorosii	✓	✓	✓
Baekia camphorosmae	✓	✓	✓	Levenhookia pusilla	✓	✓	✓	Isotoma hypochaeritiformis	✓	✓	✓
Leucopogon pulchellus	✓	✓	✓	Millotia? tenuifolia (sterile)	✓	✓	✓	Tetrarrhena nuda	✓	✓	✓
Isopogon asper	✓	✓	✓	Romulea rosea	✓	✓	✓				
Gonolobium marginatum	✓	✓	✓	Anagallis arvensis	✓	✓	✓	Dielsia crinita	✓	✓	✓
Hibbertia commutata	✓	✓	✓	Xanthesia candida	✓	✓	✓	Haemodorum discolor	✓	✓	✓
Grevillea pilulifera (seedling)	✓	✓	✓	Daucus glochidiatus	✓	✓	✓	Neurachne alopecuroides	✓	✓	✓
Bossiaea eriocarpa	✓	✓	✓	Chaenactis composita	✓	✓	✓	Lomandra micrantha	✓	✓	✓
Bossiaea sp. Wreocarpa	✓	✓	✓	Lagotis sp. Huegelii	✓	✓	✓				
Cryptanthus aviculiflorus	✓	✓	✓	Trichostema spatulatum	✓	✓	✓				

* Recorded during our survey, but not on quadrats.

Patterns in the richness and Composition of Assemblages

We found 135 species on our quadrats during the sampling program (Table RR1): 12 frogs, 17 geckos, 11 pygopids, 16 dragons, 57 skinks, 4 goannas and 18 snakes. This list includes a number of taxonomic sub-divisions of species previously known from the study area, as well as 4 species recorded in the study area for the first time:

Pseudophryne guentheri, *C. calurus*, *C. piankai*, and *Vermicella multifasciata* (see Table PR and Aplin *et al.*, this publication).

We recorded 16.3 $\pm$ 5.6(s.d.), n=63 species on the average quadrat (Table QR).

Quadrats on saline claypans were poorest in species (NA1, PE1, BB3, CU1: 4.3 $\pm$ 2.0, 4), while those on red sand dunes were the richest (BB4, BO5, CU3, KE1, MR3, PE2, PE5: 22.9 $\pm$ 4.2, 7). Quadrats that had been regularly grazed by stock, feral goats and/or rabbits (BB, BO, CU, EL, GJ, KE3-5, MD, MR, NA1, NE2-5, PE, WO and ZU1-3: 16.1 $\pm$ 5.9, 54)) were not significantly poorer in species than those elsewhere in the study area (KE1-2, NA2-5, NE1, ZU4-5: 17.1 $\pm$ 2.8, 9). Even those in overtly degraded condition, with sheet erosion and virtually no leaf litter or A1 soil-horison remaining, retained similar richness (16.8 $\pm$ 4.1, 10: BO5, GJ4-5, KE4, MD1-2,4-5, PE4 and WO1).

High levels of syntopy were recorded among *Ctenotus* and *Lerista* species. The average quadrat supported 5.0 $\pm$ 2.4 s.d. (n= 63) species belonging to these two genera. Quadrats representing the red sand with hummock grass environments that dominate Australia's arid zone (BB4, PE2,5, CU2-5, MR2-5, NE1, KE1-2) were significantly richer in these species than were quadrats representing the other environments in the study area, including red dunes without hummock grass: 7.8 $\pm$ 1.6 (14) species (comprising 3.4 $\pm$ 2.1 *Ctenotus* and 4.4 $\pm$ 1.5 *Lerista*) versus 4.2 $\pm$ 1.9 (49) (comprising 0.9 $\pm$ 0.7 *Ctenotus* and 3.4 $\pm$ 1.6 *Lerista*).

Table QR. Herpetofaunal species richness per quadrat

Campsite	Quadrat					
	1	2	3	4	5	6
BB	16	16	6*	19	15	
BO	14	10	22	18	18	
CU	6	18	23	16	17	23
EL	15	10				
GJ	16	20	20	17	23	
KE	22	18	8	7	6	
MD	17	20	18	17	17	
MR	18	28	32	26	20	
NA	1	15	20	19	16	
NE	17	14	13	16	11	
PE	4	22	18	19	24	
WO	13	14	13	13	18	
ZU	16	12	22	13	14	

* 11 if sandy patch species are included.

BUSHLAND PLANT SURVEY RECORDING SHEET 2 (Mulr)- use pencil only

3. VEGETATION STRUCTURE AND COVER

For each layer record - appropriate life form, cover class (see below) and dominant species in each layer.

Cover Class	2-10%	10-30%	30-70%	over 70%
-------------	-------	--------	--------	----------

LIFE FORM	TREES			MALLEES	
	over 15m	5-15m	under 5m	over 8m	under 8m
					
COVER CLASS (%)	16-30%				
DOMINANT SPECIES	<i>P. mangrove</i> <i>E. wandoo</i> <i>E. calophylla</i>				
	SHRUBS → coded as forest			SHRUBS	
	over 2m	2m - 1.5m	1.5 - 1m	1 - 0.5m	under 0.5m
					
COVER CLASS (%)			16-30%	10-30 30-70%	
DOMINANT SPECIES			<i>X. gracilis</i> <i>H. amplexicaulis</i> <i>X. preissii</i> <i>H. cydocarpa</i>	<i>H. lissocarpa</i> <i>X. gracilis</i> <i>Aracia dumondii</i>	<i>Dry. nivea</i> <i>Hibb. hyperi.</i> <i>Astroloma sp.</i> <i>Phy. cal.</i>
	GRASSES		HERBS	SEDGES	
	over 0.5m		under 0.5m		
					
COVER CLASS (%)	2-10%		30-70%		
DOMINANT SPECIES	<i>Scaevola phibopetia</i> <i>Dampiera alata</i> <i>Dampiera linearis</i>		<i>Tet. cap</i> <i>Tet. oct</i> <i>lep. smooth terete</i>		

4. VEGETATION CONDITION

Comments

GOHLØ3. Upland Jarrah. Few weeds
logging history → prob. logged.
Rich clayey spur w. *E. laetiae* &
E. wandoo

Has been burnt

74.a.
754.a.

condn
→ code
= 145
2

Rich
Orange-brown
gravelly,
loamy clay

BUSHLAND PLANT SURVEY RECORDING SHEET 3 - use pencil only

5. SPECIES PRESENCE

Label each plant with plants number, site code, date and plant's name or working name if required

SITE No COHL 63

Record on Sheet

Date 17.11.96

15.12.96 (R)

- Column 1 plant name
- Column 2 plant number
- Column 3 flowering time- TICK if species flowering
- Column 4 identification check

TREES	No	FI	ID	SHRUBS (cont.)	No	FI	ID	HERBS (cont.)	No	FI	ID
<i>Eucalyptus marginata</i>	✓	✓	✓	<i>Macorania viedtii</i>	✓	-	✓	<i>Goodenia caerulea</i>	✓		✓
<i>Eucalyptus wandoo</i>	✓	-	✓	<i>Clematis pubescens</i>	✓	-	✓	<i>Chamaecilla corymbosa</i>	✓		✓
<i>Eucalyptus calyphylla</i>	✓	-	✓	<i>Lechenaultia biloba</i>	✓	-	✓	<i>Daucus glochidiatus</i>	✓	✓	✓
<i>Eucalyptus laelae</i>	✓	-	✓	<i>Stylidium junceum</i>	✓	✓	✓	<i>Crocia micrantha</i>	✓	✓	✓
<i>Acacia obovata</i>	✓	-	✓	<i>Billardiera parviflora</i> var <i>guttata</i> (sterile)	✓	✓	✓	<i>Hypochaeris glabra</i>	✓	✓	✓
SHRUBS				<i>Drosera erythronitiza</i>	✓	✓		<i>Comesperma virgatum</i>	✓		✓
<i>Xanthorrhoea gracilis</i>	✓	-	✓	<i>Drosera macrantha</i>	✓	✓		<i>Caladrea longicauda</i> sp			
<i>Leucopogon capitellatus</i>	✓	✓	✓					<i>longicauda</i>	✓		✓
<i>Daviesia preissii</i>	✓	✓	✓	GRASSES				<i>Cassipoua porriiformis</i>	✓	✓	✓
<i>Astroloma pallidum</i>	✓	✓	✓	<i>Poa drummondiana</i>	✓	✓	✓	<i>Lomandra brittanii</i>	✓	✓	✓
<i>Hypocalymma robustum</i>	✓	✓	✓	<i>Briza maxima</i>	✓	✓	✓	<i>Lomandra nigricans</i>	✓	✓	✓
<i>Phyllanthus calycinus</i>	✓	✓	✓	<i>Briza minor</i>	✓	✓	✓	<i>Lomandra sericea</i>	✓		✓
<i>Labiichea punctata</i>	✓	✓	✓	<i>Aira caryophylla</i>	✓	✓	✓	<i>Lomandra caespitosa</i>	✓		✓
<i>Isopogon sphaerocephalus</i>	✓	✓	✓	<i>Stipa pycnostachya</i>	✓	✓	✓	SEDGES			
<i>Hibbertia acerata</i>	✓	✓	✓	<i>Tetrarrhena laevis</i>	✓	✓	✓	<i>Mesomelaena tetragona</i>	✓	✓	✓
<i>Hibbertia amplexicaulis</i>	✓	✓	✓	<i>Danthonia setacea</i>	✓	✓	✓	<i>Tetraria capillaris</i>	✓	✓	✓
<i>Olearia paucidentata</i>	✓	✓	✓	<i>Dichelachne crinita</i>	✓	✓	✓	<i>Tetraria octandra</i>	✓		✓
<i>Hibbertia quadrilobata</i>	✓			HERBS				<i>Lomandra nigricans</i>	✓	✓	✓
<i>Acacia patericola</i>	✓	✓	✓	<i>Dampiera lineavis</i>	✓	✓	✓				
<i>Hakea lissocarpa</i>	✓	✓	✓	<i>Scaevola calyptera</i>	✓	✓	✓				
<i>Leptomeria cunninghamii</i>	✓	✓	✓	<i>Dampiera alata</i>	✓	✓	✓				
<i>Grevillea pilulifera</i>	✓	✓	✓	<i>Myliodium schoenoides</i>	✓	✓	✓	→ recorded as S. affine.			
<i>Symphelia tenuiflora</i>	✓	✓	✓	<i>Craspedia variabilis</i>	✓	✓	✓				
<i>Dryandra lindleyana</i> splindly	✓	✓	✓	<i>Thysanotus thysoides</i>	✓	✓	✓				
<i>Hibbertia hypericoides</i>	✓	✓	✓	<i>Stylidium amoenum</i>	✓	✓	✓				
<i>Hakea cyclocarpa</i>	✓	✓	✓	<i>Lagotis huogelii</i>	✓	✓	✓				
<i>Astroloma ciliatum</i>	✓	✓	✓	<i>Peltapeltis peltigera</i>	✓	✓	✓				
<i>Boronia eriogona</i>	✓	✓	✓	<i>Tetraneura hirsuta</i>	✓	✓	✓				
<i>Daviesia preissii</i>	✓	✓	✓	<i>Conostylis setosa</i>	✓	✓	✓				
<i>Boronia</i> sp. <i>waroona</i> ?	✓	✓	✓	<i>Kennedia coccinea</i>	✓	✓	✓				
<i>Hakea amplexicaulis</i>	✓	-	✓	<i>Burchardia congesta</i>	✓	✓	✓				
<i>Acacia alata</i>	✓		✓								

THIS IS REAL & ENTERED!

The physical attributes within each of these six sets were strongly inter-correlated and, in general, the climatic attributes provided tighter fits (higher Kruskal-Wallis values) to the classification structure (that summarises the herpetofaunal patterns) than did the soil attributes (**Table histo1**). The geomorphological attributes did not emerge.

Table histo1. Kruskal-Wallis values for physical attributes that showed significant (<0.05) differences between groups of quadrats that had been clustered in terms of their herpetofaunal similarities (**Fig. dendo-histo1**). Attribute inter-correlations are also listed (Kendall's Tau; * = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$, ns = not significant).

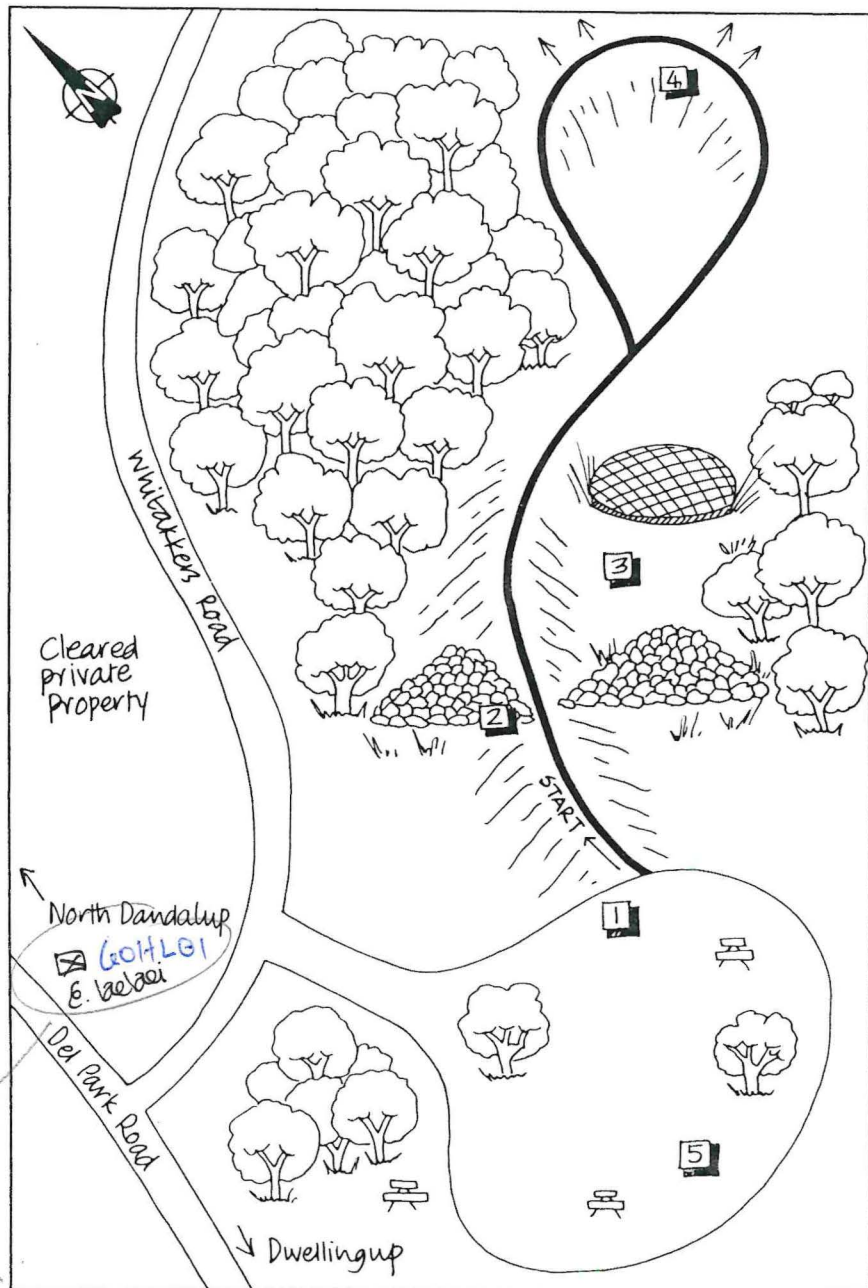
Attribute	Kruskal-Wallis value		Kendall's Tau (prob.) from Appendix 2.
	6-groups	15 groups	
PwetQ	48	60	
PcldQ	46	54	0.95 (***)
Pseas	49	56	0.81 (***)
TwarQ	42	58	- 0.84 (***)
Pann	38	60	0.74 (***)
TdiurRa	27	56	- 0.46 (***)
Longitude	32	55	0.80 (***)
TannRa	26	55	0.95 (***)
Altitude	21	51	0.58 (***)
TcldQ	16	55	- 0.27 (***)
Latitude	11	58	- 0.81 (***)
K(H ₂ CO ₃)	30	52	- 0.34 (***)
exK	31	50	0.89 (***)
sand	28	38	- 0.42 (***)
exMg	18	40	0.63 (***)
P	18	35	0.52 (***)
P(H ₂ CO ₃)	16	41	0.54 (***)
C6	35	43	0.57 (***)
N6	25	33	0.65 (***)
exCa	21	34	0.32 (***)
EC	23	34	0.16 (ns)
pH(CaCl ₂)	21	42	0.65 (***)
pH(H ₂ O)	18	41	0.59 (***)
exNa	17	29	0.56 (***)
CEC	15	30	0.58 (***)

Several distinct step-wise structures dominate both the quadrat- and the species-dendrograms. Such structures would occur if the species-assemblages were responding to different gradients in the physical environment or differently to sub-sets of environmental gradients (McKenzie et al. 1989, 1991a). To test this hypothesis, the four species-assemblages were treated as independent data-sets and analysed separately using the above analysis pathways.

- Assemblage_1's dendrogram structure showed a close, significant fit to the gradient in TdiurRa and, within that, to pH(H₂O)(**Fig. Histo_assem1**). The pH relationship was only significant in the context of high TdiurRa environments. Although TdiurRa

☑ Jarrah GCHLO3

☑ heath GCHLO2



Goldmine Hill Walk

41

Quartz

Length: 400 metres return

Grade: 2

Walk time: 15 minutes

Although this is quite a short walk, it has been included because of its interesting features and proximity to the popular Goldmine Hill picnic site. It affords good views of the Peel Inlet and Swan Coastal Plain. Along the walk is a diversity of vegetation including salmon white gum, wandoo, and dwarf mountain marri.

- 1 The trailhead sign (north-east side of the carpark). From here, the trail leads up a steep, slippery incline.
- 2 Mullock heap. This shows the different rocks that were dug from the mineshaft as miners dug for gold.
- 3 Mineshaft. The shaft, which is covered by a grill, is approximately 7.5 metres deep. No gold was found in the area.
- 4 Lookout. Good views of the Peel Inlet and Swan Coastal Plain.
- 5 Picnic area. Good for fossicking with evidence of prospecting.

John Hanel

Where is it?: 65 km south of Perth via South-West Highway, Del Park Road and Whittaker Road.

Travelling time: 1 hour 30 minutes.

Facilities: BBQs and carpark.

On-site information: Trailhead sign.

Best season: All year.

E. lane-pollen

E. wandoo

E. haemotoxylon